Emergency and Disaster Reports

ISSN 2340-9932 Vol 3, Num 2, 2016

Monographic issue

An approach to the profile of disaster risk of Indonesia

Leroy de Priester

University of Oviedo – Department of Medicine
Unit for Research in Emergency and Disaster

Letter from the editors

The *Emergency and Disaster Reports* is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This second number of 2016 of the Emergency and Disaster Reports covers the situation in Indonesia. The archipelagic country of the Republic of Indonesia is one of the world most natural disaster-prone countries in the world. The country is located at the meeting point of three mayor tectonic plates, the Eurasian plate, the Australian plate and the Pacific plate and Indonesia is part of the so-called 'Ring of Fire' and is therefore extremely prone to seismic activities such as earthquakes and tsunamis. Around 129 active volcanoes have to be closely monitored due to the continuous threat of eruption and earthquakes. Indonesia also faces regularly landslides, droughts, wildfires and floods, which destroys and affects the lives of millions of people. Besides global warming and climate change, indirect vulnerability factors such as poverty and high population density contribute to the severity and increasing number of natural disaster in the country.

After the massive ravage of the Indian Ocean earthquake that was followed by a tsunami on 'Boxing Day', the 26th of December 2004 that resulted in 165.708 causalities and affected more than 532.000 in Indonesia alone, and caused approximately US$ 4.5 billion of economic damages, the Government of Indonesia recognized that its national disaster plan was grossly inadequate to effectively respond to a major catastrophe. With other words, the country was not ready, not prepared and not resilient in facing disasters. A milestone

was reached in 2007 when president Susilo Bambang Yudhoyono signed the Disaster Management Law 24/2007 that intends to reduce disaster risk and incorporates disaster risk reduction in its development plan. The new law clearly recognizes the shift from a focus on Disaster Response to Disaster Risk Reduction (DRR) while clearly identifying a systematic approach to disaster management across the three phases of the disaster management cycle. The three phases include pre-disaster planning and preparedness, emergency response (including search and rescue, relief), and post-disaster long terms recovery and rehabilitation. The new law also provides legal sanctions and recognizes international organizations as partners in the new disaster management paradigm.

The National Agency of Disaster Management (*Badan Nasional Penanggulangan Bencana*, BNPB) was established in 2008 as mandated in the Disaster Management law 24/2007. Reporting directly to the President, the BNPB's mandate is to command, coordinate and implement integrated disaster management strategies in all stages of the disaster management cycle (Preparedness, Mitigation, Response and Recovery). Furthermore, the Government of Indonesia established Regional/Local Agencies of Disaster Management (*Badan Penanggulangan Bencana Daerah*, BPBDs) in all 33 provinces and 339 out of 497 districts. The BNPB's in Indonesia faces enormous decentralization challenges due to its legal obligations and potential sanctions for non- performance in disaster management, versus its limited capacity both in human as in financial resources to fulfill its mandate, which is the same as that of the National Agency. Besides the executing institutions Indonesia launched the National Platform for Disaster Risk Reduction (Planas Pengurangan Risiko Bencana) as an independent forum to support and facilitate cooperation among stakeholders on DRR.

Due to the formation of a new disaster management system the paradigm of disaster response also came into transition. The local BPBDs play a key role in providing response services. The regional/local agencies of disaster management may use the immediate assistance from Emergency Operation Centers tat are currently being established in 6 out of the 33 provinces in the country. The multi-sectorial centers play a pivotal role in the coordination of rapid-live saving activities that include among others; search and rescue operations, specialized medical services and a fire fighting department. In case the local capacity of the BPBD at regional/district and provincial level is overwhelmed by the disaster the National Agency of Disaster Management can/will request the assistance of the Indonesian Disaster Rapid Response and Assistance Agency (*Satuan Reaksi Cepat Penanggulangan Bencana,* SRC-PB*)*. This agency is established in 2009 and serves as a combined civil and military based stand-by force that can be deployed immediately to undertake initial and rapid operations following an disaster situation.

The Republic of Indonesia continues to scale-up its disaster preparedness and response capacity through national programs as well as through regional initiatives to develop for example early warning systems for all key hazards,

starting to build resilient villages along the nation, the creation of a centralized national disaster information database and building capacity in terms of logistics and human resource. It also recognizes that its geographical location makes it constantly vulnerable to catastrophic disasters where international humanitarian assistance as well as the considerable assets of civil military assistance will be needed. Indonesia is benefiting from international initiatives, such as the Hyogo Framework for Action (HFA). The HFA 2005-2015 has provided the necessary encouragements for advocating DRR funding and mainstreaming DRR in development planning and legislation.

Although Indonesia made magnificent progress towards a more resilient nation the Disaster Management System is a new and evolving process. The decentralization process is facing many challenges. There is a lack of clear national and local guidance for the regional and local agencies of disaster management and this has hampered the development of solid institutional structures and the institution's performance. Provincial and district disaster management agencies are not effectively coordinating local government agencies to prepare for disasters, by conducting response planning and simulations which are informed by hazard mapping. The main difficulties are constraints with human resources, (the recruitment of skilled personnel), planning and budget allocations. Strengthening the grass-root levels of disaster management by capacity building strategies through training and education, scaling up financial and human resources, clear guidance and policies and enhancement of coordination and communication.

After all, disaster preparedness and response is a challenge that can unite mankind. The government of Indonesia, the institutions of the disaster management, the local governments, the international community, the local communities and every individual should embrace the idea of a resilient nation for everyone. Indonesia will ultimately push forward development and safeguard Indonesian citizens to be ready for disasters that are very likely to happen in the near future.

Prof. Pedro Arcos, Prof. Rafael Castro
Editors, Emergency and Disaster Reports
Unit for Research in Emergency and Disaster
Department of Medicine. University of Oviedo
Campus del Cristo 33006 Oviedo – Spain
www.uniovi.net/uied

Monographic issue

An approach to the profile of disaster risk of Indonesia

Author: Leroy de Priester

Table of Contents

List of abbreviations 7

Introduction 8

Background and History 9
Geographical information 9
Demographic information 10
Economical information 10

History of disasters in Indonesia 11
Data on natural disasters 11
Historical events categorized by event 14
Earthquakes 14
Floods 16
Droughts 18
Wildfires 18
Epidemics 18

Main disaster risk factors present in Indonesia 19
Geophysical/geological hazards 19
Earthquake Hazards 20
Tsunami Hazards 21
Volcanic Eruption Hazards 21
Landslides/Land Mass Movement 23
Hydrological hazards 24
Flood hazards 24
Drought Hazards 25
Wildfires – Forest and Land Fire hazards 26
Biological hazards 26
Epidemical hazards 26
Other Natural Hazards 27
Man-made hazards 27
Technological Failure 27
Social conflict 28
Other factors of Vulnerability 28
Population increase and urbanization 29

Disaster prevention and response strategies 29

Legislation 30
Institutions 32
The National Agency for Disaster Management *32*
Regional Agencies for Disaster Management *33*
National and Regional Platforms for Disaster Risk Reduction *35*
Planning & Funding 35
National Disaster Management Plan *36*
Capacity-building 38
Prevention, Preparedness and Awareness Strategies 39
Early Warning System *39*
Tsunami Early Warning System *40*
Master Plan for Tsunami Disaster Risk Mitigation *40*
Conference on Disaster Risk Reduction in Indonesia *41*
Enhancement of preparedness in practice *41*
Disaster resilient village programs *42*

Emergency and disaster response system in the country 42
Emergency Operation Centers 43
Indonesia Disaster Rapid Response And Assistance (SRCPB) 43
Inter-cluster Preparedness Package 44

Discussion 45

Conclusions 47

Bibliography 48

Annex I – OFDA/CRED: EMDAT data overview (1984-2013) 55

Annex II – Earthquake Risk Map 2011 59

Annex III – Tsunami Risk Map 2011 60

Annex IV – Volcano Risk Map 2011 61

Annex V – Landslide Risk Map 2011 62

Annex VI – Flood Risk Map 2011 63

Annex VII – Drought Risk Map 2011 64

Annex VIII - Land- and Forest Fire Risk Map 2011 65

Annex IX – Socio-Economic Vulnerability Index map 66

List of abbreviations

AMCDRR	Asian Ministerial Conference on Disaster Risk Reduction
ASEAN	Association of Southeast Asian Nations
BNPB	*Badan Nasional Penanggulangan Bencana* / National Agency of Disaster Management
BPBD	*Badan Penanggulangan Bencana Daerah* / Regional Agency of Disaster Management
DM	Disaster Management
DRR	Disaster Risk Reduction
EOC	Emergency Operations Center
EWS	Early Warning System
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GNI	Gross National Income
GoI	Government of Indonesia
HFA	Hyogo Framework of Action
IFRC	International Federation of Rec Cross
InaTEWS	Indonesian Tsunami Early Warning System
MDG	Millennium Development Goal
NDRI	Natural Disasters Risk Index
NGO	Non Governmental Organization
OCHA	Office for the Coordination of Humanitarian Affairs
OFDA/CRED	Office of Foreign Disaster Assistance/ Centre for Research on the Epidemiology of Disasters
PMI	*Palang Merah Indonesia* / Red Cross Indonesia
SAR	Search and Rescue
SRCPB	*Satuan Reaksi Cepat Penanggulangan Bencana* / Indonesian Rapid Response & Assistance Team
TNI	*Tentara Nasional Indonesia/* Indonesian National Armed Forces
TNI-AL	*Tentara Nasional Indonesia Angkatan Laut/* Indonesian Navy
TNI-AU	*Tentara Nasional Indonesia Angkatan Udara/* Indonesian Air Force
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction
USGS	United States Geological Survey
WFP	World Food Program

Introduction

As the forth largest country in the world in terms of population, with an estimation of 251,160,124 citizens at July 2013 (1) and as the largest archipelago country in the world Indonesia in one of the most disaster-prone countries in the world. Under the presidency of Susilo Bambang Yudhoyhono the country is uniting against disasters and embracing disaster risk reduction strategies in to their policies and their national highest priorities. As the president was stating in a video conference when he received the first recognition from the United Nations as the Global Champion for Disaster Risk Reduction in 2011: " We need to change our paradigm from reactive to proactive, from emergency response to risk reduction and from government to civil society. After all, disaster affecting one country, ultimately affects all of humanity"(2).

Only in the first quarter of 2011, Indonesia faced many challenges of natural disasters with earthquakes, 67 significant earthquakes with magnitude of 5.0 RS or higher were registered, as a mayor threat. (3) Followed by volcanic eruptions, floods, landslides and tsunamis that pose continual threats on the country. However, lets not forget the impact of man-made or industrial disasters in Indonesia. Social conflict, technological failures and forest-fires are examples that result in increasing threats on Indonesian civil society. Where Indonesia's consistency in various in ethnic, linguistic and religious diversities is the building foundation of the country, it can also lead to potential conflicts and develop into national disasters. Moreover, the fast economical development that the country is currently going through give rise to common technical failures such as fatal transportation accidents, industrial accidents and outbreaks of human illness due to higher mobilization within the nations many islands.

Though Indonesia have made outstanding progress in the last years building more resilience and working towards a nation where disasters risk reduction is the central point of attention the country is still having many challenges and problems to overcome. Besides organizational challenges as for example the process of decentralization of disaster management policies, global warming, with its rising sea levels, pose continues threats on the extensive country coastlines and thousands of small islands. Disparities between urban and rural areas, high poverty and malnutrition rates and the vast growing population create higher vulnerability among the Indonesian population. An archipelago that remains extremely susceptible to natural and man-made disasters.

This disaster risk profile is written as the final assignment of the first semester of the Erasmus Mundus Master course in Public Health in Disasters. This report will firstly elaborate on the background and demographics of Indonesia, the disasters that occurred in the last 30 years, as well as their impact on various factors. Secondly, an analysis will be provided of the main risks factors of disasters where Indonesia is exposed under. Then the preventive and the response strategies will be explained in detail followed by the structure and characteristics of the emergency and disasters

response systems will be described. The report will end with and discussion and conclusion of the analysis made.

Background and History

Geographical information

The Republic of Indonesia is located in South-East Asia, between the Indian Ocean and the Pacific Ocean and between the Asian and Australian continent. It is situated on the equator that explains its tropical environments. Indonesia is the largest archipelagic country in the world (1,904,569 sq. km), which consists of approximately 17.508 islands of which around 6000 are inhabited (4). The five main Islands of Indonesia are Sumatra, Java, Kalimantan, Irian Jaya (also called Papua) and Sulawesi. Of these islands Java is the most fertile and most densely populated which only represents 7% of Indonesia's soil. Maluku and Nusa Tenngara are the two biggest archipelagic provinces of Indonesia. Other Islands are small and most of the time unhabituated. Indonesian territory is covered in water for more then 80% (5).

Base 80289BAI (C00429) 11-02

Figure 1. Map of Indonesia (Source: NationMaster.com)

Indonesia is situated on the meeting point of three major tectonic plates, the Eurasian plate, the Indo-Australian plate and the Pacific plate. Besides it is located at the so-called pacific ring of fire, a region of high volcanic and seismic activity that surrounds the Pacific Ocean. The volcanoes located along the ring of fire gave birth

to the islands of Indonesia in history and shaped its country to what it is today. Currently there are approximately 129 active volcanoes in Indonesia (6).

Demographic information

Indonesia is a diverse county with many different ethnic, linguistic and religious backgrounds. As the State Emblem of Indonesia is reflecting through the national motto says: "Bhinneka Tunggal Ika"/"Unity in Diversity" the country is build on diversity (4). With a number of populations of 251,160,124 Indonesia is the forth-largest country in the world in terms of population, after China, India and the United States. The greatest share of the population, namely 60%, lives on the Java Island, which has relatively only a small share of the countries total area (only 7%). There is a mayor difference in population density on Java Island with 951 people per sq. km in comparison with 109 people per sq. km of the national average density. This is reflected in the diversity of ethnic groups as well, with Javanese (40%) as the largest ethnic group followed by the Sundanese (15%) and many other smaller ethnic groups (1).

Indonesia has the biggest Muslim population in the world, with 86,1% of the people living in Indonesia practicing the Islamic religion. Other religious groups include Christians Protestants and Catholics, Hinduism and Buddhism (1). Although Indonesia is having the largest Muslim community in the world it is not officially an Islamic state. The Indonesian government type is based on a demographic multi-party presidential republic where the House of Representatives and president are directly elected for a five-year term of presidency by the voting system. The current president is Susilo Bambang Yudhoyono who is on his second and final term of presidency (the President can be elected for a maximum of two times 5 year term). He was sworn in for his second term on October 2009. In 2014 Indonesia awaits new presidential elections (4).

Economical information

Indonesia is a vast growing country and is now one of Asia Pacific's most vibrant democracies that maintained political stability. It has emerged as a confident middle-income country. Indonesia continues to reach economical growth with in 2012 increasing GDP (Gross Domestic Product) of 6,2% to $878,192,879,854 and the countries GNI (Gross National Income) per capita has risen steadily from $2,200 in 2000 to $3,563 in 2012 (7). Despite all the significant growth Indonesia is facing considerable economic challenges. There are large disparities and inequalities within the population. These include for example the poverty head count 12% of the population is still living under the national poverty line. This is approximately 30 million of the total population, a gruesome amount that is almost equal as the population size of the countries of the Netherlands, Belgium and Luxembourg together (7). For the standards of a middle-income country Indonesia's public

services remain inadequate and this is consequently resulting in poor indicators on health and infrastructure. Especially maternal mortality rates of 220 per 10.000 pregnant women (World Bank, 2010) persists being unacceptably high, although progress as been made. There is also not a significant increase of the proportion of population with sustainable access to clean water and sanitation. It is therefore that Indonesia is unlikely to meet all the in 2000 created millennium development goals (MDGs) targets (8).

History of disasters in Indonesia

This chapter will elaborate on the various disasters that occurred in the past 30 years in Indonesia, instead of the past 50 years that was given in the assignment outline owing to the fact that the databases used in this assignment had proper information of this specific period of time. In addition a short summary of their impact on the health of the population, the environment, the economy and the development will be given.
Data on the occurrence of disasters is taken from EM-DAT, the OFDA/CRED International Disaster Database. In order to have a disaster entered in the EM-DAT database at least one of the following criteria has to be fulfilled:

1. 10 or more people reported killed.
2. 100 or more people reported affected
3. A call for international assistance
4. Declaration of a state of emergency

Data on natural disasters

Indonesia is one of the most disaster and hazard prone countries in the world and in the last 30 years the country faced multiple hazards such as, volcano eruptions, earthquakes, floods, tsunamis, forest-fires, landslides and droughts.
Based on volcanic eruptions events in history two significant volcanic eruptions found there home in Indonesia. Although this happened some centuries ago it is worth mentioning the 1815 Tambora Volcano eruption in Sumbawa Island, West Nusa Tenggara and the Krakatau Volcano eruption between Sumatra and Java in 1883 that had major impact on the geographical shaping of the country and caused many causalities and affected people (6).

Disaster historical data have shown that Indonesia has experienced a substantial number of natural disasters, with significant number of people killed. In the period from 1984-2013, according to the OFDA/CRED International Disaster Database, the Republic of Indonesia has experienced 325 natural disasters events that have killed 190.794 people. The number of people affected by those disasters is even bigger, i.e. 20.974.907 people. Besides the human losses, economic damage effect by the

disasters occurred in the past 30 years are immense. The country has suffered an economic damage of US $ 26.332.780.000 for the period of 1984-2013 (9).

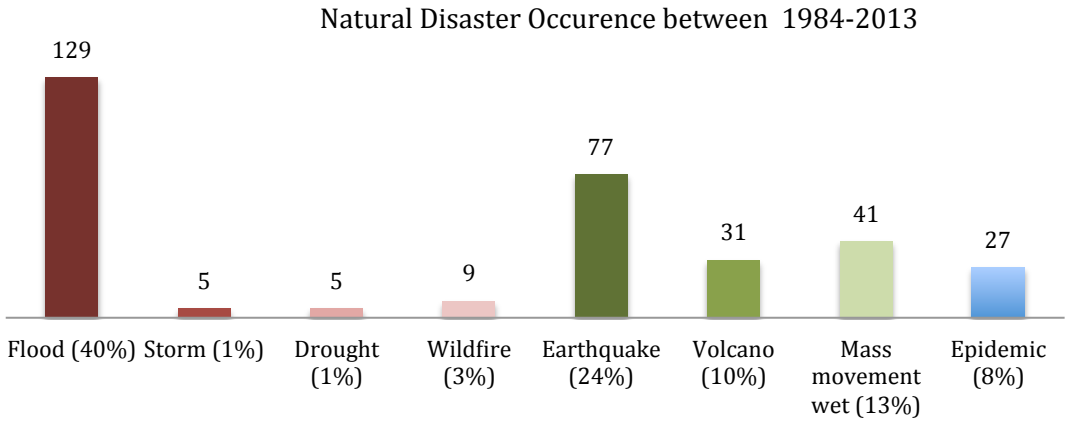


Figure 2. Natural disasters occurrence between 1984 - 2013 (Source: OFDA/CRED Database)

Of the 190.794 people being killed by disasters in the period of 1984-2013 approximately 93,9% were killed by earthquakes and tsunamis, while the other 2,5% by floods and 0,7% by epidemics. In terms of the human loss geological disasters claimed more lives than hydro-meteorological disasters, climate-change related disasters and epidemic outbreaks, however in terms of the number of people being affected by disasters, the situation is more equally distributed. Out of 20.974.907 people affected from natural disasters, between 1984 – 2013, 53% were affected by hydro-meteorological disasters, while around 44% by geological disasters and around 3% by epidemic outbreaks. (9).

In terms of economical damage for the period of 1984-2013 Indonesia suffers a total economic loss of US $ 26.332.780.000. Out of this enormous amount of economic loss the biggest loss is caused by earthquakes and tsunamis (US $ 11.343.626.000), followed by wildfires (US $9.329.000.000), floods (US $ 5.439.409.000), wetland mass movements (US $ 120.745.000) and volcanoes (US $ 9.000.000) (9).

When examined deeper, it can be seen that Indonesia has almost an even number of hydro-meteorological (148) as geological (149) disaster events and that biological disasters are relatively low. In terms of people being affected there is a slightly higher proportion affected due to hydro-meteorological disasters. Besides the fact that hydro-meteorological disasters affect more people it also have a greater impact on economical losses (US $ 14.858.409.000) than those caused by geological disasters (US $ 11.474.371.000), especially when wildfires are considered as a hydro-meteorological disasters since they are usually closely related to climate-change, caused by droughts as a consequence of the el Niño phenomenon (9).

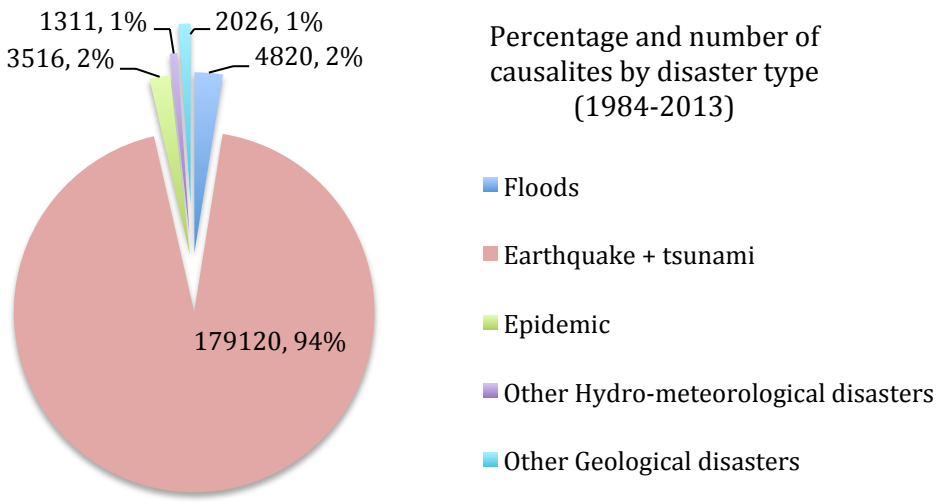


Figure 3. Percentage and number of causalities by disaster type (Source: OFDA/CRED Database)

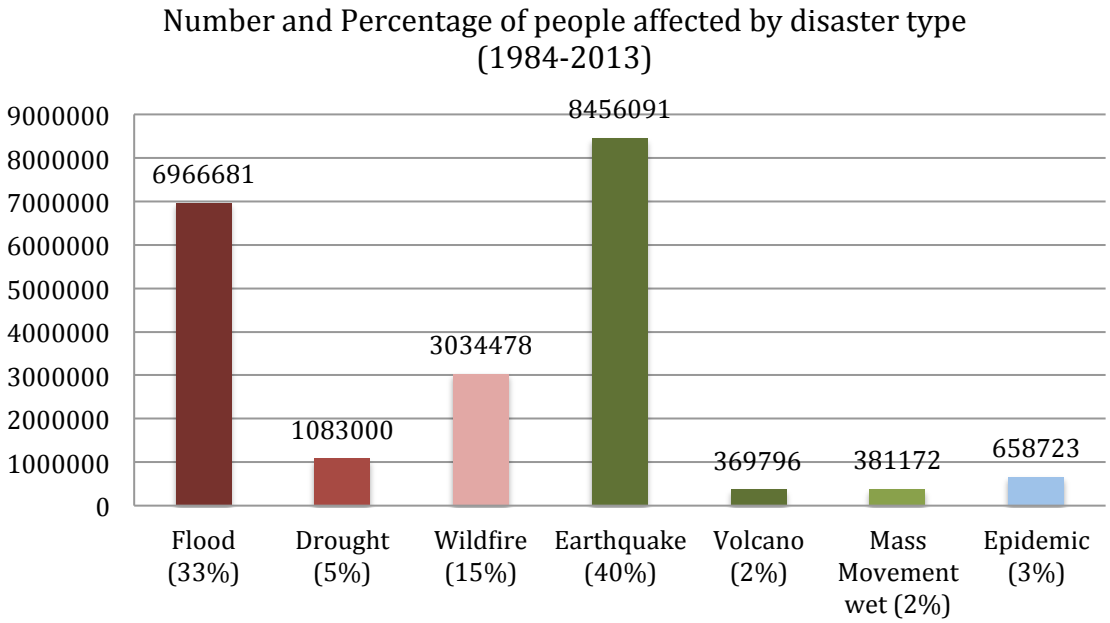


Figure 4. Number and percentage of people affected by disaster type (Source: OFDA/CRED Database)

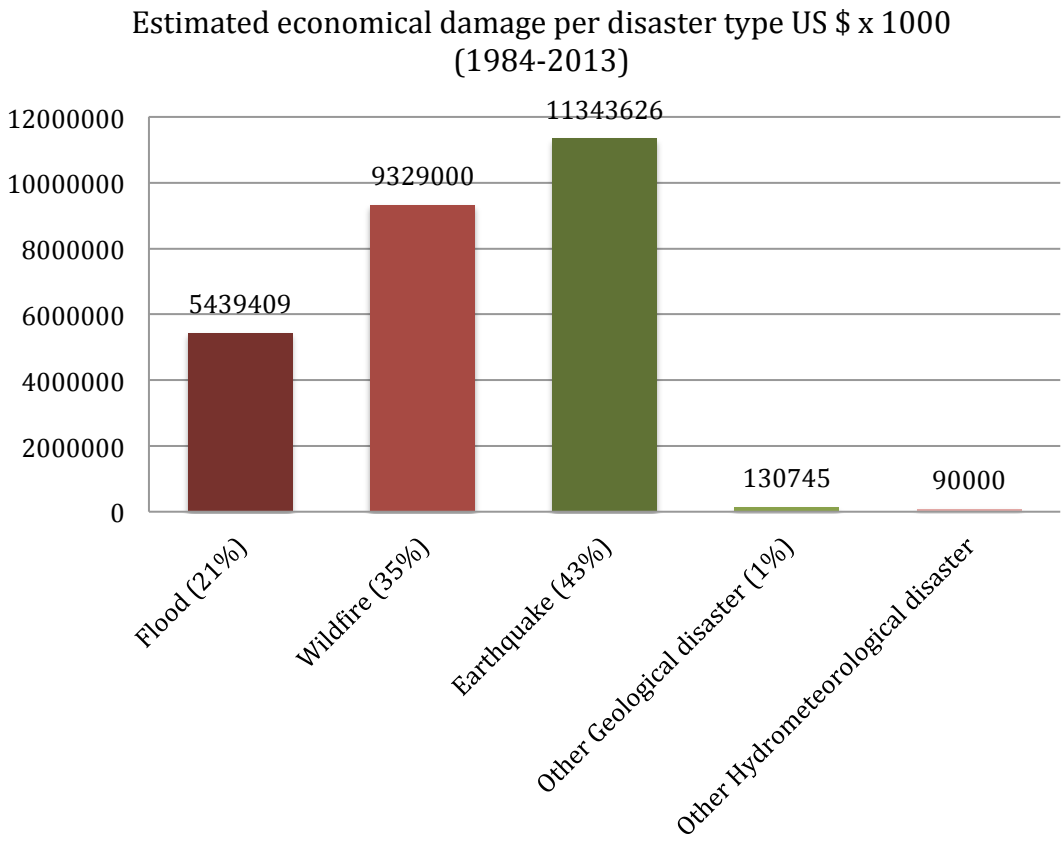


Figure 5. Estimated economical damage per disaster type (Source: OFDA/CRED Database)

It is obvious that climate change has increased the number of disaster events in Indonesia and op top of that it made meteorologically influenced events such as floods, droughts and wildfires more intense. As in many other parts in the world climate change, accelerated by human activities, have indeed generated an increase in hydro-meteorological-related disasters (10).

Historical events categorized by event

In the following section of the historical patterns of disasters occurred in Indonesia only the most significant disaster events from 1984 – 2013 will be mentioned. These events are classified in the top 10 natural disasters in terms of number of people being killed, number of people affected and total economic damages. These events are classified according to the OFDA/CRED International Disaster Database.

Earthquakes

Of all the natural disasters of the last 30 years the deadliest occurred in the early 21st century on the 26th of December 2004. A massive 9.2 magnitude earthquake struck in the sea near Simeulue Island, west of Sumatra Island. The earthquake triggered a

tsunami that later killed more than 225.000 people in eleven countries and devastated coastal areas in the countries it affected. In Indonesia alone the earthquake and the tsunami that followed killed around 165,708 people, it affected approximately 532.898 people and resulted in an economic loss of over US $4.5 billion. Displacement and damage to infrastructure were important contributors to the human, social, and economic effects of the tsunami. The primary cause of mortality during the 2004 earthquake and tsunami was drowning followed by severe injuries (9) (11).

In 2006, on the 27th of May another massive earthquake with a magnitude of 6.3 occurred 25 kilometers from the city Yogyakarta at central Java Island. The quake happened at 5.54am local time and in less than a minute, the roofs of homes caved in, many on top of sleeping inhabitants, and hotels and government buildings collapsed. The quake caused 5,778 deaths, while 36,299 people were injured, and an estimated 1.5 million left homeless. This earthquake affected approximately a total of 3,177,923 people. More than 135,000 houses were destroyed and an additional 451,000 were damaged in the area, with the total loss estimated at approximately 3.1 billion US dollars (9) (12).

Another deadly earthquake happened just off the west coast of northern Sumatra (between Nias Island and Simeulue Island), only three months after the 2004 East Indian tsunami, on the 28th of March 2005 at 23:00 local time. The event caused panic in the region. This 8,7 magnitude earthquake generated a relatively small tsunami that caused limited damage. Approximately 915 people were killed while they were either sleeping or trying to run from the second and third floors. Besides this, tens of thousands of people were left homeless after the collapse or destruction of their houses. The earthquake resulted in a number of 105.312 people affected. Extensive damage to infrastructure including the destruction of ports, bridges and roads hampered relief efforts to the islands. In addition, further delays were caused by a lack of storage facilities, power outages and insufficient inland transportation and distribution mechanisms (9) (13).

At the 30th of September 2009 a tremendous 7.9 magnitude earthquake occurred just off the southern coast of Sumatra, Indonesia. The major shock hit at 17:16 local time. The epicenter was 45 kilometers west-northwest of Padang, Sumatra. In this earthquake there were 1195 causalities reported and approximately 2,501,798 people were affected through the total or partial loss of their homes and livelihoods. Economic damages were estimated to be around US $ 2,2 billion. The epicenter of the earthquake was not on the line of subduction of the Indo Australian Plate beneath the Eurasian plate, and therefore there was no tsunami triggered. Many buildings in the public sector collapsed, exacerbated by poor detailing of reinforcement, especially at the joints. There were some cases of liquefaction, which is a potential hazard for significant areas in the city (9) (14).

In 2007 there where several severe earthquakes reported at the Sumatra Island. On 6 March 2007, an earthquake measuring 6.4 on Richter scale struck West Sumatra

Province, affecting ten districts and municipalities. 67 people died, at least 826 other resulted injured and 137,000 people were displaced. Total number of people affected: 137.660. Around 13,000 houses were totally damaged, 12,800 moderately damaged and 18,000 slightly damaged with an economic damage of US $ 200,000,000 (9) (15)

In the same year in September several other earthquakes occurred in Sumatra. On September 12 and 13, 2007 two earthquakes struck off the island of Sumatra, Indonesia, causing damage in the provinces of Bengkulu, Jambi, West Sumatra and the Mentawai Islands and affected 459.567 people. An 8.4 Richter Scale (RS) earthquake struck off the southern coast of Sumatra on 12 September. On 13 September, another earthquake measuring 7.9 RS shook Jambi province and another one measuring 6.7 RS struck off the coast of West Sumatra. All earthquakes and the 6.6 RS aftershock generated tsunami alerts that were subsequently called off. 25 people died and 100 other resulted injured from the earthquakes. Around 18,000 houses were totally damaged, 21,000 moderately damaged and 49,500 were slightly damaged with a total damage of US $ 500,000,000 (9) (16).

The July 2006 Java earthquake was a magnitude 7.7 earthquake off the southwestern coast of Java, Indonesia. It occurred on July 17, 2006 at 15:24 local time. The earthquake caused a three-meter-high tsunami that destroyed houses on the south coast of Java, killing at least 802 people, affected 35.543 people and caused an economic damage of approximately US $ 55 million. (9) (17)

In December 1992, a 7.8 magnitude earthquake, that also triggered a tsunami, struck Flores Islands in Nusa Tenggara. At least 2500 people were killed in the Flores region. More than 5000 people were injured and 40,000 left homeless. An estimated number of 92.103 people were affected by the earthquake/tsunami. Severe damage, with approximately 90 percent of the buildings destroyed at Maumere, the hardest hit town, by the earthquake and tsunami; 50 to 80 percent of the structures on Flores were damaged or destroyed. Damage also occurred on Sumba and Alor. According to CRED there was an economic loss of US $ 100 million. It was reported that the tsunami run-up of 300 meters with wave heights of 26.2 meters on Flores along with landslides and ground cracks at several locations around the island. (9) (18)

Floods

The most severe flood in Indonesia in terms of the number of people affected struck the northern coast of Sumatra on 22 December 2006 causing widespread devastation in areas still recovering from the 2004 tsunami. The torrential rains in December 2006 caused serious floods and landslides covering wide geographical areas in the province of Aceh, North Sumatra and Riau. The floodwater reached up to three meters, temporarily displacing over 300,000 persons at the height of the disaster in the Aceh province alone. It was reported that more than 618,486 people were affected in all three provinces and killed over a hundreds of people (236). More

rains in January and February 2007 worsened the conditions of flood-affected populations and damaged their infrastructure such as roads, bridges and telecommunication facilities as well as their livelihoods and agricultural products. An US $ 55.2 million has been reported as the total economic damages this flood caused. (9) (19)

Every year floods occur in Jakarta. Widespread flooding occurred in 1996, 2002 and 2007, inundating up to 40% of the city. Increasing population pressure and subsidence (10 cm/year or more) of areas already under mean sea level (MSL) lead to an autonomous increase of flood risk. In February 1996 a major flood occurred that 5000 hectares (20-30% of Jakarta's total area) of land covered under water, at least 20 people were killed, 556,000 people were affected and its economic damages are estimated on US $ 434,800,000. (9) (20)

In 2002 a massive flood affecting 500,750 people and resulting in a total economic loss of US $ 350 million again struck Jakarta. Due to bad city planning and the poor drainage system torrential downpours have swept through the capital again. About 20% of the city was underwater and the flood resulted in approximately 150 causalities. (9) (21)

In February 2007 the greatest flood in the last three centuries inundated about 60 % of the city. River had burst, dikes had broken and the water level ranged from 10 centimeters to 4 meters. The flood, pouring muddy water, affected 80 separate regions in and around Jakarta, and over 74,000 homes were submerged, resulting in the displacement of some 340,000 people. This flood caused by torrential rains resulted in an estimated death toll of 68 people. There was a high level of illness, with 1,066 patients treated by hospitals due to diarrhea and 329 due to dengue fever. The flood has caused US $ 971 million in economic losses. A total of approximately 190,000 people have fallen ill due to flood-related illnesses. (9) (22)

The most recent severe flood, January 2013, affected around 248.846 people in Jakarta, of which 19,000 people were evacuated to temporary shelters. The flood had an immense economic loss of US $ 3 billion. The floods in 2013 began as the result of heavy rains and waterways clogged with garbage and other kinds of debris. Serious flooding began along several main roads of Jakarta. A 30-meter-long section of Jakarta's West Flood Canal dike on Jalan Johannes Latuharhary in Menteng collapsed. This breach quickly caused flooding in nearby areas. There were around 34 deaths reported. (9) (23).

Severe flooding is reported to have hit Jakarta on numerous occasions in the past, including in 1621, 1654, 1918, 1942, 1976, 1996, 2002, 2007 and 2013. An important part of the flooding problem is caused by the fact that a substantial part of Jakarta is low-lying. Around 24,000 ha (about 240 square km) of the main part of Jakarta is estimated to be below sea level. Flooding can become severe if heavy rains happen to coincide with high tides. When this happens, high tides tend to push water into

low-lying areas just as the run off from rains in upland areas such as nearby Bogor is flowing down into the Jakarta area. (24)

Droughts

The worst drought in Indonesian history is the El Niño drought crisis in 1997 that affected approximately 1,065,000 people throughout Indonesia and killed around 672 people. Indonesia has suffered from this severe drought as a result of a strong El Niño phenomenon. This has led to food shortages in many provinces. Besides that, Indonesia was going through a regional economic crisis that was affecting its ability to import sufficient quantities of rice. Under these circumstances, the Government's ability to mount relief operations at required levels was seriously hampered and ongoing poverty alleviation programs were being curtailed. Especially large areas of central Irian Jaya (Papua) were severely affected by the drought that was creating major food shortages, high-level of malnutrition and excess in morbidity and mortality. Over 400 deaths have been reported in the Jayawijaya district, one of the highest affected areas in Irian Jaya, since the onset of food and water shortages caused by the extended drought and frost damage to local crops. Many children in the area were severely malnourished. The drought resulted in an estimated economic loss of US $ 88 million. (9) (25)

Wildfires

Related to the droughts, and strengthened by the El Niño phenomenon, Indonesia has suffered some substantial wildfires. In 1994 about 5,400,00 hectares of forest area were burned at the Sumatra and Kalimantan Island. The forest fires covered Indonesia and the neighboring countries of Malaysia and Singapore with smoky haze. This affected health of many people and hindered aircraft movement and shipping throughout Southeast Asia. This wildfire affected 3 million people. (9) (26)

Another worse haze occurred, due to wild fires hit the country in 1997/1998, when widespread fires, destroying over 12 million acres of forests, mostly on Kalimantan Island and Sumatra blanketed South-East Asia for several months. This disaster resulted in 34.070 affected persons and 243 causalities. The fire partly blamed on droughts brought by El Niño and partly on illegal logging in parts of the country hampered transport, raising health concerns and caused an estimated US $ 9,3 billion in economic damages to the region. (9) (27)

Epidemics

An extensive outbreak of dengue fever and dengue hemorrhagic fever occurred in the city of Palembang, South Sumatra, Indonesia from late 1997 through March/April 1998. In this year Indonesia witnessed the largest epidemic on record, with 72,133 reported cases (IR 34.2/100,000) of dengue fever and dengue

hemorrhagic fever and 1,414 dengue-attributable deaths with overall case fatality rate of 2.0 (WHO, 2004). This numbers differs from the OFDA/CRED database that states 777 people being killed and 32.665 people affected. (9) (28)

From 1 January to 30 April 2004, a total of 58 301 cases of dengue fever and dengue hemorrhagic fever (DHF) and 658 deaths have been registered with the Indonesian Ministry of Health. The case-fatality rate of 1.1 is lower this year than in previous years. Although all 30 provinces have been affected, outbreaks with unusually high numbers of cases have been reported from 293 cities and districts in 17 provinces of the country. (9) (29)

Main disaster risk factors present in Indonesia

According to the Natural Disaster Risk Index (NDRI), by the global risk advisory firm Maplecroft, Indonesia has been rated as one of the nations most at risk from extreme weather situations and geophysical events based on the vulnerability to natural disasters.

This is shown by a study in 2010 and is calculated by measuring the human impact of natural disasters, in terms of deaths per annum and per million of population, plus the frequency of events over the last 30 years. The methodology has been refined to reflect the likelihood of an event occurring and covers disasters including earthquakes, volcanic eruptions, tsunamis, storms, flooding, drought, landslides, extreme temperatures and epidemics. (30)

Indirect contributors to the severity and impact of natural hazards have to be mentioned. Poverty is an important factor in countries where both the frequency as the impact of natural disasters is severe. Poor infrastructure, dense population or overcrowding in high-risk areas contributes to high causality. Another indirect contributor to increasing vulnerability is climate change and global warming. Due to climate change hydro-meteorological events are predictably increasing in Indonesia. (30)

The Republic of Indonesia is situated on one of the most active disaster hot spots on earth, where earthquakes, tsunamis, volcanic eruptions, floods, landslides, drought and forest fires frequently occur. In order to formulate actions concerning disaster preparedness, risk reduction strategies and response the identification of all hazards should be taken in to account. Besides that, hazard-prone areas and high-risk areas in Indonesia need to be identified. In the next section of this report there will be a general overview provided of the main disaster risk factors.

Geophysical/geological hazards

Around 47% of all disasters that happen in Indonesia are from a geophysical/geological nature. Although there are almost an even number events being reported in hydro-meteorological disasters over the last thirty years, in terms of people being killed geophysical disasters, and mainly earthquakes (including those triggering tsunamis) results in higher catastrophes in Indonesia. There have been many events resulting in loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. (9)

Geological hazards include internal earth processes, such as earthquakes, volcanic activity and emissions, and related geophysical processes such as mass movements, landslides, rockslides, surface collapses, and debris or mud flows (31). Hydro-meteorological factors are important contributors to some of these processes. Tsunamis are difficult to categorize; although triggered by undersea earthquakes and other geological events, they are essentially an oceanic process that is manifested as a coastal water-related hazard. However, in this country risk profile it will be categorized as a geophysical hazard owing to the fact that the largest tsunami recorded in Indonesia was triggered by an earthquake.

Earthquake Hazards

The archipelago of Indonesia is situated at the meeting point of three active tectonic plates. The Indo Australian plate to the south, the Euro Asian plate to the north and the Pacific plate in the east. This three plates are moving and thrusting into each other in such a way that the Indo Australian plate thrusts under the Euro Asian plate. Moving northward the Indo Australian plate pushes into the Euro Asian plate that is moving southward (convergent plate boundary) and this creates a seismic line and triggers a belt of active volcanoes, known as the ring of fire, along the Sumatra, Java, Bali and Nusa Tenggara Islands, turning north to the Maluku and North Sulawesi. This goes parallel with the subduction zones of the two plates. Earthquakes are caused by the above-mentioned activities in the subduction zones. (6)

Earthquake prone areas in Indonesia are distributed close to subduction zones and nearby active faults. Areas that are close to the subduction zones include western coasts of Sumatra, southern coast of Java, southern coasts of Bali and Nusa Tenggara, the Maluku Islands, North Maluku, the north and east coasts of Sulawesi and the north coasts of Papua. These areas make together the most vulnerable sites to earthquakes in Indonesia. The zoning map of potential earthquake hazards in Indonesia (Annex II) has been developed based on the tectonic mapping plates compilation, and shallow crustal, earthquakes events in the Indonesian history, the Meteorological and Geophysics Agency (Badan Meteorologi, Klimatologi, dan Geofisika) instrumental recording, and Probabilistic Seismic Hazard Analysis. The earthquake Hazard Zoning Map in Indonesia shows that almost all regions in Indonesia are potentially at risk for earthquakes ranging from a low to high intensity. (32)

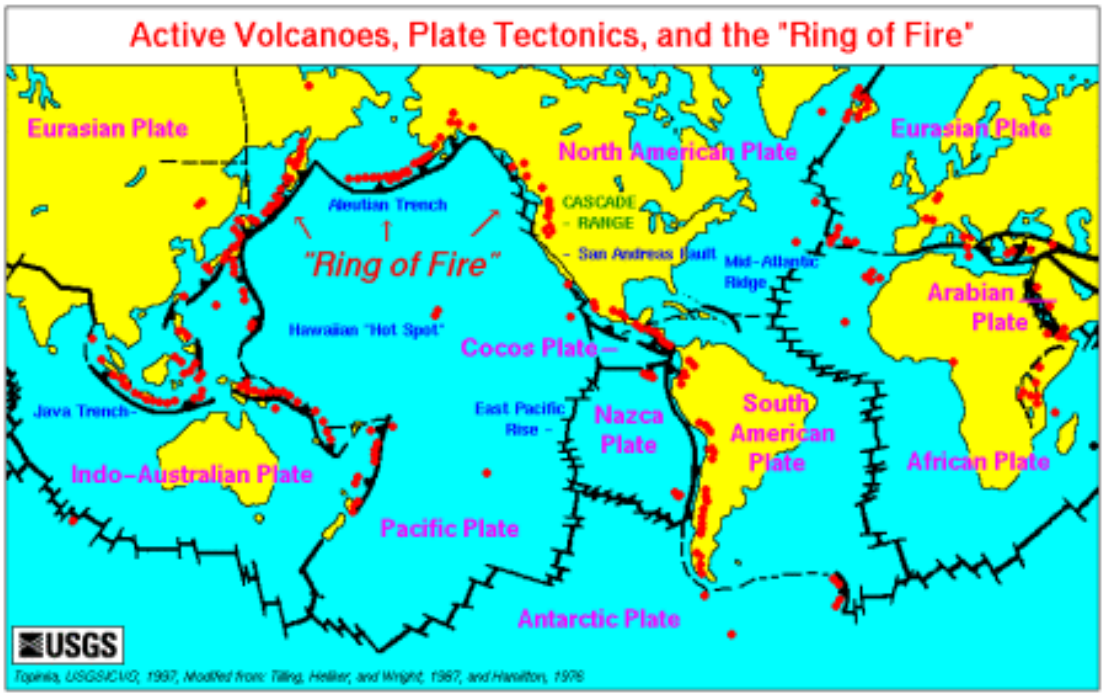


Figure 6. Active volcanoes, plate tectonics, and the 'Ring of Fire' (Source: USGS)

Tsunami Hazards

When shallow and great earthquakes occur under the sea this seismic activity may generate a tsunami. A tsunami is a long wave generated by sudden and impulsive changes at the sea floor of body of water changes due to earthquakes, underwater volcanic eruption, submarine landslides, or even due to objects from space falling to the sea surface (31).

Tsunamis have claimed great numbers of casualties with the Tsunami in Nanggroe Aceh Darussalam and North Sumatra in December 26, 2004 with the highest loss of life (165.708) recorded in Indonesia. Based on various data studies it is recorded that out of 110 tsunami events occurred in Indonesia, 100 events were caused by earthquakes, 9 events by volcanic eruptions and one event by landslide (6).

The zoning map of potential tsunami hazards (Annex III) for Indonesia has been developed based on tsunami history compilation that was subsequently adopted with data simulation producing tsunami hazards at coastline. Especially the western area of Sumatra, southern area of Java, Nusa Tenggara, the northern area of Papua, Sulawesi and Maluku, the eastern area of Kalimantan, are prone to tsunami hazards (32).

Volcanic Eruption Hazards

Related to the geographical location where Indonesia is established on the meeting point of the major tectonic subduction zones outlined above and the Pacific ring of fire makes this country on continuous threat of geophysical disasters. The so called Pacific ring of fire, also known as the circum-Pacific belt, compiles a region of high volcanic and seismic activity that surrounds the majority of the Pacific Ocean Basins. The arc stretching from New Zealand, along the eastern edge of Asia, north across the Aleutian Islands of Alaska, and south along the coast of North and South America This creates major risks for geologic activities including volcano eruption, earthquakes, deep-sea trenches and tsunamis (34).

Indonesia has more then 500 volcanoes of which 129 are active. The active volcanoes distributed in Sumatra, Java, Bali, Nusa Tenggara, north Sulawesi and the Maluku Islands constitute 13% of the world's active volcano distribution (32).

Based on the past volcanic activities in history, volcanoes in Indonesia can be classified into three categories, namely as follows:

1. Type A, namely active volcanoes with minimum one eruption after year 1600, compromising 80 volcanoes;
2. Type B, namely active volcanoes with no historical record of eruption after the year 1600, but still active as indicated by emission of sulfurous gas and emission of hot water, compromising 28 volcanoes.
3. Type C, namely active volcanoes with no record of eruption activities of emission of sulfurous gas or hot water. But indicates past activities of emissions. Compromising 21 volcanoes (6).

Volcano hazard (Annex IV) at the national level is assessed by means of relative assessment of volcano hazard for each surrounding regency/municipality, particularly based on the distribution of disaster prone areas and volcanic ash ring of hazard.

In the immediate future, special attention needs to be given to around 70 volcanoes including mount Merapi, Semeru and Ijen (Java), mount Soputan. Lokon and Karangetang (north Sulawesi), Ibu (Maluku), Talang and Dempo (Sumatra) and Batur (Bali) (6).

Mount Merapi in Yogyakarta (Java) indicates a relatively short eruption recurrence history in 1994, 1997, 1998, 2001 and 2006. These eruptions have the same pattern, namely the enlargement of lave dome, the collapse of lava dome and the emission of hot cloud affecting the surrounding area within a certain distance (6).

Figure 7. Major volcanoes of Indonesia (Source: USGS)

Landslides/Land Mass Movement

In addition to facing earthquakes, tsunamis and volcanic eruption hazards, Indonesia geologically also faces land mass movement hazards or landslides.
The term landslide is defined as rock mass movement, soil or loosened component of slope composing materials downward or outward the slope influenced by gravity. It is often identified as general land mass movement because in constitutes a type of land movement caused by a disruption to stability of the land (31).

Nearly every year Indonesia is experiencing land mass movement causing disasters and almost all major islands in Indonesia have districts and cities that are prone to land mass movement. Especially areas that have rough structures with steep slopes are generally more prone to land mass movement. Besides, the condition of the rocks and solid soil that is not compact and easily degraded may easily lead to land mass movement. This is especially the case in areas with large deforestation and forest degradation and deteriorates by torrential rainfall and earthquake events that both frequently occurs in Indonesia. (32).

The assessment of land mass movement hazards (Annex V) at the national level can be implemented by assessing relatively land mass movement hazards for each regency/municipality, namely by reassessing the area of each vulnerable zone in comparison with the area in regency/municipality in a proportional manner (6).

More than half of Indonesia's population lives in areas at risk of land mass movements with traditional farming methods, deforestation and land degradation blamed for the widespread vulnerability. Some 124 million Indonesians out of a population of around 246 million live in moderate- to high-risk landslide areas. The level of risk is influenced by aspects such as population growth, population density, people's general vulnerability states, vulnerability of building structures and infrastructure and greater volume of rain as a result of climate change. Increasing levels of industrialization and modernization in an economic growing Indonesia is causing devastating deforestation and land degradation, which are main contributors to the risk of land mass movement disasters in the immediate future of Indonesia (34).

Hydrological hazards

Hydrological hazards are described and defined by the UNISDR as a process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. Hydro-meteorological hazards include tropical cyclones (also known as typhoons and hurricanes), thunderstorms, hailstorms, tornados, blizzards, heavy snowfall, avalanches, coastal storm surges, floods including flash floods, drought, heat waves and cold spells (31).

Flood hazards

Indonesia is geographically situated in the tropical zone, directly located at the equator, that has two seasons, the hot season and the rainy season (monsoon rains), which are characterized with extreme change of weather, the temperature and wind direction. Within the past century, floods have been the most frequent disaster for Indonesia. They often hit major population centers such as Jakarta, the capital of Indonesia (with a population of more then 13 million) (32).

Areas with a high risk of flooding are spread all throughout Indonesia (Annex VI), however especially in the east coast of the northern part of Sumatra, the north coast of the western part of Java, western and southern parts of Kalimantan, the southern part of Sulawesi and the southern parts of Papua. Several large cities like Jakarta (as mentioned before), Medan, Semarang and Banjarmasin suffer from periodic flooding, and so are several big rivers in Java and East Nusa Tenggara (32).

Based on the source of water, excess water/flooding can be categorized into three:

1. Flood caused by heavy rains.
2. Flood caused by the increased water level in the rivers due to tidal water of storm-related sea waves.

3. Flood caused by failure in man-made water structures (dams, embankments, flood control facilities)

In general, flood is caused by above normal rainfall that makes the water flow system that consists of natural rivers and tributaries and drainage and canal systems not able to receive the accumulation of rainwater and overflow. There are 5590 main rivers throughout Indonesia, 600 of them potentially cause floods and over 30% of the rivers pass through a major population centers.

Flood prone areas affected by these main rivers reach 1.4 million hectares of Indonesia's land. However, the land in such areas is usually fertile and offers various potentials and facilitates, generating considerable interest for cultivation. Therefore, most of the major cities, trade centers and other economic activities grow and develop in these hazard prone areas (6).

Deforestation in Indonesia, especially in upstream areas, also contributes to the increase of floods since water catchment areas are getting lost. The amount of surface water due to for example torrential rains goes now directly to drainage systems that in turn will exceed its capacity and overflow causing floods (32).

Drought Hazards

In addition to flood hazards, Indonesia is facing the opposite hydro-meteorological hazard drought as well. Drought in this case is the substantial reduction of water availability to a point below normal that is temporary in nature, both in the atmosphere and in the surface soil. Because Indonesian archipelago is located at the equator and between two continents and two oceans, the country has a unique climate, but is very prone to regional and global climate change. Drought is caused by the decrease in rainfall in a long period that is caused by the interaction of the atmospheric and oceanic aspects and the irregularity of sea surface temperature known as the El Niño phenomenon (32).

El Niño is a global natural phenomenon showed with increasing sea surface temperature in the Equatorial Pacific waters or the positive anomaly of sea surface temperature in the area. The el Niño phenomenon is divided into three categories (weak, moderate and strong) based on the intensity of the positive anomaly of sea surface temperature. During the last years, as a result of strong el Niño, almost all regions in Indonesia have suffered from a very low rate of rainfall (6).

Drought leads to insufficiency of water availability for human activities. It potentially affects the water system, irrigation management and the management of other resources resulting in affected agricultural activities, forestry but also fishery. Serious disruption in crop pattern will pose a threat to the people's food security and therefore livelihood (32).

The drought hazard index map (Annex VII) indicates that drought threats in almost all areas in Indonesia. The high-level drought hazard is relatively dominant in Sumatra, Kalimantan and Java. Other regions are subject to moderate hazard level. Take note to the fact that drought is different from aridity. Drought hazard is generally higher in areas with great rainfall variation, as compared to areas with dry climate (32).

Wildfires – Forest and Land Fire hazards

Partly related to the drought hazard, Indonesia is also facing the threat of forest and land fire. Wildfires occur in Indonesia are mostly caused by human activities in clearing lands for farming, industrial forestry or plantation and this has been made worse by the El Niño phenomenon that triggers drought (32). Besides the social-economical impact, the large scale of economic losses due to wildfires, it also deteriorates climate change due to the emission of CO2.

On top of that, trees play a significant role in reducing erosion and landslides and moderate climate on global scale. They remove carbon dioxide from the atmosphere, store large quantities of carbon in their tissues and release most importantly, oxygen. Finally, wildfires causes many health-related problems mostly related to respiratory diseases. (35).

Regions that are prone to wildfires (Annex VIII) include Sumatra and Kalimantan that have large areas of plantation and large-scale farming as well as several districts and cities in Sulawesi, East Nusa Tenggara and Java (32). Indonesia is having one of the largest biodiversity structures in the world and is accountable for the 3rd largest rainforest in the world. Unfortunately Indonesia is also having one of the largest deforestation rates that continue to affect and pose threats on Indonesian communities and citizens. (35)

Biological hazards

Another form of a natural disaster or hazard that Indonesia is exposed to is categorized as biological hazards. This is defined as the devastating effects that may be caused by an enormous spread of an organic origin or conveyed by biological vectors, including exposure to pathogenic microorganisms, toxins and bioactive substances. This may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (31).

Epidemical hazards

Disease outbreaks or epidemics may potentially occur in Indonesia, particularly considering the fact that many Indonesians are still living below the poverty line and

cannot afford (or cannot access) to lead a healthy and hygienic life. Then the population density, especially on Java and the various other urban slums, play a significant role in the distribution of infectious diseases (6).

Severe Avian Influenza cases, diarrhea or other water-borne diseases, dengue and malaria are infectious that pose a continuous threat on the population. Besides this the HIV epidemic is now among the fastest growing in Asia.
The epidemic is concentrated in four most-at-risk populations:

I. Injecting drug users
II. Female sex workers
III. Clients of sex workers/high risk men
IV. Men who have sex with men, transgendered populations, male sex workers and their clients (36).

Other Natural Hazards

The above-mentioned geophysical/geological, hydro-meteorological and biological hazards are together posing the main threats on Indonesia and have resulted in national disasters. However the identification of existing hazards and the analyses of disaster risk do not end with these major risks. There are additional, smaller-scale hazards that have to be considered whilst writing a comprehensive country risk profile.

These include erosion hazards, extreme wave and coastal erosion hazards, and extreme weather hazards. Lots of these hazards are related to global climate change. Indonesia has increasingly become challenged by extreme waves and erosion of its coastal areas. Extreme waves are usually caused by tropical cyclones, typhoons and whirlwinds. The latter is the most occurring hazard that generally occurs during the transition from the hot season to the rainy season or vice versa. Especially light roofing, inadequate building structures, electricity poles and trees are prone due to the high speed of whirlwinds causing mainly economical losses (32).

Man-made hazards

Man-made hazards, also known as anthropogenic hazards can result in the form of a man-made disaster. In this case, anthropogenic means threats having an element of human intent, negligence, or error; or involving a failure of a human-made system. It results in huge loss of life and property (31).

Technological Failure

Indonesia's significant economical growth, vibrant democracies and stable position as a middle-income country have besides it victories also its challenges. Taking into account the socio-economical progress Indonesia is going through the last decade's

technical failure has also become a relevant problem in Indonesia. These hazards can be caused by faulty in design, mistake in the operation or human error in the use of technology. Such hazards may lead to fire, hazardous or radioactive material pollution, industrial accidents, or transportation accident that kills and affect people and damages properties resulting in economical loss. Technical failures do trigger natural disasters as well and are in that manner interconnected with each other. Some examples of these include drilling failure causing massive mudflows, large scale of deforestation and land degradation for industrialization and plantation causing land mass movements and floods, mining activities causing subsidence and coral degradation through destructive fishing practices causing breakdowns in the natural form of barriers that protect Indonesian shorelines from the eroding forces of the sea.

With reference to technological failure, special attention needs to be given to the number of people killed and loss suffered by transportation accidents. Attention needs to be given to safety in the streets, by maintaining street conditions and infrastructure that is safer and that can unsure the safety of users as well as encourage safe traffic practices (32)

Social conflict

Indonesia is a country that has multi-ethnic groups with many different languages, religions and culture. This diversity is Indonesia's strength but at the same time a challenge since the country will often need to manage social frictions, which when not managed well may transform into social conflicts. Difference in faiths and the stark gap in prosperity level may be exploited by irresponsible parties to trigger social conflict. This happened in Ambon (Maluku), Poso district (Sulawesi), West Kalimantan en Papua.

The wide gap between the rich and the poor, widespread unemployment and high poverty levels are triggering factors to potential conflicts. Economical imbalances and injustice in social structures of various local populations pose potential threats and reemergence of local conflicts. Election of local governors of district heads or city mayors may also pose hazards that could lead to conflict and unrest between supporters of candidate leaders.

Man-made social conflict may interact with one or more natural disasters such as volcanic eruptions, flood or forest fires. This situation may leas to a complex emergency. Social conflict and complex emergency need immediate and correct handling (32).

Other factors of Vulnerability

In order to identify the risks that are posing threats to the Indonesian population other vulnerability factors have to be taken into account. Poverty, population density, inadequate infrastructure and building structures, low health indicators and physical vulnerability are some indicators that play an essential role. (Annex IX).

Population increase and urbanization

As in many other developing countries, economic growth in Indonesia has shown a strong correlation with urbanization, both in the sense of people moving from rural areas to the cities and in terms of the urbanizing of rural settlements. By 2008, at least 50 percent of the population was living in cities, and urban areas were increasing in population at 4.4 percent per year, well beyond national population growth. Currently, more than 110 million people live in or around 60 cities that are predominantly located in the coastal areas, exposing them to common hazards such as earthquakes, flooding and communicable diseases. The high population density and unplanned development in many of the larger cities has also increased the vulnerability of the population in the case of large-scale disasters (32).

Increased exposure due to poorly enforced zoning and poorly maintained infrastructure. The high rate of urbanization in Indonesia, and limited capacity of urban centers to provide adequate shelters and infrastructure, has led to the emergence of many unplanned settlements. Poor quality and enforcement of land use zoning in turn has led
to many hazard prone locations being occupied by settlements, thereby increasing the exposure of the population to disasters. The Ministry of Public Works estimated that a quarter of urban population (or around 25 million people) lives in slums and informal settlements. The combination of the poor quality settlements and inadequate infrastructure has increased Indonesia's vulnerability, especially when larger scale disaster events occur (6).

Disaster prevention and response strategies

There has been a change in the paradigm of disaster management since "boxing day", the earthquake and the tsunami that hit Ache in West-Sumatra, the 26th of December 2004. The Government of Indonesia realized that disaster prevention and response should be taken extremely serious and the government has placed this issue high above the political agenda and made it one of the main priorities of the country.

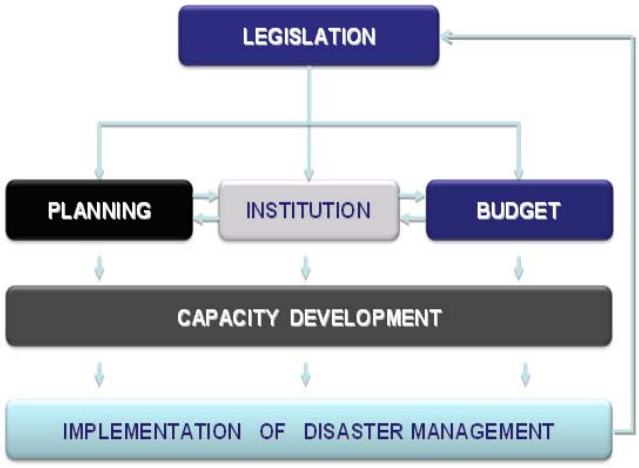
Susilo Bambang Yudhoyono took only 2 months of office as the newly elected Indonesian President when the devastating earthquake, followed by the tsunami in December 2004 hit the country severely. Swift and decisive action and response was required to conquer the humanitarian crisis. At the beginning of his presidency Susilo

Bambang Yudhoyono faced the big audit of the at that point existing disaster management strategies. He pushed for a massive change with the constant defense of disaster risk reduction issues, influencing national and regional policies and calling for more investment in disaster risk reduction policies. He stressed the immediate need for upgrading early warning systems, preparedness measures, establishment of DRR law in urban planning policies, the creation of a national platform on DRR, decentralization of Indonesian institutions that have the mandate to protect local population against disasters and the increase in national budget for DRR strategies.

The beginning of a new comprehensive, integrated and decentralized disaster management system was born in Indonesia. Unfortunately it needed 225.000 lives of people in several Asian countries and 165.708 people Indonesia (9), not to speak of the addition hundreds of thousands of people severely affected by the tsunami, before this was realized and the government started reformation in the paradigm. (37)

Knowing that disaster management is a very comprehensive, multidimensional and multi-sectorial field all stakeholders have to show commitment and political will. Indonesia established a national system of disaster management. This national disaster management system includes several aspects that are focused on legislative, institutive, planning & funding and capacity-building features (38).

Figure 8. Indonesian disaster management system (Source: BNBP)



Before elaborating on the four focus elements of the disaster management system it is important to notice the vision and mission of Indonesian authorities. The overall vision is to build Indonesia as a nation that is resilient in facing disasters. This vision is harmonized with three substantial missions:

1. To protect the nation from disaster through risk reduction measures
2. To build a reliable disaster management system
3. To conduct disaster management in a planned, integrated, coordinated and comprehensive manner (39).

Legislation

In terms of legislation Indonesia reached a milestone in 2007 when the national parliament passed the Disaster Management Law (Law no. 24 of 2007). The law

marked a shift of paradigm from a previously response-orientated disaster management to disaster risk reduction. The law has three important aspects. First, instead of focusing just on emergency response, disaster management now represents all aspects of risk management, particularly prevention and preparedness. Second, the government must provide protection against disaster threats as a basic human right. Third, responsibility for disaster management no longer lies just with the government, but is shared by all elements of society (40).

The Disaster Management Law (24/2007), that provided a framework for the implementation of the Hyogo Framework of Action, is focusing on the role of national and local governments, the establishment of national and local institutions, the roles and responsibility of communities, the roles of private sectors and international institutions, the overall disaster management implementation in pre-disaster, emergency response and post-disaster phase, funding and relief-assistance management and finally on controlling, monitoring and evaluation of disaster management implementation (40, 41).

Furthermore, the Disaster Management Law provides legal basis for actions and sanctions. It established single legislation that harmonizes the excessive amount of otherwise fragmented regulations. The law also states the right of the people to be protected from harm and acknowledge the duty and responsibility of the government to guarantee the safety of its citizens (40). The DM law established in 2007 was followed by the issuance of four key implementing regulations:

1.	The establishment of a new National Disaster Management Agency, the BNPB (*Badan Nasional Penanggulangan Bencana*)	Presidential Regulation 8/2008
2.	The implementation of disaster management	Governmental Regulation 21/2008
3.	Funding and Management of disaster assistance	Governmental Regulation 22/2008
4.	The role of International Institutions and International Non Governmental Organization in disaster management.	Governmental Regulation 23/2008

In addition to Law No. 24/2007, the Disaster Management Law, the other regulations constitutes the milestones in the institutional reform in disaster management including:

1.	National Disaster Management Agency (BNPB)	Presidential regulation 8/2008
2.	Guidelines for the organization and standard procedures of the Regional Disaster Management Agency *(Badan Penanggulangan Bencana Daerah, BPBD*)	Ministerial regulation of Home Affairs 46/2008
3.	Establishment of the Regional Disaster Management Agency (BPBD)	BNPB regulation 3/2008

Institutions

Referring to the aforementioned regulations formal institutions where established at the central and local level. These institutions form the center of Indonesia's national disaster management system. In the next sections these will be described in details.

The National Agency for Disaster Management

The Government of Indonesia has made much progress in promoting better disaster management in the country with the establishment of the National Agency for Disaster Management (*Badan Nasional Penanggulangan Bencana*/BNPB) in 2008. The BNPB is a non-departmental Governmental Institution on a level that is equal to a ministry. The head of the BNPB is appointed by the head of the state (currently Dr. Syamsul Maarif) and have to reports directly to the President of the Republic of Indonesia. This agency acts as the coordinator of all ministers and agencies in disaster management, for example the National Search and Rescue (SAR) Agency (known in Indonesia as *Basarnas*), the Indonesian Red Cross (PMI), Indonesian Armed Forces, and various other actors in humanitarian aid. The BNPB has the authority to coordinate and implement disaster management programs and activities. The agency is responsible for formulation of policies in disaster management and displaced person's management through rapid, accurate, effective and efficient actions. The BNPB agency serve as the key actor responsible for the disaster management of national, provincial and district level (42).

The National Disaster Management Agency is made up of a steering committee and a managing executive body. The steering committee has the function of formulating the concept of policy on national disaster management and has the task to monitor and evaluate existing disaster management strategies. The steering committee is appointed by the House of Representatives and should include related governmental officials and professional community members. The managing executive body of the BNPB is selected by the government of Indonesia and has coordinating, commanding and executing functions to fulfill in disaster management. They are made up of professional and expert staff. These two bodies operate under the direct supervision and leadership of the head of the Agency (40).

The BNPB tasks (43):

- Providing guidelines and direction on disaster management that include disaster prevention and preparedness, emergency response, rehabilitation and reconstruction in a fair and equitable way.
- Setting disaster management standardization and requirements by virtue of legislation.
- Communicating information on activities to communities.
- Reporting on disaster management to the President once a month, in a normal condition and at anytime in disaster emergency situations.
- Using and giving international and national contributions and aid.

- Caring out other obligations in accordance with legislation and regulations.
- Preparing guidelines on the establishment of Regional Disaster Management Agencies.

Since the National Disaster Management Agency is having the important task to provide guidelines and directions on disaster management that include disaster prevention and preparedness, emergency response, rehabilitation and reconstruction. The agency is made-up with a division in four deputy sections each of them responsible for the various stages of the disaster cycle. In the pre-disaster period the deputy department of Prevention and Preparedness focus on disaster risk reduction, community involvement and empowerment and disaster preparedness and mitigation. The deputy department of Emergency Management put their emphasis on emergency response, emergency assistance and emergency preparedness. Damage assessment, recovery and improvement, economical recovery and improvement and handling of refugees are the responsibilities of the deputy department for Rehabilitation and Reconstruction. Their task is to coordinate and implement general policy on disaster management during the post-disaster period. Finally the deputy department for Logistics and Equipment have the task of carrying out logistics and equipment coordination and support in disaster management (32).

With these developments, the establishment of the BNPB, the Government of Indonesia made a step towards a more resilient country. However, national policy and legal framework for disaster management have to be decentralized into the local government systems to be able to reduce disaster risk to all levels of the country (42).

Regional Agencies for Disaster Management

At local level the disaster management was first managed through ad-hoc coordinating bodies that consists representatives of local government offices and agencies. There are over 30 government agencies at each of the national, provincial and district levels that are expected to deliver services before, during and after a disaster. For example, the Ministry of Health provides health and medical services; the Ministry of Social Affairs provides basic relief items; the National Search and Rescue Agency (BASARNAS) and the Indonesian Armed Forces (TNI) conduct search and rescue operations; and the Ministry of Public Works reconstructs public infrastructure, conducts spatial planning and enforces building codes. The establishment of the National Agency for Disaster Management, BNPB, but more far reaching the establishment of Regional Agencies for Disaster Management, *Badan Penanggulangan Bencana Daerah,* BPBD at the local level constituted a significant change in the field of disaster management as it signified the departure of “ad-hoc” and responsive approaches to disaster management (38)

As the BNPD at the central level, at the local level the BPBDs is responsible for the formulation of policies related to disaster and displaced people in their respective area. The local agency is also tasked with the coordination of disaster management related activities in a well planned, integrated, and comprehensive manner. The establishment of BPBDs under regional regulations or regulations of the head of BNPD is facilitated by the Ministry of Home affairs (32).

According to the latest national progress report on the implementation of the Hyogo Framework of Action (2011-2013) all 33 provinces of Indonesia have established their Regional Disaster Management Agencies (BPBD). At the district/municipal level more then 80% (339 out of 497) of districts/municipals have set-up BPBDs (42).

The tasks of the Regional Agencies for Disaster Management include (43):

1. Stipulating guidelines and directions in accordance with local government and Disaster Management National Agency policies on disaster management that include disaster prevention, emergency response, rehabilitation, and reconstruction in a fair and equitable manner.
2. Stipulating disaster management standardization and requirements by virtue of Legislation.
3. Preparing, deciding on, and disseminating maps of disaster-prone areas.
4. Preparing and deciding on disaster handling fixed procedure.
5. Carrying out disaster management in its territory.
6. Reporting disaster management to head of local government on a monthly basis in normal condition and at any time in disaster emergency condition.
7. Check on money or goods collection and channeling.
8. Giving account for the use of budget from APBD (*Anggaran Pendapatan dan Belanja Daerah*/Annual budget plan for local governments in Indonesia).
9. Carrying out other obligations in accordance with Legislation.

The head of Regional Agency for Disaster Management, at the provincial level, is an official who ranks second to the governor or equivalent and the head of a BPBD in a district of municipally is an official whose position ranks second to the regent/mayor. Like the National Agency for Disaster Management a regional agency is also having a steering committee (consisting regional government officials, professionals and expert community members appointed by the Regional House of Representatives) and an executive body (consisting professional and expert staff). The responsibilities of the steering committee include; preparing concepts for local disaster management policies, implementation of national policies, and monitoring and evaluating of local disaster management strategies. The executive body, also known as the implementation unit, is having authority of the regional government and has the function of coordination, command and executing interventions of disaster management strategies within its territory (43).

The Regional Agencies of Disaster Management at the local levels of Indonesia are just as the National Agency focused on three divisions: 1) Preparedness, 2)

Emergency Response and 3) Rehabilitation and Reconstruction. The supporting units within the institutions are the Logistic Division and the Operations Control Centers (PUSDALOPS). This is making the fourth division in the executive body of the BPBDs. The latter division is responsible for logistics and equipment. BPBDs are the first to respond when a disaster occurs in their territory and BNPB supports the regional agencies with Emergency Response Fund. Besides this BNPB is responsible to strengthen the capacity of BPBDs personnel, resources and equipment through regular training on prevention, mitigation, response and recovery (44).

National and Regional Platforms for Disaster Risk Reduction

As part of the institutional strengthening of disaster management system in the country, Indonesia has also launched its National Platform for Disaster Risk Reduction (*Planas Pengurangan Risiko Bencana)* in 2009. This independent multi-stakeholder forum promotes disaster risk reduction and mobilizes the community and the relevant stakeholders to implement risk reduction measures based on the Hyogo Framework of action and help realizing commitments to implement the HFA and DRR into governmental policies. The Indonesian National Platform (Planas PRB) is established to create campaigns on DRR on both national as regional level, conduct research, stimulate policy making processes and advocacy, promote information management and facilitate sharing and learning among all stakeholders involved in building resilient communities and building a resilient nation (45).

At the regional and local level several provinces and districts/municipals have established similar DRR forums and platforms. There are in ten provinces and several regions local platforms for DRR, for instance Forum Merapi that involves four districts and local stakeholders bordering Merapi Volcano in Central Java and Yogyakarta Provinces, Forum for the Management of Bengawan Solo River Basin that involves districts/municipalities in Central and East Java, and thematic forums such as the University Forum for DRR and Consortium for Disaster Education that involves international, national as well as local stakeholders concerned with advancing DRR through education (42).

Planning & Funding

Another important element of the national management system is planning & funding. Implementation of a comprehensive disaster (risk) management plan requires both consensus and a strong political will from all stakeholders involved. Indonesia's effort to build a national system has provided more room for concrete action to reduce risks and to be fully prepared in case of disaster. Government budgets have quadrupled on disaster related activities between 2001 and 2007 in response to the two major disasters in Acheh, Sumatra (2004) and Java (2006). As part of the effort to build an integrated disaster management system, at the national level, the Government of Indonesia has formulated a five-year plan in 2010 that is based on the national development plan of Indonesia and the Hyogo Framework of Action (46)(42).

National Disaster Management Plan

In order that the country could face better the increased potential and complexity of disasters in the future, Indonesia needs an integrated, coordinated, and comprehensive disaster management plan. In 2009 the BNPB formulated a National Disaster Management Plan for 2010-2014. With this plan they expect that all disaster management related activities, from prevention, mitigation, preparedness, emergency response and recovery, could refer to the plan. It is expected that all programs/activities that are written in this national disaster management plan can be mainstreamed into the strategic plans of every relevant government ministry and agencies. The national disaster management plan is the realization of the government effort to formulate effective disaster management programs and priority focuses which arose after an extensive identification research of existing hazards, data and analyses (32).

Disaster management is based on the ideology of the Constitution of the Republic of Indonesia year 1945. The key principles in disaster management include the principle of humanity; justice; equality before the law and government; balance, harmony, and match; order and legal certainty; togetherness; environmental sustainability; and science and technology, meanwhile the disaster management principles include the principle of rapid and accurate; priority activities; coordination and integration; efficiency and effectiveness; transparency and accountability; partnership; empowerment; non-discriminatory; and not for religious purposes (43).
The plan proposes the implementation of effective disaster risk reduction efforts, efficient emergency response and effectual recovery. The overall objectives of the National Disaster Management Plan are as the following:

1. To identify hazard prone and high-risk areas in Indonesia and formulate actions that should be prioritized, including the programs, priorities focuses and indicative budget.
2. To provide a reference for government ministries and agencies, and all disaster management stakeholders in Indonesia in order that they could implement their disaster management effort in a planned, integrated, coordinated and comprehensive manner (32).

The strategies that are being created to realize the Indonesian disaster management vision and mission will be as the following; First of all, the enhancement of disaster management regulatory framework through the formulation of regulations, standard operating procedures and disaster management plans for the central to local levels. (2) Integration of disaster risk reduction programs into development programs at the central and local level so that DRR programs and activities will not stand by themselves but will be mainstreamed into regular development programs. (3) Capacity building for universities to empower them to facilitate training and education for disaster management and develop disaster science and technology at national as well as the local levels. (4) Community-based disaster management as a strategy to build capacity of communities that are living in highly hazard prone areas. This is an important strategy because the community is the first party that faces

disaster risk. Since the capacity of the government for emergency response is still very limited, it is more effective to build community resilience and capacity to anticipate in preparedness and response. For this purpose, volunteerism will be encouraged at all levels of the society. (5)

Establishment of the Indonesian Rapid Response and Action Team/INDRRA teams (*Satuan Reaksi Cepat Penanggulangan Bencana, SRC-PB*) to provide emergency response to large-scale disasters in Indonesia. These units will be manned by selected specialists from all branches of sciences and expertise and are based at to headquarters at the Java Island. There is a unit headquartered in Jakarta that serves the western areas and a unit in Malang that will serve the eastern areas of Indonesia. (6). Specific risk reduction programs for groups with special needs refer to more vulnerable citizens of Indonesia. These include women and children, poor, minority and marginalized groups as well as people living with disabilities or other special needs.

This strategy will increase their resilience to disaster. (7) Enhancement of the role of NGOs and government partner organizations. In the past many local, national or international NGOs have gained more and more roles, especially in terms of emergency response and post-disaster recovery. This strategy will focus on the enhancement of these NGOs to move more to a disaster risk reduction strategy and to focus more preparedness and pre-disasters. The government of Indonesia tends to cooperate more with NGOs and community organizations in mobilizing volunteers and promoting volunteerism. Finally, the 8^{th} strategy of the National Disaster Management Plan aims to enhance the role of the private sector to mobilize volunteers and promote volunteerism in disaster management, including through the conduct of disaster training programs and capacity building for volunteers. Private sectors are also encouraged to actively participate in national and regional forums on DRR and to be involved in the field of finance and contribution of risk transfer mechanism like disaster insurance and similar instruments (32).

The National Disaster Management Plan is developed based on the vision to build Indonesia as a resilient nation in facing disasters. The supportive three missions and the creation of the eight strategies for the realization of the overall aim of this plan is translated into an extensive program. This program embraced the Hyogo Framework of Action as the main pillar of creating a disaster management system that is implemented on central and local level in a planned, integrated, coordinated and comprehensive way. As being written in the previous parts of this chapter the disaster management systems is build-up by legislation, institution, planning and budgeting. This system has been build to response to the current problems and challenges and to implement/create programs to build a safer nation for all (32).

Since the paradigm of the previous response- and recovery focused mindset has changed into a more disaster risk reduction and preparedness perspective the national disaster management plan puts more weight to programs related to pre-disaster situations. This is manifested in the first seven programs:

1. Improvement of regulations and institutional capacity
2. Integrated disaster management planning
3. Research, education, and training
4. Capacity building and community and stakeholders participation in DRR
5. Disaster prevention and mitigation
6. Early warning systems
7. Preparedness

The programs in place during a disaster situation:

8. Emergency response programs

And finally the program in a post-disaster situation:

9. Rehabilitation/Recovery and reconstruction programs (32)

Currently all 33 provinces and several districts/cities in Indonesia have developed their DM Plans. Efforts are under way to mainstream DRR into regular development plans at the national as well as local levels. Contingency plans have also been developed in several provinces and districts/cities to respond to specific hazard potentials, while recovery plans have always followed all major disaster events. Planning in disaster management constitutes one of the key components in Indonesian National Disaster Management System (42).

Capacity-building

The last key component of the DM system is capacity development. In the past five years Indonesia has launched numerous capacity building initiatives, including strengthening of human resources in DM as a key element. Initiatives are under way to develop physical capacities of national and local DM agencies through provision of disaster infrastructures and facilities, construction of logistics depot and training centers at the national and local levels, and gradual increase for operational funding for these offices. In relation to that, the country has just started the establishment of an integrated complex for disaster, peacekeeping and counter-terrorism works that will house world-class forces. The disaster wing will include a Main office of INA-DRTG (Indonesia Disaster Relief Training Ground), Disaster Management Training Academy and Emergency Operation Center, Warehouses and Outdoor Facilities (46).

Besides physical infrastructures and facilities as mentioned above, efforts are also being done to enhance the science and technology aspect of disaster management. Early Warning Systems have been developed for tsunami, flood, volcanic eruption, earthquake, landslide, forest fire, and drought hazards by BNPB in cooperation with the different line ministries. BNPB has developed a centralized Disaster Information Database (DiBi) that contains information about disaster, including the victims and damage and losses from all over Indonesia, spanning from 1815-2013 (3)(46).

In relation to disaster education, measures have been taken to integrate DRR into school curricula from elementary to high school levels. Numerous preparedness-training programs have also been developed and implemented at the grassroots level with many community groups in cooperation with local and national NGOs, especially in the most hazard-prone parts of the country. In future emphasis will be given on efforts to empower universities to be an agent for mainstreaming DRR into development, through facilitation and coaching for local governments. Together with the university, BNPB will prepare DRR professionals that are ready to develop appropriate knowledge, technology and expertise in DRR. These professionals will help local governments and the other stakeholders in integrating risk sensitive considerations into development planning and implementation as well as advancing a culture of safety and resilience (32).

University and academicians helped develop research, seminars, discussions and other academic endeavors related to natural hazards and efforts to mitigate their risks. It has also served as consultant for local governments and private sectors on policies and technical issues related to disaster risk reduction. University could further be involved in institutionalization of disaster risk reduction in the regions through formulation of guidelines, standard operating procedures and other strategic measures. Lastly, it could take the lead in inventing early warning systems, communication instruments for emergency situation and other innovative tools that may be beneficial for disaster management (46).

BNPB, with support from interested stakeholders, also promoted revitalization of indigenous knowledge and traditional coping strategies that local people have developed to face disasters. Indigenous knowledge was enhanced as a valuable source of information and as a key contributor to reducing risk, and combined with modern knowledge and technology. Internalization of disaster risk reduction has been done through government structure from the national level to the provincial and district/city levels. (46)

Prevention, Preparedness and Awareness Strategies

Early Warning System

Indonesia has established Early Warning Systems (EWS) for all key hazards such as flood, tsunami, extreme weather, extreme waves, volcanic eruptions and forest fires. EWS that currently are in place included the Tsunami Early Warning System (TEWS) and the Weather Early Warning System (MEWS) and the Climate Early Warning System (CEWS) (42).

Only a few, however, have reached the community level and followed-up with the development of relevant capacity at the grassroots level to response to these warnings. The availability of EWS has been improving significantly in Indonesia, but its utilization continuous to be limited because not all levels of communities have

access to disasters warning messages. For now there is not a proper system established to deliver warning messages to the households (42).

Tsunami Early Warning System

The German-Indonesian Tsunami Early Warning System is a project designed for the detection of earthquakes and tsunamis occurring in the Indian Ocean. Germany has contributed significantly to the realization of this tsunami early warning system. The project was entirely handed over to Indonesia on 29th of March 2011, now operation under the InaTEWS (Indonesia Tsunami Early Waning System) and has demonstrated its full functionality during several strong earthquakes and tsunamis. Tsunami warnings are issued in less than 5 minutes after a seaquake and followed by updates or cancelation messages. Tsunamis are very rare events. Usually they are triggered by seaquakes, earthquakes that take place deep beneath the sea. Not every seismic tremor on the seafloor results in tsunamis.
In the warning center in Jakarta based at the Indonesian Meteorological, Climatological and Geophysical Agency BMKG, about 30 people work in shifts around the clock. The system was internationally evaluated and classified as one of the most advanced tsunami warning systems worldwide. (49)

The Indonesian Tsunami Early Warning System has three levels: an earthquake monitoring system, a sea level monitoring system, and a computer modeling system able to generate different tsunami projections. It collects data from seismometers, tide gauges, and GPS tracking units mounted on buoys to detect subtle changes in water pressure which could indicate an incoming tsunami, as well as ocean bottom satellite-linked sensors, allowing it theoretically to issue a tsunami warning at a regional level five minutes after an earthquake. (48)(49)

When earthquake data indicate a potential tsunami, computer predictions of the tsunami's height, volume and impact will be generated, as well as its estimated arrival time at different points along the coast. The sea-level monitoring systems produce predictive information about any tsunami that might affect the coastal lines of Java and Sumatra. 50 tide gauges had been installed along the coasts of Java, Sumatra, Sulawesi and the Papua region and 20 more tsunami buoys would be installed across the country. When all indicators predict a tsunami the warning would be relayed to the authorities, the media and communities likely to be affected(47) (49).

Master Plan for Tsunami Disaster Risk Mitigation

Indonesia is increasingly focusing on the preparedness and mitigation of tsunami disaster risk. Tsunamis, mostly followed after an earthquake, have caused far more deaths than any other natural disaster in Indonesia's history and have the potential to affect almost every province. While floods affect the most people and cause the largest economic loss, they do not cause nearly as many deaths as tsunamis do. There is an opportunity to save lives in tsunamis. Lives can be saved if people know

how to understand early warnings and where to run when they think a tsunami is coming. Upon feeling an earthquake or receiving a formal warning, people have time to evacuate to safety before a tsunami hits. There is limited time to save lives in the event of a tsunami and therefore any response by communities and government needs to be planned and coordinated. Early warnings for volcanoes, on the other hand, provide more advanced warning and therefore usually provide longer periods for response, meaning the same emphasis on planning and coordination is not needed ensure an effective response. Preparedness for tsunamis is one of BNPB's highest priorities as demonstrated by the President's new Master Plan for Reducing Tsunami Risk. The tsunami master plan comprised four major components, strengthening the early-warning system; temporary-shelter development and improvement; enhancing capacity on disaster-risk reduction readiness; and developing independence in dealing with disasters. The master plan was developed in 2012, but has not been given approval by the government.

Conference on Disaster Risk Reduction in Indonesia

Indonesia was the most recent host of the Asian Ministerial Conference for Disaster Risk Reduction (AMCDRR) that is a biennial conference by the rotation of different Asian countries since 2005 with the technical support from the United Nationals International Strategy for Disaster Reduction (UNSIDR). This conference was initiated after the devastated impact of the great Indian Ocean in 2004 to continuously promote dialogue and collaboration but above all to ensure political and stakeholder's commitment towards Disaster Risk Reduction implementation.

At the 22nd of October 2012, Yogyakarta hosted the 5th Asian Ministerial Conference for Disaster Risk Reduction (AMCDRR) where experiences, advise and guidance was exchanged among DRR stakeholders. The overall theme of this conference was "Strengthening Local Capacity for Disaster Risk Reduction" and its three sub-themes were integrating local level disaster risk reduction and climate change adaptation into national development planning, local risk assessment and financing, and strengthening local risk governance and partnership. Building local community resilience is among the important outcomes of this international conference. These were stated in the outcome document, the Yogyakarta Declaration, of the 5th AMCDRR conference. Yogyakarta Declaration also calls on countries to build and sustain capacities and legal mandates of national and local governments and the private sector to integrate DRR in land use planning and building disaster-resistant infrastructure. The implementation of crosscutting issues, such as socio-economic vulnerability and exposure, gender, disability and age capacities and cultural diversity that enables integrated approach of DRR measures has also agreed upon in Yogyakarta (50).

Enhancement of preparedness in practice

Although the most reliable audit for DRR implementation in the nation is a factual disaster, the Government of Indonesia is using its efforts to strengthen local DRR, by convening the 'Mentawai Megathrust Disaster Relief Exercise' in March 2014 to anticipate the real threat faced by communities living along the coastline of West Sumatra Provence. Efforts to strengthen the capacity of disaster preparedness and disaster risk management can be done through joint exercises that involve multi-stakeholders to strengthen early warning systems and emergency response command system.
The BNPB, the National Agency for Disaster Management, supported by various ministries and organizations, will execute various civilian-military exercises for all the ten Association of South-East Asian Nations (ASEAN) that include: Myanmar, Laos, Cambodia, Thailand, Singapore, Philippines, Malaysia, Vietnam, Brunei, and Indonesia and eight non-ASEAN countries (China, Japan, India, USA, Russia, Korea, New Zealand, Australia. The overall main theme of this program is to strengthen collaboration and partnership in disaster response to build a resilient region (51).

Disaster resilient village programs

Most of Indonesia's islands are located in remote areas with very limited access. The Government of Indonesia is realizing this challenging aspect and therefore had being reinforcing the strategic efforts for implementation of disaster resilient village programs.
To manage the significant risk of disasters, the Indonesian Government is linking its national disaster management policies and laws to the community through the "Desa Tangguh: Resilient Villages". Disaster Risk reduction and resilient villages can be achieved through community action, community participatory approached and inclusion of the marginalized to build temporary shelters, microfinance to build safer houses and livelihoods, and climate adaptation for resilient habitats (53).

Emergency and disaster response system in the country

It is the government's role to deliver response services including disseminating early warnings, search and rescue, evacuation, health and medical services and provision of basic needs such as food, water, clothing and shelter. The Regional Agencies for Disaster Management (BPBD) and Civil Society Organizations (CSOs) play a key role in providing response services at the community level and have the ability to reach marginalized groups. Communities need to respond to early warnings by taking action to save their lives, for example by following agreed evacuation procedures and by accessing government services (53).

In case of an emergency situation BNPB and BPBD performs the function of command, in coordination as well as in implementing emergency response activities. In this situation BNBP and BPBD should coordinate sectorial agencies in emergency response operations (32).

Emergency Operation Centers

Since 2004 Indonesia started to develop Emergency Operation Centers (EOC) in the country and started this establishments in Jakarta, Aceh, West Sumatra, Jambi, Bali and Yogyakarta. EOCs act as the hub before and during a disaster for multi-agency command and coordination, decision-making and information management. EOCs play a particularly important role in coordinating actors that provide rapid-live saving services immediately after a disaster, particularly Search and Rescue teams, specialized medical services and air support. Integrated information technology enables quick reporting of disaster situations and links to the central government. An EOC should provide 24 hour monitoring of hazards, an effective information management system, multiple communication systems, and be designed to enable coordination and information sharing. Unfortunately the establishment of these centers is still in a very early stage. Further establishing and strengthening of EOCs in all 33 provinces and preferably in all districts of Indonesia is a priority for the BNPB agency (53) (42) (32).

Indonesia Disaster Rapid Response And Assistance (SRCPB)

The Agency for Indonesian Disaster Rapid Respons and Assistance *(Satuan Reaksi Cepat Penanggulangan Bencana* – SRCPB) is a stand by disaster relief force of personnel/units from various institutions/organizations being deployed to undertake initial operations during emergency situations in a timely and integrated manner.

This agency is coordinating their interventions under the support and assistance from the Government of Indonesia (Under the command of BPNB and under coordination of Ministry of Peoples Welfare) as they undertake their regular emergency response functions. SRC-PB is executing the important task to do rapid damage and needs assessments of urgent necessities. They work on the containment of existing emergency. The unit will conduct search, rescue, and evacuation of victims. The immediate provision of heath services, assisting in relocation and establishing temporary shelters of displaced populations. The SRCPB is assisting in logistic distribution and immediate restoration of structures and infrastructures needed for survival. Finally, organizing first aid programs and volunteering programs is one of their tasks as well.

Organizationally, the SRCPB is under the Head of BPNB and has two Regional Units in Indonesia, namely the Western Area SRCPB is located at the Air Force Base in Jakarta and Eastern Area SRCPB located at the Air Force Base in Malang.

The working mechanism of the SRCPB is consists of a standby unit, a main unit and a reinforcement unit.

1) Standby Unit (75 Persons). Consisting of designated personnel with required qualifications from various agencies/organizations. The names are submitted to BPNB according to requirements and designated as members of SRCPB by Head of

BPNB for a certain period of time. The designated personnel must be ready to deploy at any time in under attachment to BPNB. The standby unit is deployed to the scene of disaster with potential massive impact on the life of nearby communities by government decision. Head of BPNB will issue an order to deploy the Standby Unit to the location and perform initial coordination with local authorities, conduct initial response by utilizing local resources that are available in the area before the arrival of the Main Unit. The Standby Unit will also inform BPNB on the actual situation on the site as input for the Main Unit in doing assessment and deciding the amount and type of aid to be sent.

2) Main Unit (550 Persons). This is the unit prepared for relief according to the type of disaster. This unit will continue the initial actions of Standby Unit in a more coordinated manner. SRCPB tasks are conducted using information gathered by the Standby Unit that is comprehensively analyzed to minimize the impact of disaster.

3) Reinforcement (2000 – 3000 Persons). If the impacts of the disaster require extended and intensive efforts to rehabilitate and recondition the impacted areas, a Reinforcement Unit will be formed to follow up the works of Standby and Main Units. The Reinforcement Unit can be deployed in stages according to rehabilitation and recondition plans decided.

The Indonesian National Army (TNI), the Indonesia Navy (TNI-AL) and Indonesian Air Force (TNI-AU) all have the legal obligation to also be actively involved in disaster relief efforts. However the SRCPB is the foremost agency in coordinating and executing disasters relief efforts. The Indonesian army provides personnel that work in the SRCPB formation in all units. To minimize the loss of lives and material the Indonesian Army, Navy, Air Force are important supporting components whose presence is required. Disaster relief / aid operations, especially during the emergency response stage must be executed timely, accurately, and coordinated under a clear command. Disaster relief requires effective and efficient, unified and accountable handling (54).

Inter-cluster Preparedness Package

While there is considerable national commitment and capacity to prepare for and respond to disaster, it is worth noting that a large-scale disaster could overwhelm the government's capacity to respond at the national and local level. In this context the government of Indonesia could ask for assistance from the international humanitarian community. There are three scenarios possible. 1) A medium-impact scenario in which Indonesia welcomes in-country international assistance. 2) A medium-impact scenario that intend international response. 3) And finally, a large-scale impact scenario where the capacity of the Indonesian government is overwhelmed.

The inter-cluster Preparedness Package is developed to ensure that appropriate and adequate arrangements are made in advance to respond in a timely, effective and appropriate manner to the needs of affected populations.

There are ten clusters active in Indonesia that are:

1. Agriculture – led by FAO
2. Education – co-led by UNICEF and Save the Children
3. Emergency Shelter – convened by IFRC
4. Food and Nutrition – led by WFP and UNICEF
5. Health – led by WHO
6. Logistics, - led by WFP
7. Emergency Telecommunications – led by WFP
8. Child protection and Gender-Based Violence – led by UNICEF and UNFPA
9. Water, Sanitation and Hygiene – led by UNICEF
10. Early Recovery – led by UNDP (55)

All the ten clusters have significantly engaged their GoI counterparts in the development of cluster contingency and preparedness plans. The BNPB has also actively participated in the development of the inter-agency and inter cluster preparedness packages. All the activities are complimented to the National Disaster Management Plan 2010-2014.
The coordination of the inter-cluster mechanism will be facilitated by OCHA and will work together to ensure a multi-sectorial approach, prioritizing of activities, and accountable and transparent financial recourse allocation for the clusters. Henceforward, OCHA's key focus is to work closely with the National Disaster Management Agency (BNPB) to strengthen its capacity for preparedness and response (56).

Discussion

Natural disasters cause a large number of deaths, high numbers in people being affected and high economic loss in Indonesia, with most of these caused by tsunamis and earthquakes. The recognition DRR that is shown by the launching of a disaster law in 2007 and the establishment of institutions focusing on disaster management at the central and local level made magnificent progress towards a more resilient nation. However, the disaster management system is evolving and new to Indonesia and its inhabitants. The national disaster management agency (BNPB) is in the middle of a decentralization process where the focus on management is on preparedness, mitigation and prevention.

Although there have been significant changes in the approach to disaster management there are still many challenges to be faced by the Indonesian authorities. Firstly, communities are not sufficiently preparing for disasters nor mitigating disaster risks. In particular, communities are not responding appropriately to warnings by using agreed evacuation routes and shelters. This is because district

government disaster management agencies (BPBDs) do not have the human or financial resources to reach down to the village level to build community resilience without sustained support from suitable partners. Secondly, provincial and district governments are not sufficiently prepared to respond to disasters in a timely and coordinated manner.

The swift establishment of BPBDs indicates the commitment to better disaster management. However, preparedness and disaster risk reduction is still a new field for local authorities. The lack of clear national and local guidance for these agencies has hampered the development of solid institutional structures and the institution's performance. Provincial and district disaster management agencies are not effectively coordinating local government agencies to prepare for disasters, by conducting response planning and simulations which are informed by hazard mapping. The main difficulties are constraints with human resources, (the recruitment of skilled personnel), planning and budget allocations. In addition, provincial disaster management agencies are not effectively implementing Emergency Operations Centers, to act as the hub before and during a disaster for multi-agency command and coordination, decision-making and information management.

The key reason for these two factors is that the DM sector in Indonesia is new and evolving. The current DM framework, including dedicated national and local disaster management agencies, was only established since the passage of the Disaster Management Law in 2007. The policy framework is not fully developed or resourced, organizational systems are not fully aligned with the policy framework, and other aspects of organizational capacity of relevant agencies requires strengthening, so that they can perform their key functions well.

Considering the risk profile of Indonesia where hazard occurrences are increasing while a large number of populations become more exposed and vulnerable, development investment targeting different aspects of risk reduction, based on the HFA, is urgently required. Four key issues need to be addressed in order to build a resilient nation:

1) Strengthening of disaster management agencies at central (BNPB) and local (BPBD) levels including in risk assessment and risk-response (preparedness and mitigation)
2) Building more financial capacity to ensure an increase in disaster risk reduction management at both central and local level.
3) Linking DRR strategies to climate change strategies in Indonesia.

In May 2013 the Chief/Minister of National Agency for Disaster Management, the national agency for disaster management (BNPB), H.E. Syamsul Maarif stated on the fourth session of Global Platform for Disaster Risk Reduction:
"As most disasters occurred at the sub-national level, strengthening the capacity of local governments in assessing disaster risk in their respective areas as well as

building their institutional capacity to mitigate, respond and recover from disasters becomes a key to sustainable risk management"

At the same time this is by far the greatest challenge Indonesia is facing. The disaster resilient villages program for example face difficulties. The program tries to build resilience at the village level through the introduction of risk analysis and mapping, preparation of disaster management plan and DRR action plan by communities, early warning system, volunteer development, and development of economic resilience
The big number of existing villages in Indonesia, with approximately 75,410 villages, challenges these efforts. Resources and budget available from the GoI are simply limited. In the implementation of DRR and DM related activities different ministries/agencies tend to implement their programs on their own, with minimum coordination among each other. With many government and non-government institutions/agencies involved in disaster risk reduction activities, coordination and communication among stakeholders become critical in building community's resilience to disaster.

Conclusions

Indonesia is one of the most disaster-prone countries in the world. Experiencing both hydro-metrological and geographical disasters that pose massive impacts on livelihoods of millions of people living in Indonesia. The geographical location where Indonesia sits at the intersection of three tectonic plates, the countries position on the seismic active 'ring of fire' and the equator that crosses through the middle of Indonesia makes Indonesia extremely vulnerable to catastrophic disasters. Indonesia is often considered as the perfect 'laboratory' of disasters. The impact of floods, volcanic eruptions, landslides, earthquakes and tsunamis on people's live ad the economy is frequently felt across the country. Since the intensity of disasters is increasing and becoming more complex there is a need to strengthen the multi-sectorial and multi-disciplinary approach, in a coordinated and integrated manner.

There has been remarkable changes since 'Boxing Day, at the 26th of December 2004 when the earthquake followed by a massive tsunami stuck Sumatra. President Susilo Bambang Yudhoyono pushed forward a new Disaster Management System, with legislation, institutions, planning, financing and capacity building as a central key. However, the shift to a paradigm of disaster mitigation and preparedness, both within institutions and in the public development, is an ongoing process that will take time. BPBDs at the district level and city level play a major role in this transition process, as they are the closest to the problem and the people, and therefore are most instrumental. In spite of that, they will be successful only if they receive sufficient guidance and support, in terms of political commitment, human resource development and budgeting from the national and local levels of the Indonesian government.

With the aims of optimizing a better disaster management implementation with orientation on disaster risk reduction and simultaneously reducing disaster risks, it is important to increase decentralization efforts and optimize capacities of regional agencies of disaster management (BPBD). The overarching 2012-2014 National Disaster Management Plan, accompanied with the several strategies and programs have to be implemented at all levels and have to trickle down to the grassroots levels in order to build a resilience nation that still has an increasing population. At the regional level, provinces and regencies/municipalities vulnerable to disaster need to formulate and implement their own DRR plans in order to ensure the effective implementation of the comprehensive national disaster management plan.

When the government of Indonesia, the institutions of the disaster management agencies, the local governments, the international community, the local communities and every individual embrace the idea of a resilient nation for everyone. Indonesia will push forward development and safeguard Indonesian citizens to be ready for disasters that are very likely to happen in the near future. After all, disaster preparedness and response is a challenge that can unite mankind.

Bibliography

1. Central Intelligence Agency (CIA). The World Factbook, East & Southeast Asia, Indonesia [INTERNET]. 2013 [Updated 2010 Oct 31; cited 2013 Nov 12] Available from: https://www.cia.gov/library/publications/the-world-factbook/geos/id.html

2. Ageng Wibowo Leksono. The Indonesian National News Agency (Antara), Community gives president Yudhoyono UN award [INTERNET]. 2011 May 11. [Cited: 2013 Oct 13] Available from: http://agengsworld.blogspot.com.es/2013/04/news-focus-community-gives-president.html

3. DiBi database (Data and Information on Disaster in Indonesia), National Disaster Magagement Agency (BNPB) [INTERNET] Available from: http://dibi.bnpb.go.id/DesInventar/dashboard.jsp

4. Kementerian Sekretariat Negara Republik Indonesia. Indonesia at a glance, the geography of Indonesia. [INTERNET] Available from: http://www.indonesia.go.id/en/indonesia-glance/geography-indonesia

5. World Health Organization (WHO). WHO Indonesia, Indonesia profile, geography [INTERNET] 2013 [Updated 2013 Oct 7; cited 2013 Oct 13] Available from: http://ino.searo.who.int/EN/Section3.htm

6. Indonesia. State Ministry for National Development Planning (BAPPENAS) and Badan Nasional Penanggulangan Bancana (BNPB). National action plan

for disaster risk reduction 2010-2012. Jakarta: 2010.

7. World Bank. Indonesia overview [INTERNET] 2013. Available from: http://www.worldbank.org/en/country/indonesia/overview

8. Republic of Indonesia. Report on the achievement of millennium goals in Indonesia 2011. Jakarta: Published by Ministry of National Development Planning/National Development Planning Agency (BAPPENAS); 2012. 142 p.

9. EM-DAT. The OFDA/CRED International Disaster Database. Université catholique de Louvain. Brussels. Belgium [INTERNET] 2013 [Updated 2013 Sep; cited 2013 Oct 6] Available from: http://www.emdat.be/result-country-profile?disgroup=natural&country=idn&period=1984$2013

10. O'Brien G, O'Keefe G, Rose J, Wisner B. Disasters: Climate change and disaster management. Oxford, England: Blackwell Publishing; 2006

11. Doocy S, Daniels A, Dick A, Kirsch TD. The human impact of tsunamis: a historical review of events 1900 – 2009 and systematic literature review. Balitmore, Maryland, United States: Johns Hopkins Bloomberg School of Public Health; 2013

12. Gatignona A, Van Wassenhoven LN, Charles A. The Yogyakarta earthquake: Humanitarian relief through IFRC's decentralized supply chain. Toulouse, France: Elsevier BV; 2010 Available from: http://phd.insead.edu/students/profiles/0752016/pub_tmp2.pdf

13. World Health Organization (WHO). Humanitarian Situation Overview. 28 March earthquake: Situation report 1 [INTERNET] 2005 [Updated 2005 March 28 cited 2013 Oct 12] Available from: http://www.who.int/hac/crises/idn/sitreps/2005/earthquake_01/en/

14. Grundy P. The Padang Earthquake 2009 – Lessons and Recovery. Proceedings of the Australian Earthquake Engineering Society 2010 Conference; 2010. Perth, Western Australia. Available from: http://www.aees.org.au/Proceedings/2010_Papers/19-Grundy.pdf

15. UNOCHA. Indonesia: Earthquakes West Sumatra Province OCHA Situation Report No. 2. [INTERNET] 2007 [Updated 2007 March 7, cited 2013 Oct 15] Available from: http://reliefweb.int/report/indonesia/indonesia-earthquakes-west-sumatra-province-ocha-situation-report-no-2

16. Earthquake-report.com. Indonesia Tsunami – Historic facts on the 2007 earthquake – tsunami [INTERNET] 2010 [Updated 2010 Oct 26, cited 2013 Oct 15] Available from: http://earthquake-report.com/2010/10/26/indonesia-tsunami-historic-facts-on-the-2007-

earthquake-tsunami-same-area/

17. Lavigne F, Gomez C, Giffo M, et all. Field observations of the 17 July 2006 Tsunami in Java.: Natural Hazard and Earth System Science; 2007. Available from: http://www.nat-hazards-earth-syst-sci.net/7/177/2007/nhess-7-177-2007.pdf

18. National Geophysical Data Center, National Oceanic and Atmospheric Administration (NOAA). Major Tsunamis of 1992 - Nicaragua and Indonesia. [INTERNET] 2007. Available: http://www.ngdc.noaa.gov/docucomp/page?xml=NOAA/NESDIS/NGDC/MGG/Hazard_Photos/iso/xml/G01219.xml&view=iso2html&altview=none

19. International Federation of the Red Cross and Red Crescent Societies (IFRC). Operations Update: Indonesia: Sumatra Floods. [INTERNET] 2008 [Updated 2008 January 18, cited 2013 Oct 16] Available from: http://www.ifrc.org/docs/appeals/08/MDRID002-OU2.pdf

20. Lassa JA, Sagala S, Suryadini A. Conceptualizing an established network of a community based flood early warning system: Case of Cawang, East Jakarta, Jakarta, Indonesia. IRGSC Working Paper No 3; 2013. Available from: http://www.irgsc.org/pubs/wp/IRGSCWP003floodwarningjakarta.pdf

21. UNOCHA. Indonesia - Floods OCHA Situation Report No. 3 [INTERNET] 2002 [Updated: 2002 Feb 5, cited 2013 Oct 16] Available from: http://reliefweb.int/report/indonesia/indonesia-floods-ocha-situation-report-no-3-1

22. International Federation of the Red Cross and Red Crescent Societies (IFRC). Operations Update: Indonesia: Jakarta Floods. [INTERNET] 2007 [Updated 2007 September 26, cited 2013 Oct 16] Available from: http://www.ifrc.org/docs/appeals/rpts07/IDFL260907.pdf

23. UNOCHA. Indonesia: Floods in Jakarta and its greater area. Situation Report No. 02/2013. [INTERNET] 2013 [Updated: 2013 Jan 18, cited 2013 Oct 16] Available from http://reliefweb.int/sites/reliefweb.int/files/resources/Indonesia%20Sitrep%20no%2002-2013%20Jakarta%20Flood%2018012013.pdf

24. Caljouw M, Nas PJM, Prawito. Flooding in Jakarta: Towards a blue city with improved water management. Bijdragen tot de Taal-, Land- en Volkenkunde; 2005.

25. Reliefweb. Indonesia Drought Situation Report No. 5 [INTERNET] 1998 [Updated: 1998 May 06 5, cited 2013 Oct 16] Available from: http://reliefweb.int/report/indonesia/indonesia-drought-situation-report-no-

5

26. Shenon P. Indonesia Forest Fires Blanket Southeast Asia. New York Times. 1994 Oct 09. Available from: http://www.nytimes.com/1994/10/09/world/indonesia-forest-fires-blanket-southeast-asia.html

27. Barber C., Schweithhelm J. Trial by Fire: Forest Fires and Forestry Policy in Indonesia's Era of Crisis and Reform. Washington DC, United States. World Resources Institute; 2000. Available from: http://pdf.wri.org/trialbyfire.pdf

28. Bangs MJ, Larasati RP, Corwin AL, Wuryadi S. Climate factors associated with epidemic dengue in Palembang, Indonesia: implications of short-term meteorological events on virus transmission. Jakarta, Indonesia: The Southeast Asian Journal of Tropical Medicine and Public Health; 2006. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17333762

29. World Health Organization (WHO). Weekly epidemiological record. No. 20. 2004 May 14. Available from: http://www.who.int/wer/2004/en/

30. Preventionweb; Serving the information needs of disaster risk reduction. Countries top 'natural' disaster ranking – France, Italy, USA at 'high risk'. [INTERNET] 2010 [Updated: 2010 May 26, cited 2013 Oct 18] Available from: http://www.preventionweb.net/english/professional/news/v.php?id=14025

31. United National Office for Disaster Risk Reduction (UNISDR). Terminology on DRR. [INTERNET] 2007 [Updated 2007 Aug 30, cited at 2013 Oct 19] Available from: http://www.unisdr.org/we/inform/terminology#letter-g

32. Republic of Indonesia. National Agency for Disaster Management (BNPB). National Disaster Management Plan / 2010-2014. Jakarta; 2010 Available from: http://www.preventionweb.net/english/policies/v.php?id=26349&cid=80

33. National Geographic Society. Encyclopedic Entry: Ring of fire. [INTERNET] 2013 [cited on 2013 Oct 19] Available from: http://education.nationalgeographic.com/education/encyclopedia/ring-fire/?ar_a=1

34. Republic of Indonesia. National Agency for Disaster Management (BNPB). *Geospasial BNPB.* [INTERNET] 2012 [Updated: 2012 Oct 16, cited 2013 Oct 19] Available from: http://geospasial.bnpb.go.id/

35. United Nations Reducing Emissions from Deforestation and Forest Degradation (REDD Desk). Indonesia country profile. [INTERNET] 2013 [Updated: 2013 cited: 2013 Oct 20] Available from

http://theredddesk.org/countries/indonesia

36. President's Emergency Plan for Aids Relief (PEPFAR). Indonesia Operational Plan Report FY 2011 [INTERNET] 2012 [Updated: 2012 March 10, cited: 2013 Oct 21] Available from: http://www.pepfar.gov/documents/organization/212147.pdf

37. Maarif S. Remarks by the Head of Indonesian Delegation Dr. Syamsul Maarif Chief of the Indonesian National Agency for Disaster Management at the Plenary Session of the Global Platform for Disaster Risk Reduction; 2009 June 16; Geneva, Switzerland. Available from: http://www.preventionweb.net/english/policies/v.php?id=10015&cid=80

38. ASEAN Inter-Parliamentary Assembly. 3rd AIPA CAUCUS. Manila, Philippines. Disaster Response Management [INTERNET] 2011 [Updated: 2011 May 03, cited 2013 Oct 21] Available from: http://www.aipasecretariat.org/reports/aipa-caucus-reports/third-aipa-caucus-report/

39. Badan Nasional Penanggulangan Bencana (BNPB). Vision and Mision. [INTERNET] 2012 [Updated: 2012 Dec 13, cited 2013 Oct 21] Available from: http://www.bnpb.go.id/page/read/2/visi-dan-misi

40. Republic of Indonesia. Badan Nasional Penanggulangan Bencana (BNPB). Law of the Republic of Indonesia number 24 of 2007 concerning disaster management. [INTETNET] 2008 [Updated: 2008 cited: 2013 Nov 12] Availavle from: http://www.preventionweb.net/english/policies/v.php?id=10841&cid=80

41. United Nations of Development Programs (UNDP) and Badan Nasional Penanggulangan Bencana (BNPB). Lessons learned: Disaster Magegement Legal Reform, the Indonesian experience. [INTERNET] 2009 [Updated: 2009 cited: 2013 Nov 12] Available from: http://www.preventionweb.net/english/professional/publications/v.php?id=10468

42. Hyogo Framework for Action (HRA). Indonesia National progress report on the implementation of the Hyogo Framework for Action (2011-2013) [INTERNET] 2012 [Updated: 2012 Oct 7, cited: 2013 Nov 12] Available from: http://www.preventionweb.net/english/policies/v.php?id=28912&cid=80

43. Rebublic of Indonesia and Badan Nasional Penanggulangan Bencana (BNPB). Presidential regulation of the Republic of Indonesia number 8 of 2008 concerning National Agency Disaster Management [INTERNET] 2008 [Updated: 2008, cited 2013 Nov 13] Available from:

http://faolex.fao.org/docs/pdf/ins115001.pdf

44. Wicaksono W, Usdianto B, Hoppe M. Local Disaster Management Agency. Experiences with the establishment of BPBD in the pilot areas. GTZ-IS-GITWES. Jakarta. Indonesia; 2010. Available from: http://www.gitews.org/tsunami-kit/en/E6/our_experience/Local%20Disaster%20Management%20Agency.pdf

45. Platform Nasional Pengurangan Risiko Bencana Indonesia (Planas PRB Indonesia). Profile Planas. [INTERNET] 2013 [Updated: 2013, cited: 2013 Nov 14] Available from: http://planasprb.org/profil-planas/

46. ASEAN Inter-Parliamentary Assembly. 4th AIPA CAUCUS. Bangkok, Thailand. Disaster Response Management in Indonesia. Summery country report 2012 [INTERNET] 2012 [Updated: 2012 May 03, cited 2013 Oct 26] Available from: http://www.aipasecretariat.org/wp-content/uploads/2013/07/Indonesia-Country-Report-Disaster-Management.pdf

47. Lauterjung J, Munch U, Rudloff A. The challenge of installing a tsunami early warning system in the vicinity of the Sunda Arc, Indonesia. Natural Hazard and Earth System Science; 2010. Available from: http://www.nat-hazards-earth-syst-sci.net/10/641/2010/nhess-10-641-2010.pdf

48. Harjadi PJP. Indonesia Tsunami Early Warning System (InaTEWS): concept and implementation. Jakarta, Indonesia; 2008. Available from: http://balittanah.litbang.deptan.go.id/dokumentasi/prosiding/post%20tsunami/1harjadi.pdf

49. German-Indonesian Tsunami Early Warning System (GITEWS). Concept. [INTERNET] Available from: http://www.gitews.org/index.php?id=8&L=1

50. Republic of Indonesia. 5th Asian Ministerial Conference on disaster risk reduction, Yogyakarta, October 2012 [INTERNET] Available from: http://5thamcdrr-indonesia.net/key-documents-for-the-conference/

51. Badan Nasional Penanggulangan Bencana (BNPB). Mentaiwai Megathrust DiREx. Background [INTERNET] 2013 [Updated: 2013 cited: 2013 November 8] Available from: http://bnpb.go.id/mmdirex2013-2014/?page=about_background

52. Preventionweb. Desa Tangguh; Resilient Villages in Indonesia. [INTERNET] Available from: http://www.preventionweb.net/files/globalplatform/entry_bg_paper~resilientvillagesinindonesia12may1.30pmglobalplatform.pdf

53. Australian Government. Department of foreign affairs and trade. Concept note for Disaster Risk Management Program, Indonesia. [INTERNET] 2013 [Updated on 2013 Feb 20, cited: 2013 Nov 10] Available from: http://aid.dfat.gov.au/countries/eastasia/indonesia/Documents/drm-conceptnote.pdf

54. Aldedharma ES. The role of defence force in humanitarian assistance and disaster relief. Indonesian Navy. [INTERNET] [cited: 2013 Nov 11] Available from: http://ions.gov.in/sites/default/files/Papers%20presented%20during%20seminar%202.pdf

55. United Nations Office for the Coordination of Humanitarian Affairs (OCHA). Profile OCHA in Indonesia 2012. [INTERNET] 2012 [Updated from 2012 cited 2013 Nov 11] Available from: http://www.unocha.org/roap/about-us/about-ocha-roap/indonesia

56. United Nations Office for the Coordination of Humanitarian Affairs (OCHA). Humanitarian Response Indonesia. Indonesia Inter-Cluster Preparedness Package 2012-2013 [INTERNET] 2013 [Updated 2013 Apr 04, cited 2013 Nov 11] Available from: https://indonesia.humanitarianresponse.info/document/inter-cluster-preparedness-package

Annex I – OFDA/CRED: EMDAT data overview (1984-2013)

Top 10 natural disaster (1984 – 2013) in terms of people being killed

Disaster	Date	No Killed
Earthquake (seismic activity)	26/12/2004	165708
Earthquake (seismic activity)	27/05/2006	5778
Earthquake (seismic activity)	12/12/92	2500
Earthquake (seismic activity)	30/09/2009	1195
Earthquake (seismic activity)	28/03/2005	915
Earthquake (seismic activity)	17/07/2006	802
Epidemic	13/05/1998	777
Drought	Sep-97	672
Epidemic	Jan-98	672
Epidemic	1/1/04	658

Top 10 natural disaster (1984 – 2013) in terms of people being affected

Disaster	Date	No Total Affected
Earthquake (seismic activity)	27/05/2006	3177923
Wildfire	Oct-94	3000000
Earthquake (seismic activity)	30/09/2009	2501798
Drought	Sep-97	1065000
Flood	23/12/2006	618486
Flood	9/2/96	556000
Earthquake (seismic activity)	26/12/2004	532898
Flood	27/01/2002	500750
Epidemic	1/1/86	500000
Earthquake (seismic activity)	12/9/07	459567

Top 10 natural disaster (1984 – 2013) in terms of economic damages

Disaster	Date	Damage (000 US$)
Wildfire	Sep-97	8000000
Earthquake (seismic activity)	26/12/2004	4451600
Earthquake (seismic activity)	27/05/2006	3100000
Flood	17/01/2013	3000000
Earthquake (seismic activity)	30/09/2009	2200000
Wildfire	Mar-98	1300000
Flood	31/01/2007	971000
Earthquake (seismic activity)	12/9/07	500000
Flood	9/2/96	434800
Flood	27/01/2002	350000

Source: "EM-DAT: The OFDA/CRED International Disaster Database

Natural disasters between 1984-2014 (EMDAT- OFDA/CRED)

		# of Events	Killed	Total Affected	Damage (000 US$)
Drought	Drought	5	986	1083000	89000
	ave. per event		197.2	216600	17800
Earthquake (seismic activity)	Earthquake (ground shaking)	73	12079	7875691	6837026
	ave. per event		165.5	107886.2	93657.9
	Tsunami	4	167041	580400	4506600
	ave. per event		41760.3	145100	1126650
Epidemic	Unspecified	4	819	9984	-
	ave. per event		204.8	2496	-
	Bacterial Infectious Diseases	8	415	7724	-
	ave. per event		51.9	965.5	-
	Parasitic Infectious Diseases	2	105	504000	-
	ave. per event		52.5	252000	-
	Viral Infectious Diseases	13	2178	137015	-
	ave. per event		167.5	10539.6	-
Flood	Unspecified	25	502	989707	67000
	ave. per event		20.1	39588.3	2680
	Flash flood	30	1865	1004435	247500
	ave. per event		62.2	33481.2	8250
	General flood	73	2442	4970539	5124909
	ave. per event		33.5	68089.6	70204.2
	Storm surge/coastal flood	1	11	2000	-
	ave. per event		11	2000	-
Mass movement dry	Landslide	1	131	701	1000
	ave. per event		131	701	1000
Mass movement wet	Landslide	41	1427	381172	120745
	ave. per event		34.8	9296.9	2945
Storm	Unspecified	1	-	10000	-
	ave. per event		-	10000	-
	Local storm	3	25	12950	1000
	ave. per event		8.3	4316.7	333.3
	Tropical cyclone	1	-	1315	-
	ave. per event		-	1315	-
Volcano	Volcanic eruption	31	468	369796	9000
	ave. per event		15.1	11928.9	290.3
Wildfire	Forest fire	9	300	3034478	9329000
	ave. per event		33.3	337164.2	1036555.6

Top 10 man-made disaster (1984 – 2013) in terms of people being killed

Disaster	Date	No Killed
Transport Accident	29/06/2000	481
Transport Accident	30/12/2006	400
Transport Accident	18/10/1999	361
Transport Accident	19/10/2001	350
Transport Accident	20/01/1996	338
Transport Accident	6/2/99	313
Transport accident	10/1/09	247
Transport Accident	26/09/1997	234
Transport Accident	18/03/2004	223
Transport accident	17/12/2011	203

Top 10 man-made disaster (1984 – 2013) in terms of people being affected

Disaster	Date	No Total Affected
Miscellaneous accident	10/2/98	25000
Industrial Accident	May-06	12000
Industrial Accident	29/10/1984	7600
Miscellaneous accident	26/07/2004	2500
Transport accident	28/01/2011	627
Transport Accident	7/2/98	601
Industrial Accident	25/10/1995	500
Miscellaneous accident	9/7/02	500
Transport Accident	19/10/1987	300
Transport Accident	30/12/2006	250

Top 10 natural disaster (1984 – 2013) in terms of economic damages

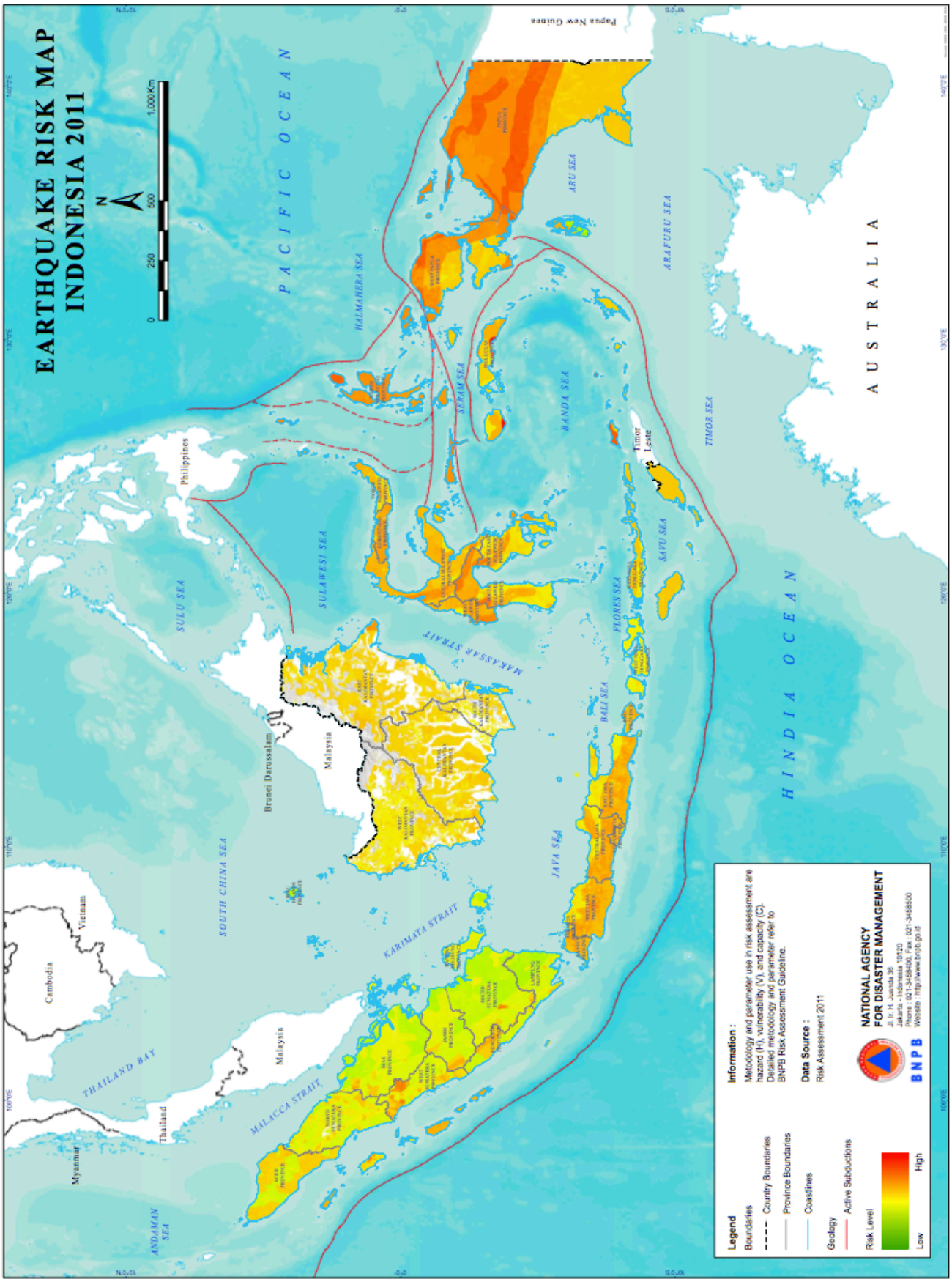
Disaster	Date	Damage (000 US$)
Industrial Accident	25/10/1995	35000
Industrial Accident	7/6/93	13000
Industrial Accident	7/1/99	3000
Miscellaneous accident	10/6/98	400

Created on: Nov-10-2013. - Data version: v12.07
Source: "EM-DAT: The OFDA/CRED International Disaster Database
www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Man-made disasters between 1984-2013

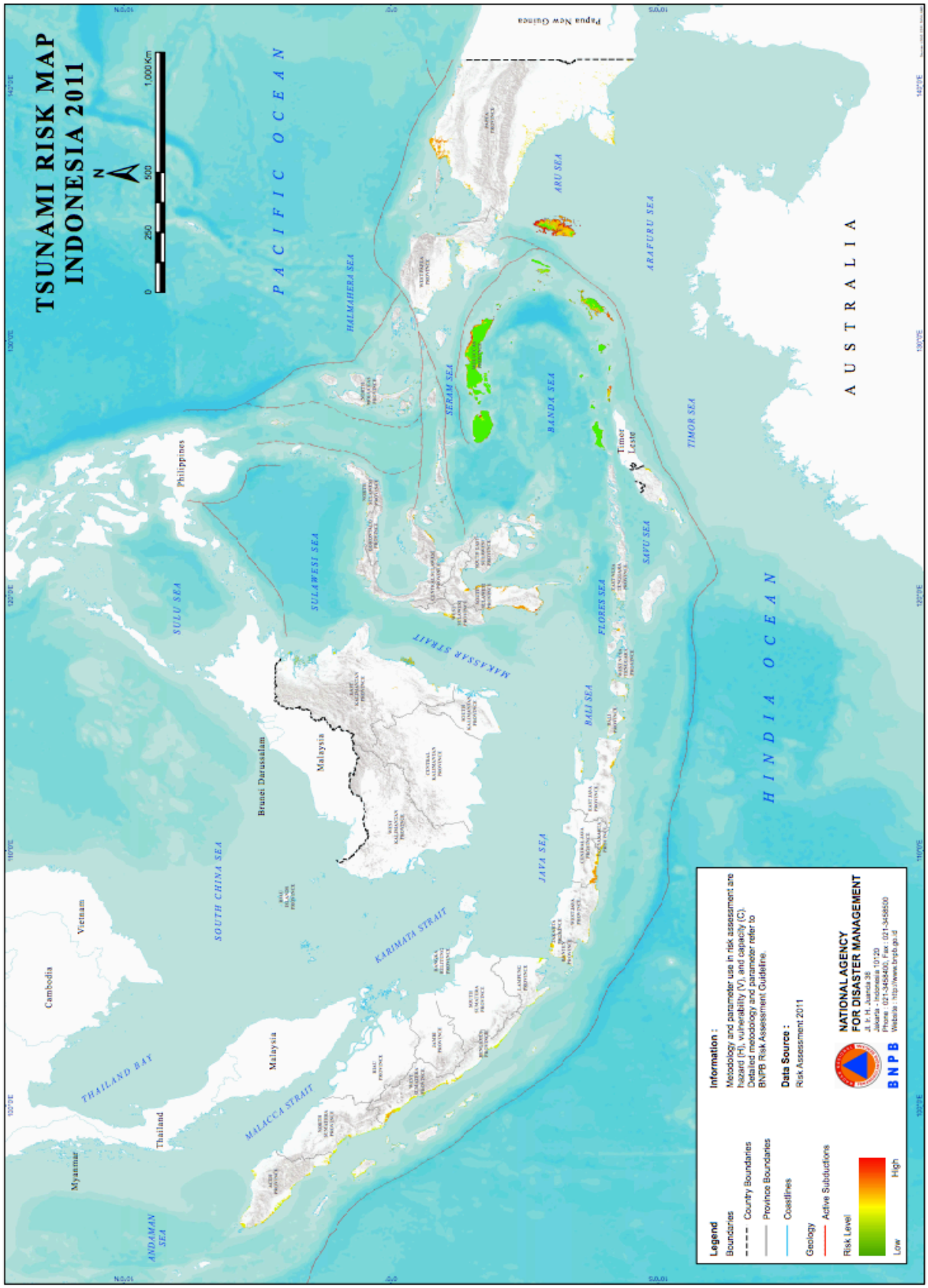
		# of Events	Killed	Total Affected	Damage (000 US$)
Industrial Accident	Collapse	5	98	10	13000
	ave. per event		19.6	2	2600
	Explosion	5	110	7676	-
	ave. per event		22	1535.2	-
	Fire	4	42	500	38000
	ave. per event		10.5	125	9500
	Other	1	-	12000	-
	ave. per event		-	12000	-
	Poisoning	1	-	100	-
	ave. per event		-	100	-
Miscellaneous accident	Collapse	3	110	64	-
	ave. per event		36.7	21.3	-
	Explosion	2	22	46	-
	ave. per event		11	23	-
	Fire	10	338	28244	400
	ave. per event		33.8	2824.4	40
	Other	6	102	150	-
	ave. per event		17	25	-
Transport Accident	Air	34	1405	225	-
	ave. per event		41.3	6.6	-
	Rail	22	603	1739	-
	ave. per event		27.4	79	-
	Road	30	696	308	-
	ave. per event		23.2	10.3	-
	Water	75	5936	2295	-
	ave. per event		79.1	30.6	-

Source: "EM-DAT: The OFDA/CRED International Disaster Database
www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

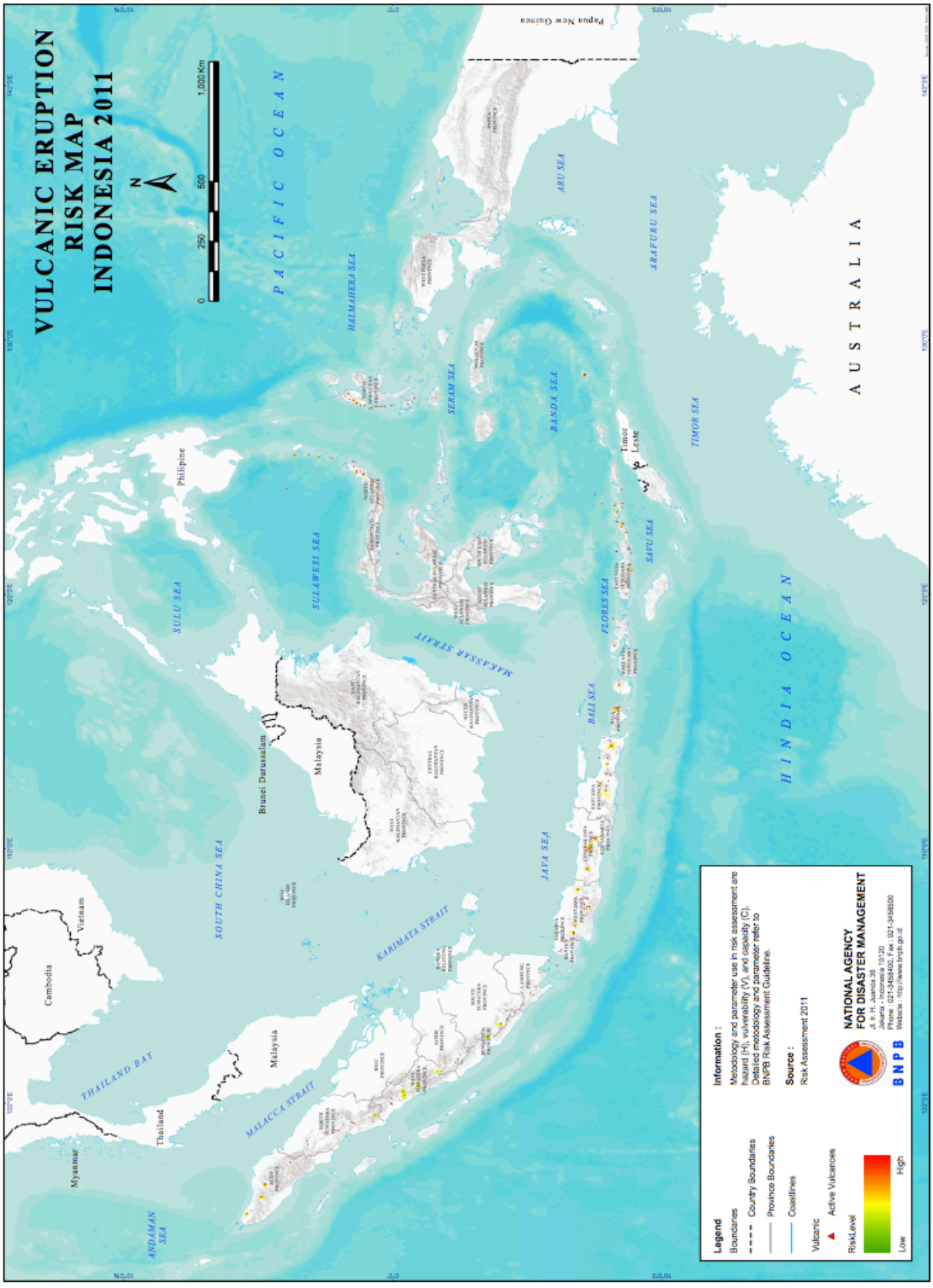


Annex II – Earthquake Risk Map 2011

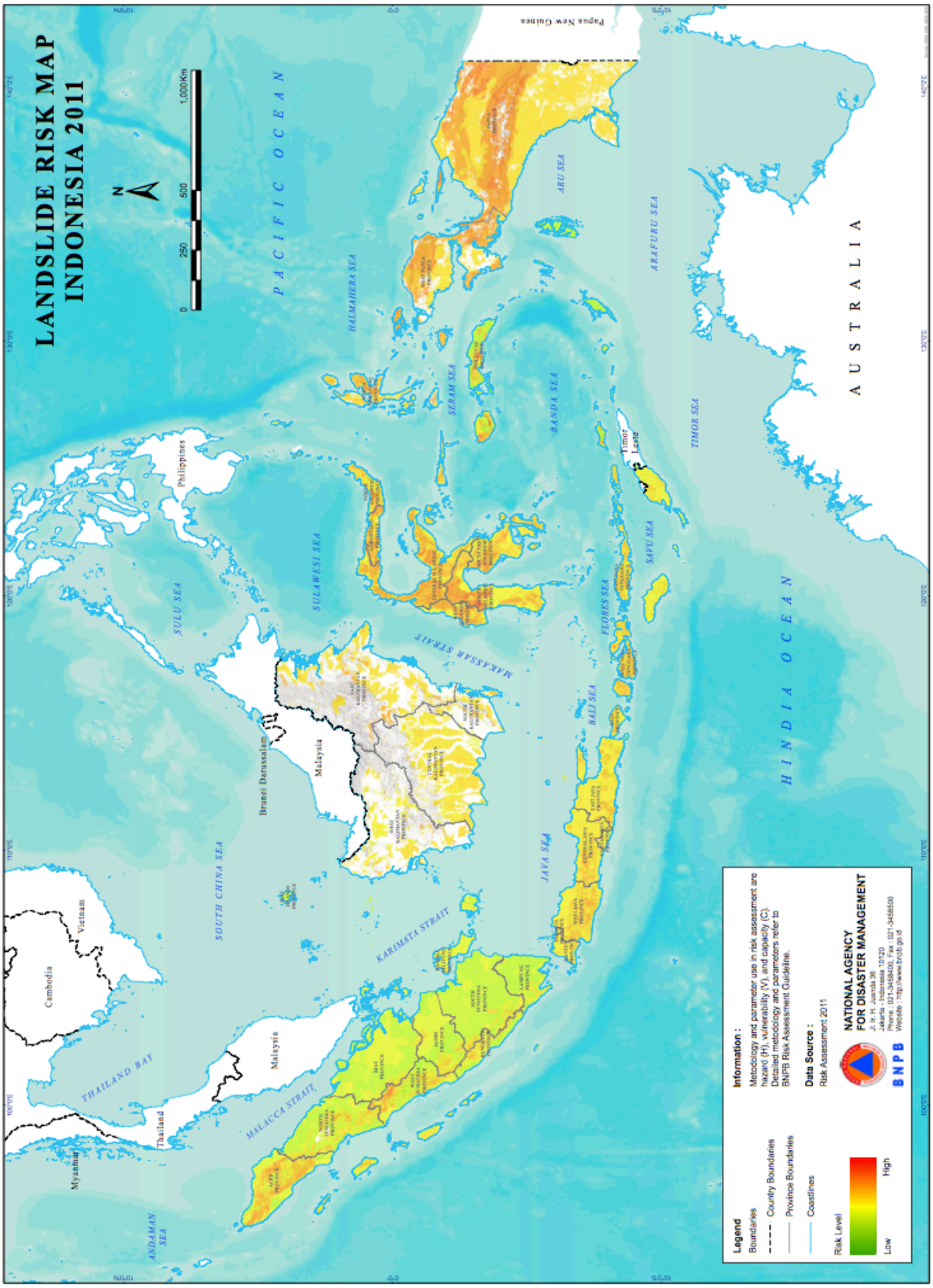
Annex III – Tsunami Risk Map 2011



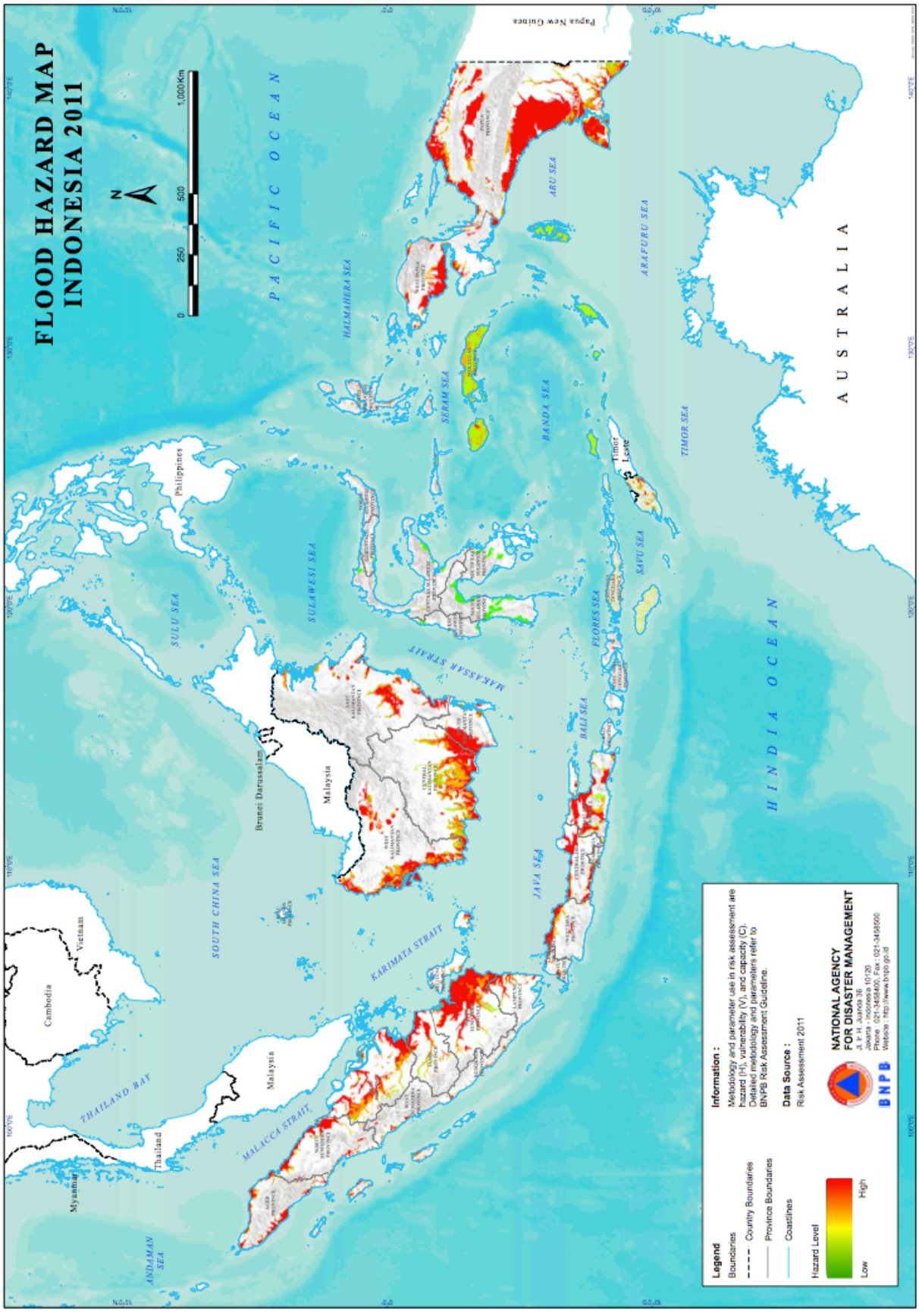
Annex IV – Volcano Risk Map 2011



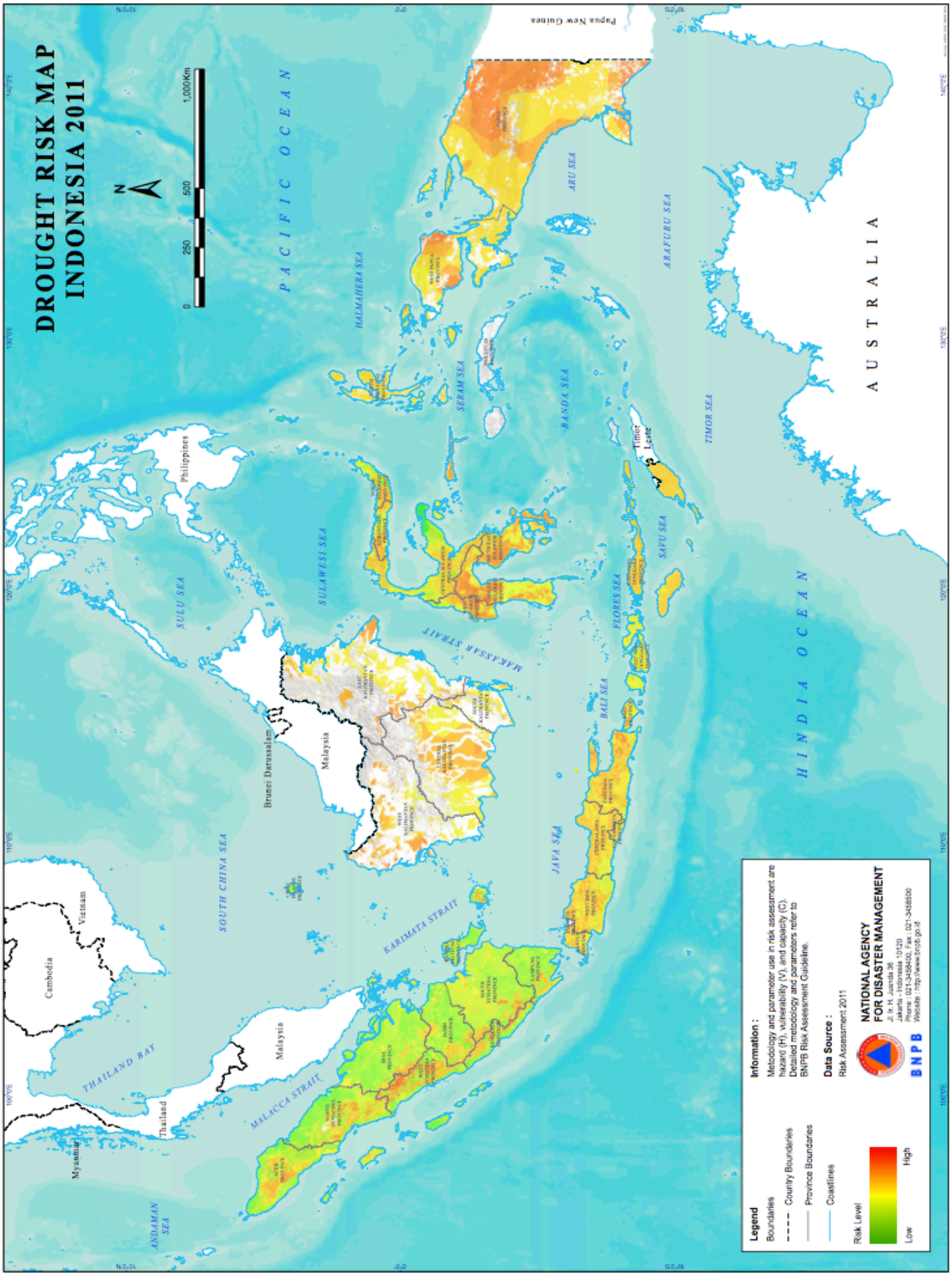
Annex V – Landslide Risk Map 2011



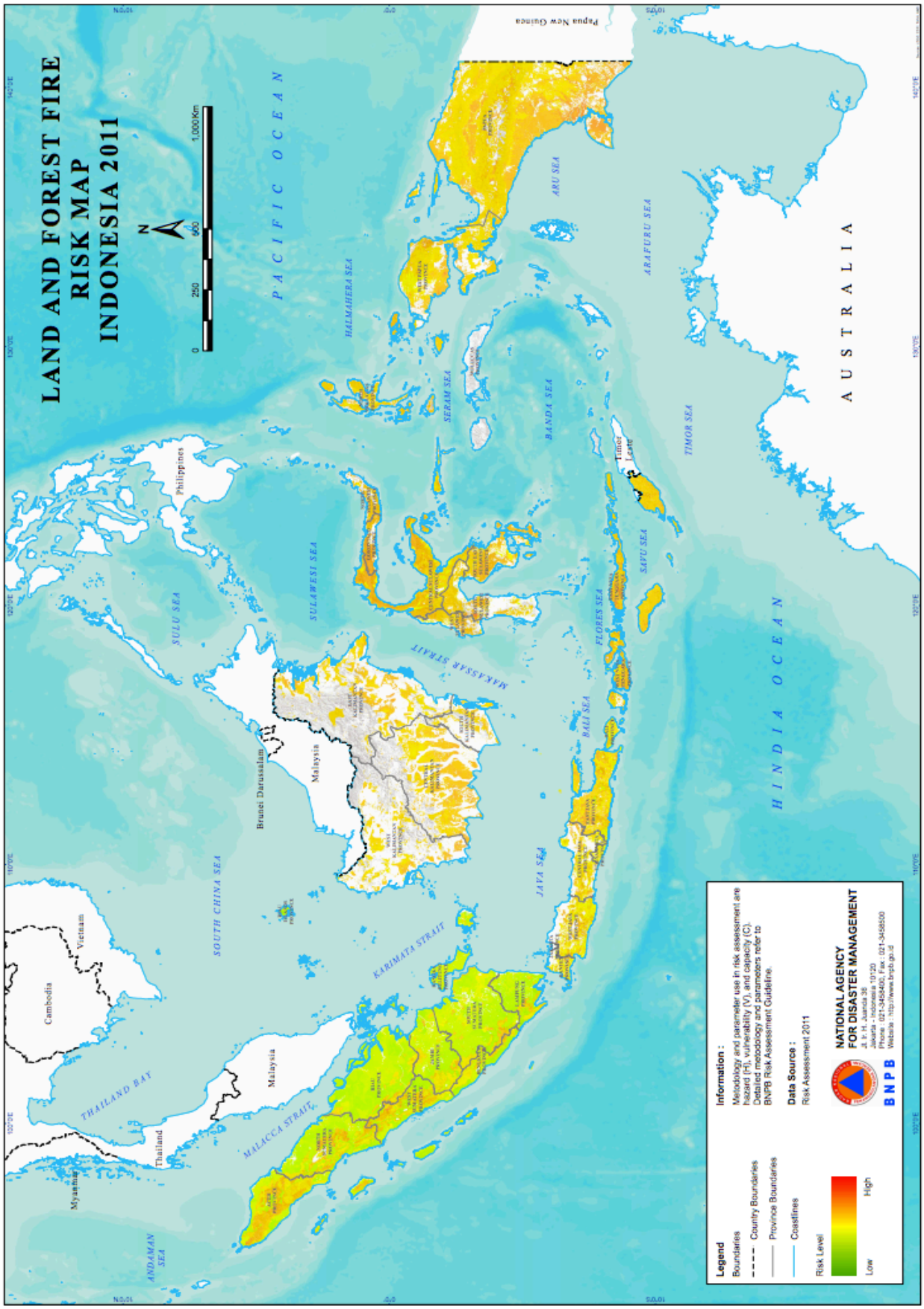
Annex VI – Flood Risk Map 2011

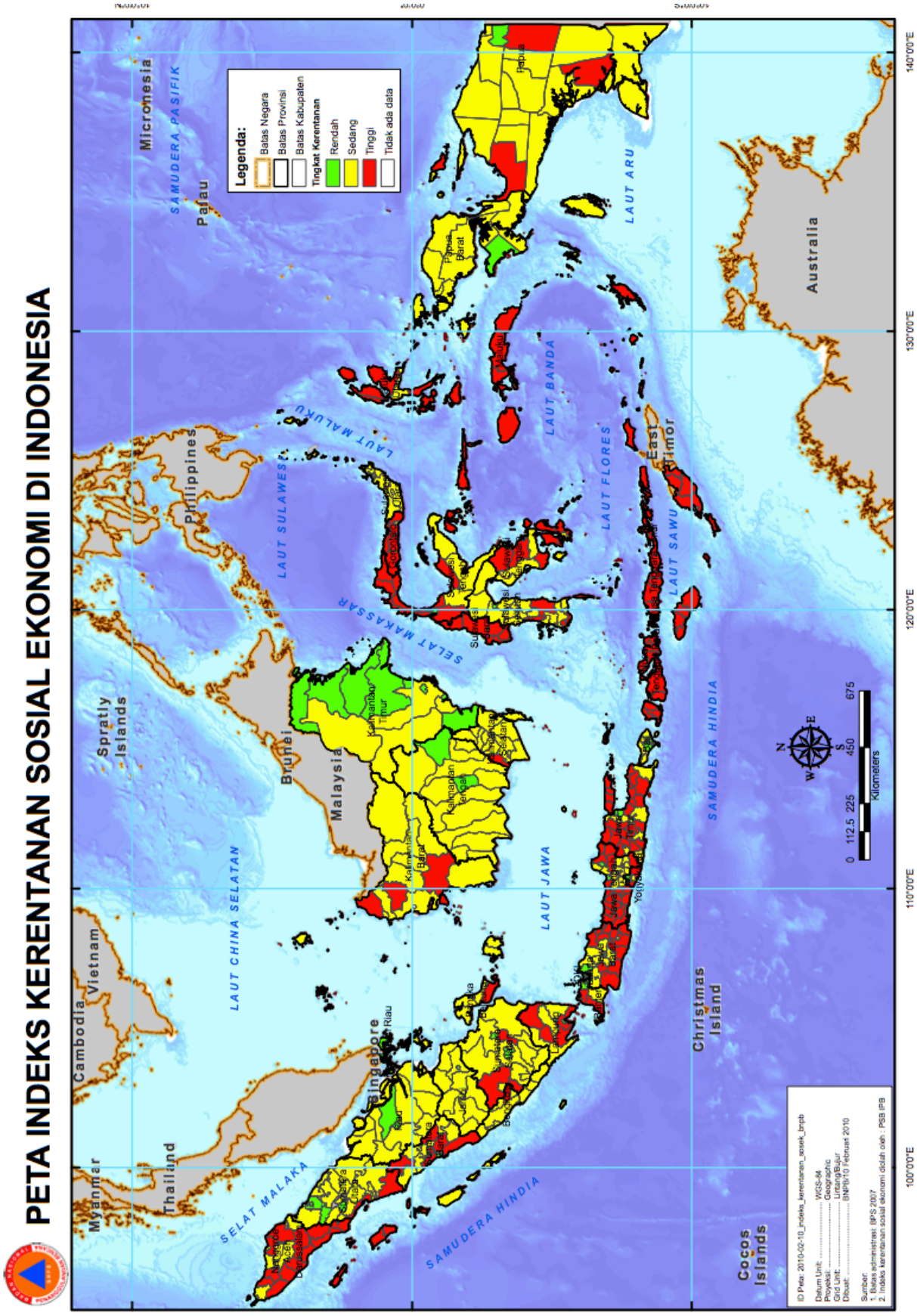


Annex VII – Drought Risk Map 2011



Annex VIII - Land- and Forest Fire Risk Map 2011





Annex IX – Socio-Economic Vulnerability Index map