SOVEREIGN CATASTROPHE MANAGEMENT IN ASEAN



ASEAN NATURAL DISASTER RESEARCH WORKS SHARING

ASEAN INSURANCE COUNCIL

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FOREWORD

Since 2019 ASEAN Insurance Council (AIC) meeting in Myanmar, all ANDREWS (ASEAN Natural Disasters Research and Works Sharing) delegates of the ASEAN Member States have agreed to put back ANDREWS into the original intention why it was established, i.e., to create research and work programs for the benefit of all members. Therefore, three programs were agreed upon, i.e., Agricultural Insurance in ASEAN, Sovereign Catatsrophe Management in ASEAN and collaboration between ANDREWS and ARWC (ASEAN Reinsurance Working Committee). During the course of the preparation years later, two revisions have been made. One, discontinuing the third program, i.e. collaboration of ANDREWS and ARWC and; two, creating a sub-committee under ANDREWS to focus in handling Agricultural insurance program, as the members thought, it was very important as rice is the most consumed food in ASEAN and the world is now facing climate change seriously.

We dedicate this Sovereign Catastrophe in ASEAN write-up for all country members so that this write-up can be shared. In the future, we will review and revise this write-up in relation with the changing conditions.

With the Spirit of ONE ASEAN,



Heddy Agus Pritasa
ANDREWS Chairman

CHAPTER 1
INTRODUCTION

1.1. Increased Number of Disasters

The number of disasters have significantly increased. A United Nations report in 2020 titled “The Human Cost of Disaster 2000 – 2019” states the following:

Description	**1980 - 1999**	**2000 – 2019**
No. of floods	1,389	3,254
No. of storms	1,457	2,034
Total climate-related events	3,656	6,681
Total major recorded disaster events	4.212	7,348
No. of lives claimed	1.19 million	1.23 million
No. of people affected	3.25 billion	4.2 billion
Global economic losses	USD 1.63 trillion	USD2.97 trillion

Table 1.1. Increased number of Disasters

There has also been a rise in earthquakes and tsunamis and these two events have killed more people than any of the other natural hazards under review. The report also records major increase in drought, wildfires and extreme temperature events.

Asia suffered the highest number of disaster events. Between 2000 and 2019 there were 3,068 disaster events in Asia, followed by 1,756 events in the Americas and 1,192 events in Africa.

In terms of affected countries, the highest number of disaster events occurred at the following countries:

1. China (577 events)
2. USA (467 events)
3. India (321 events)
4. Philippines (304 events)
5. Indonesia (278 events)

The largest single event by death toll was the 2004 Indian Ocean Tsunami with 226,400 deaths. The second was the 2010 earthquake of 7.0 magnitude in Haiti killing approximately

222,000 people and leaving millions homeless. The average number of deaths worldwide from 2000 to 2019 was approximately 60,000 deaths per year.

The Global Assessment Report (2022) released by the UN Office for Disaster Risk Reduction (UNDRR) reveals that between 350 to 500 medium to large scale disasters took place every year over the past two decades. Human activity and behaviour is contributing to an increasing number of disaster across the world, putting millions of lives in danger, together with a wide range of social and economic gains over recent decades.

1.2. Global Mitigation

Due to the increased number of disaster, it is important for countries to strengthen their disaster risk governance. At a World Conference in 2015, the world has adopted Sendai Framework for Disaster Risk Reduction, and by 2020, 93 countries have put national strategies for disaster risk reduction in place.

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines the following seven targets:

1 Reduce global disaster mortality
2 Reduce the number of affected people globally
3 Reduce direct economic loss in relation with GDP
4 Reduce disaster damage to critical infrastructure and disruption of basic services
5 Increase the number of countries with national and local disaster risk reduction strategies
6 Substantially enhance international cooperation to developing countries
7 Increase the availability of and access to multi-hazards early warning systems and four priorities for action to prevent new and reduce existing disaster risks:
    - Understanding disaster risk
    - Strengthening disaster risk governance to manage disaster risk
    - Investing in disaster reduction for resilience and
    - Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

It aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years.

The framework works hand in hand with other agreement such as Paris Agreement on Climate Change and Addis Ababa Action Agenda on Financing for Development and also the Sustainable Development Goals. The Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on March 18, 2015.

1.3. Regional Mitigation

Countries of the ASEAN region are fully aware that the region is prone to disaster, hence it continues to enhance its regional mechanism for cooperation, coordination, technical assistance and resource mobilisation in all aspects of disaster management under the framework of the ASEAN Agreement on Disaster Management and Emergency Response (AADMER). AADMER serves as a comprehensive regional framework and policy backbone for disaster management and emergency response in ASEAN.

To address the current risks and future threats and to adapt to the changing humanitarian landscape the ASEAN Committee to Disaster Management (ACDM) came up with ASEAN Vision 2025 on Disaster Management. It charts the strategic direction that ASEAN needs to embark on and identifies the key areas to move the implementation of AADMER forward to a people-centred, people-oriented, financially sustainable and network approached by 2025.

ASEAN has also established ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) which is an inter-governmental organisation aiming to facilitate cooperation and coordination among ASEAN Member States and with the United Nations and international organisation for disaster management and emergency response. AHA Centre reports it progress and activities to ACDM on regular basis. ACDM members consists of heads of NDMOs (National Disaster Management Organisation) of the ten ASEAN Member States who serve as the governing board of AHA Centre.

AHA Centre carry out several tasks including Disaster Monitoring, Preparedness and Response and Capacity Building.In Disaster Monitoring, AHA Centre aims to reduce loss of life and damage to property from natural disasters through the identification of hazards and risks prior to impacts and by increasing warning time. It works closely with the National Disaster Management Organisations (NDMOs) of all ten ASEAN Member States in monitoring and sharing information about hazards and disasters in the region. Additionally, the AHA Centre also closely monitor the hazards and earth observation as well as early warning releases by hydro-meteorological and geological agencies of ASEAN Member States. Information management and information dissemination may help strengthen the coordination efforts of assisting Parties when responding to potential as well as actual disasters. Early identification of hazards and risks can help accelerate the activation of early warning alerts to reduce potential losses in the face of disasters. Thereby, the AHA Centre regularly monitor and updates the situation through various platforms and tools.

As part of its Preparedness and Response efforts, the AHA Centre develops various tools and guidance to accelerate the mobilisation of resources between ASEAN Member States and its partners in times of disasters. Some of the available resources include stockpiled relief items and ASEAN Emergency Response and Assessment Team. To build a

disaster-resilient region, the AHA Centre supports the National Disaster Management Organisations across ASEAN Member States through capacity building.

CHAPTER 2
CATASTHROPE PROFILES IN EACH ASEAN COUNTRIES

2.1. BRUNEI DARUSSALAM

2.1.1 Catastrophe Profile

The explanation below will discuss the geographical locations and geological profiles of the country.

2.1.1.1 Geographical Location

Brunei Darussalam is in South-East Asia, situated along the northern coast of the Borneo Island and shares border with Sarawak and Sabah of Malaysia.

2.1.1.2 Geological Profile

Due to its geographical location, Brunei does not have volcanoes and is free of volcanic eruptions, earthquakes, typhoons, and tsunami. The climate of Brunei is generally hot and wet throughout the year with high humidity rates and periodic monsoon rains. The average monthly rainfall indicates seasonal patterns with two maxima (December being the wettest) and two minima (February being the lowest minimum).

2.1.2. Disaster Risk Profile

Natural hazard experienced by Brunei mainly consist of:

a.Flooding
b.Landslides
c.Forest Fires
d.Haze

According to the Brunei Disaster Management Reference Handbook, 2018, recent history of natural disasters includes:

a. Flash floods in June 2018;
b. Flash floods and landslides in December 2017, caused by heavy rains and strong winds due to tropical storm Kai-Tak;
c. Flood and landslide in January 2014; and
d. Flooding of the Capital of Bandar Seri Begawan in January 2010.

2.2. CAMBODIA

2.2.1. Hazards and Climate Change

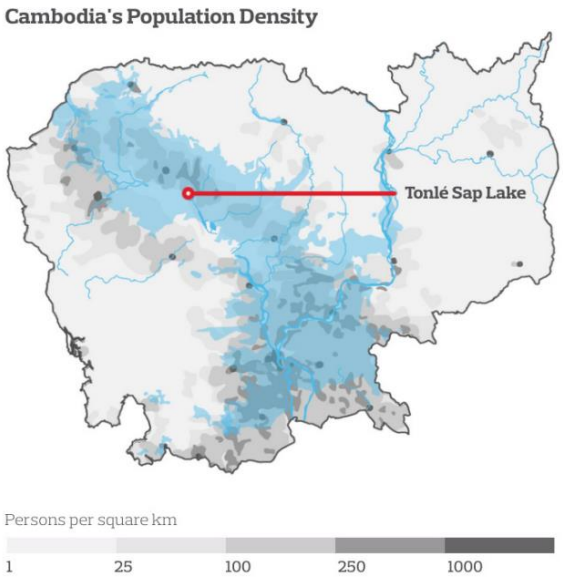
Cambodia is exposed to nearly all types of hydrometeorological hazards from floods to droughts, heavy storms, typhoons and lightning strikes. Additionally, the Strategic National Action Plan for Disaster Risk Reduction recognizes disease outbreaks (such as cholera, malaria, and dengue), climate change impacts, fires, and technological hazards as potential triggers of disasters (NCDM & Ministry of Planning, 2009). However, the geographical characteristics of the country contribute to varying exposure; for example, the floodplains along the Mekong are more exposed to river flooding, whereas the mountain ranges (such as the Cardamom) have a higher risk of localized landslides and flash flooding (GFDRR, 2019). Storms and typhoons in Cambodia are often not considered a significant threat as the country is sheltered by mountain ranges which lessen the impacts (NCDM & Ministry of Planning, 2009). Cambodia has two seasons – a dry season from November to April, followed by the monsoonal rains lasting for six months, (NCDM, 2014), which bring 80 percent of the annual rainfall. However, there is a dry spell occurring during the monsoon, lasting generally from two to three weeks between July and August, during which droughts may occur depending on the region (NCDM, 2014).

In 2015, Cambodia experienced its worst drought in 50 years; 2.5 million people were severely affected across 25 provinces (UNDP, 2019). Droughts have a severe impact on the rural populations who rely on subsistence agriculture, and lack of rainfall correlates with decreased production because artificial irrigation is not yet feasible to practice in large scale (Open Development, 2016). As a predominantly low-lying country with large flood plains, flooding is common across the country (figure 1). While the flooding does have beneficial impact on agriculture-based livelihoods as they increase soil moisture and fertility, there are occasions when they have caused loss of lives, homes, and livelihoods in already fragile communities. Mekong flooding and flash flooding are the most common hydrometeorological hazards, and major events occur approximately every five years (NCDM & Ministry of Planning, 2009). It should be noted that rice production is a significant contributor to the national economy and important provider of livelihoods, but it is also susceptible to heavy losses due to aforementioned hazards. In 2004, severe drought led to an 82 percent loss of harvest, and in 2009, the government had to spend US$ 12 million to cover the costs (Chhinh, 2015). The 2016 drought caused massive depletion of fish stocks and livestock (Crothers, 2016). Water scarcity threatened national food security and livelihoods, and 260,000 affected families were estimated to be in need of water deliveries (Caritas, 2016). Such events suggest that climate change may have severe consequences to the agricultural production. As a predominantly low-lying country with large flood plains, flooding is common across the country

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Climate change is indeed threatening the development of Cambodia, and contributes to increasing hazards, despite the government's efforts to mainstream environmental protection and climate adaptation. The future projections indicate an increase in annual rainfall, but also a decrease in precipitation in the northeast of the country. The coastline is expected to suffer from inundation during the next 90 years as a result of sea level rise (Ministry of Environment, 2016). Low-lying farming lands would not only be exposed to increased flooding, but also to saline intrusion, and 10 percent decline in rice yields is estimated for every 1° increase in temperature, indicating that climate change is a serious threat to food security and safety (National Climate Change Committee, 2013).

Figure 2.1. Cambodia's population density and the exposure to flooding (Aon, 2016)



2.2.2. Exposure

Cambodia is among the most exposed countries to disasters worldwide, ranking 15th in the global comparison which measures the average occurrences of disasters per million people and per 1,000 km2 land area (UNESCAP, 2015). Malnutrition, agricultural dependence, and high number of settlements in flood plains all contribute to the increased vulnerability to weather events and disasters (Davies, et al., 2015). For example, in 2018, thousands of people in northern parts of the country were exposed to massive flooding following the breach of the Xepian-Xe Nam Noy dam in Lao PDR in the wake of heavy storms. The flood waters crossed the Cambodian border via the Sekong river and caused rise of water levels of up to 11.5 meters, which displaced more than 6,000 people across the river basin (Ellis-Petersen, 2018). Flooding may also cause exposure to diseases in the aftermath of disasters.

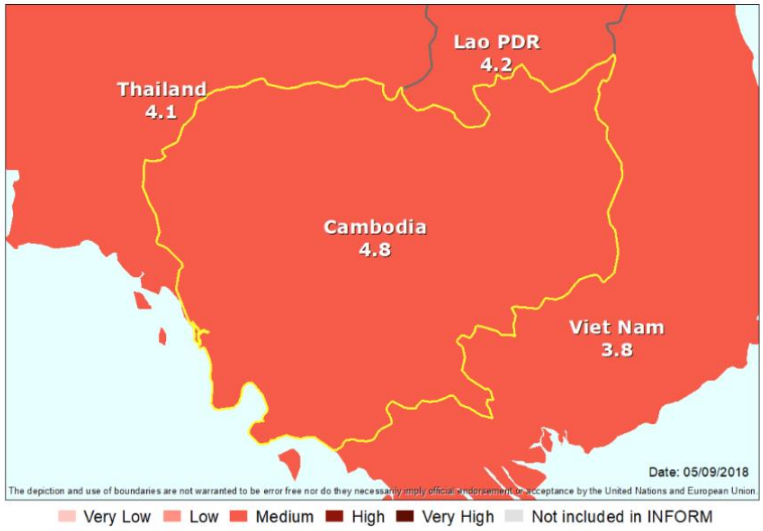
Unplanned urbanization is also contributing to increased exposure. Approximately 250,000 informal settlers reside in Phnom Penh, a city with an estimated population of 1.6 million people (Flower, et al., 2017). Increase in exposure to hazards is often associated with lack of infrastructure; informal settlements occupy low-lying areas and riverbanks susceptible to flooding, drainage is inadequate, eviction is always a possibility due to lack of legal ownership, and the poor-quality dwellings are not resilient enough to withstand heavy weather (Flower, et al., 2017). An estimated 10 million people are in need of decent housing across the country, and approximately 2 million houses require critical improvements to meet the minimum quality standards (Habitat for Humanity, 2018). Furthermore, an additional 1.1 million houses are required by 2030 to accommodate the growing population in the urban regions (Habitat for Humanity, 2018). Finally, the Cambodian people are largely dependent on the fish in the Tonlé Sap Lake, where billions of fish from more than a 100 species thrive and flock to during the monsoon season when the flood waters are high. More than 1.2 million people live in the vicinity of the lake, and the consumption of fish nationally is up to three times over the global average (Seiff,2018) However, the lake ecosystem is highly susceptible to the impacts of climate change.

2.2.2. Socio-economy Vulnerability

The National Strategy for Disaster Risk Reduction recognizes underlying vulnerabilities as sources of disasters; high prevalence of poverty, remoteness of communities, dependence on agriculture and fisheries as well as exposure to the weather-related events all contribute to increased vulnerability in Cambodia (NCDM & Ministry of Planning, 2009). Despite the proportion of people living in absolute poverty has drastically reduced, large numbers of people are economically vulnerable as they remain close to the poverty line (Open Development, 2015). In 2014, 52 percent of the people did not have access to improved sanitation, and malnutrition is prevalent – even when the public health care infrastructure has improved,

issues related to poverty persist especially in the rural regions (WHO, 2016), where 90 percent of the poor in the country reside (ADB, 2014). This unequal distribution of services and wealth applies to education as well. Rural and disadvantaged schools tend to have worse facilities, fewer and less experienced teachers, students from these areas are four times less likely to achieve baseline level of proficiency in mathematics, and the difference between urban and rural schools amounts to a more than a year spent in schooling (MoEYS, 2018). Rural regions are also often worst affected by hazards, which then creates an impasse for rural demographics; low education may correlate with lesser opportunities for employment, which often leads into further reliance on subsistence agriculture, which in turn is susceptible to heavy damages following to adverse weather. Thus, cycles of poverty are being born. However, it should be noted that poverty cannot be used as a blanket term. For example, disability of an individual in Cambodia has been determined to aggravate poverty by 12 to 15 percent (Kang, et al., 2017). Gender is also likely to affect poverty levels; households headed by women are more likely to be vulnerable to poverty, and women have limited economic opportunities and access to resources due social hierarchies (ADB, 2014). Also, households or individuals with only singe livelihood source, such as fishing, tend to be most vulnerable to changes in ecological systems as they have the least capacity to adapt to accommodate losses (Teh, et al., 2019). When the livelihoods of drought or flood impacted families burdened by debt are lost, households are often forced to engage in illegal or dangerous work. Brick production is among the industries where children and people from low-income backgrounds often resort to for employment, but the conditions are often dangerous, lowly paid and poorly regulated (Summers & Cristofoletti, 2018). These demographics are more exposed and vulnerable to disasters due to lack of livelihood options, debt burdens, lack of access to education and services, and often due to ill health following dangerous professions. Finally, there is also an increasing interest in understanding the connection between weather events and migration in Cambodia, and a growing number of studies are exploring the mobility patterns in flood-prone areas. Agricultural adaptation strategies would often require resources, indicating that the rural poor are often resorting to sale of assets and loans which increases indebtedness and landlessness during times of crises (IOM, 2016). This in turn drives migration as an adaptation mechanism, which may lead to domestic and international migration to areas which are able to provide employment. Most of the opportunities for alternative livelihoods are found in the vicinity of growing urban regions, and the migrants are often forced to inhabit the unregulated, informal settlements in the peripheries of cities as the living costs tend to be too high in the cities themselves. Thus, more and more people are increasingly exposed to hydrometeorological and epidemics in the urban slums.

Figure 2.2 Cambodia Risk Profile (INFORM, 2019)



2.2.3. Physical Vulnerability

Cambodia has a medium risk ranking on the INFORM 2019 index (figure 2), but the country still scores high on some indicators, including vulnerability and lack of coping capacity. It has a score of 7.2 out of 10 for vulnerability due to deprivation and lack of development, and 5.7 on hazards and exposure (INFORM, 2019). The risk indicators measuring lack of coping capacity are high as well (7 out of 10), and they measure the resilience of infrastructure, access to healthcare and risk governance among other factors. However, some issues are not reflected in INFORM measurements. For example, the government has recognized land degradation as one of the most severe issues contributing to increased vulnerability of rural communities and agriculture (IOM, 2016). Alongside losing their livelihoods to disasters or weather, the poor rural households are also forced to seek alternative options due to resource depletion and land degradation. Degradation further contributes to increased uncertainty of maintaining livelihoods of many, as their opportunities for employment are often limited due to lack of education and access to credit. Degradation is prevalent in the urban regions as well, which contributes to increased vulnerability to extreme events. Several major problems are prevalent in the urban centers, including congestion, urban flooding, increased numbers of urban poor and the associated growing slums in the peripheries of cities (UNFPA, 2014). A plethora of laws and regulations exist to control this development, but the laissez-faire implementation and monitoring of existing regulatory framework has resulted in an unplanned growth of informal settlements, which exposes large numbers of households living in poverty to flooding or diseases associated with lack of infrastructure (UNFPA, 2014). Furthermore, the wastewater accumulation in the cities is not well managed due to lack of urban drainage facilities, and the overflows of septic tanks are often directly running into watersheds in the Phnom Penh Metropolitan Area (JICA, 2016). It is also an acknowledged fact that the

freshwater resources along the coasts of Southeast Asian countries are at risk of salinization due to storm surges, frequency and intensity of which are exacerbated by climate change (Hoque, et al., 2016). Droughts and adverse weather already threaten the availability of fresh water and irrigation infrastructure in Cambodia, and the effects of future climate change to water resources cannot be overlooked.

2.2.4. Future of Disaster and Climate Risks

Cambodia is very vulnerable to climate change because the rising temperatures, change in sea level and varying hydrological cycles are expected to reduce the productivity of agriculture, fisheries and labor. Tourism and forestry are also expected to suffer greatly. By 2030, Cambodia's GDP could be reduced by 2.5 percent, and by 2050 the loss could reach nearly 10 percent following the impacts of climate change (National Council for Sustainable Development, 2018). Most severe impacts would be borne by the agricultural and garments sectors, which contribute highly to the GDP and are major providers of employment in the country but are also among the most vulnerable. This trend has severe consequences not only to the future economic growth, but also to livelihoods of people who rely on agricultural production and natural resources as their only sources of livelihoods. Increasing flooding, intensity of storms and inundation in the coastal regions are also threatening the lives, wellbeing, and safety of people.

The temperature is estimated to increase by 0.013° to 0.036° degrees annually, meaning that during the next century the increase could cross 0.7° degrees (Ministry of Environment, 2016). Furthermore, the sea levels could rise by 56 centimetres by 2090 under the worst-case GHG emission scenario, indicating a severe impact on the economic, social and natural systems, and with the potential to derail sustainable development efforts as well. Already achieved development gains are also in danger, which suggests that increased investments are required to address the challenges posed by the climate (Ministry of Environment, 2016). Damage to infrastructure is also projected to be significant; for example, the investment needs for resilient transport infrastructure accounts for over 20 percent of the total climate change-related expenditure as proposed in the government's estimates (Ministry of Economy and Finance & National Council for Sustainable Development, 2018).

Reference: 1. UNDRR and ADPC_ Disaster Risk Reduction in Cambodia_ status reported 2019

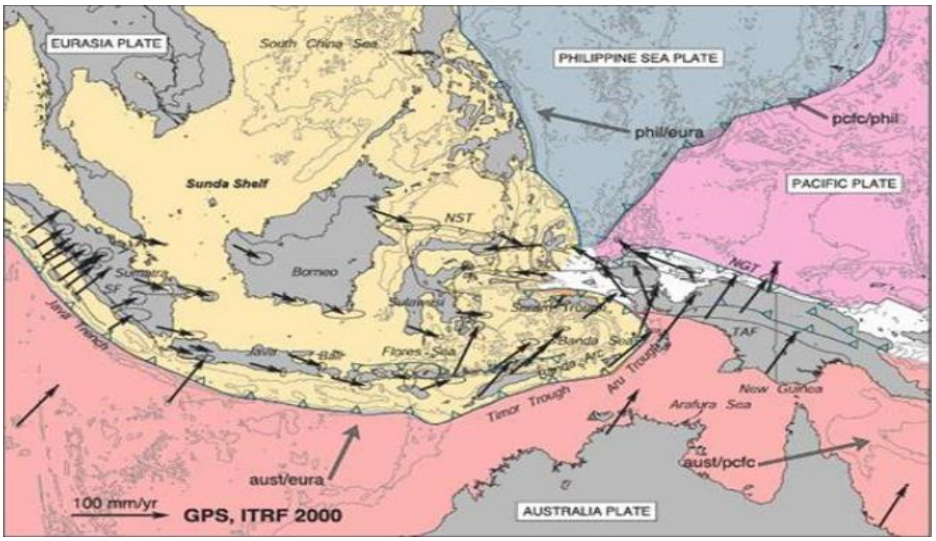
2.3. INDONESIA

Catastrophe Profile

Indonesia is amongst the countries with high exposure to natural disaster, because geologically it is located in the meeting point of two continental plates namely Eurasian and Indo Australian plate and two oceanic plates, namely Philippine and Pacific plate (figure 1 below). The subduction of Indo Australian plate beneath the Eurasian plate formed volcanic arc in Sumatra, Java, Bali and further east to Papua. This is an active zone containing active volcanoes and active faults which are the sources of earthquakes.

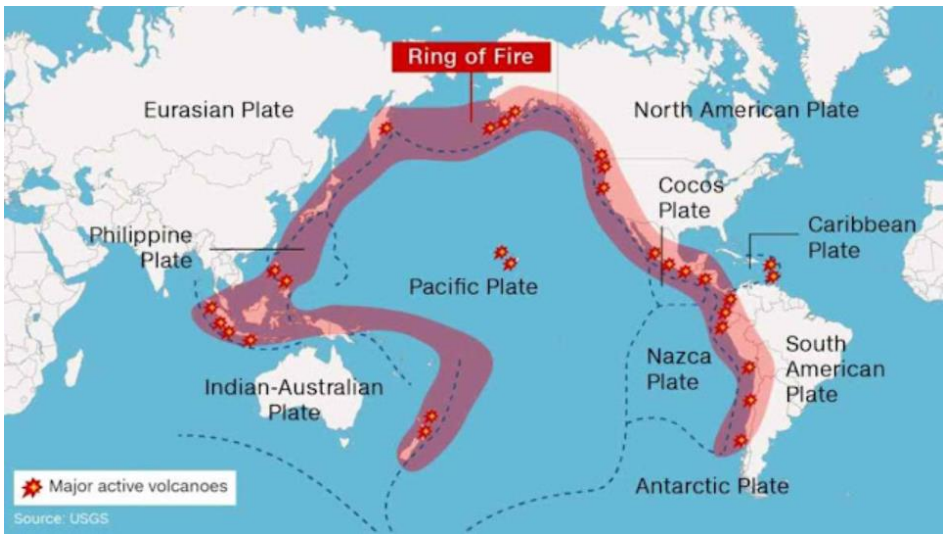
Indonesia has also Sunda megathrust, a long fault located along the southwestern of Sumatra to the south of Java and Bali, which is a source of even bigger earthquake of high magnitude. On 26 December 2004, the Sumatra-Andaman Earthquake occurred with an epicentre off the west coast of northern Sumatra. It was an undersea megathrust earthquake with a magnitude of 9.1 - 9.3 Mw, triggering a series of tsunami of up to 30 m once heading inland. The devastating tsunami caused severe damage to some districts of Aceh province with more than 200 thousand death toll. It also caused disruption to coastal areas of Sri Lanka, India and Thailand.

Figure 2.3. Indonesia is located between continental and oceanic plates



Indonesia is located on the Pacific Ring of Fire (figure 2 below), a major area in the basin of the Pacific Ocean where a large number of earthquake and volcanic eruptions occurs. Indonesia has 127 active volcanoes, the highest in the world and 20% of the world's earthquakes occurs in Indonesia.

Figure 2.4. Indonesia is located on the Ring of Fire



Based on its geographical location, Indonesia is located in tropical zone at the meeting point of Indian Ocean and Pacific Ocean and Asia Continent and Australia Continent. This makes Indonesia prone to hydro meteorological hazards such as flood, landslides, flash flood, extreme weather, abrasion and drought that can lead to forest fire.

Climate change which relates with the world temperature increase due to excessive greenhouse gas emission has contributed to the increase of hydro meteorological hazards. Drought season is longer than usual and rainy season is shorter but with higher rainfall. However it is not the only cause, other cause is ecological damage due to land misuse by human activity. The river upstream area which should have been the water infiltration area supporting the hydrology system is converted to residential or farming area. This takes place in high density population area such as Java island.

Based on disaster data, from the 1,800 disasters occurred during period of 2005 – 2015, 78% are hydro meteorological and 22% are geological.

Indonesia is the biggest archipelago in the world with more than 17,000 islands. The main islands being Java, Sumatera, Kalimantan, Sulawesi and Papua. Total Indonesia's land area is 1.9 million km square, however, 57% of its population is located in Java which has a land area of 139 thousands km square. It is the fourth most populated country in the world with 270 million population.

2.4. MALAYSIA

2.4.1. Country Profile

Malaysia is a country in Southeast Asia. The federal constitutional monarchy consists of thirteen states and three federal territories, separated by the South China Sea into two regions, Peninsular Malaysia and Borneo's East Malaysia. Peninsular Malaysia shares a land and maritime border with Thailand and maritime borders with Singapore, Vietnam, and Indonesia. East Malaysia shares land and maritime borders with Brunei and Indonesia and a maritime border with the Philippines and Vietnam. Kuala Lumpur is the national capital, largest city and the seat of the legislative branch of the federal government. The nearby planned capital of Putrajaya is the administrative capital, which represents the seat of both the executive branch (Cabinet, federal ministries and agencies) and the judicial branch of the federal government. With a population of over 32 million, Malaysia is the world's 45th-most populous country. The southernmost point of continental Eurasia is in Tanjung Piai. In the tropics, Malaysia is one of 17 megadiverse countries, home to numerous endemic species.

2.4.2. Catastrophe Profile

ASEAN Insurance Pulse 2021 reported that:

"With regards to disasters Malaysia is relatively sheltered from hazards originating from the tectonic movements. It is also too far south from major typhoon paths due to which storm impacts are often relatively minor. However, occasionally, the country faces threats arising from cyclones, floods, landslides, droughts, epidemics or environmental degradation. These events have the potential to endanger the country's development aspirations, and the wellbeing of its population. Within the range of possible events, flooding and landslides are the most severe concerns. Large areas of the country are flooded annually, and heavy precipitation increases the likelihood of landslides depending on the topography and soil conditions[1]

Malaysia is one of the most urbanized countries in Southeast Asia, and the increasing concentration of population and assets, together with an equatorial climate and the presence of two monsoon seasons, make flooding the most expensive natural disaster in the country.[2]

Monsoonal floods are among the severe threats, made worse by an increasing concentration of assets and population, climate change and environmental degradation. Although monsoons very rarely impact the country directly, the months between May and November may be affected by heavy winds and storms. [3]

[1] ASEAN Insurance Pulse 2021 - An Annual Market Survey, Exclusive Partner Malaysian Reinsurance Berhad and Prepared by Faber Consulting AG **("ASEAN Insurance Pulse 2021")** at pg.26
[2] ASEAN Insurance Pulse 2021 at pg.26
[3] ASEAN Insurance Pulse 2021 at pg.26

According to a report from 2017 11, flooding alone has caused annual economic damages of over US$ 60 million annually in Malaysia, and have had negative impacts on agriculture, especially, by decreasing the sectoral GDP by 0.22 % per every one % increase of flooded areas in the longer-term. The costs and damages of the Johor flooding between 2006 and 2007 exceeded US$ 1 billion. According to Marsh McLennan, the late 2014 / early 2015 floods, described as one of the worst in the last decades, caused economic loss exceeding US$ 280 million on the Malaysian Peninsular, with estimated insured losses of around US$ 63 million (Axco)."[4]

[4] ASEAN Insurance Pulse 2021 at pg.26

2.5. MYANMAR

2.5.1. Introduction

Myanmar became a member of ASEAN on 23 July 1997, at the same time as Laos. Myanmar was a socialist country until 1988. As a result of the isolationist policy of the military government, which continued until 1988, Myanmar's economic development has lagged far behind other ASEAN countries. It is expected that Myanmar will accelerate its economic development by means of democratization. Overview on basic information about Myanmar are:

- Population 54.05 million (2019)
- Population growth (annual %) 0.9
- Urban population (% of total) 33
- Religions Buddhism (90%), Christianity, Islam, others 10%
- GDP (US$76.19) (billion), GDP per capita, 1218.35, 2020 (Source World BaPPP (current international) - 55 (Estimate)
- GDP growth (annual %) 6.4 (Estimate)
- Agriculture, value added (% of GDP) 48
- Industry, value added (% of GDP) 16
- Services, etc., value added (% of GDP) 35

In terms of its economy, Myanmar is a lower middle-income country with a per capita gross national income of USD 1,210 in 2017. Due to its high growth, poverty rose from 48 percent in 2005 to 32 percent in 2015 (World Bank, 2019). The country's annual Gross Domestic Product (GDP) growth in 2018 reached 6.20 percent, supported by major sectors such as services, various productive industries (oil, gas and minerals) alongside agriculture, which contributes to 37.8 percent of the GDP and employs approximately 70 percent of the working-aged populations (FAO, 2019)

Myanmar has the misfortune to be battered by natural disasters almost every year. In 2021, the most common natural disaster type in the world were floods that appeared in 223 floods. Storms were the second type of natural disasters most commonly occurring in 2021 with 121 of them being reported as a natural disaster. Major natural hazards, namely floods, earthquakes, tsunamis, cyclones and landslides are impacts to Myanmar.

2.5.2 Catastrophe Profile

The Union of Myanmar faces numerous natural risks, including cyclones, earthquakes, floods and fires. It has been occasionally affected by natural disasters. Recent major catastrophic events include: (Sources ADPC, MIMU, Government)

- Cyclone Nargis, 2008 which led to the loss of 84,537 human lives, 53,836 persons missing and damage to property to the tune of approximately 4.1 billion USD,

- Cyclone Mala, 2006 led to loss of 37 lives
- Indian Ocean Tsunami, 2004 claimed 61 lives and
- Taungdwingyi Earthquake (M: 6.8 RS), 2003 led to loss of 7 lives

Fires are the most frequent disaster in Myanmar and represent 71% of disasters in the country. Storms and floods represent 11% and 10% of disasters respectively, while other disasters, including earthquakes, landslides, etc. accounts for 8 percent of the disasters.

Given the predisposition to multiple risks, it is important to profile Myanmar's hazards as this will assist in identifying and prioritizing future disaster preparedness and mitigation responses.

The Post-Nargis Joint Assessment Report [PONJA] was prepared by the Tripartite Core Group (TCG) comprising the Government of the Union of Myanmar, the United Nations, and the Association of Southeast Asian Nations (ASEAN) to determine the full scale of the impact of the cyclone and requirements for both immediate humanitarian assistance needs and medium to longer term recovery, in the aftermath of the cyclone Nargis 2008. It identifies five main pillars namely

- Risk identification and assessment
- Strengthening and enhancing emergency preparedness
- Institutional capacity building
- Risk mitigation investments and Risk financing and transfer mechanisms along which disaster risk reduction activities can be aligned in Myanmar.

2.5.3. Risk Identification (Sources WHO)

Natural Hazards 50% of the total number of disasters in Myanmar was related to floods followed by storm (23%), earthquake (15%), and mass movement-wet (12%), whereas 73% of the total affected people by disasters were due to storm followed by floods in 1980-2011. Similarly, storm is a major cause of disaster-related death and biggest estimated damage cost (86%). Earthquake (11%) and flood (3%) are next on the estimated damage cost. This pattern of disasters is due to Cyclone Nargis in 2008 affected 2,400,000 people, left 138,000 fatalities and estimated damage cost of US$4,000,000 to Myanmar.

2.5.4. Risk Assessment Initiatives in Myanmar

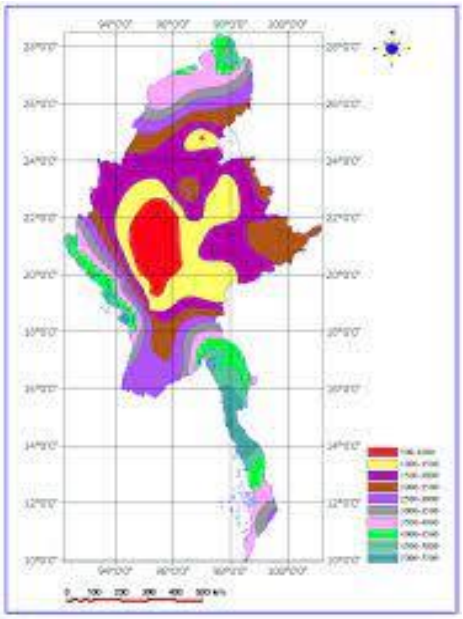
Several risk assessment projects have been undertaken in Myanmar, such as:

- Seismic hazard assessment of Yangon City, 2015, MGS, MEC and UN-Habitat
- Earthquake risk assessment of Pyay City, 2015, MGS, MES, MEC and UN-Habitat

- Earthquake risk assessment of Bago, Taungoo and Sagaing City, 2013, MGS, MES, MEC and UN-Habitat
- Earthquake Risk Assessment of Mandalay, 2012, ADPC/DMH/ MEC
- Multi Hazard Risk Assessment of Rakhine State of Myanmar, 2011, UNDP/ ADPC/ MES
- Multi Hazard Risk Assessment of Nargis-affected Area, January 2011, UNDP/ TARU/ INRM/ MSR
- Hazard Profiling of Myanmar, 2009, ADPC
- Deterministic and Probabilistic Seismic Zoning Map of Myanmar, 2008 and 2012- Myanmar Earthquake Committee
- Flood Hazard Mapping of Lower Chindwin River Basin, 2005, DOH India Flood Risk Assessment for Hpa-An City, ongoing, DMH, RRD, DUHD, UNDP and UN-Habitat Flood Risk Assessment- Yangon, Mawlamyine and Mandalay - DMH and ADB
- Flood Risk Assessment of Bago River Basin
- Seismic Risk Assessment of Yangon City

These projects were mainly motivated by stakeholder interests or by the availability of financial and technical resources undertaken for certain purposes. Nevertheless, these efforts have contributed to the body of risk knowledge of the country and provide good examples of risk assessment products and outputs that are used for disaster risk reduction and management in Myanmar. (Sources ADPC MIMU Government).

Figure 2.5. Hazard Profiles of Myanmar



The ‘Hazard Profile of Myanmar’ report includes nine frequent hazards of Myanmar using existing information, studies and research on occurrence, causes, impacts, distribution and direction of future studies. The report has been prepared by a team comprising five Government Ministries and Departments and four non-Government Agencies.

Myanmar is particularly threatened by cyclones due to its location on the borders of the Bay of Bengal and the Andaman Sea in South-East Asia, a place of tropical cyclone generation. The country is further exposed because of its long coastline, compounded by the fact that most of its population lives along riverbanks prone to flooding and coastal zones suitable for agricultural production. From 1887 to 2005, there were 1,248 tropical storms in the Gulf of Bengal, 80 of which hit the coast of Myanmar. Since 2000, the frequency of cyclones hitting land has increased from once every three years to once a year.

There are important differences in settlement patterns, agricultural systems and economic activities because of the different features of topography, climate and ecology. Many of the prevailing risks are also affected by geography and seasons. There are three different seasons in Myanmar: the cold and dry season from November to February, the hot-dry season from March to April, and the wet season from May to October. Annual rainfall in coastal areas ranges from 2500 to 5000 millimeters, while average annual rainfall in the dry zone is less than 1000 millimeters.

Major natural hazards such as floods, earthquakes, tsunamis, cyclones and landslides have occurred in Myanmar. Among them, floods, tsunamis and earthquakes have marked effects in Myanmar. The impact of Cyclone Nargis in 2008 far exceeds other catastrophes in terms of the number of deaths (around 140,000). Three other cyclones killed more than 1,000 people during the 20th century. Deaths from floods are lower than those from cyclones, but they are more common.

Figure 2.6. Historical Flood and Flood Zone



This map shows that the areas have been determined based on the historical floods. Many floods are caused by heavy rains from the southwest monsoons in July and October. The topography of the country is characterized by the central plain (delta), which is surrounded by rugged mountains on the western side and highlands on the eastern side. Precipitation in the mountains and highlands causes flooding in the central plain and coastal zones.

The flood extended for a long time to the delta near the mouth of the river. Significant examples of flooding include:

- The flood of October 2006, triggered by a large scale monsoon, which hit Thailand and Myanmar, caused damage, including human losses and property losses in Mandalay, the eastern areas, and the central areas.
- The June 15, 2010 flood was caused by heavy rains, recorded at 340 mm/day in Rakhine State in the Western Region.
- The October 2011 cyclone-triggered flood affected Magway and Mandalay in the central areas and Sagaing in the northern region. Sudden flooding struck Pakokku and the bridge collapsed. Hotspots are flood disasters includes the central areas: Mandalay and its surrounding delta of the Ayeyarwadi River.

Earthquake

The sites of earthquake disasters in Myanmar are the magnitude of the disasters in terms of human and economic losses. Geographically, a large part of Myanmar is found in the southern part of the Himalayas and on the east side of the Indian Ocean. Myanmar is prone to earthquakes because it is part of one of the world's two major seismic belts, known as the Himalayan Alpine Belt. 16 or more 7.0 magnitude earthquakes have occurred over the last 170 years since 1839. The earthquakes that resulted in many deaths were the Innwa earthquake in 1839 and the Near Kahan earthquake in 1930. They each left hundreds dead.

Not only have earthquakes claimed victims, but they have also had economic consequences for society. One death and 1 million dollars (0.006% of GDP) of losses were registered for the earthquake that occurred in Bagan in 1975. Approximately 70 deaths and 4 million dollars (0.004% of GDP) in losses were recorded for the earthquake which occurred in Tachilek on 2011.

Earthquakes in Myanmar were principally attributed to the following two activities:

- The subduction of the Indian plate moving northwards under the Myanmar plate, which is a part of the Eurasian plate, and.
- The northern movement of Myanmar's platelet along the Saga in the rift of a propagation center on the Andaman Sea. A seismic zone map of Myanmar is shown in below;

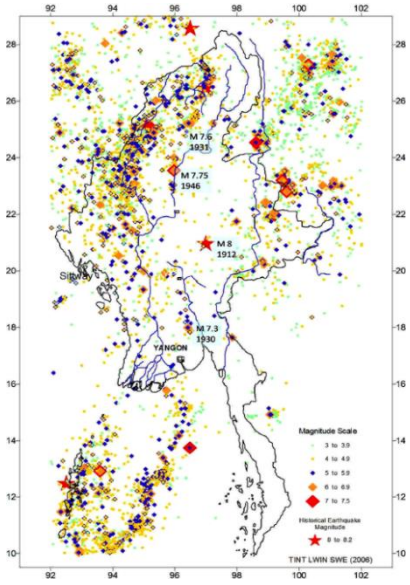


Figure 2.7. Seismic zone map of Myanmar

This map is essentially a probability map, but several areas have been determined deterministically based on historic seismic intensity maps or peak ground acceleration values from some earthquakes.

2.6. Philippines

2.6.1. Catastrophe Profile

The Philippines is an archipelago that consists of about 7,100 islands, covering a land area of approximately 300,000 km^2. The country comprises three groups or large islands: (1) the Luzon group in the north and west, consisting of Luzon, Mindoro, and Palawan, (2) the Visayan group of islands in the centre, consisting of Bohol, Cebu, Leyte, Masbate, Negros, Panay and Samar, and (3) Mindanao in the South. Manila and nearby Quezon City, the country's most-populous cities, are part of the National Capital Region (NRC or Metro Manila), located on the largest island Luzon (Cullinane, 2019). The islands and groups are divided into four main classes of administrative divisions, which consist of 17 autonomous regions, 81 provinces, 1,489 municipalities, and the smallest political units, 42,044 Barangays as of 2018 (PSA, 2018). In terms of disaster risk, Philippines ranked third among all of the countries with the highest risks worldwide according to the World Risk Report 2018, with index value of 25.14% (World Economic Forum, 2018). At least 60% of the country's total land area is exposed to multiple hazards, and 74% of the population is susceptible to their impact (GFDRR, 2017). This is largely due to the location and geographical context as the risk involving coastal hazards such as typhoons, storm surges and rising sea levels is high. Also, as the islands are located within the "Ring of Fire" between the Eurasian and Pacific tectonic plates, earthquakes and volcanoes are posing serious risks to the safety of the populace. Flooding, landslides, droughts and tsunamis further contribute to the exposure to natural hazards (CFE-DM, 2018). Of these, hydro-meteorological events including typhoons and floods, accounted for over 80% of the natural disasters in the country during the last half-century (Jha, 2018). Given the local ecologies, agriculture, mining, forestry, fishing and services are major sources of people's livelihoods. In 2019, employment rate was reported at 94.8 % (PSA, 2019), and out of the three key sectors of employment (industry, agriculture and services), workers in service providing comprised the largest proportion of the employed population (PSA, 2018)

2.6.2. Demographic Characteristics

The Philippines population has reached more than 100 million, according to the 2015 Population Census (PSA, 2015). 57% of the population resided in Luzon, 23% in the Visayas, and 20% in Mindanao, and in total, 51.2% of the overall population lived in urban regions (PSA B, 2019). The population density in the urban regions is 60 times higher (20,785 persons/km2) than the national average of 337 according to the 2015 census.

Economic Impact of Disasters Since 1990, the Philippines has been affected by 565 disaster events which have caused an estimated $US 23 billion in damages (Jha, 2018). Approximately 85.2% of the sources of the country's production have been reported to be

susceptible to disasters, and 50.3% of the total land area is considered to be economically at risk (ADB, 2012). Much of the damage has been resulting from recurrent, massive-scale super typhoons, including Ondoy and Pepeng in 2009, Washi in 2011, Bopha in 2012, Haiyan in 2013, Koppu in 2015, Haima in 2016, and Mangkhut in 2018. Much of the country's exports and trade income have relied on resource-extractive industry (Martinico-Perez, et al., 2018), which further create implications in terms of disaster vulnerability and sustainable economic growth. Large-scale and recurrent disasters have had long-term implications on the country's economy. The estimated multi-hazard annual losses are close to US$ 8 million, which is equivalent to 69% of the country's social expenditure (Alcayna, et al., 2016). One of the most severe disasters to directly hit the Philippines in the recent history is the typhoon Haiyan in 2013. It affected an estimated 16 million people, destroyed more than 1.1 million houses and affected hundreds of thousands of hectares of crops across 41 provinces (FAO, 2018). Overall damage to agricultural sector amounted to $US 1,4 billion, 74% of which was borne by the crops sector (FAO, 2018). The fishing sector carried 20% (approximately 280 million) of the total losses of $US 9.6 billion in the form of destroyed boats and other assets (FAO, 2018). Such impacts had far-reaching economic consequences due to lessened future production, which in turn decreased the annual GDP by 0.9% following the event (Bowen, 2015). However, it has been suggested that the greatest losses are not due to the impact on agriculture; large-scale typhoons have impaired the GDP growth due to disrupted electricity production infrastructure, affecting the output of industry, manufacturing and services in the long term (Ang, 2014). According to the government, the typhoon season costs approximately 2% of the country's yearly GDP on average, and another 2% is consumed by the recovery activities – a recurrent disaster trap which hinders overall economic development (Vidal, 2013 When it comes to education, children regularly lose school days and suffer the compounding negative effects on their schooling during disasters; schools are often used as evacuation centers, buildings are damaged, teaching materials are lost or damaged, schedules are disrupted (Save the Children, 2016) and returning to schooling might be impossible for children from low-income backgrounds. This has even longer term cascading impacts as lack of educational background may foretell increased vulnerability in the future (Hoffman & Muttarak, 2017).

2.6.3. Disaster Risk Profile

The geographical location of the Philippines makes the country uniquely exposed to a plethora of hazards, including recurrent typhoons, earthquakes and 53 active volcanoes, eruptions of which are classified as the most deadly and costly globally (Doroteo, 2015). The subduction zone between the two tectonic plates (Eurasian and Pacific) creating the seismic activity in the region are predicted to have the capacity to generate major earthquakes in the near future, and in the vicinity of metropolitan cities (Pailoplee & Status Report 2019 Pages //

10 Boonchaluay, 2016). Other hazards include floods, landslides, tsunamis and wildfires, all of which are occurring in a frequency which has fundamentally changed the perception of hazards in the country. 2.1 Hazards and Climate Change Disasters in the past, measured during the period between 1900-2014, illustrate extreme spatial variability. Frequency and the extent of impacts are unevenly distributed across the regions, with majority of the events affecting Central Luzon, Cordillera Administrative Region and the Central Visayas (Doroteo, 2015). On average, about 20 tropical cyclones enter the Philippines waters each year, with approximately eight or nine making landfall (ESCAP/WMO, 2009; Bankoff, 2003). They are also the largest contributors to disaster damage. Of all the disasters, cyclones and the accompanying landslides, storm surges and floods have caused the largest losses of life and property (Huigen & Jens, 2006; Bankoff, 2003), mostly because majority of the population is living within 60km from the coast. However, 80% of all the damages and deaths caused by typhoons between 1970-2014 have been caused by 6 super-scale events, Haiyan included (Espada, 2018). Based on vulnerability studies, the most vulnerable regions to tropical cyclones in the country are the National Capital Region (NCR), Southern Tagalog, Cagayan Valley, Central Luzon, the Cordillera Administrative Region, and Bicol Province (Cruz, et al., 2017). Visayas and Mindanao are likewise becoming more at risk due to an increasing number of tropical cyclones entering the southern part of the country. Furthermore, the varying geomorphology affects the distribution of hazards. For example, the Baguio district is most landslide prone region due to highest recorded rainfalls resulting from the interaction of the monsoon season, cyclones, and the orographic lifting of air by the Cordillera mountains (Nolasco-Javier, et al., 2015). Severe, reoccurring flooding on the other hand is common in the lowland areas (Bankoff, 2003). Earthquakes also tend to have their unique characteristics depending on the local context. Seismic activity produces severe secondary impacts in areas with cohesionless soil conditions. Liquefaction is a significant concern in central Luzon, especially in the provinces of Pangasinan and Tarlac (Bankoff, 2003). Extremely destructive earthquakes and associated tsunamis have been known to occur during the known history and are a likely threat in the future. In terms of climate, the Philippines is among the top countries at risk of adverse impacts of climate change due to sensitive ecological systems (including reefs and marine fauna), large numbers of coastal populations and exposure to frequent weather extremes which are likely to grow in intensity. Climate change effects are considered to be a key factor contributing to the occurrence of stronger typhoons, sea-level rise, and elevated storm surges in coastal regions. Intensified storm surges are predicted to affect more than 40% of the coastal population living in informal settlements and they are likely to face the first impacts of increased storm surges and flooding (CFE-DM, 2018). Studies indicate that temperature and precipitation have increased steadily during the past six decades, and temperature extremes are becoming more frequent (Cinco, et al., 2014). Data also illustrates

temporal and spatial variability of rainfall which has unique regional characteristics of increased precipitation in western and central regions. Disaster Risk Reduction in the Philippines Pages // 11 However, the country has undergone an overall climatological drying trend outside of the monsoon (Villafuerte, et al., 2014). These changes are reflected in rice production losses, as the crops are most sensitive to temperature changes, and in some extent, to typhoons and excessive flooding. Production variability in the past has largely correlated with soil moisture changes (Stuecker, et al., 2018), indicating that future droughts may pose the highest risk to crop yields and thus to national food security. Conversely, increased monsoonal precipitation will likely increase the risk of flash flooding and landslides.

2.6.4 Exposure

Nearly half of the population is residing in urban centers, 25% of which in the capital alone. Massive urban sprawl has expanded the metropolis of Manila into the Greater Manila Area, now covering parts of the neighboring provinces as well. This expanded metropolitan area has a population of about 25 million, (The Centre of Expertise on Asia, 2016). Informal settlement and unplanned city expansion are prevalent issues, resulting in urban congestion as well as compounding physical, social and environmental vulnerabilities to hazards in the National Capital Region (NCR). Rapid urbanization, conversion of agricultural lands to residential areas and concreting open spaces have resulted in the loss of topsoil and destruction of the natural ecosystems, which drastically reduce the ground's capacity to absorb water (OCD-NDRRMC, 2015). This will further exacerbate the impacts of heavy rainfall and flooding. An estimated one third of the inhabitants of Metro Manila reside in informal settlements, where inadequate housing and lack of infrastructure are often highlighted as the most prevalent issues (Morin, et al., 2016). Demographic growth and urbanization have also affected the provision of services, resulting in inadequate solid waste management among other issues. The urban poor are also often highly vulnerable to natural hazards, partly due to rapid urban growth and lack of tenure which have forced many to inhabit hazard-prone areas such as flood plains, riverbanks, the coasts and on steep slopes (Swiss NGO DRR Platform, 2014). Coastal areas are also increasingly exposed and vulnerable to the impacts of climate and sea-level rise, impacts of which are only exacerbated by the environmental degradation (pollution, habitat destruction, and erosion) prevalent in resource-rich coastal communities (Sales Jr., 2009). Thus, disaster and climate resilient urban development is crucial to safeguard people and sustainable development, especially in major cities like Metro Manila, which contributes to about 35 % of the Philippine economy (The World Bank, 2017). Status Report 2019 Pages // 12 Figure 4. Distribution of poverty in the Philippines by province (GSMA Intelligence, 2014) 2.3 Social Vulnerability Poverty in the Philippines is characterized by distinct spatial and individual disparities; poorest provinces are located in the southern regions

of the country (figure 4) and the poor households are also very heterogenous in nature. The poor, depending on their background, location and gender, are affected by various observable economic and natural shocks such as fuel prices, varying rainfall, or natural hazards, and for many, education is determining factor of future income and economic status (Mina & Imai, 2016). This is an important consideration given the evidence indicating that even small scale recurrent disasters, such as periodical flooding, can have negative impacts on education, especially for students from low-income backgrounds (Cadag, et al., 2017; Save the Children, 2016). This observation indicates that a cycle has been forming between disasters, hindered education, subsequent increased likelihood for poverty and thus, increased vulnerability. The impacts of climate change and environmental degradation do not impact the populations equally. Among various socioeconomic groups in coastal communities, especially small-scale enterprising poor such as fishers and shellfish gatherers, have been found to be most vulnerable to coastal flooding, coastal erosion and saltwater intrusion (Sales Jr., 2009). This is due to increasing coastal hazards, lack of household resources, environmentally dependent sources of livelihoods and exposure to frequent hazards, among other factors. Small-scale farmers are the other most vulnerable group; household levels often carry the brunt of disaster impacts, suffering from food insecurity Disaster Risk Reduction in the Philippines Pages // 13 and other ripple effects due to lack of diverse coping strategies (Danilo & Roehlano, 2012; Anttila-Hughes & Hsiang, 2013). Some vulnerabilities have strong gendered characteristics, as men's and women's vulnerability to disasters is influenced by cultural norms and perceptions influencing gendered behavior. For example, evidence from Central Philippines suggests that cultural norms and perceptions of modesty significantly lower the swimming capabilities of women and girls, which also has transgenerational effect (Hunter, et al., 2016). 2.4 Physical Vulnerability The paradigm shift emphasizing economic development through effective utilization of resources has jeopardized the physical and natural reserves in certain regions. Strategic resources from upland, lowland, and coastal areas have experienced negative impacts as a result of industrial development, such as mining. Threats to natural protective shields, including mangroves, watersheds, forest covers, and topsoil (OCD-NDRRMC, 2015), cause profound impacts on people's lives, livelihoods, food security, health and well-being. Due to growing informal urban settlements, proliferation of substandard materials and poor construction is still observed in many areas. It increases the vulnerability to earthquakes and flooding, as well as increases the probability of WASH related diseases to occur due to lack of infrastructure, poor drainage systems and lack of sanitation (Morin, et al., 2016). Many low-lying coastal communities are habitually exposed to flooding, and numerous housing units are often built with wood on pile foundations, covered by sheet metal and plastic, all of which are inadequate to withstand typhoon (or earthquake) impacts (Morin, et al., 2016). The mangrove ecosystems, one of the best buffers against typhoons, coastal flooding and

storm surges, have been severely deteriorated (Ida Gabrielsson, 2018). The Philippines has lost hundreds of thousands of hectares of mangroves in the last century, as a result of rampant conversion of natural space to the use of agriculture, fish ponds, aquaculture. Also, the forests have been degrading due to extensive use of mangrove for timber and and fuel, and due to the expansion of coastal settlements. Large scale mining development has been found to be another source of environmental degradation, and they may potentially enhance the processes resulting to the loss of rural livelihoods (Holden, 2015)

NOTE: *The above report is culled from the UNDRR 2019 Status Report for Disaster Risk Reduction in the Philippines. Sources used by the report are cited accordingly.*

2.6. THAILAND

2.6.1 Catastrophe Profile

Thailand is located in the centre of Indochina. It is bordered by Cambodia to the east, Laos to the north, Myanmar and the Andaman Sea to the west, and the Gulf of Thailand and Malaysia to the south, covering the area of 514,000 square kilometres.

Thailand has mountainous area in northern part and Chao Phraya river delta in the central part which is one of the greatest rice-growing areas in the world.

Figure 2.8. Map of Thailand



Source: https://www.freeworldmaps.net/asia/thailand/map.html

The climate is a tropical climate which has rainy season from May to October. In the north and central regions, it has high precipitation from August to October, which causes frequent floods. The capital city is Bangkok and total population nationwide stood at 66.17 million. Thailand is exposed to flooding, landslides, drought, earthquakes, tsunamis, heat waves,

forest fires, and epidemics. Thailand is also exposed to technological hazards such as chemical accidents. Flooding is the natural hazard with the most significant impact on human life, livelihoods, and the economy for the country. The occurrence of droughts has increased in recent years due to the effects of the El Niño-Southern Oscillation (ENSO) cycle, which brings drier-than-average rainfall conditions. Drought has adversely impacted the country's agriculture sector, which employs around one third of the country's workforce.

Climate change is intensifying the natural hazards that Thailand faces, such as severe storms, flooding, and drought. Thailand's agricultural sector stands to be impacted the most by climate-related hazards arising from changes in carbon dioxide availability, precipitation, temperature, and water scarcity. Experts estimate that loss of farmland value and output alone could exceed US$94 billion under a high-emissions scenario by 2050.

Sea level rise is another significant climate change risk for the country. Rising sea levels are expected to worsen the impact of storms and flooding and lead to permanent inundation in some areas of the country. Bangkok City, which stands only 1.5 meters (m) (4.92 feet (ft.)) above sea level, is expected to become one of the world's worst affected cities alongside Jakarta and Manila.

The Royal Thai Government (RTG) recognizes climate change is a major challenge for the country, affecting livelihoods, economic growth, and the achievement of sustainable development. Since 2007 the RTG has incorporated climate change into its national economic and social development plans. Climate change is addressed at the highest level under the country's National Strategy 2018-2037, an overarching framework for sustainable development.9 The RTG has also developed the Climate Change Management Master Plan 2015-2050, which sets out mitigation, adaptation, and capacity building targets. Moreover, at the 26th United Nations (UN) Climate Change Conference of the Parties (COP26) held in 2021.

Thailand pledged to reduce greenhouse gas emissions by 20% by 2030, or by 40% with further financial and technological assistance.

CHAPTER 3

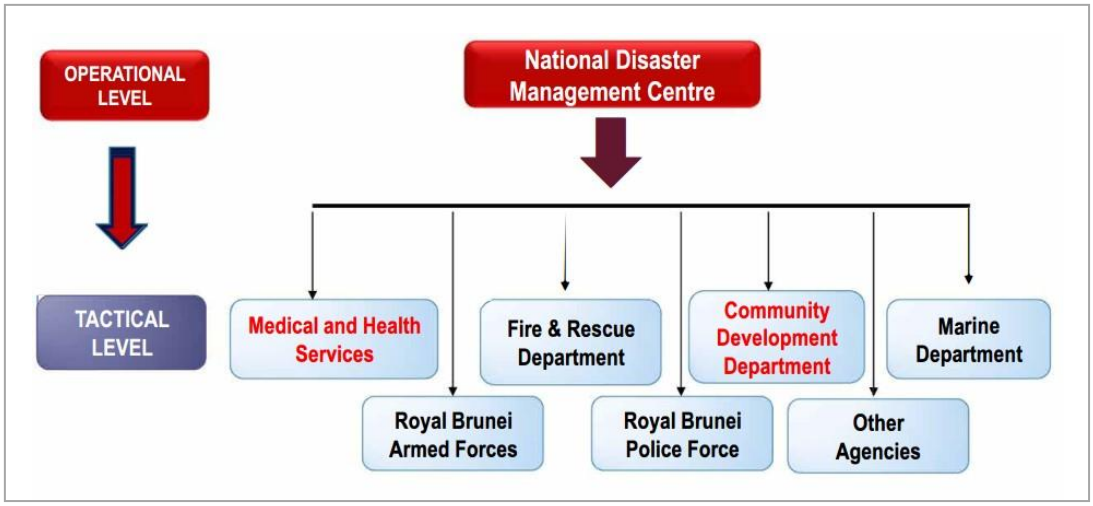
CATASTROPHE MANAGEMENT IN EACH ASEAN COUNTRIES

3.1. BRUNEI DARUSSALAM

3.1.1. Catastrophe Management

The lead agency in Brunei in response to natural disaster is the National Disaster Management Centre (NDMC).

Figure 3.1. National Disaster Management Centre Structure



(source: Brunei Disaster Management Reference Handbook 2018).

3.1.2. Disaster Risk Management as Governing Laws

a. Disaster Management Order, 2006

The National Disaster Council (NDC) and the NDMC was established in 2006 under the Disaster Management Order. The NDC main function is to develop a strategic policy framework for disaster management for Brunei Darussalam. NDMC, under the administration of the Ministry of Home Affairs, is tasked to help the NDC exercise or perform its functions, including to provide advice and recommendations disaster management related matters.

b. National Standard Operating Procedure (NaSOP) for response

The NaSOP is a document outlining the agreed standard operating procedures for

all agencies involved in a disaster operation. The content of NaSOP is periodically reviewed by the NDMC.

3.1.3. Public-Private Partnership

Non-Government-Organization (NGO) is observed to have actively give their contribution for vulnerable community development activities.

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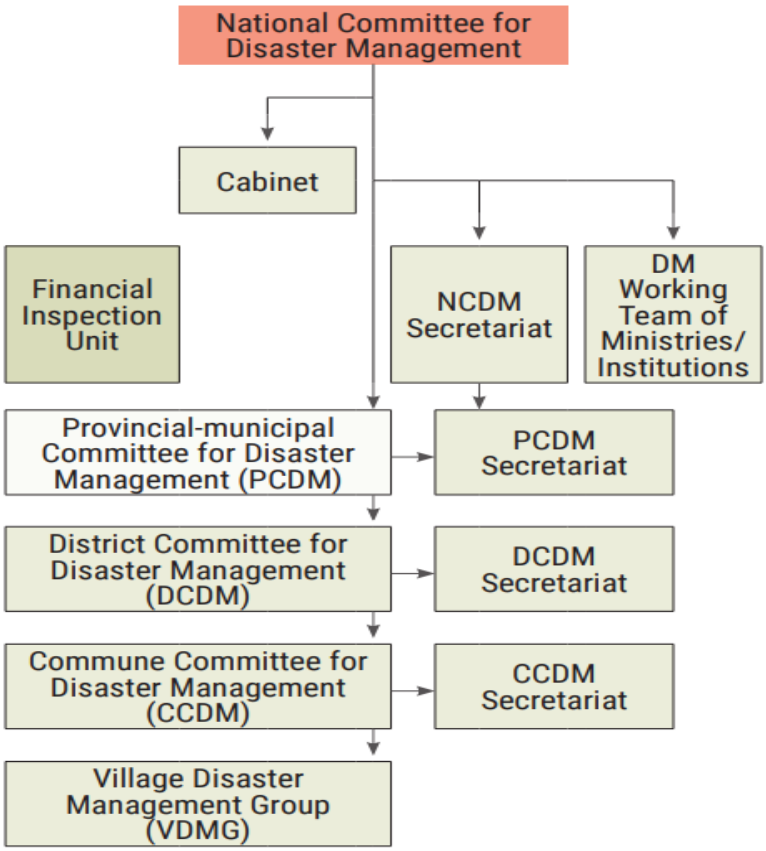
3.2. CAMBODIA

3.2.1. Organization Structure for Disaster Management

Legal framework for Disaster Risk Management (DRM) began when the National Committee for Disaster Management (NCDM) was established in 1995 under the sub-decree No.54 ANKR-BK, which was followed and supported by the sub-decree No. 30 ANKR. BK for establishing sub-national level disaster management committees. The National Action Plan for Disaster Risk Reduction (NAP-DRR) for 2014-2018 continued the national strategy of emphasizing poverty reduction as the main development priority while also expanding the scope. The NAP-DRR focused on capacity building, mainstreaming disaster risk reduction (DRR), creating synergies between DRR and climate change adaptation (CCA), hastening institutional reforms, and highlighting research and academic institutions in national disaster management. The NAPDRR replaced the Strategic National Action Plan for Disaster Risk Reduction for 2008-2013, which was established to focus on vulnerability reduction, especially for people living in poverty, and to provide a guide for comprehensive DRR in Cambodia.

The National Committee for Disaster Management (NCDM), established in 1995, is the main agency responsible for disaster management in Cambodia. During a disaster, the NCDM assembles at the National Emergency Coordination Centre to coordinate disaster response activities. At the national level, the NCDM consists of the Secretariat and five technical departments. It is also comprised of 22 members from different ministries, Cambodian armed forces, the Civil Aviation Authority, and the Cambodian Red Cross. At the sub-national level, the structure is comprised of Municipal Committees for Disaster Management, Provincial Committees for Disaster Management, District Committees for Disaster Management, and Commune Committees for Disaster Management. There are also Village Disaster Management Groups, which are the lowest-level bodies.

Figure 3.2. Disaster Risk Management Institution Framework



The government ministries most actively involved in disaster risk management include:

- Ministry of National Defence
- Ministry of Public Works and Transport – provides transportation facilities for rapid movement of relief supplies and personnel for evacuations; reconstructs damaged infrastructure
- Ministry of Health – initiates the Rapid Response Teams (RRT) and Emergency Operation Center
- Ministry of Water Resources and Meteorology – provides hydro meteorological early warning tools
- Ministry of Education, Youth and Sports – provides education on DRR and integrates DRR into public education
- Ministry of Agriculture, Forestry and Fisheries – preparing a Priority Framework for Action in CCA and DRR
- Ministry of Planning – key role in developing the Strategic National Action Plan.

The Ministry of Economy and Finance, while not as generally active as the ministries listed above, is notable for implementing the Cambodia Food Reserve System. The system was

established in 2012 to set up a rice and vegetable seed stockpile to be sold at discounted prices, enabled by 50% subsidy, in response to disasters and emergencies.

3.2.2. Laws, Policies, and Plans on Disaster Management

Cambodia's Law on Disaster Management (DM Law 2015) was passed by the National Assembly in June 2015. This was a significant shift from a system of disaster management based only on subsidiary legislation, which had been in place since 1995. In contrast, the 2015 DM Law is a broader and more authoritative legislative mandate on disaster management. A legal framework for disaster management assigns legally binding roles and responsibilities, establishes institutions, and helps ensure allocation of resources and mechanisms for coordination amongst different institutions. Reflecting Cambodia's vulnerability to climate change, the law specifies that hazard risk prevention programs need to address climate change adaptation. With the objective to regulate disaster management, the three stated goals include:

- Prevention, adaptation, and mitigation in the pre-disaster period, due to natural or human made causes; and
- Emergency response during the disaster; and
- Recovery in the post-disaster period.

The DM Law formalized the NCDM as the main authority of the government on disaster management, mandating the NCDM lead, administer, and coordinate all disaster management activities. Notably, for the first time, the DM Law provided a strong legal basis for the NCDM to coordinate international assistance during major disasters. It also formalizes budgetary support for the NCDM, as the law guarantees a budget for the NCDM and national or sub-national authorities to ensure the materialization of disaster management in Cambodia. It also includes guidelines for reserving assets to be used by public and private sectors, armed forces, civil societies, and other relevant institutions in disaster relief. The Cambodia Red Cross played a key role in disseminating the 2015 Law on Disaster Management, with the objective to ensure greater understanding of the rights, roles and responsibilities of various actors provided in the law, including at the community level. The International Federation of Red Cross and Red Crescent (IFRC) supported the Cambodia Red Cross in developing an inclusive, systematic, and practical dissemination package containing three themes which can be modified for different audiences; 1) International and Regional Commitments; 2) Cambodia Law on Disaster Management 2015; and 3) Know your Rights, Roles and Responsibilities in Disaster Risk Management.

IMPLEMENTATION	POLICY/PLAN	SCOPE	PURPOSE
ROYAL GOVERNMENT OF CAMBODIA	Sub-decree No.54 ANKR-BK	National	Mandates the establishment of the National Committee for Disaster Management
NATIONAL COMMITTEE FOR DISASTER MANAGEMENT	Sub-decree No. 30 ANKR-BK	National, Provincial	Supports the decree No. 54 by requiring disaster management committees to be established below the national level
NATIONAL COMMITTEE FOR DISASTER MANAGEMENT, OTHER RELEVANT PARTIES	National Action Plan for Disaster Risk Reduction (2008-2013)	National, Provincial, Districts	Provides focus on vulnerability and poverty reduction, a road map for comprehensive DRR
NATIONAL COMMITTEE FOR DISASTER MANAGEMENT, OTHER RELEVANT PARTIES	National Action Plan for Disaster Risk Reduction (NAP-DRR) (2014-2018)	National, Provincial, Districts	Articulates country's DRR strategic focuses and desired outcomes towards resilience building
NATIONAL COMMITTEE FOR DISASTER MANAGEMENT	Law on Disaster Management (2015)	National	Formalizes the role of the NDMC as the lead administrative organ of disaster management activities. Identifies roles and responsibilities of other institutions as well.

Table3. 1: National Disaster and Climate Change Policies, Plans and Legislations in Cambodia

Reference: 2. Center for Excellence_ Cambodia Disaster Management Reference Handbook_ December 2020.

3.3. INDONESIA

3.3.1. Introduction

In order to reduce disaster risks, Indonesia has passed Law no. 24 year 2007 on Disaster Management. This is a milestone in disaster management in Indonesia since the law regulates the management of disaster from its core values, institutions, up to authority distribution. The law defines disaster management as all efforts or activities carried out for prevention, mitigation (actions taken to eliminate hazard or reduce its potential impact), preparation (planning for major emergencies including training and exercise), emergency response (actions taken in response to emergencies) and recovery (actions taken to restore services and reconstruct communities) of disaster taken place before, at the time of and after disaster.

In Indonesia the word disaster has a wider meaning and it would normally include the meaning of catastrophe, although in the West both terms are different in term of scale in which the term catastrophe implies an event that has more severe and long lasting negative effects than a disaster. In Indonesia a catastrophic event will normally be called a disaster.

Disaster management is started with risk identification which will enable people identifies and measures risks.

3.3.2. Risk Identification

Risk identification is the foundation of risk management. It becomes the basis for risk reduction program, emergency preparedness, financial protection measures, recovery and reconstruction. Risk identification relies on data sets of hazards, exposures and vulnerabilities, and should be conducted at national, provincial and district level.

In Indonesia, the risk identification is coordinated by National Disaster Management Authority (BNPB) and the first priority action is to understand disaster risks with the following parameter: hazards, vulnerabilities and capacity. The activity is in line with Sendai Framework for Disaster Risk Reduction (2015-2020), an agreement that sets out the objective to substantially reduce disaster risk and losses. In Indonesia, the types of hazard are listed as follows:

No.	Hazards
1.	Earthquake
2.	Tsunami
3.	Volcanic Eruption
4.	Landslide
5.	Flood
6.	Drought
7.	Extreme Weather
8.	Extreme Wave
9.	Forest fire
10.	Flash Flood

Table. 3.2. Types of Hazard In Indonesia

Risk identification is carried out by local government at provincial level and the results is called Disaster Risk Analysis which provide comprehensive views of risks in one location by analysing hazards, vulnerability and local capacity to manage it.

The efforts for disaster risk reduction uses an approach to reduce hazards, vulnerability of the area, and increase the capacity. The approach can be formulated as follows:

R = Risk

H = Hazards

V = Vulnerability

C = Capacity

3.3.2.1. Hazards

Hazard is physical phenomenon or human activity that has the potential to cause damage or loss to lives, property, society and economy and the environment. In order to identify and understand hazards, a methodology is established to calculate hazard index which takes into account relevant parameters that affect the hazards. Below is brief description of the methodology applied to each hazard:

A. Earthquake

Earthquake is shaking of the earth's ground due to collision of the earth's tectonic plates, active faults, volcanic activity or rock fall. Earthquake index is calculated based on methodology developed by JICA (2015) based on shake intensity on ground which is obtained from combination of peak ground acceleration and soil amplification factor. The peak ground

acceleration is derived from Indonesia earthquake hazard map from the Ministry of Public Works (2010).

B. Tsunami

Tsunami is a series of giant sea waves caused the displacement of large volume of water. Land area affected by tsunami is obtained from mathematical calculation developed by Berryman. The land inundation is modelled based on wave height from coastal line, land slope and type of land.

C. Volcanic Eruption

Volcanic eruption is part of volcanic activity. The hazards of a volcanic eruption can be in the form of pyroclastic flow, lava, volcanic ash, poisonous gas, tsunami and mud flood. Volcanic eruption hazard index is calculated with reference to guidelines from Center for Vulcanology and Geological Hazard Mitigation (2011) using weighted zone of volcanic disastr prone area based on flow zone and fall zone.

D. Flood

Flood is a situation where an area or land is inundated due to increase of water volume. Flood hazard index is calculated based on local data on flood prone areas taking into consideration depth of inundation as per guidelines from the BNPB regulation no. 2 year 2012.

E. Landslide

Landslide is a kind of soil or rock movement, or mixture of them, going down the hill due to disturbed soil or rock stability forming part of the hill. Landslide hazard is determined based on soil movement vulnerability zone issued by Center for Vulcanology and Geological Hazard Mitigation.

F. Drought

Drought is the level of water availability which is well below the level of water requirement for life, farming, economic and environment activity. Drought hazard is determined by meteorological drought approach which is analysed by Standardized Precipitation Index with 3 month period.

G. Forest Fire

Forest fire is a situation where forest or land get caught in fire, causing damage to forest or land that result in economic and/or environmental loss. Forest fire hazard is calculated using

the method as prescribed within BNPB regulation no. 2 year 2012. The parameter includes type of forest, weather and soil type.

H. Extreme Weather

Extreme weather is occurrences of unusually severe weather or climate conditions that can cause devastating impact on community, agricultural and natural ecosystems. Hazard of extreme weather is determined as per BNPB regulation no. 2 year 2012 with scoring method for parameters which include land opening, land slope and yearly rainfall.

I. Extreme Wave

Extreme wave is big sea waves due to tropical cyclone in the Indonesia region and it has strong potential to cause natural disaster. Index for extreme wave hazard and abrasion is determined by method of BNPB regulation no. 2 year 2012 using parameter of wave height, seawater flow, coastal typology, coastal vegetation, and coastal lines.

J. Flash Flood

Flash flood is a sudden flood with large volume of water flow caused by blockage of river flow. Flash flood hazard is determined based on guidelines from Ministry of Public Works. The parameters are landslide hazard at the river upstream area, river exposed to landslide materials and topography (slope) of river flow area.

3.3.2.2. Vulnerability

Vulnerability index for each hazard is obtained from four factors which are social, physical, economy and environment. The vulnerability index is calculated by multiplying weighted social index, physical index, economy index and environmental index. For example:

Earthquake Vulnerability Index = (Social Vulnerability Index x 40%) + (Physical Vulnerability Index x 30%) + (Economic Vulnerability Index x 30%) + (Environmental Vulnerability Index x 0%)

Parameters affecting each type of vulnerability are as follows:

- Social Vulnerability is affected by population density, gender ratio, age group ratio, poor population ratio, and disabled ratio.
- Physical Vulnerability is affected by rupiah amount of housing, public facility and critical facility.
- Economic Vulnerability is affected by Regional Gross Domestic Product and the productivity of land. The productive use of land (such as forestry, farming, food crops, mining etc) will increase the index.

- Environment Vulnerability is affected by ratio of wild forest, protected forest, mangrove, bushes and wetland.

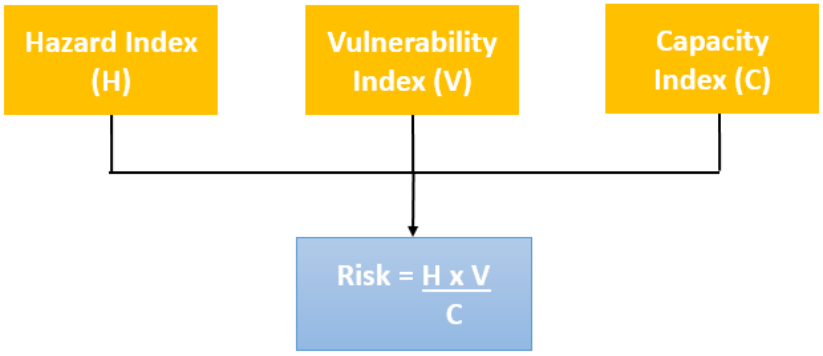
3.3.2.3. Capacity

Local capacity in disaster management is an important parameter to measure the success of risk reduction. Local capacity in disaster management refers to the National Disaster Management System within the Law no. 24 and its lower regulations. After analysing the local capacity, ones can understand which areas need improvements and this becomes the target for the development of Disaster Management Plan with the objective of increasing local capacity index.

3.3.2.4. Risks

Risk index is derived from combination of hazard index, vulnerability index and capacity index. The calculation process is carried out spatially to produce risk map and grid values. The concept is as follows:

Figure 3.3. Risk Index Concept



3.3.3. Disaster Risk Index

The results of disaster risk identification is called disaster risk index and it is made available for public to allow people create the appropriate plan of actions to reduce and mitigate risks. It also allows people to understand their level of capacity and what to do to increase their capacity in disaster management. The result of identification and analysis is put into graphical information on BNPB web portal namely InaRisk which uses arcgis server as data services describing:

- Scope of the disaster area
- Number of affected population
- Physical damage potential (in Rupiah)
- Economic loss potential (in Rupiah)
- Environment damage potential (in hectares)

and this is integrated with disaster risk reduction achievement as a monitoring tool of disaster index reduction.

InaRISK was launched on 2016, the portal can be used by public in planning disaster management. As a spatial data sharing portal it provides the following benefits:

- Dissemination tool for disaster risk study
- Assists national and local government and other stakeholders in creating strategy for implementation of programs, policies and activities in disaster risk reduction at national and local level
- Assists the government in monitoring the achievement of disaster risk index reduction
- Provides spatial data for various purposes such as Global Centre Disaster Statistics, Ministry of Housing, space management etc.

3.3.4. Disaster Management in Indonesia

The function of the National Disaster Management Authority is to establish disaster management policies and to coordinate the implementation of disaster response activities in a comprehensive and integrated way. Disaster management includes all activities for disaster prevention, handling of emergency situation, rehabilitation and reconstruction.

Since 2013 Indonesia issued Disaster Risk Index. This index is obtained based on the three contributing components which are hazards, vulnerability and capacity in handling disaster. The scoring of risk level based on loss potential allows the calculation or quantification of achievement of risk reduction in a particular area. The risk index will increase or decrease based on changes on the three components. The risk index is put into graphical information in a portal named InaRisk so that it can be easily referred to by government and the public:

We can see the contribution quantitatively of any program or activities related with the reduction of vulnerability or increase of capacity in the form of disaster risk index reduction. Regular evaluation to the index can be carried out to measure achievement of a disaster management program in a certain period.

Indonesia comprises of 34 provinces and based on the latest 2021 disaster risk index, 19 provinces have high disaster risk index, 15 provinces have medium disaster risk index and no provinces have low disaster risk index. Three provinces having highest risk index are:

- West Sulawesi (score 164.85)
- Bangka Belitung Islands (score 160.98)
- Maluku (160.84)

Three provinces with lowest risk index are:

- West Nusa Tenggara (score 122.33)
- Riau Islands (score 114.71)
- Jakarta (score 60.43)

Disaster management is a complex and multi dimension issues and Indonesia is developing system for disaster management which covers several aspects.

3.3.6 Legislation

The Law No. 24 Year 2007 on disaster management defines various types of disaster. After the law was issued, the government issued subsequent lower regulations in the form of Government Regulations and Presidential Decrees, including Presidential Decree No. 8 year 2008 regarding National Disaster Management Authority.

3.3.7. Institution

The National Disaster in Management Authority handles all kinds of disaster including natural disaster, non-natural disaster (fire, industrial and transportation accident), and social (social conflict, terrorism, sabotage) disaster. The authority has a coordinating function on the implementation of a planned, integrated and comprehensive disaster management in Indonesia.

The mission of National Disaster Management Authority is to protect the community from disasters by integrating risk management culture and preparedness into national development programs. It develops effective and efficient emergency response system, conducts recovery programs for the community through rehabilitation and reconstruction, provides support, logistics and equipment for affected areas and conduct disaster management with good governance principles. The authority becomes the focal point for disaster management in the government. It has a ministerial level thus reports directly to the President.

To ensure optimum performance of National Disaster Management Authority, each provincial government establishes Local Disaster Management Authority (BPBD) which works together with National Disaster in Management Authority in many aspects of disaster management. The role and function of the local authority is similar with the national authority, the difference is on the coverage area. The BPBD reports to head of provincial government (Governor).

According to the Law no. 24 year 2007, disaster management cannot be carried out only by BNPB, it should be supported by other government ministries and institutions, private sectors and the public. Participation of other stakeholders is required to support the

implementation of an integrated program on risk reduction, disaster prevention, emergency response, rehabilitation and reconstruction.

Since disaster management affects all aspects of the society, some forums for disaster management are established by the public comprising of civil communities, business organization, universities, media and international institutions who will support the performance of both Local and National Disaster Management Authority. This is where private, public and people work hand in hand.

3.3.8 Funding

Disaster risks are not only local or national issues, but it is also an international issue. International communities support the government of Indonesia in building a better disaster risk management. On the other hand, the government of Indonesia is keen in managing disaster risk and it is reflected by significant budgeting to address issue. Following are sources of funding related with disaster management in Indonesia:

1) National Budget Fund
2) Contingency Fund
3) On-Call Fund
4) Social Fund
5) Public Fund
6) Fund from international communities

The fund allocated for disaster is normally not adequate to cover for a disaster loss, consequently government may utilise fund allocated for other sectors such as education and health. To solve this issue, the government has launched DRFI (Disaster Risk Finance and Insurance). The government has since 2019 utilised insurance as a solution to complement to national budget fund to cover for disaster loss.

3.4. MALAYSIA

3.4.1. Introduction

ASEAN Insurance Pulse 2021 reported that:

"In 2015, following its worst flood event thus far in December 2014, the government founded the National Disaster Management Agency (NADMA) which currently manages the country's flood risk. According to NADMA about 9 % of Malaysia's territory is regarded as flood prone, which includes a population of close to 5 million people. While the B40 segment depends on public support in case of a disaster, insurance protection is easier to access for the higher income groups.

Most homeowners are insured against flood losses in Malaysia. Flood is included in the homeowner policy with an overall premium rate without premium breakdown for flood according to the building construction. As for fire policies the rate is rather nominal, generally amounting to about 0.086 % of the sum-insured for standalone fire policy. Homeowners typically purchase the cover that is arranged by their bank when they sign their mortgage."[5]

3.4.2 Malaysia Risk Index

Based on the Malaysia Reinsurance's ASEAN Insurance Pulse 2021 - An Annual Market Survey:

*"The Global Climate Risk Index analyses the extent countries and regions have been affected by impacts (direct losses and fatalities) of climate related extreme weather events (storms, floods, heatwaves etc.). Malaysia scores **105.67** (medium) on the German Watch 2021 Global Climate Risk Index (CRI), based on incurred losses for the period 2000–2019."*[6]

Country	CRI Score	Average Fatalities (rank)	Average fatalities per 100'000 inhabitants (rank)	Average losses in US$ million (rank)	Average losses per unit GDP in % (rank)
Malaysia	105.67	64	108	66	144

Table 3.3. Data Source from ASEAN Insurance Pulse 2021 - An Annual Market Survey

*"The World Risk Index is based on the understanding that disaster risk is not determined solely by the occurrence, intensity and duration of extreme natural events, taking into account components such as exposure to disasters, vulnerability, susceptibility, coping capacities and adaptive capacities. Malaysia's index score sits at **7.71**, which is considered **medium** on the World Risk Index 2020 In the ASEAN country overview."*[7]

[5] ASEAN Insurance Pulse 2021 at pg. 33
[6] ASEAN Insurance Pulse 2021 at pg.15
[7] ASEAN Insurance Pulse 2021 at pg.16-17

Country	World Risk Index	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
Malaysia	7.71	19.05	40.46	16.9	33.59	70.89

Table 3.4. Data Source from ASEAN Insurance Pulse 2021 - An Annual Market Survey

"The INFORM Risk model balances between the hazard and exposure dimension on one side, and the vulnerability and the lack of coping capacity dimensions on the other side. Malaysia has an overall rating of 3.1 out of 10, which is classified as having low risk profile.[8]

The selected hazards and expose for Malaysia on the INFORM Risk is[9]*:"*

Country	Overall risk index / category	Hazard & Exposure					
		Earthquake	Flood	Tsunami	Tropical Cyclone	Drought	Epidemic
Malaysia	3.1 / low	2.3	6.6	7.1	2.9	3.2	5.6

Table 3.5. Data Source from ASEAN Insurance Pulse 2021 – An Annual Market Survey

3.4.3. Disaster Management in Malaysia

The mission of disaster management in Malaysia is to ensure the welfare of the public and wellbeing of the country via collaboration with various parties united as a team towards capacity building and vigilance on disaster management[10].

Table 3.6.Disaster Risk Management is conducted via the Disaster Management Cycle[11]

(a)	Response	Disaster Response Mechanism through the On-Scene Command Post (OSCP) according to zones and Disaster Operation Control Centre (DOCC) as a monitoring platform upon the occurrence of a disaster incident
(b)	Recovery	Restoration and reconstruction activities by conducting damage assessment and implement rehabilitation and redevelopment of public infrastructures
(c)	Prevention and Mitigation	Capacity building through reviewing policies, development of programs, evaluate effective governance and sharing of prevention and mitigation information
(d)	Preparation	Preparedness initiatives, early warning systems, awareness and training

[8] ASEAN Insurance Pulse 2021 at pg. 18
[9] ASEAN Insurance Pulse 2021 at pg.18-19
[10] National Disaster Management Agency's website at https://www.nadma.gov.my/ms/korporat/visi-misi
[11] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 12, 16, 17 and 23

Those Spearheaded by the National Disaster Management Agency (NADMA), the roles and responsibilities includes:

- Acting as the Malaysia's National Focal Point for disaster management;
- Formulating the National disaster management policies;
- Regulating the implementation of policies;
- Coordinating disaster risk reduction initiatives;
- Cohering disaster relief exercise;
- Implementing Public Awareness Programme
- Conducting After Action Review (AAR);
- Managing Disaster Relief Trust Funds;
- Acting as the Secretariat of National Disaster Management Committee;
- Acting as Head of Humanitarian Assistance Disaster Relief delegation; and Deployment of the Special Malaysia Disaster Assistance and Rescue Team (SMART)[12].

For floods, the Government has also embarked on structural mitigation measure such as building flood control dams, canalisation, bunding of rivers, storage ponds of flood attenuation, poldering (Ring Bund), flood diversion channel or tunnel. Aside from that, there are also non-structural measures such as Integrated River Basin Management (IRBM), flood forecasting and warning system, preparation of guidelines and design standards for urban drainage projects and resettlement of population.

3.4.4. Legislation

Malaysia is guided by an executive direction, which is the National Directive No. 20 of the National Security Council (NSC) dated 11 Mei 1997 ("Direction No. 20"), revised on 30 March 2012. The Direction No. 20 lays out a holistic management mechanism during pre, during & post disaster; and determining roles & responsibilities of various Government Agencies, statutory bodies, the private sector and voluntary bodies in disaster management[13].

The country has also enacted the National Security Council Act 2016 [Act 776] which came into effect on 4 August 2016. Act 776 provides for the establishment of the National Security Council (NSC), the declaration of security areas, the special powers of the Security Forces in the security areas and other related matters. Section 43(2) of Act 776 states that any direction made and in force by the existing NSC remain in force[14], preserving the status of Direction No. 20 under the purview of the NSC and Act 776.

[12] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 7

[13] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 13

[14] National Security Council Act 2016 [Act 776]

3.4.5. Institutions

Following a massive landside/ land erosion incident on 11 December 1993 caused by heavy rains (known as the "**Highland Towers Collapse Tragedy**"), the Government of Malaysia formulated a disaster management mechanism placed under the purview of the Nation Security Council (NSC), Prime Minister's Department (also known as "**Majlis Keselamatan Negara (MKN)**")[15][16]

The NSC is guided by the Directive No. 20 with the collective involvement of various other agencies, with respective roles[17].

Following the worst monsoon flood affecting several states in Malaysia in December 2014, the Government of Malaysia established and formed the National Disaster Management Agency (NADMA) under the Prime Minister's Department taking over the responsibility from the National Security Council. NADMA consolidated the Disaster Management Division of the NSC, Post-Flood Recovery Unit of the Prime Minister's Department and the Special Malaysia Disaster Assistance and Rescue Agency (SMART)[18].

NADMA handles all kinds of disaster, which is set to mean an event that constitute a **serious disruption of the functioning of a community or national affairs** involving widespread human, material, economy or environmental losses and impacts which exceeds the ability of the affected community or society to cope using its own resources and requires extensive mobilisation of resources[19]. This includes disaster incidents such as[20]:

a) Natural Disaster;
b) Industrial Disaster;
c) Hazardous Material Transportation Accident;
d) Structural Collapse;
e) Air Crash Accident; Chemical, Biological, Radiological and Nuclear (CBRN) Accident/Mishaps;
f) Train Collision/Derailment;

[15] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 11

[16] National Directive No. of the Nation Security Council (NSC) dated 11 Mei 1997 ("Direction No. 20"), revised on 30 March 2012 at pg. i

[17] National Directive No. of the Nation Security Council (NSC) dated 11 Mei 1997 ("Direction No. 20"), revised on 30 March 2012

[18] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 4

[19] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 14

[20] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 15

(g) Haze;
(h) Fire Outbreak;
(i) Uncontrollable Epidemic/Pandemic;
(j) Burst Hydro Dam/Reservoirs; or
(k) Other Disasters Declared by the Government.

The objective of NADMA is to outline holistic policies and mechanism on disaster management on land, covering pre, during and post disaster stages. In acting as the National Focal Point of Disaster Management and the secretariat of the National Disaster Management Committee, NADMA coordinates and determines the roles and responsibilities of various governmental agencies, statutory bodies, the private sector and voluntary bodies involved in disaster management[21].

The Disaster Management Mechanism set by NADMA covers 3 levels of Disaster Management Platforms and Tiers[22].

Table 3.7. Three levels of Disaster Management Platforms and Tiers

LEVEL III	**Central Disaster Management Committee (CDMC/JPBP)** • Chaired by the Minister in the Prime Minister's Department • Setting up policy and strategy in disaster management, mobilize assets, monetary assistance and human resources • Deals with complex incidents, covering wide area or more than two (2) states • Manages financial, human resources and assets coordination • Post-disaster - decide which Rehabilitation and redevelopment programs to be implemented (as proposed by the DDMC and SDMC)
LEVEL II	**State Disaster Management Committee (SDMC/JPBN)** • Chaired by the State Secretary • Assist the District Level management in terms of assets, monetary assistance and human resources • Deals with incidents covering two (2) or more Districts but no potential to spread • Coordinate assistance at the State levels to the affected districts • Post-disaster - to carry out assessment, planning and endorse rehabilitation and redevelopment programs to the CDMC while incorporating the concept of Disaster Risk Reduction
LEVEL I	**District Disaster Management Committee (DDMC/JPBD)** • Chaired by the District Officer • Ensure coordinated actions, sufficient assets and human resources, and manage the media • Deals with localized incident which are controllable and has no probability of spreading • Disaster is managed by the authorities at the District Level • Post-disaster - to carry out assessment, planning and endorse Rehabilitation and development programs to the CDMC while incorporating the concept of Disaster Risk Reduction

[21] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 6

[22] Slides on Disaster Management in Malaysia by Mr. Zainal Azman bin Aby Seman, Deputy Director General, Operation Coordination Division, National Disaster Management Agency @ chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adrc.asia/acdr/2017/documents/7%20Malaysia%20National%20Disaster%20Management%20Agency%20(NADMA)%20and%20its%20philosophy,%20Mr.%20Zainal%20Azman%20Bin%20Abu%20Seman,%20Deputy%20Director%20General,%20NADMA.pdf at slide 21 and 22

3.4.6. Funding

Government National Budget

Disaster risks such as flood is a yearly occurrence in Malaysia, as such, the Government via the Supply Act will allocate funds to NADMA to address impact of natural disasters. The Government often distributes additional financial aid to flood victim post major flood incident for post-floods recovery, repairs to dilapidated houses and car damaged by natural disasters and effected by the flood, running of shelters and distribution of food kits.

National Disaster Relief Fund (*Tabung Bantuan Bencana Negara*) ("TBBN")

Aside to that, the government, via NADMA manages a National Disaster Relief Fund (*Tabung Bantuan Bencana Negara*) ("**TBBN**"). This fund receives allocation from the government via the Supply Act and donations from the public as disaster management/ assistance is seen as shared responsibility by the Government and the community as a whole[23].

Industry Initiative

On the aspect of managing and mitigating losses as a result of disaster, the Government, via Bank Negara Malaysia and the insurance industry has been fervently educating the public on the importance of having adequate insurance protection against natural calamities like flood which is occurring on more frequent basis due to the effects and fallout from the global climate crisis.

Malaysia Reinsurance Berhad in their paper on Malaysian Re Foresights stated that capacity for flood risk is sufficiently available where general insurers are adequately capitalized to shoulder/carry the risk. However, the pricing of the risk is perceived as high and, as a result, flood cover is often only purchased in flood prone regions or following recent events[24] [25].

[23] https://www.nadma.gov.my/en/public/national-disaster-relief-fund
[24] Malaysian Insurance Highlights 2021 Exclusive Partner Malaysian Reinsurance Berhad and Prepared by Faber Consulting AG
[25] Malaysian Re Foresights Issue 4 dated 4 April 2022, published by Malaysia Re at pg. 5

3.5. MYANMAR

Myanmar has made significant progress on disaster management policies, plans and procedures since 2008, when Cyclone Nargis struck the country, leaving it devastated. The Government of Myanmar has changed the structure of government and created new authorities and plans to improve the effectiveness of disaster management at all levels. While this progress is encouraging and reflects the government's commitment to make the necessary adjustments, the resources required to implement policy changes have been slow to develop.

3.5.1 Law

The Natural Disaster Management Law of 2013 of Myanmar defines natural disasters as the destruction to life and property, livelihood, infrastructures, education and health of the public, to the environment, and damage to crops.

In the Act, natural and man-made hazards are identified as follows:

Fire, landslide, storm, flood, drought, earthquake, tsunami, avalanche, heat or cold wave, volcanic eruption, erosion of banks and shores.

1. Outbreak of contagious human diseases.
2. Pests or plant diseases, starvation, or outbreak of animal diseases.
3. Maritime, industrial, chemical or nuclear accident, oil spill, or leakage of natural gases.
4. Violence and armed insurgencies.

Myanmar's Natural Disaster Management Act was enacted on 31 July 2013, with the ultimate aim of reducing the risk of natural disasters. The Road Map is in line with the objectives outlined in:

a) Implement natural disaster management programs systematically
b) Expeditiously in order to reduce disaster risk.
c) Coordinate with national and international government departments and organizations, social organizations, other non-government organizations and regional organizations in carrying out natural disaster management activities.

The Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) 2009-2015 has been prepared, but it requires endorsement from the national government to be a formal document.

(Source; Disaster Management Reference Handbook 2017 source CFE-DMHA)

Figure 3.4. National Disaster Management Committee



According to the Disaster Management Law, th National Disaster Management Committee (NDMC) has formed. National Disaster Management Committee is the supreme agency on Disaster Risk Management (DRM) (policy level, decision making, formulating strategies, and overall supervision).

The duties and functions of NDMC are as following:

a) to set up required organizations to implement the activities of the committee; to provide policies according to the priority of step by step activities; to review the progress of the work of the committee and give instructions as necessary.
b) To provide guidance to use domestic resources as necessary in the face of natural disasters.
c) To adopt basic principles on coordination for activities which are necessary to receive assistance external sources.
d) To manage national finance and resources, and then to distribute them to required places.
e) If necessary, to issue orders and instructions to carry out natural disaster management functions without hindrances, avoiding the misuse of rescue materials and prevail law and order in the community during and after the natural disasters;

3.5.2. Vulnerability

Socio-economic vulnerability in Myanmar Human vulnerability is described as the difficulty of resisting, coping with and recovering from the impact of a particular risk scenario. Certain features and circumstances of individuals, communities, systems or assets make them

susceptible to the harmful effects of a hazardous event. For example, socio-economic conditions can make it harder for a poor community to cope with the effects of river flooding as well as prolong the process of economic recovery. Hence, in a disaster situation, some groups of people can be more vulnerable than others.

3.5.3. Disaster Risk Index

The Myanmar Disaster Risk Reduction Action Plan touched on several stages of disaster development and advanced national projects. It has been a challenge to implement Community preparedness and response initiatives.

In 2022, the likelihood of flooding in Myanmar was 9.9 to a maximum of 10 points. In comparison, the chance of a drought in Myanmar in 2022 was one in ten.

Table 3.8. Risk index of natural disasters in Myanmar for 2022, by type

Characteristic	Risk index score
Flood	**9.9**
Earthquake	**9.1**
Tsunami	**8.9**
Epidemic	**6.8**
Tropical Cyclone	**5.6**
Drought	**1**

Source: Empowering people with data (statista)

3.5.4. CONCLUSION

Government of Myanmar has been trying their best to manage disaster risks by conducting many initiatives including financial preparedness for post-disaster relief and early recovery, establishment of disaster management fund, strengthening of Government's National Disaster Risk Management Framework, focusing on increased awareness and

capacity for disaster risk financing etc. but existing arrangements are not sufficient enough for big catastrophic risks and disasters.

Myanmar is in the process of political and economic transformation. Faced with a wide variety of natural hazards and ongoing conflicts, the country's under-developed infrastructure has led to a higher risk of disaster.

3.6. PHILIPPINES

In the Philippines, the Insurance Industry has identified the Catastrophic Perils as the perils of Typhoon, Flood and Earthquake, and Insurance Protection is available for these perils. There are other perils that one may consider catastrophic, but those contemplated by current practice within the ambit of Insurance are limited to those mentioned above.

For the purpose of this paper, we shall discus how Catastrophic Risks are managed by the Public Sector (Government) and the Private Sector (Insuring Public, and the Financial Sector meaning Banks and Insurers).

3.6.1. Public Sector Initiatives

Disaster risk reduction and climate action have been embraced as compulsory functions of all levels of governance required to sustain productivity, and to shelter development gains in the Philippines. DRR and institutionalization of disaster risk management have become permanent elements of the official governance, in recognition of the fact that disasters and climate change are increasingly threatening the national security. The following sheds light on the process and key interventions on disaster risk reduction (DRR) and climate change adaptation (CCA), in consideration of the global policy frameworks: Sendai Framework for Disaster Risk Reduction (SFDRR), Sustainable Development Goals (SDGs) and the Paris Climate agreement.

3.6.2. Sendai Framework for Disaster Risk Reduction

Priority 1. Understanding Disaster Risk.

Philippines has made significant progress in collecting comprehensive and updated risk information using different technological tools including GIS, Light Detection and Ranging (LiDAR), Interferometric Synthetic Aperture Radar (IfSAR), computer simulations, and fault mapping. Country's assessments of hydro-meteorological, geological, and seismic hazards as well as community vulnerabilities, especially in the urban context, cover the parameters of hazards, exposure and vulnerability contributing to risks. However, enhanced cross-agency collaboration will be required to optimize the use of existing databases, managed by different government offices to generate finer scale of risk information. Disaster Risk Reduction in the Philippines Pages // 15 At national level, technical agencies with direct and relevant mandates for conducting risk assessments are the Philippines Institute of Volcanology and Seismology (PHIVOLCS), the Philippines Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), NAMRIA, and Mines and Geoscience Bureau (MGB), and UP Resilience Institute. The agencies have technical expertise that complements one another

when conducting multi-hazard risk assessments. Conducting risk assessments for volcanic eruptions, earthquakes, and tsunamis are the main technical services of PHIVOLCS. It is also in-charge of earthquake impact assessments, as well as severe wind and flood impacts from the Barangay to provincial level. This service, in turn, requires inputs from PAGASA, responsible for data collection, modeling and tracking of typhoons, and other hydro-meteorological hazards, alongside climate projections. Landslide mapping falls under the technical expertise of the MGB, with products including urban exposure maps, population exposure maps, and road network exposure maps for the local government units. The assessment relies on base maps, developed by NAMRIA, which provides key services and products, including resource assessment and mapping, delineation of maritime boundaries, and risk mapping at the sub-national levels.

Priority 2. **Strengthening Disaster Risk Governance to Manage Disaster Risk**.

Since 1970s, Philippines has updated legal foundations for disaster risk reduction and management, emphasizing response-centric interventions, along with disaster prevention preparedness, and mitigation activities. This has been complemented by local risk governance legislation since 2003 to enable the use of local calamity funds for disaster preparedness and mitigation. However, these were considered insufficient to support change at the local level (GoP, 2009). This acknowledgement led to the enactment of the Philippine Disaster Risk Reduction and Management Act of 2010 (or Republic Act 10121), as the country's foremost legal instrument and guiding policy framework driving DRRM momentum across various governance levels. In terms of institutional arrangements, National Disaster Risk Reduction and Management Council (NDRRMC) serves as the highest decision-making body, comprising members from different departments, government agencies, LGUs, Civil Society Organizations and private sector. The architecture of DRM consists of multi-tiered bodies down to the Barangay (community) level, comprising Disaster Risk Reduction and Management Office (DRRMO) in every province, city and municipality, and a Barangay Disaster Risk Reduction and Management Committee (BDRRMC), which are responsible for operations requiring vertical coordination, as mandated by the DRRM Act. In the attempt to strengthen risk governance at the local level, the Guidelines for the Establishment of Local Disaster Risk Reduction and Management Offices (LDRRMOs) or Barangay DRRM Committees (BDRRMCS) in Local Government Units (LGUs) have been issued in 2014 through a Joint Memorandum Circular between the NDRRMC, Department of the Interior and Local Government (DILG), Department of Budget and Management, and Civil Service Commission (JMC No. 2014-1). The government is also contributing significantly to capacitating local government units (LGUs) by developing a checklist of actions to be taken and supplies to be procured together with providing communications and contingency templates for disaster

preparedness (Alcayna, et al., 2016). Community involvement in local DRRM (at the Barangay level) taking place through CBOs and private sector operators who are key stakeholders of the DILG in joint trainings and projects under the auspices of the Local Government Academy (LGA). Status Report 2019 Pages // 16 The DRRM Act 2010 and the Climate Change Act of 2009 have explicitly indicated environmental protection provisions, the monitoring of which is mandated to NDRRMC and Department of Interior and Local Government (DILG), Department of Environmental and Natural Resources (DENR) and the offices under it. Programs to translate policies into actions have been formulated and implemented, including sector-specific programs on coastal resource management, forest development, protection and rehabilitation, the Ridge to Reef Framework of Development and localized policies, such as the Agno River Basin Inter-Regional Watershed Management Program in Ilocos (OCD-NDRRMC, 2015). IMPLEMENTATION LEGISLATION/POLICY SCOPE PURPOSE NATIONAL DISASTER COORDINATING COUNCIL The Presidential Decree No. 1566 (1978) National, provincial and municipalities Emphasizes disaster prevention, preparedness, mitigation and community preparedness against natural and man-made hazards. GOVERNMENT OF THE PHILIPPINES Local Government Code of 1991 Local governments in provinces, municipalities and the Barangays Aimed to achieve decentralization by increased stakeholder participation through for civil societies and allocated national powers and responsibilities to LGUs. BUREAU OF FIRE PROTECTION Revised Fire Code of the Philippines (2008) National Assigns authority to BFP to issue rules and regulations relating to fire management, to oversee national fire safety across sectors. THE CLIMATE CHANGE COMMISSION Climate Change Act of 2009, RA No. 9729 (2009) National, provincial, and municipalities Monitors and evaluates all national programs and action plans to guarantee mainstreaming of climate risk considerations across sectors, operated under the autonomous CCC. GOVERNMENT OF THE PHILIPPINES Philippine Disaster Risk Reduction and Management Act of 2010 (2010) National, provincial and municipalities Extending Decree 1566, focusing on pro-active disaster and climate risk reduction and management via participation of all levels and sectors. A whole of society approach, which includes considerations to gender and indigenous people. PHIVOLCS & PAGASA Calamity Hazard Mitigation Program Act (2010) Sectoral Requires the PHIVOLCS and PAGASA to establish natural calamities' hazard mitigation programs for all coastal areas, to perform hazard monitoring, assessment and early warnings Disaster Risk Reduction in the Philippines Pages // 17 IMPLEMENTATION LEGISLATION/POLICY SCOPE PURPOSE GOVERNMENT OF THE PHILIPPINES Disaster Risk Reduction Management Plan (NDRRMP) 2011-2028 National, districts and municipalities Aims to guarantee sustainable, climate adaptive and disaster resilient development across sectors by fulfilling the mandates set in Decree 1566 and the Disaster Act of 2010 DEPARTMENT OF DISASTER RESILIENCE Department of

Disaster Resilience Act (2018) National Mandates the creation of Department of Disaster Resilience, advised by the National Disaster Resilience Council, to mainstream disaster and climate risk reduction across sectors and stakeholders, to focus on local resilience and on proactive recovery, rehabilitation and “building back better”.

Priority 3. Investing in Disaster Risk Reduction for Resilience.

Since 2008, National Economic and Development Authority (NEDA) has been developing and updating DRR mainstreaming framework for addressing disaster risk issues. The local DRRM Plans (LDRRMPs) are developed by the Local Disaster Risk Reduction and Management Office (LDRRMOs) at the provincial, city and municipal levels and the Barangay Development Councils, to guide DRRM activities and investment. Significant efforts have been made to enhance risk-informed spatial planning, with the OCD tasked to evaluate and ensure that disaster risk reduction measures are incorporated into the Comprehensive Development Plan (CDP) and the Comprehensive Land Use Plan (CLUP). Also, overcoming budget constraints for resilience building is critical, and they are being addressed substantially. The Republic Act 10121 provides that the Local Disaster Risk Reduction and Management Fund (LDRRMF); amounting to no less than 5% of income from regular sources which is to be set-aside for disaster risk reduction and management, with a ratio of 70% for prevention, mitigation and preparedness, and 30% is dedicated to Quick Response Fund (QRF), (OCD-NDRRMC, 2015). This is helping to ensure budget allocation for disaster risk interventions at local levels. The 70% allocation will finance implementation of structural and non-structural activities, including risk-mitigation infrastructure, purchase of equipment, stockpiling of basic emergency relief supplies, training, planning, capacity including, development of Information, Education and Communication (IEC), and risk transfer mechanisms among others (OCDNDRRMC, 2015). While there are budgeting mechanisms in place for cities to allocate financing for disaster risk management through the Local Disaster Risk Reduction and Management Funds, cities often face significant challenges in securing adequate resources for post-disaster operations, including rapid access to funding to support early recovery efforts such as Status Report 2019 Pages // 18 the restoration of critical infrastructure, delivery of services, and support for livelihoods. Effective and inclusive risk transfer options have been explored, given the need to reduce financial constraints and fiscal risk of the government, including the use of marketbased catastrophe risk insurance - the Philippine City Disaster Insurance Pool (PCDIP), to directly support contingency financing that provide liquidity immediate after disaster. This involves stakeholders from finance and insurance domains, including Department of Finance (DoF), Insurance Commission, Government Service Insurance System (GSIS), and Philippines Insurance and Reinsurance Association (PIRA). Incentives for DRR investment at local level are being explored, in the form of concessional loans for investing in disaster risk

reduction activities (ADB, 2016). However, more is to be done to create attractiveness and an enabling environment to put this into operationalization. To address fiscal challenges, after the Typhoon Haiyan in 2013, the Department of Finance of the Philippines has elaborated a national Financial Protection Strategy to enhance the resilience to disaster and climate risks with priority actions identified at the national, local and individual level (ADB, 2018). This builds on a countryspecific catastrophe risk model carried out by the Department of Finance with support of the World Bank and the Global Facility for Disaster Reduction and Recovery.

Priority 4. Enhancing disaster preparedness for effective response to "Build Back Better" in recovery, rehabilitation and reconstruction.

A national disaster response plan was formulated and adopted for different hazards and disaster scenarios with the participation of stakeholders, including civil societies and the private sector. The NDRRMC Operation Center has been established for monitoring, evaluation, and coordination of disaster response operations. The OCD conducts Pre-Disaster Risk Assessment – Actions Programs and Protocols (PDRA-APP), and capacity building for emergency preparedness, Incident Command System (ICS), Search and Rescue and PDNA. OCD, in partnership with other government counterparts, including DILG, and the Philippine Public Safety College (PPSC) have continued support to LGUs on DRM. LGUs and the members of the Regional Disaster Risk Reduction and Management Council (RDRRMC) have already set their "Oplan Paghahanda" to properly respond to any disaster scenario, but they would need to continuously enhance their response capabilities (Baccay, 2018). Some LGUs have also already established their own local operations center. Hazard forecasting and monitoring equipment are regularly updated. As of 2015, the country has 74 seismic stations for earthquake monitoring, 36 tsunami detection stations, 6 volcano observatories and 10 tsunami early warning systems. There are also 19 NAMRIA sea level monitoring stations. PAGASA has over 1000 automated weather stations and water level sensors, with information provided for public access on their respective websites (OCD-NDRRMC, 2015). There is also the Nationwide Operational Assessment of Hazards (NOAH Program) under the Department of Science and Technology (DOST), to provide early warning with a six-hour lead time to vulnerable communities against impending floods. The NOAH Program has reported significant achievements, including the production of useful, sophisticated hazard maps and accomplishing wide Light Detection and Ranging (LIDAR) survey coverage. (OCD-NDRRMC, 2015) While a certain technical capacity has been developed for forecasting and hazard anticipation, these have yet to be fully expanded to the end-users. Advisories from PAGASA-DOST and PHIVOLCS-DOST are shared through the agencies' official internet websites and at the same time through Disaster Risk Reduction in the Philippines Pages // 19 SMS to the Office of Civil Defense, Local Chief Executives of LGUs, RDRRMC/PDRRMC member

agencies and local media. LGUs are then expected to inform their barangay officials via SMS and/or handheld radios. Hazard maps are also available both in hard copies and electronic copies downloadable from the websites (OCD-NDRRMC, 2015). Early warning systems are further enhanced by the Free Mobile Disaster Alert Act of 2014, which mandates telecommunication operators to issue free public warnings via mobile phones, as required by the state, PHIVOLC or PAGASA (GoP, 2014). Post-Disaster Needs Assessment (PDNA) undertaken after major disasters with widespread impacts (such as the Ondoy and Pepeng typhoons 2009, and Yolanda Typhoon 2013) provides a comprehensive and thorough assessment of the damage, losses, and impacts in 13 key sectors of the economy. Previous assessment covered the damage to public assets and flows, while the more recent ones are more comprehensive, covering an estimate of the damage and losses suffered by the private sector. An assessment is also presented of the broader economic and social impacts of the disasters. The PDNA also provides a basis for determining the country's needs for post-disaster recovery and reconstruction (GoP, 2009). Now, 'building back better' in recovery and reconstruction has evolved towards a more long-term approach. The post Yolanda 2013 recovery efforts have geared towards inclusive, risk-sensitive and locally viable options, governed by the Comprehensive Rehabilitation and Recovery Plan (2014), devised by NEDA to set short, medium and long term recovery framework and investment for reconstruction of infrastructure including education, health, housing and recovery of social services, livelihoods, employment and resettlement. A number of good practices reflecting participatory approaches are also being adopted in efforts to further support the affected, facilitated by LGUs, non-government agencies, and CBOs. Special needs and intersectional vulnerabilities are ensured to be addressed during the recovery phase; National agencies such as the Government Insurance Service Systems (GSIS), the Home Development Mutual Fund (HDMF), and the Social Security System (SSS) provide calamity loans to disaster affected persons. The Development Bank of the Philippines (DBP), Land Bank of the Philippines (LBP), local cooperatives and microfinance institutions provide assistance to farmers and other individuals. The Department of Labor and Employment (DOLE) implements integrated livelihood and emergency employment programs under the "Tulong Pangkabuhayan" (livelihood assistance) for Displaced/ Disadvantaged workers. (OCD-NDRRMC, 2015) 4. Coherence with the Sustainable Development Goals & the Paris Climate Agreement Development strategies and planning instruments of the Philippines have geared towards resilient development with integrated disaster risk considerations as exhibited in the Philippine long-term vision 2040 (integrates the global agendas: SDGs, SFDRR, and Climate Change Agreement). To support the efforts, the current Philippines Development Plan (PDP) 2017-2022, the first socioeconomic blueprint of the Philippines, sets the focus on inclusive growth, and a globally-competitive economy. Development, Status Report 2019 Pages // 20 DRR and climate

resilience have been articulated in the plans to improve adaptive capacities to minimize disruption in services by hazards with the lead of government agencies, including LGUs. A human approach to development and governance is adopted by the government, which is providing a solid strategic framework for equity and inclusive growth aligned with the SDGs. Legal provision has been established for securing, protecting and promoting human rights of women and children, persons with disabilities, and indigenous peoples, guaranteeing the access to education, health, public services and social services. (GoP, 2017). Given the potential for large/scale disasters to occur, the Philippine Government prioritizes the provision of social protection and the reduction of poverty and inequality. DRR has been guided by the overarching sustainable development agenda, and is aligned with climate change efforts. Climate change has been identified as a cross-cutting development agenda in the governance system, with solid legislative framework and policy instruments, with the Philippines ratifying the UNFCCC treaty in 1994, and later on the Kyoto Protocol in 2003, followed by the ratification of the Paris Climate Change Agreement in 2015. Enactment of laws and regulations pertaining to climate change over the years have led to the implementation of the Solid Waste Management Act (2000), the National Environmental Awareness and Education Act (2008), and the Renewable Energy Act (2008). The Climate Change Act 2009 promulgates implementation structures with Climate Change Commission (CCC), as the principal climate policymaking body of the government. The NFSCC sets up strategic framework to address climate vulnerabilities, promote adaptation capacities and formulate climate-sensitive interventions in key sectors including agriculture and fisheries, health, coastal system, water resources and ecosystem management. The need for local governments to adopt evidence-based resilience plans, programs and practices is made even more urgent given the combined impacts of climate change, rapid urbanization and environmental degradation. Currently, the DILG-LGA is exploring how the climate and disaster risk assessment (CDRA) relates to the core functions of local governments particularly in the rationalized and simplified planning of their development plans such as comprehensive land use plan (CLUP) and comprehensive development plan (CDP), considering the hazards, exposures and vulnerabilities of the LGU (LGA, 2018). Sectoral Aim Policies with ties to Sendai Framework for Disaster Risk Reduction Development targets by 2022 (Explicit SDG targets not available) Policies with ties to the Paris Climate Agreement or Environment National Development Philippine Disaster Risk Reduction and Management Act (2010) Philippine Development Plan (2017-2022) Access to health services improved nationally Philippine Disaster Risk Reduction and Management Act (2010) Climate Change Act (2009) Disaster Risk Reduction in the Philippines Pages // 21 Sectoral Aim Policies with ties to Sendai Framework for Disaster Risk Reduction Development targets by 2022 (Explicit SDG targets not available) Policies with ties to the Paris Climate Agreement or Environment Agriculture & Mining Mineral Resources Development Presidential Decree No.

463 (1974) Comprehensive Agrarian Reform Program Extension with Reforms (CARPER) (2009) Ratio of irrigated area and area required for agricultural development increased to 65,07% Growth of GVA in agriculture, forestry and fisheries increased by 2,5- 3,5% Philippine Mining Act of 1995, RA No. 7942 The Agriculture and Fisheries Modernization Act of 1997, RA No. 8435 (1997) Disaster and Climate Risk Reduction Philippine Disaster Risk Reduction and Management Act (2010) Free Mobile Disaster Alert Act (2014) Calamity Hazard Mitigation Program Act (2010) Number of CC/DRRMenhanced plans increased within all LGUs Quality of coastal and marine habitats improved substantially Area of land degradation hotspots decreased by 300 000 hectares Decree No. 1467 for the “Philippine Crop Insurance Corporation (1978, revised in 1995) Philippine Disaster Risk Reduction and Management Act (2010) Climate Change Act (2009) Vulnerability Reduction Department of Disaster Resilience Act (2018) Adopting a National Building Code in 1997 Proportion of families affected by natural and man-made calamities provided with relief assistance 100% Proportion of urban population living in slums/ informal settlements/ inadequate housing decreased to 0 Percentage of population covered by health insurance 100% Climate Change Act (2009) The Agriculture and Fisheries Modernization Act of 1997, RA No. 8435 (1997) Penalizing Squatting and Other Similar Acts Presidential Decree No. 772 (1975) Urban Development Philippine Development Plan (2017-2022) National Land Use Act (2017) Urban Development and Housing Act (1992) Percentage of households with access to safe water supply increased to 95,16% HHs with access to basic sanitation increased to 97,46% Solid waste diversion rate increased to 80% Percentage of barangays with access to sanitary landfills increased to 29,26% Philippine Development Plan (2017-2022) HHs with access to basic sanitation increased to 97,46% Philippine Development Plan (2017- 2022) Table 2. Some of the synergies between international agreements and different policies and commitments of the Philippines in various sectors. Status Report 2019 Pages // 22 5. Issues in Implementation of the DRR and Climate Policy Typhoon Yolanda in 2013 was the most significant test of governance structure and related strategies. It revealed drawbacks of the current council-led governing structure to advancing resilience. Salient topics include how to respond better to disaster realities, how to efficiently coordinate among relevant agencies, and how to be more inclusive of relevant actors. Together with other issues, a thorough examination of RA 10121 by the national government and advocates for DRRM is underway. The most important discourse to date focuses on ways to institute a powerful governing body that enables more efficient DRRM with administrative and financial powers. The hope is that by instituting a governing system that can thoroughly lead all phases of preparedness, mitigation, response, and recovery, the country can better withstand future—and likely more frequent— mega-disasters (KanakoIuchi, 2019). The recovery framework also needs a thorough revisiting. The RA 10121 provides that the responsibility for post-disaster recovery and rehabilitation falls under NEDA, but the

practice after Yolanda – specifically the creation of a new office called the OPARR – shows that the mechanisms, systems, and structures on recovery have yet to be clarified and institutionalized. This is an imperative in order to ensure that the country can quickly "build back better" after every disaster (OCD-NDRRMC, 2015).

3.6.3. Private Sector Initiatives

3.6.3.1 PIRA's Membership into ARISE

ARISE - Philippines is a Local Network of ARISE (the Private Sector Alliance for Disaster Resilient Societies). ARISE is a United Nations Office for Disaster Risk Reduction (UNDRR) - led network of private sector entities whose members voluntarily commit to support and implement the Sendai Framework, aligned with the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs), Paris Climate Agreement, New Urban Agenda and Agenda for Humanity. PIRA's joining demonstrates the Philippine Insurance Industry's agreement with the UNDRR's principles and support of activities aligned to the SENDAI Framework.

In the period of little over a year, PIRA has undertaken various Webinars and Talks on Risk Management and Insurance and how these are valuable tools to address Disaster Risks. These talks were aimed at the SMSE's acknowledged as one of the underserved sectors in the Financial arena. There have also been knowledge sharing sessions with other ARISE member countries such as Japan talking about best practices on handling DRR concerns, and finally the Philippine Catastrophe facility was introduced an made an example of concrete steps to mitigate the effects of Disasters arising out of Typhoons, Floods and Earthquakes.

3.6.3.2. PIRA's Collaboration with Earth Security

Mangrove forests can significantly reduce economic losses from storms and floods because they are natural coastline barriers. By factoring them into risk underwriting, insurance products and commercial strategies, re/insurers can meet a growing need from companies and governments to invest in greener infrastructure for a resilient future. This report offers a simplified quantitative model to illustrate the value of the protection that mangroves provide against tropical cyclones. It focuses on five coastal cities in the Philippines, one of the world's most climate vulnerable countries. It uses available science and public datasets to build a business case for supporting innovation in re/insurance products, insurance regulations, and sustainable investments and suggests product innovation routes for re/ insurers, companies and governments.

One of the acknowledged difficulties of compiling this report is a lack of data. Our approach is simple, because current underwriting models do not allow for more dynamic and

nuanced variables and the available data itself is sparse. That being the case, however, the evidence points clearly to the potential of natural assets to mitigate the impact of extreme weather events. This opens an opportunity for re/insurance companies, their corporate and government clients, and regulators to prepare for a new era where nature-based solutions will enhance investments, insurance products and business strategies.

There is a significant buy in by both the Philippine Insurance Industry and the Insurance Commission, and plans are afoot to factor in the protective value of these natural assets into underwriting and risk management processes.

The study is a result of a collaboration between Earth Security and PIRA.

3.6.3.3. PIRA's Collaboration with the Banko Sentral ng Pilipinas on their Financial Inclusivity and Literacy Program.

The FinEd Expo now on its fifth year, is a flagship financial education event convened annually by the BSP which aims to ensure synergy of financial education programs, explore productive partnerships, and build an organized network of advocates imbued with the shared vision and collective responsibility of implementing sustainable and effective financial education programs. It also supports the celebration of the Economic and Financial Learning Week under Republic Act No. 10922 and the objective of establishing a "Strong, Comfortable and Sustainable Livelihood for all Filipinos" under the National Plan entitled "AmBisyon Natin 2040".

3.6.3.4. PIRA's Collaboration with the Insurance Commission, Philippine National Reinsurance Corporation together with the World Bank and Global Insurance Brokers AON, Guy Carpenter and Gallagher on the creation of the PCIF.

Majority of the populace does not purchase insurance to protect themselves against Catastrophic Perils as evidenced by the fact that insurance penetration is less than 1% of the country's GDP. Recognising that a systemic multi-sectoral collaboration is essential to address this insurance gap, the regulatory authority Insurance Commission, the Philippine Insurers and Reinsurers Association (PIRA) and NatRe signed a Memorandum of Understanding (MoU) in January 2020 to establish **Philippine Catastrophe Insurance Facility (PCIF)** and review minimum catastrophe risk insurance rates by early 2021. The MoU aims to:

1. Increase Philippine financial resilience towards natural disasters to hasten the recovery of communities after a large loss event;
2. Address the catastrophe insurance gap;
3. Create a more risk-appropriate rating environment that would ensure sustainable disaster premium rates;

4. Increase the catastrophe resilience of the Philippine insurance industry and its capacity to retain catastrophe risks;
5. Provide the public with more inclusive access to catastrophe insurance protection.

3.6.3.5. Context and objectives of Philippines Catastrophe Insurance Facility (PCIF)

PCIF is for non-life insurers in the country to redirect the catastrophe risks to the facility that shares the pooled risks with the participating companies. By doing so, the facility capacitates the insurers to cover catastrophe risks and manage their exposures to catastrophes more effectively.

PCIF aims to satisfy four core objectives:

1. **Stronger Philippine non-life insurance industry**: PCIF enables more insurers to provide coverage against disasters, and thus promote the financial resilience of the people and businesses of the Philippines against disasters like floods, typhoons and earthquakes. This includes ensuring that insurers provide timely claims settlement after each natural disaster.
2. **Higher insurance penetration over a period of time**: The enhanced ability to develop and offer catastrophe insurance solutions is aimed to be converted into a marked increase in insurance penetration. This requires complementing the advanced supply with complementary measures, including insurers adjusting the products to the needs of specific population segments and raising awareness accordingly.
3. **Adequate and sustainable catastrophe premium rates**: As the local Philippine insurance industry has limited financial capacity to adequately retain catastrophe risks, PCIF is envisioned to increase natural catastrophe premiums of an estimated 30% to 50% of current market rates via the use of technically-proven rates. The purpose is to ensure a more resilient industry where the premium reserves are sufficient to respond to disasters.
4. **Increased local catastrophe retention**: when currently the providers of catastrophe insurance reinsure primarily abroad, PCIF provides the opportunity to leverage on the retentions of the Philippine companies in a way that the premium base can be grown internally. Nevertheless, given the nature of catastrophe risks, some level of international reinsurance is likely to remain necessary.
5. **Striking a balance between various interest groups**

   Setting up PCIF involves several challenges, one of the central ones being **how to strike a balance between the interests of various stakeholder groups**.

   As an example, some actors might question whether it is appropriate for PCIF to use the technically-proven rates to increase the premiums of catastrophe insurance.

   For instance, increasing the premiums appears to work against making insurance more affordable, and thus the efforts of PCIF seem to be disjoint from the needs of the *low-income and vulnerable households and businesses*.

Nevertheless, *the* viability of the non-life insurance industry is essential to ensuring sustainable insurance solutions. Only later the industry can leverage its advanced competencies and financial capacities to retain catastrophe risks, in order to make catastrophe insurance solutions more affordable to various population segments.

Further, universal minimum premium requirements could restrict underwriters from following their current practices of setting premiums, as it would affect their current considerations and neglect the differences in the capacities and strategies of the various insurance companies.

NOTE: The above material has been culled from the PFIF Primer created by the GIZ with inputs from PIRA.

3.6.3.6. PCIF progress and expectations

PCIF is currently in the inception phase and will be launched in January 2023. Thus far, 17 Companies have signed up to join and support the Facility. Meanwhile, the Minimum Catastrophe Rates have been determined, internationally benchmarked, reviewed and approved by the Insurance Commission and a Circular has been sent to all Regulated entities authorizing them to use the Minimum Cat. Rates for all policies incepting 01 January 2023.

The PCIF itself has morphed into two work streams where PCIF2 separate and distinct from the Cat Facility, is designed to cover the underserved sector of society. Currently in the formation stage, PCIF2 is envisioned to be a combination indemnity based and Parametric Cover designed to respond immediately to an Insured who may need cash assistance to get back on their feet, following a disaster. It is not envisioned that PCIF 2 will be launched anytime soon, but a significant amount of work is being poured into PCIF 2 as well to ensure that it sees the light of day.

3.7. THAILAND

3.7.1. Risk Identification

Due to its geographical location, Thailand has been highly exposed and vulnerable to natural disasters caused by hydrometeorological hazards such as floods, landslides, storms, droughts, etc. For example:

Flood

Floods are most often caused by torrential downpours or accumulated precipitation over the long period. These rain events will eventually trigger flash flood or sudden flooding, and overbank flow and inundation. Floods have been the most frequented natural disaster in Thailand and have imposed tremendous hardships for households, claimed hundreds of lives and caused heavy damage to public and private property. The main causes of floods in Thailand are the influence of the following weather phenomena; southwest monsoon which prevails over the Andaman Sea and Thailand's land mass during May till September, north-eastern monsoon which prevails over the Gulf of Thailand and southern region; monsoon through and the elongated region of relatively low atmospheric pressure pass across northern, north-eastern and central regions as well as tropical cyclone (tropical storm, tropical depression and typhoon). The great flood of 2011 was Thailand's most catastrophic flood, 64 out of its 77 provinces including Bangkok, a total of 5,247,125 households or 16,224,304 people were affected; the death toll reached to 1,026 people and total economic damages and losses stood at Baht 1.44 trillion (US$ 45.7 billion approximately).

Drought

The phenomenon of drought occurs as the consequence of the sharp decrease in the amount of rainwater, water stored in reservoirs or other natural water sources, or in the underground water level over the period of time, to the extent that it has resulted in the lack of sufficient water supply to meet the demands of humans and animals and for vegetation. This subsequent drought induced shortages of water for domestic consumption and for industrial and agricultural purposes in any area for an extended of time can have significant and widespread impacts on people and communities as well as causing extensive damage to overall economy of the country. In addition, the global phenomenon such as climate change or the long – term change of weather over the period of time has shorten the rainy season or in other words it has prolonged the dry season, thus most of the upper parts of Thailand have received consistently below average precipitation, and further has caused the abrupt and unusual decrease in storage within Thailand's major reservoirs. This phenomenon has

subsequently brought about the lack of sufficient available water resources to meet the demands of water usage for domestic and agricultural purposes particularly in the unirrigated areas. Moreover, the simultaneous and rapid pace of modernization, urbanization, and industrialization will inevitably be resulted in an increasing demand for water and decreased supply.

Landslides

Generally, a landslide occurs simultaneously with or following the flash floods created by the continuous heavy downpours which have saturated and destabilized the land mass in such areas. Eventually, the aforesaid land mass and rocks move down a slope under the influence of gravity. At present, Thailand has experienced an increasing occurrence and intensity of landslides due to diversified preconditions and contributing factors particularly the anthropogenic activities including deforestation, cultivation of cash crops in a sloping area, destruction of a land's surface, etc.

3.7.2. Risk Identification and Analysis: Hazards, Vulnerability, Capacity

Natural Disaster: Flood/Flash flood, Land slide/Mud slide, Drought, Strom, Forest fire, Earthquake etc. Strom, Forest fire, Earthquake, etc.

Man-made Disaster: Transportation accident, Fire, Chemical and Hazmat Disease Epidemic, etc

The Level of Natural Disaster Intensity, Vulnerability, The Level of Disaster Intensity, Vulnerability, Managing Competency and Risk Levels of Thailand as follows:

Figure 3.5. Disasters types and level in Thailand

Type of Disaster	Intensity Level	Vulnerability Level	Managing Competency Level	Risk Level
Flood	High	Moderate	Moderate	High
Tropical Cyclone	High	High	Moderate	Moderate
Earthquake	Low	Low	Poor	Moderate
Drought	High	Moderate	Moderate	Moderate
Fire	High	Moderate	Moderate	Moderate
Explosive	High	Moderate	Moderate	Moderate

Type of Disaster	Intensity Level	Vulnerability Level	Managing Competency Level	Risk Level
Accident	High	Moderate	Poor	High
Human Epidemics	Low	Low	Moderate	Low
Agricultural Pest & Diseases	Moderate	Low	Poor	Moderate
Social Unrest	Low	Low	Poor	Moderate
Influx of Refugee	Moderate	Low	Moderate	Moderate

Source: Nation Civil Defence Plan 2005, Civil Defence Secretariat Office Ministry of Interior, Thailand

3.7.3. Disaster Management in Thailand

Disaster management in Thailand has evolved from a historically civil defense posture and emergency management orientation. The first comprehensive disaster management law was the Civil Threat Prevention Act passed in 1979. The law covered all hazards including fires, wind, storms, floods, military air attacks, and terrorism. Following the 2004 Indian Ocean tsunami, which had a catastrophic impact on Thailand's southern coastal region, the RTG further developed a systematic and comprehensive disaster management policy that incorporates all disasters in addition to military threats. The RTG enacted the Disaster Prevention and Mitigation Act (DPM Act 2007), effective 7 September 2007, which sets out the main statutory framework for Disaster Risk Management (DRM) and disaster response in Thailand.

In addition to the government-led system, a vast network of NGOs, charities, academic institutions, business and private enterprises, and community and citizen-led networks support the country's disaster management capabilities.

Thailand's disaster management system is comprised of policy-level and operational-level agencies. At the policy-level, the inter-ministerial National Disaster Prevention and Mitigation Committee (NDPMC), chaired by the Prime Minister or Deputy Prime Minister, is the top policy body for DRM. The Department of Disaster Prevention and Mitigation (DDPM) under the Ministry of Interior is the secretariat for the NDPMC. In addition, the National Safety Council is responsible for national safety policy.

At the operational-level the following agencies are responsible for responding to a disaster:

a. National Disaster Command Headquarters;

As a national command and control facilities this headquarter has responsibilities to direct, oversee, and coordinate the emergency management practices of all lower disaster management centers. The Minister of Ministry of Interior has been designated as the National Incident Commander, and the Permanent Secretary for the Ministry of Interior to be the Deputy National Incident Commander.

b. Central Disaster Management Center;

Department of Disaster Prevention and Mitigation is required to set up the Central Disaster Management Center, and the Director – General of this Department has been designated as the Central Incident Commander. Its functions and authority are set forth as follows:

1. In a non-emergency situation: Coordinates and integrates the emergency response information, resources, and plans of all relevant government agencies in order to ensure the overall state of readiness for handling any type of potential disaster.
2. Likelihood of disaster: Undertakes full scale preparation for potential response operations, keeps a close watch on the disaster situation, conducts data analysis and rapid situation assessment, disseminates early warning message as well as reporting and providing recommendations to the National Incident Commander as the Prime Minister as the case may be for the purpose of making decisions related to disaster relief and emergency response operations to be jointly conducted by all participating agencies in a coordinated and seamless manner.
3. During a disaster: Responsibilities for directing, conducting disaster situation assessment and providing technical support and assistance to the National Incident command Headquarters and acting as the constituent part of in the Emergency Response Coordination Center under the National Disaster Command Headquarters in case of the Disaster upgrade to level 3 and level 4.

c. Provincial Disaster Management Center;

This center has been tasked to direct, control, provide support for and coordinate disaster risk management efforts within the respective provincial jurisdiction. In this connection, the provincial governor has been designated as the Provincial Incident Commander, the vice – provincial governor whom assigned by the provincial governor and chairman of the provincial administrative organization have been designated as Deputy Provincial Incident Commanders.

d. Bangkok Metropolitan Disaster Management Center;

This center has been tasked to direct, control, provide support for and coordinate disaster risk management efforts within the respective provincial jurisdiction. In this connection, the Bangkok governor has been designated as the Bangkok Incident Commander.

e. **District Disaster Management Center;**

As a district command and control center, it has been tasked to direct, provide support for and coordinate disaster management efforts of local administrative organizations located in its jurisdiction, as well as performing any function as assigned by the provincial governor or by the Provincial Disaster Management Center. The chief district officer has been designated as the District Incident Commander.

f. Pattaya City Disaster Management Center;

As Pattaya City command and control center, it has been tasked to direct, provide support for, and coordinate disaster management efforts of Pattaya City as well as functioning as emergency response unit during an actual disaster, along with developing Pattaya City Disaster Management Action Plan in line with the Provincial Disaster Risk Management Plan and the District Disaster Risk Management Plan. The mayor of Pattaya City has been designated as the Local Government Incident Commander.

g. Municipal Disaster Management Center;

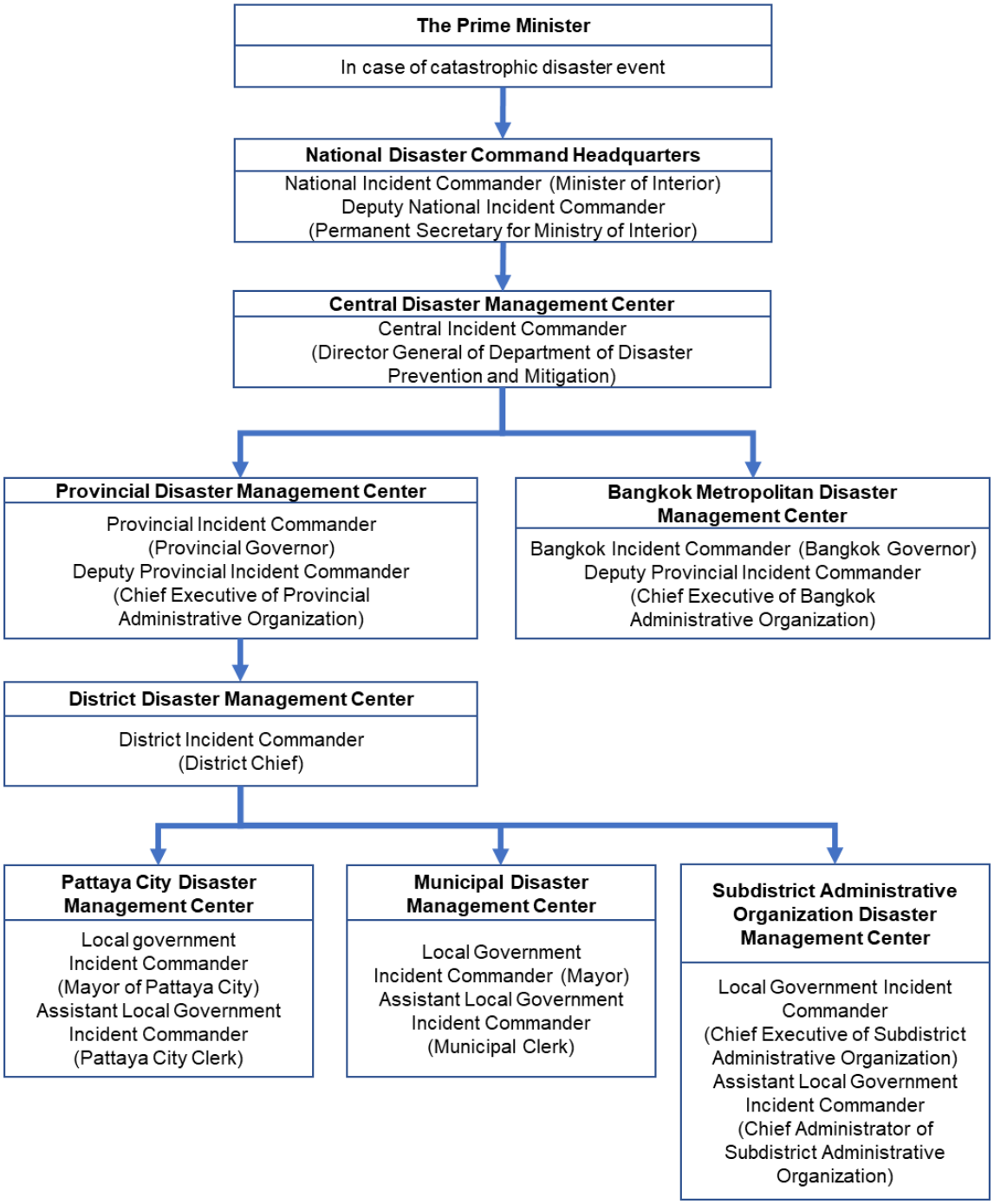
As a municipal command and control center, it has been tasked to direct, provide support for, and coordinate disaster management efforts of the respective municipality as well as functioning as emergency response unit during an actual disaster, along with developing the Municipal Disaster Risk Management Action Plan in line with the Provincial Disaster Risk Management Plan and the District Disaster Management Plan. In addition, this center has been tasked to provide support and assistance to the Provincial Incident Commander and the District Incident commander as being assigned, including provision of assistance and support to the neighboring or adjacent local administrative organizations related to the implementation of disaster risk management activities upon their requests. The municipal mayor has been designated as a Local government Incident Commander.

h. Subdistrict Administrative Organization Disaster Management Center;

As a subdistrict administrative organization command and control center, it has been tasked to direct, provide support for, and coordinate disaster risk management efforts of the respective sub – district as well as functioning as emergency response unit during an actual

disaster The chairman of sub-district administrative organization has been designated as the Local government Incident Commander.

Figure 3.6. Disaster Risk Management Mechanism



3.7.4. Legislation

Thailand's disaster management framework includes the following laws, policies, and plans:

1. Disaster Prevention and Mitigation Act of 2007 (DPM Act 2007);
2. National Disaster Risk Management Plan 2015-2020 (National DRM Plan);
3. Provincial and District DRM Plans;
4. DRM Annual Action Plans.

Below are the scope and purpose of the key legal and policy instruments that makeup Thailand's disaster management framework:

Figure 3.7. Scope of Work and Purpose of DRM of Thailand

Implementation	Plan/Policy	Scope	Purpose
Department of Disaster Prevention and Mitigation	Disaster Prevention Mitigation Act (2007)	National, Provincial, District, Sub-District, Local Community	Aims to streamline disaster management systems of Thailand by clarifying roles and coordination among stakeholders. Includes provisions for DRR.
Department of Disaster Prevention and Mitigation and Other Agencies	National Disaster Prevention and Mitigation Plan (2015-2020)	National, Provincial, Local	Outlines strategic focus areas for DRM interventions, aligned with the Sendai Framework for Disaster Risk Reduction. Intended to cater for all levels of the government, alongside relevant stakeholders.
Sub-District Administration Unit	DRM Action Plan (updated annually)	Local	Guides the implementation of risk management activities at the local level. Intended for the respective sub-district authorities.
Provincial Authorities	Provincial and District Disaster Prevention and Mitigation Plans	Provincial	Guides the implementation of DRM activities at the provincial level, implemented by province governance and supporting stakeholders.

3.7.5. Funding

Funding for disaster management in Thailand are categorizes by levels and agencies which are responsible for responding to the disaster. The budget limitation of each organization was shown as follow:

Figure 3.8. Budget of Thailand DRM

Agency	Budget Limitation (Baht)	Authorized Person
Thai Government	Over 100,000,000	The Cabinet
Secretariat of the Prime Minister	100,000,000	Prime Minister
Office of the Permanent Secretary for Defense	50,000,000	Permanent Secretary for Defense
Department of Disaster Prevention and Mitigation (DDPM)	50,000,000	Director-General of DDPM
Office of the Permanent Secretary for Ministry of Agriculture and Cooperatives	50,000,000	Permanent Secretary for MOAC
Office of the Permanent Secretary for Interior	50,000,000	Permanent Secretary for Interior
Office of the Permanent Secretary for Ministry of Public Health	10,000,000	Permanent Secretary for MOPH
Office of the Permanent Secretary for Ministry of Social Development and Human Security	10,000,000	Permanent Secretary for SDHS
Provincial Disaster Prevention and Mitigation Office	20,000,000	Provincial Governor

Source: 1. Regulations of the Ministry of Finance on Government Advances to Assist Disaster Victims in Emergencies B.E. 2562 (2019)/MOF

2. Disasters Manual for Agricultural Assisting/DOAE

3.7.6. Public Private and People Partnership (P4)

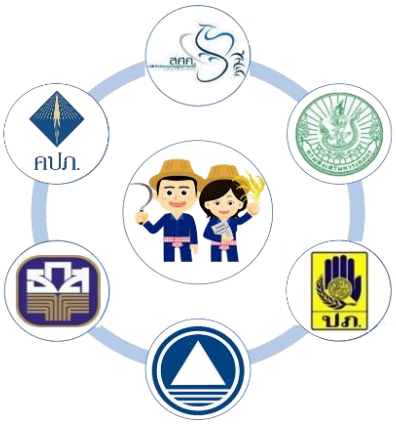
Crop insurance is considered the private sector's insurance mechanism that serves as the government's risk management tool. It will enable farmers to manage the risks of natural disasters themselves. In Thailand, crop insurance was concretely established in 2011. Because farmers were exposed to risks during cultivation, the government introduced risk management tools by introducing insurance systems. The government allocated a portion of the budget to subsidize the insurance premiums for participating farmers. During the initial stage, the government started with rice crop insurance to comprehensively cover farmers' risks. This scheme would strengthen rice farmers' financial stability and mitigate damage when they encountered natural disasters. In cooperation with participating insurance companies, the scheme assigned the Thai General Insurance Association to manage the project. Its responsibilities included coordinating with the government sector, collecting insurance premiums, paying for claims, and sourcing international reinsurers. Risk management is particularly critical for insurance underwriting. The Association has provided reliable, well-established, and globally accepted reinsurance companies to take potentially greater risks than what domestic insurance companies could bear. The roles of various agencies joining the scheme Thai Rice Insurance Top Up Scheme illustrates clearly the role each of agency in the PPP initiative performs.

The PPP between the Thai government and the private sector was initiated by the Fiscal Policy Office (FPO) under the Ministry of Finance. The ministry is in the forefront to assist farmers in managing the risks of the natural disasters, with the assistance of other institutions,

both from the government and private sectors. These institutions with their corresponding contributions are:

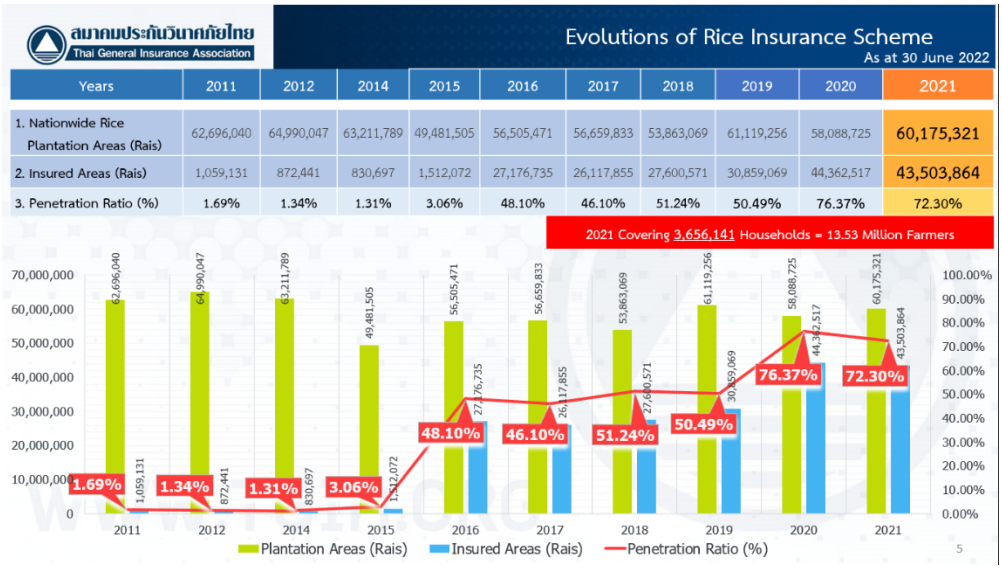
1. Department of Agricultural Extension (DOAE), Ministry of Agriculture and Cooperatives: supporting on farmers on registration and acting as a national loss adjuster.
2. Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior: responsible for disasters declaration and risk mitigation
3. Office of Insurance Commission (OIC): approving rice insurance Top Up policy wordings and premium pricings
4. Bank for Agriculture and Agricultural Cooperatives (BAAC): acted as a distributor in selling rice insurance policies to their rice loanees as well as the non-loanees
5. Thai General Insurance Association (TGIA): Is The Thai Crop Insurance Top Up Scheme administrator and managing the program on behalf of its participating TGIA Members

Figure 3.9. Parties of Rice Crops Scheme in Thailand



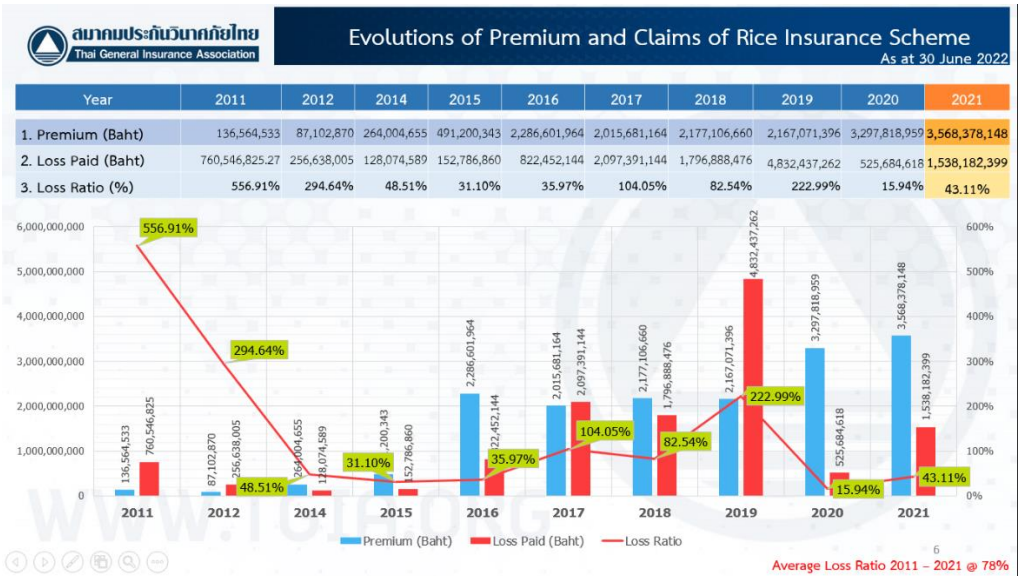
The rice crop insurance scheme has been implemented since 2011. As a public-private collaboration, it required claims assessment criteria that could be promptly implemented, which also responded to farmers' risks in a practical manner. As a result, Thailand initiated the name peril protection that provided coverage against the farming areas' loss or damage caused by natural disasters, pests, or diseases. The coverage and sum insured were developed based on the information obtained from past insurance records. Because farmers have recognized the importance of insurance, the insured areas have been growing continuously. In 2021, the insured areas exceeded 72 percent of the country's farming areas covering 3,656,141 households or around 13 million farmers.

Figure 3.10. Evolution of Rice Insurance Scheme



Years	2011	2012	2014	2015	2016	2017	2018	2019	2020	2021
1. Nationwide Rice Plantation Areas (Rais)	62,696,040	64,990,047	63,211,789	49,481,505	56,505,471	56,659,833	53,863,069	61,119,256	58,088,725	60,175,321
2. Insured Areas (Rais)	1,059,131	872,441	830,697	1,512,072	27,176,735	26,117,855	27,600,571	30,859,069	44,362,517	43,503,864
3. Penetration Ratio (%)	1.69%	1.34%	1.31%	3.06%	48.10%	46.10%	51.24%	50.49%	76.37%	72.30%

Figure 3.11. Evolution of Premium and Claim of Rice Insurance Scheme



Year	2011	2012	2014	2015	2016	2017	2018	2019	2020	2021
1. Premium (Baht)	136,564,533	87,102,870	264,004,655	491,200,343	2,286,601,964	2,015,681,164	2,177,106,660	2,167,071,396	3,297,818,959	3,568,378,148
2. Loss Paid (Baht)	760,546,825.27	256,638,005	128,074,589	152,786,860	822,452,144	2,097,391,144	1,796,888,476	4,832,437,262	525,684,618	1,538,182,399
3. Loss Ratio (%)	556.91%	294.64%	48.51%	31.10%	35.97%	104.05%	82.54%	222.99%	15.94%	43.11%

Source: Thai General Insurance Association

Reference:

✓ National disaster Risk Management Plan (2015)
✓ Nation Civil Defence Plan 2005, Civil Defence Secretariat Office Ministry of Interior, Thailand
✓ Disaster Management Reference Handbook: Thailand, January 2022. Available at https://reliefweb.int/report/thailand/disaster-management-reference-handbook-thailand-january-2022

- ✓ https://www.disaster.go.th/en
- ✓ Thailand's Agricultural Insurance Implementation, Thai General Insurance Association (TGIA), Excerpt from Agricultural Insurance in ASEAN, A Report Compiled by AIC Agricultural Insurance Working Group (AIC AIWG)
- ✓ http://www.ratchakitcha.soc.go.th/DATA/PDF/2562/E/120/T_0036.PDF
- ✓ http://www.plan.doae.go.th

CHAPTER 4
SUMMARY

The number of disaster such as droughts, wildfires, extreme temperature, earthquake and tsunamis increases, and Asia suffered the highest number of disaster events. Over the past two decades, between 350 – 500 medium to large scales disaster took place every year (United Nations for Disaster Risk Reduction).

The world has adapted Sendai Framework for Disaster Risk Reduction and by 2020, 93 countries have put national strategies for disaster risk reduction in place.

ASEAN enhances its regional mechanism for cooperation, coordination, technical assistance and resource mobilisation in all aspects of disaster management under the framework of the ASEAN Agreement in Disaster Management and Emergency Response (AADMER). ASEAN has established ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) aiming to facilitate cooperation and coordination among ASEAN Member States and international organisation for disaster management and emergency response. It reports to ACDM which consists of heads of National Disaster Management Organisation of the 10 ASEAN Member States who serve as the governing board of AHA Centre.

As the Catastrophe Profiles may be different we should know each characteristics of each member state of ASEAN. Some are noted as follows:

1. Brunei Darussalam

Brunei is relatively free of volcanic eruption, earthquake, typhoon and tsunami, but it has experienced flood, landslide, forest fire and haze

2. Cambodia

Cambodia is exposed to nearly all types of hydro meteorogical hazards such as flood, droughts, storms, typhoons, lightning strike. However, storms and typhoons are not considered as significant threat.

3. Indonesia

Indonesia is amongst the countries with high exposure to natural disaster because geologically it is located in the meeting point of continental and oceanic plates. This generates an active zone with active volcanoes and active faults which are the sources of earthquakes

and tsunamis. This also makes Indonesia prone to hydro meteorological hazards such as flood, landslides, flash flood, extreme weather, abrasion and drought that can lead to forest fire.

4. Malaysia

It is relatively sheltered from hazards originating from the tectonic movements and also too far south from major typhoon paths. Occasionally, the country faces threats arising from cyclones, floods, landslides, droughts, epidemics or environmental degradation.

5. Myanmar

It faces numerous natural risks including cyclones, earthquakes, floods and fires. Fires are the most frequent disaster in Myanmar and represent 71% of disasters in the country. Storms and floods represent 11% and 10% of disasters respectively, while other disasters, including earthquakes, landslides, etc. accounts for 8 percent of the disaster.

6. Philippines

The geographical location of the Philippines makes the country exposed to a plethora of hazards including recurrent typhoons, earthquakes and 53 active volcanoes, eruptions of which are classified as the most deadly and costly globally. The subduction zone between the two tectonic plates (Eurasian and Pacific) creating the seismic activity in the region are predicted to have the capacity to generate major earthquakes in the near future, and in the vicinity of metropolitan cities. Other hazards include floods, landslides, tsunamis and wildfires, all of which are occurring in a frequency which has fundamentally changed the perception of hazards in the country.

7. Thailand

Thailand is exposed to flooding, landslides, drought, earthquakes, tsunamis, heat waves, forest fires, and epidemics. Flooding is the natural hazard with the most significant impact on human life, livelihoods, and the economy for the country. The occurrence of droughts has increased in recent years due to the effects of the El Niño-Southern Oscillation (ENSO) cycle, which brings drier-than-average rainfall conditions. Climate change is intensifying the natural hazards that Thailand faces, such as severe storms, flooding, and droughts.

Catastrophe Management in each member state is basically handled by National Disaster Management Agency of the member state. Some agencies have wider scope of works than others as follows:

1. Brunei Darussalam

The lead agency in Brunei in response to natural disaster is the National Disaster Management Centre (NDMC). The National Disaster Council (NDC) and the NDMC was established in 2006 under the Disaster Management Order. The NDC main function is to develop a strategic policy framework for disaster management for Brunei Darussalam. NDMC, under the administration of the Ministry of Home Affairs, is tasked to help the NDC exercise or perform its functions, including to provide advice and recommendations disaster management related matters.

2. Cambodia

The National Committee for Disaster Management (NCDM), established in 1995, is the main agency responsible for disaster management in Cambodia. At the national level, the NCDM consists of the Secretariat and five technical departments. It is also comprised of 22 members from different ministries, Cambodian armed forces, the Civil Aviation Authority, and the Cambodian Red Cross. At the sub-national level, the structure is comprised of Municipal, Provincial, District and Commune Committees for Disaster Management and Village Disaster Management Groups. NCDM is the main authority of the government on disaster management, the task is to lead, administer, and coordinate all disaster management activities including coordinating international assistance during major disasters.

3. Indonesia

Indonesia passed the Law no. 24 year 2007 on Disaster Management that regulates the management of disaster from its core values, institutions, up to authority distribution. Following the law, the government issued Presidential Decree No. 8 Year 2008 regarding the establishment of National Disaster Management Authority. The function of the Authority is to establish disaster management policies and to coordinate the implementation of disaster response activities in a planned, integrated and comprehensive way. Disaster management includes all activities for disaster prevention, handling of emergency situation, rehabilitation and reconstruction. In 2016 the authority launched InaRisk, a portal that shows risk index and various disaster information using infograph.

4. Malaysia

In 2015, following its worst flood event thus far in December 2014, the government founded the National Disaster Management Agency (NADMA). NADMA handles all kinds of disaster. The mission of disaster management in Malaysia is to ensure the welfare of the public and wellbeing of the country via collaboration with various parties united as a team towards capacity building and vigilance on disaster management. Spearheaded by the National

Disaster Management Agency (NADMA), the roles and responsibilities includes acting as the Malaysia's National Focal Point for disaster management, formulating the National disaster management policies, regulating the implementation of policies and coordinating disaster risk reduction initiatives.

5. Myanmar

The Natural Disaster Management Law of 2013 of Myanmar defines natural disasters as the destruction to life and property, livelihood, infrastructures, education and health of the public, to the environment, and damage to crops. The law has the ultimate aim of reducing the risk of natural disasters. According to the Disaster Management Law, the National Disaster Management Committee (NDMC) has formed. National Disaster Management Committee is the supreme agency on Disaster Risk Management (DRM) (policy level, decision making, formulating strategies, and overall supervision). Duties and functions of NDMC includes setting up required organizations to implement the activities of the committee, providing guidance to use domestic resources as necessary in the face of natural disasters, adopting basic principles on coordination for activities which are necessary to receive assistance external sources, managing national finance and resources and then to distribute them to required places.

6. Philippines

Philippines have developed its legal foundations for disaster risk reduction and management, emphasizing response-centric interventions, along with disaster prevention preparedness, and mitigation activities. The enactment of the Philippine Disaster Risk Reduction and Management Act of 2010, as th country's foremost legal instrument and guiding policy framework driving DRRM momentum across various governance levels. In terms of institutional arrangements, National Disaster Risk Reduction and Management Council (NDRRMC) serves as the highest decision-making body, comprising members from different departments, government agencies, LGUs, Civil Society Organizations and private sector. The architecture of DRM consists of multi-tiered bodies down to the Barangay (community) level, comprising Disaster Risk Reduction and Management Office (DRRMO) in every province, city and municipality, and a Barangay Disaster Risk Reduction and Management Committee (BDRRMC), which are responsible for operations requiring vertical coordination, as mandated by the DRRM Act.

7. Thailand

The RTG enacted the Disaster Prevention and Mitigation Act (DPM Act 2007), effective 7 September 2007, which sets out the main statutory framework for Disaster Risk Management (DRM) and disaster response in Thailand. Thailand's disaster management

system comprised of policy-level and operational-level agencies. At the policy-level, the inter-ministerial National Disaster Prevention and Mitigation Committee (NDPMC), chaired by the Prime Minister or Deputy Prime Minister, is the top policy body for DRM. The Department of Disaster Prevention and Mitigation (DDPM) under the Ministry of Interior is the secretariat for the NDPMC. In addition, the National Safety Council is responsible for national safety policy. At the operational-level Thailand has National Disaster Command Headquarters which has responsibilities to direct, oversee, and coordinate the emergency management practices of all lower disaster management centers. The Minister of Ministry of Interior has been designated as the National Incident Commander, and the Permanent Secretary for the Ministry of Interior to be the Deputy National Incident Commander. Below the National Disaster Command Headquarters are the Central, Provincial; Bangkok Metropolitan, District, Pattaya City, Municipal and Subdistrict Administrative Organization Disaster Management Center.