Disaster Risk Reduction in Indonesia

Status Report 2020

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UN Office for Disaster Risk Reduction

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About this report

The disaster risk reduction (DRR) status report provides a snapshot of the state of DRR in Indonesia under the four priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030. It also highlights progress and challenges associated with ensuring coherence among the key global frameworks at the national level; and makes recommendations for strengthening overall disaster risk management (DRM) governance by government institutions and stakeholders at national and local levels.

As this report is based on information available as of the end of the year 2019, an update on the COVID-19 impact, response and recovery using a risk-informed approach by countries is provided at the beginning of this report. This report has been prepared by the Asian Disaster Preparedness Center (ADPC) on behalf of the United Nations Office for Disaster Risk Reduction (UNDRR) through country consultations and a desk review of key documents, including legal instruments and DRR policies, plans, strategies and frameworks, etc.

The report has benefited from inputs by the Indonesian National Board for Disaster Management (called in Bahasa as Badan Nasional Penanggulangan Bencana or BNPB) and Ministry of National Development Planning of the Republic of Indonesia (Bappenas). UNDRR and ADPC also acknowledge the government, international organizations and stakeholder representatives who contributed their valuable input and feedback on this report.

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This report serves as a reference document for the implementation and monitoring of the Sendai Framework. The findings, interpretations, and conclusions expressed in this document are those of the author(s) and do not necessarily represent those of the United Nations, including UNDRR, or its Member States. The presentation of the material in this report concerning the legal status of any country or territory or of its authorities or concerning the delimitations of its frontiers or boundaries, as well as the text and the tables, is intended solely for statistical or analytical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. While every effort has been made to ensure the accuracy of the information, the document remains open for any corrections in facts, figures and visuals.

Indonesia's Response to COVID-19 and Disaster Risk Reduction

Indonesia reported its first confirmed COVID-19 case on March 2, 2020. The government adopted various containment measures, including temporary bans on domestic and international air and sea travel, screening at ports of entry, school closures, and other restrictions on public events. In June, Indonesia began easing some containment measures. The city of Jakarta started a transitional phase from large-scale social restrictions on June 5th and further eased restrictions on malls (on June 15) and parks and recreation areas (on June 20). However, the city of Jakarta has extended the transitional phase from large-scale social restrictions through September 10 in the absence of a sustained decline in daily new virus cases. On September 9, Jakarta's governor announced that large-scale social restrictions would be tightened further to contain the spread of the virus.

Indonesia's growth improved in the third quarter of 2020 to -3.5 percent year to year against the -5.3 percent in the second quarter of 2020, mostly driven by recovery in domestic demand. The Ministry of Finance, headed by former World Bank's managing director, Sri Mulyani Indrawati has made four major decisions namely tax-incentives policy, labour protection, rescheduling of loan repayment from small and medium enterprises (SMEs) and reallocation of fiscal policy at local government levels. The national economic recovery program has been continuously refined and currently stands at IDR 695.2 trillion.

The President of Indonesia established Task Force for COVID-19 (Gugus Tugas Percepatan Penanganan COVID-19) with the Head of National Disaster Management Agency (BNPB) as the commander. The task force key focus was to assist medical force to mitigate the impact and reduce the loss of life. A number of presidential decrees, rules and regulation were issues to guide the national and local responses. One of the most important legal instruments is the President's Directives 4/2020 (Instruksi Presiden Nomor 4/2020) specifically instructing for refocusing of development activities, reallocation of government budget, and procurement of goods and services for rapid and accelerated response to COVID-19. The President Directive has major points ensuring food security, strengthening health sector through basic health services and national insurance scheme (BPJS) for COVID-19 patients, strengthening local governments and local economy among others.

BNPB played a key role despite the fact that managing an epidemic is not their natural mandate by collaborating with Ministry of Health to disseminate the information of Covid-19 through different media platforms including SMS blasts; established a rapid response team; provide logistics, materials, and health facilities; conduct surveillance for new potential cases of Covid-19; And collaborate with the Indonesia National Armed Forces, Indonesia National Police, and Ministry of Health. BNPB is equipped with approximately 176 officials who will join the existing team of Pusat Pengendalian Operasi Penanganan Bencana/the Center for Disaster Management Operation.

1. Introduction

The Republic of Indonesia is the world's largest island country located in South East Asia, nested between the Indian and Pacific Oceans. The country comprises more than 13,466 verified islands out of a total of 17,000, and thus extends over an area of about 2.01 million square kilometers (Ministry of Environment and Forestry, 2014). Given its location on the equator, the climate is dominated by tropical conditions with two distinct monsoonal and dry seasons. Yet, the temperature and humidity vary little during the year, maintaining an average of 26 to 30 degrees and 80 percent humidity, respectively. In terms of geography, the country comprises various ecoregions from lowlands to mountainous areas running through the major islands in the west coast of Sumatra, West Java, Kalimantan, Sulawesi and Papua, which also receive the highest annual rainfall (up to 6,100 mm annually) (Indonesia National Disaster Management Authority, 2016). Also, Indonesia's rainforests – which are among the world's largest in terms of area after the Amazon and Congo basin - host an incredible range of biodiversity. They contain 10 percent of all known plant species, 12 percent of mammalian species (including endangered orangutans, the critically endangered Sumatran tigers and rhinoceros) alongside 17 percent of all known bird species (RAN, 2019). However, much of the original forest cover has now been replaced with cropped land, apart from regions in Kalimantan, Sulawesi and Papua (figure 1).

Administratively, the country is divided into two levels of regional governance operating under the national government, consisting of provinces (first order administrative level, headed by provincial governors), and regencies/cities at the second-order administrative level. Under the Regional Autonomy Law, the sub-national level governments are responsible over their own laws and policy-making (PCGN, 2015), wherein cities and regencies (distinguished by demographics, size and economy) have their own governments and legislative bodies. In total, there are 34 provinces, which are further divided into 416 regencies and 98 cities at the second-order levels. While decentralization is high on the government's priorities, foreign policy, defence, system of law and monetary policy remain under the administration of national government. With regards to DRR, provincial and local level Disaster Management Agencies (BPBDs) are authorized bodies mandated with DRM/DRR functions in their respective jurisdictions, while the National Agency for Disaster Management (BNPB) serves as a national focal agency for DRR policies. The National Development Planning Agency (BAPPENAS) and local agency for planning and development (BAPPEDA) also play a vital role in DRR as they are prime authorities for development planning, including land-use planning.

in terms of its economy, Indonesia has been a tremendous success. It is the largest economy in South East Asia, 10th largest economy globally (in terms of purchasing power parity) and has been growing steadily since the Asian financial crisis from 1990 to a GDP per capita of US$ 3,932 in 2018 (World Bank, 2019). Main contributors to the country's GDP are service sectors (47 percent), industry (39 percent) and agriculture, forestry and fisheries (14 percent) (Ministry of Environment and Forestry, 2018). Given the rapid positive development, poverty rate has halved between 1999 and 2018 to 9.8 percent, and the economic outlook remains positive due to high domestic demand and flourishing export industry (World Bank, 2019). Yet, challenges remain. Out of the total population of approximately 264 million, 25.9 million lived below the poverty line in 2018, and 20.19 percent remained vulnerable of falling into poverty given their low income (World Bank, 2019).

Indonesia is also exposed and vulnerable to a range of natural hazards, including earthquakes, tsunamis, volcanic eruptions, flooding, droughts, landslides and epidemics. In terms of anthropogenic hazards, technological failures are possible given vibrant industry sector, as human errors, faulty design and operational mistakes can all constitute to a disaster in the country. Also, due to Indonesia's location on the Pacific Ring of Fire, many active volcanoes are found in the country, and seismic risks arise from the interaction of the Pacific, Eurasian and Australian plates which produce frequent (and sometimes, destructive) earthquakes (CFE-DM, 2018). For example, Mount Agung has demonstrated continued activity since late 2017 until June 2019, generating frequent eruptions and generous amounts of tephra. Also, floods, landslides and cyclones are a yearly occurrence. Prevalence of such hazards continue to endanger the population, infrastructure and development. Furthermore – in the context of hazards – it should also be noted that due to the rate of development in and around the metropolitan region of Jakarta, located on the island of Java, the capital is currently sinking at an approximate rate of 16-17 centimetres annually (Jong, 2019). Thus, facing the threat of complete submersion, the government has decided to relocate the capital to Indonesian-controlled region of Kalimantan on the island of Borneo, ownership of which is divided between Malaysia, Brunei and Indonesia. The site was considered lower risk to natural hazards and located in strategic location within close proximities to developed cities (Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation, 2019).

Figure 1. Land use map of Indonesia. Food and Agriculture Organization, cited in ADB (2016)
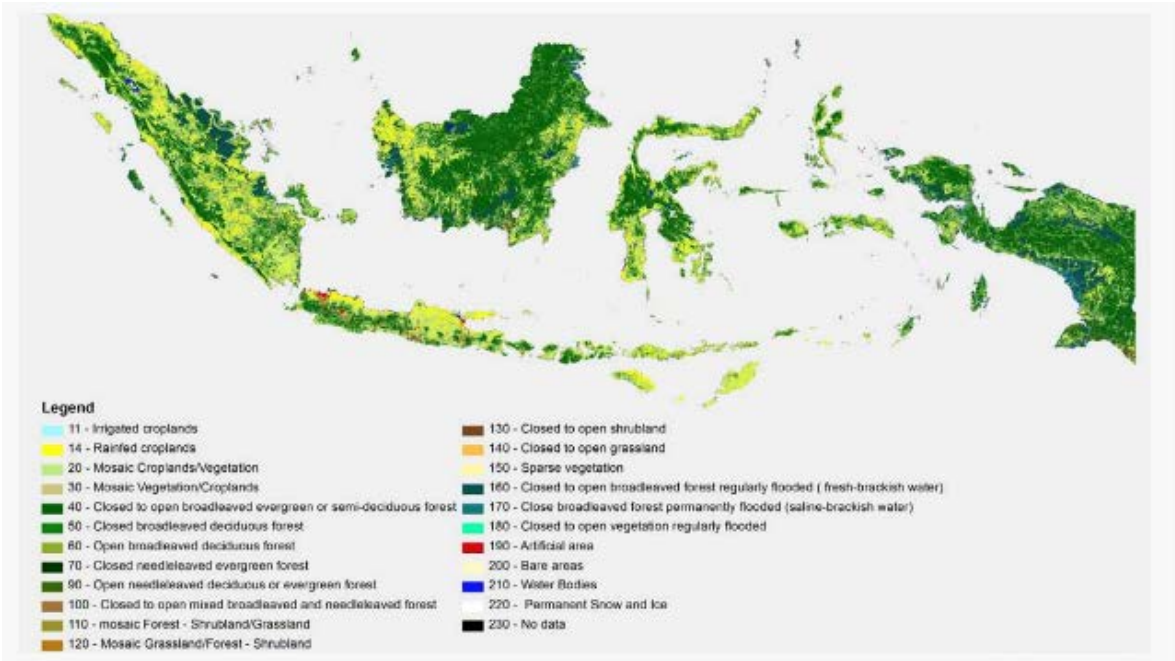
1.1 Demographic Characteristics

Indonesia is the world's fourth most populous country with an estimated population of over 271 million. It is also projected to be eight in the list of countries which contribute to highest population growth by 2050 (Hans-Peter & Behrman, 2016), due to the fact that the projected growth is expected to witness an increase of 67 million (28 percent) over the next 25 years (UNFPA, 2010). Currently, nearly 60 percent of the population reside on the island

of Java, which covers only 7 percent of the country's total land area. As a result, it has a density of 951 as opposed to the national average of 109 (de Priester, 2016). As a result of the high concentrations of people, nearly half of the growth has been predicted to occur in Java, wherein the population density could reach 1,304 persons per square kilometre by 2035 (World Bank, 2019). However, given the government's decision to relocate the capital to Kalimantan, these projections might change drastically during the upcoming decades. Elsewhere, the population densities are still highest in the coastal regions, which drastically heightens the risks of hydrometeorological hazards for much of the peoples living below an elevation of 10 meters (figure 2).

Indonesia is also immensely diverse, having the largest Muslim population in the world (86.1 percent of the population in 2016 were of Islamic faith) alongside groups of Christian Protestants and Catholics, and those Buddhist or Hindu (de Priester, 2016). Formally, the government recognizes six religions and 1,128 ethnic groups. Furthermore, the country is also a home to an estimated population of 50 to 70 million indigenous peoples according to the estimates of the national organization of indigenous peoples, Aliansi Masyarakat Adat Nusantara (AMAN) (International Working Group for Indigenous Affairs, 2019). However, the government only recognizes some "customary law societies" as per the Ministry of Social Affairs' definition, which leave numerous groups self-identifying as indigenous without an official status (International Working Group for Indigenous Affairs, 2019).

In terms of human development, the country's rapid growth has led to impressive gains. The Human Development Index value of 2018 was 0.707, positioning the country at 111 among 189 measured countries and territories (UNDP, 2018). Supported by a robust education system, the literacy rate reached 95.66 percent in 2018 (UNESCO, 2018), and the fertility rate was halved to 2.3 per woman between 1971-2000, illustrating the success of family planning programs intending to ease the demographic pressures (UNFPA Indonesia, 2015). Yet, challenges persist. For example, tackling maternal mortality has not been successful as the rates remain above 200 per 1000 live births, female participation in the labor force remains low (50.3 percent as opposed to 84.4 percent males in 2015) and vast majority of female workers are in the informal sector (Hoque, 2015).

Finally, it should be noted that given the rapid growth and bulging numbers of youth, Indonesia is undergoing a demographic transition. Currently, the country's share of working-age people in the total population vastly outweighs those dependent (below 15 or older than 65). If coupled with high investments to human capital (i.e. education and healthcare), and to the creation of employment opportunities, this demographic dividend can rapidly accelerate development and boost the economy (UNFPA Indonesia, 2019). However, a timeline for achieving this window is narrow. The tide of development may turn after 2050 as increasing numbers of people are growing older, or dependent, which creates a challenge for lower middle-income countries such as Indonesia. If the dividend is not achieved and sustained in time, the growth may be hindered as the share of elderly begins to grow among the population, while the numbers of working-aged groups begin to shrink at the other end (de Priester, 2016).

Figure 2. Population densities in Indonesia living within and outside of a 10-meter elevation coastal zone in 2007 (Columbia University, 2007).
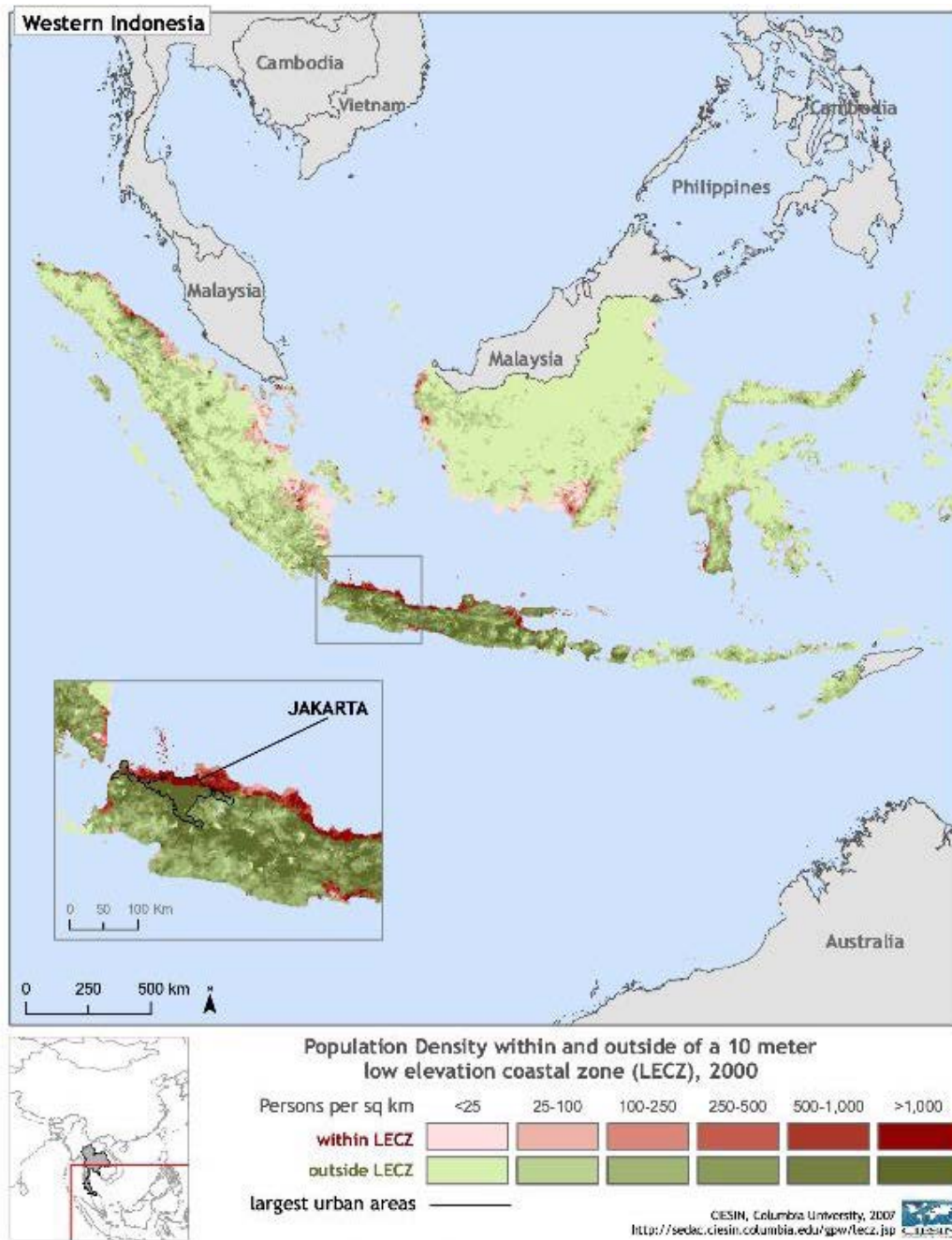
1.2 Economic Impacts of Disasters

Due to the prevalence and high frequency of the hazards Indonesia is exposed and vulnerable to, the impacts of disasters may hinder the economy and its future development significantly. Most notably, the 2004 Indian Ocean Tsunami has been studied extensively in terms of its short to long-term economic consequences. It was the deadliest tsunami ever recorded, causing approximately 230,000 casualties, 73 percent of which occurred in Indonesia alone (Lucich, et al., 2019). The preliminary assessment estimated total of damages and losses

of US$ 4.45 billion, of which 66 percent resulted from damages and 34 percent from losses due to reduced income flows and lessened production (Ministry of National Development, Bappenas, 2005). Some 78 percent of the damages and losses were borne by the private sector (including households), and the national GDP growth was projected to be reduced by up to 0.4 percent in 2005. While this may seem relatively low, impacts to local economies were massive in contrast. Total damages and losses to the worst affected Banda Aceh, for example, amounted to 97 percent of the province's GDP (Ministry of National Development, Bappenas, 2005). Agriculture was most severely impaired sector, and even when the local oil and gas industries escaped virtually unharmed, the regional GDP was predicted to contract by up to 7 percent in the longer term due to increased soil salinity, damaged assets and lost productivity (Athukorala & Resosudarmo, 2005).

Earthquakes have also caused significant damages to the country's economic performance. Between 1970-2015, there have been 97 earthquakes which have amounted to US$ 11.7 billion in losses and damages (CFE-DM, 2018). For example, the Yogyakarta earthquake caused damages of US$ 3.1 billion in 2006, and in 2009, the West Sumatra Earthquake caused economic impacts of US$ 2.2 billion (CFE-DM, 2018). Most recently, the Lombok Earthquake of 2018 led to 460 fatalities and caused total economic losses and damages of over US$ 530 million according to the government's estimates (National Board for Disaster Management, 2018). These frequent, heavy-impact disasters exert immense stress on not only to the economy, but to the populace as well, and given that recovery is sometimes costly, the government continues to struggle with disaster-related spending. The government continues to spend US$ 300-500 million annually on reconstruction, and during major disaster years the funding needs may reach 0.3 percent of the GPD (GFDRR, 2019). Also, in the wake of the series of these events, the government has now sought to double its response budget to US$ 1.6 billion in 2019, one third of which would be allocated to rehabilitation, and the rest to disaster response (Kapoor, 2019).

Disasters also affect household economies. Given that nearly half of Indonesia's districts are affected by hazards annually, continuous disruptions to education, infrastructure, markets, hospitals and livelihoods may contribute to heightened poverty and malaise (Rush, 2013). Evidence suggest that while impressive gains in poverty reduction have been made, the range of disasters have led to higher incidence of poverty in Indonesia between 2003 and 2010, as these events affect not only with those living below the poverty line, but also those vulnerable to poverty (Rush, 2013). For example, in the aftermath of the 2004 tsunami, up to 80,000 small enterprises were destroyed, which provided income to approximately 140,000 people in the affected areas (Ministry of National Development, Bappenas, 2005). Such events may severely hinder the abilities of individuals and households to sustain themselves and their families, especially if they do not have access to risk-transfers such as savings and insurance.

1.3 Social Impacts of Disasters

Disasters also affect human wellbeing, livelihoods, education, health and overall functioning of any given society to a varying degree. Often, the impacts are following socio-economic and cultural boundaries, affecting people and households based on local hierarchies of power, gender, marginalization, age, income, availability of support networks and other factors. Those with the least often experience the greatest relative losses given the lack of equitable access to various services and protection mechanisms which majorities usually

enjoy (including social protection and safety nets, access to health care, family support, equal access to opportunities for income generation and so on).

For example, in the case of the 2004 Indian Ocean tsunami, the agricultural sector and fisheries were among the hardest hit: losses on these sectors constituted to over one third of the total tsunami associated losses (Ministry of National Development, Bappenas, 2005). Hence, subsistence farmers were expected to be most severely impacted given the loss of fertile soil and due to the reconstruction processes, which may not always match household needs, nor consider time needed for recovery in realistic terms. Thus, disasters may also lead to worsened poverty in Indonesia due to lost livelihoods, housing, commercial facilities and availability of medical services all of which correlate with the stability of household economies (Rush, 2013).

Disasters also affect education. The Yogyakarta earthquake of 2006 destroyed 2,155 educational facilities, which severely hindered the contingency of schooling especially in Bantul (Setiadi, 2014). In the case of Merapi eruption, schools were reported to close for almost two weeks in some areas, and their facilities may also be used as community shelters during emergencies which have negative impacts on education (Setiadi, 2014). Disasters materializing in Indonesia have indeed been found to lower school enrolment rates, wherein poverty exacerbates the effects to those from low-income families disproportionately (Rush, 2018).

Finally, disasters always bear psychological impacts due to disruptions to life quality, health and wellbeing, which have further ripple effects to the economy (loss of productivity, low participation) and levels of happiness. In Aceh and West Sumatra post-2004, the survivors have been studied to have persisting psychological suffering, including higher levels of depression, anxiety and stress, which lasted for years after the tsunami (Musa, et al., 2014). Thus, addressing the impacts of disasters must be conducted in consideration of the diversity of human needs to guarantee that the benefits of recovery processes and future growth can be maximised for safeguarding overall national development and human wellbeing.

2. Disaster Risk Profile

2.1 Hazards and Climate Change

One of the most destructive volcanic eruptions ever recorded in history has occurred within Indonesian territory in 1883. It was the year of the eruption of Krakatoa, now etched into popular culture (in the works of writers such as Tennyson and Ballantyne) as an event comparable to the fall of Pompeii. It produced an ash plume reaching to an altitude of 6 kilometres, and a pressure wave which has been estimated to have reached 310 decibels, making it loud enough to be heard 5,000 kilometres away. It also travelled with enough power to rupture eardrums of sailors traversing within 64 kilometres distance on the Sunda Strait, and caused tsunami waves which killed over 36,000 people in Java (Morgan, 2013). The energy released during the eruption is estimated to have been comparable to an explosion of 200 megatons of TNT, five times the amount of the RDS-202 hydrogen bomb, allegedly the most powerful nuclear device ever created (Australian Bureau of Meteorology, 2016). In 2004, the Indian Ocean tsunami followed a close second in terms of energy released (Ministry of National Development, Bappenas, 2005). Given the country's positioning on the Pacific Ring of Fire, and the 136 volcanoes within its territory, the potential for catastrophic events is unusually high.

However, alongside such unique disasters, one must also consider the relenting and frequent impacts of hydrometeorological hazards which continue to strain human and ecological systems. Beside volcanic eruptions and seismicity, Indonesia is also affected by regular flooding and coastal inundation associated with storms, landslides, and cyclones. Of these, events induced by high precipitation correlate highly with La Niña conditions which increase the risk and intensity of hydrometeorological hazards. During some years, rainfall may increase by up to 200 percent vis-à-vis the normal conditions, depending on the region (CFE-DM, 2018). Conversely, some areas including Sumatera and Kalimantan tend to have negative rainfall during La Niña years, thus leading to heightened risks of drought (Hidayat, et al., 2018).

Yet, the normal rain season occurring between November and April brings in copious amounts of rainfall which may have catastrophic consequences. In 2007, floods in Jakarta affected 80 districts, destroyed 70,000 homes and displaced over 400,000 people (GFDRR, 2011). In 2013 flood inundated Jakarta city almost entirely causing massive impacts on the private sector (World Bank & GFDRR, 2017) and resulting in the displacement of 40,000 people (Yakkum Emergency Unit, 2013). Recent flooding events include floods end of 2019 affecting provinces such as North Sumatera province, Bengkulu Province and West Java provinces at different scales (ReliefWeb, 2019). Indeed, over 42 million people in the country are living on low-lying land, less than 10 meters below sea level, and the country comprises more than 81,000 kilometres of coastline, thus rendering millions exposed to flooding events (USAID, 2017). Also, much of the most recent development, driven by rapid urbanization, has been taking place on flood prone areas, which highlights the importance of risk-informed, sustainable and resilient urban planning. Moreover, high precipitation also increases landslide risks in hilly or mountainous regions, where in rockslides and mass movements may endanger human life and physical infrastructure. They account for the highest disaster-related mortalities in the country, and continuous expansion to high-risk areas contributes to the issue (Rahardjo & Marhaento, 2018).

Large parts of Indonesia also experience droughts habitually, especially the regions of Nusa Tenggara Barat and Timor. The dry conditions may be magnified to reach proportions of a disaster, during which the government and NGOs need to support the affected populations by provisions of food, water and cash assistance (CFE-DM, 2018). Most recently, the droughts between 2015 and 2017 caused food insecurity in the eastern parts of the country. West, East and Central Java, alongside Yogyakarta, Bali and Nusa Tenggara have been classified as the most vulnerable to the impacts of extreme droughts (Sufa, 2019). These areas have been identified in figure 3.

Finally, given the prevalence, impact and frequency of the aforementioned hydrometeorological hazards, climate change is, and will be a grave concern threatening Indonesia's development. Already, the capital city of Jakarta has been planned to be relocated not only because of its rate of sinking, but because expected impacts of rising sea levels as well (McCarthy & Sanchez, 2019). Impacts of droughts, flooding and landslides are also predicted to worsen, where delayed monsoon season may contribute to exacerbated droughts and forest fires. Similarly, unusually heavy concentrations of rain may increase the risk of flooding, and increased temperatures and seasonal precipitation are likely to create more favourable conditions for mosquitoes spreading malaria and dengue (WHO, 2015).

Figure 3. Drought hazard map of Indonesia, BNPB cited in ADB (2016).
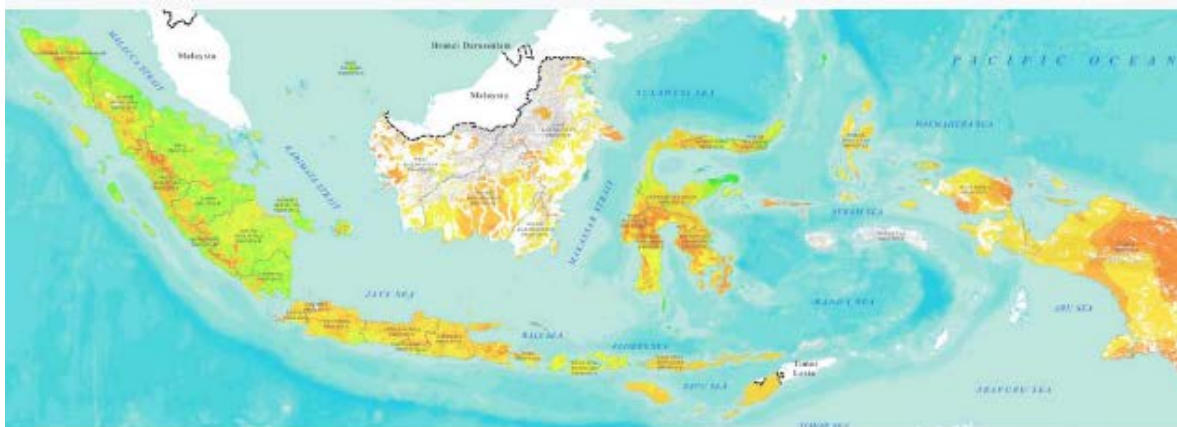
2.2 Exposure

Despite the range of hazards present in the country, their impacts are not distributed evenly. Given the diverse topography and differing degree of exposure to coastal hazards, people and infrastructure in Indonesia are affected by hazards to a varying extent (figure 4). In 2019, Indonesia was ranked 27th most at-risk country, with a very high rating on the World Risk Report's exposure scale (Bundnis Entwicklung Hilft, 2019). According to the government's estimates, 97 percent of the population are living in areas prone to disasters, wherein earthquakes are considered to be the highest-risk events, with 62.4 percent of the population considered exposed to them (BNPB; UNFPA; BPS, 2015). Additionally, 63.7 million people are exposed to flooding, 40.8 million to landslides, 4.2 million to tsunamis, and 3.9 to million to volcanic activity as assessed in a study conducted based on the 2010 population census (BNPB; UNFPA; BPS, 2015).

*Figure 4. Natural hazard risks in Indonesia (OCHA, 2011)*
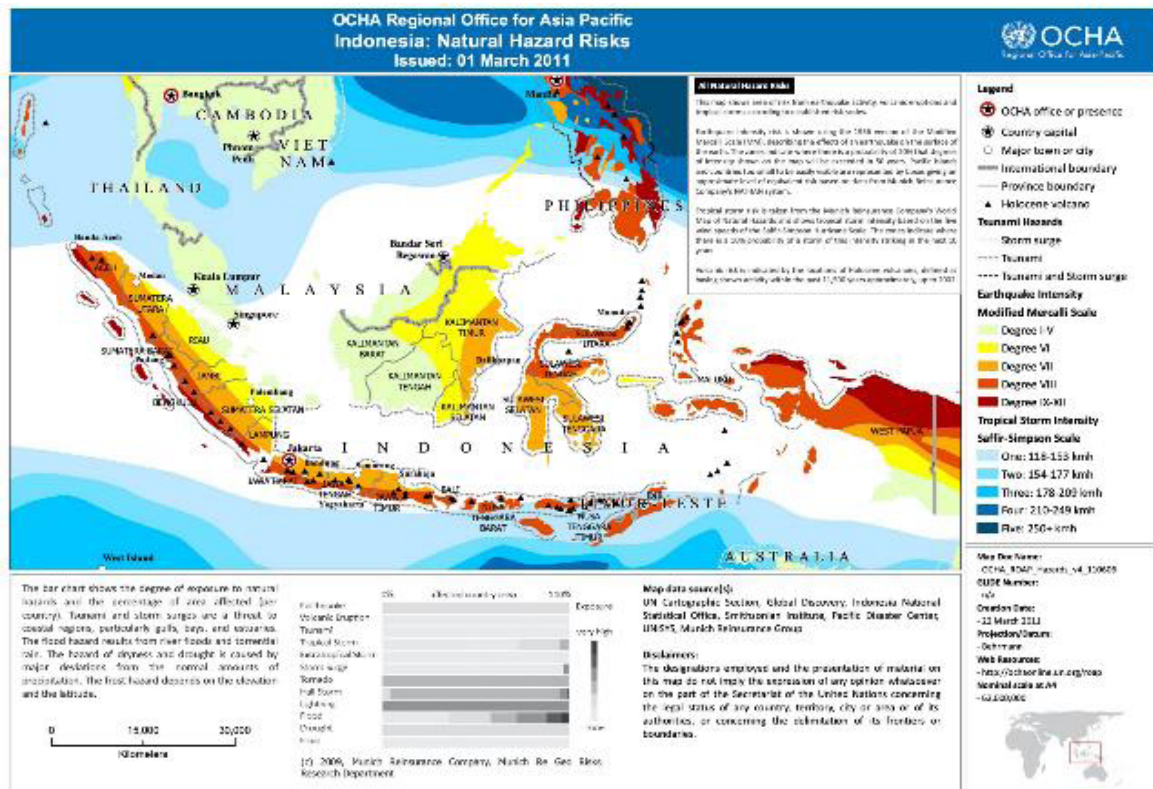
While earthquakes are indeed considered high risk due to their potential magnitude and widespread impacts, exposure to flooding remains the most significant concern for the world's largest archipelagic nation. Jakarta alone has been built on a basin with 40 percent of its area below sea level, and on a land which sinks at a faster pace than Venice (Falkenmire, 2017), rendering its population exposed to flooding. Flood waters are also associated with the spread of diseases, as they may wash up waste in areas where sanitation is compromised or lacking, and lead to the loss of access to safe water altogether. Droughts may have similar impacts to spread of diarrheal diseases following desperation linked to diminishing water resources. Tropical climate also increases the peoples' exposure to vector-borne diseases, including dengue and chikungunya, which have the potential to develop into epidemics (de Jong, et al., 2018). Especially dengue has been reported to be on an ascending trend, rising to an incidence of 35 to 40 per every 100,000 people between 1968 and 2013, and it is currently present in 80 percent cities and regencies of Indonesia (Haryanto, 2018).

Landslides are also a concern given the number of people inhabiting hazardous areas. They are caused by complex interaction of myriad factors, including dynamic triggers (such as seismic activity or high precipitation), ground conditions (soil types, slope angle) as well as anthropogenic stressors resulting from road cutting and unplanned development which is spreading to unstable land (Hidayat, et al., 2019). Due to the growing population and increasing urbanization, landslides have indeed become more common, rising from 112 events in 2008 to 515 in 2015, and the most affected areas are in Jawa Tengah, Jawa Barat, Jawa Timur, Sumatera barat and Kalimantan Timur (Government of Indonesia, 2016).

One must also consider the exposure to pollution given its potential to severely degrade quality of life and wellbeing. Most recently, 11,000 reported forest and peatland fires across Kalimantan and Sumatran regions were causing severe problems in terms of air quality – the AQI reached levels of 155 which is considered dangerous to sensitive groups and young children (UNICEF, 2019). An estimated of 10 million children were at risk in these areas according to a UNICEF press release in 2019. Furthermore, persisting pollution from industry and congestion in urban areas is also endangering the lives of millions. Currently, the loss of life expectancy in some areas exceeds 4 years (figure 5), and Indonesia does not maintain a national standard for assessing air pollution levels despite the particulate concentrations which have increased 171 percent between 1998 and 2016 (Greenstone & Fan, 2019). In 2016, 80 percent of the population lived in areas wherein the average particulate pollution levels exceeded the WHO guidelines (Greenstone & Fan, 2019).

Figure 5. Life Expectancy Gain in Indonesia from Reducing PM2.5 from 2016 Concentrations to WHO Guideline (Greenstone & Fan, 2019)
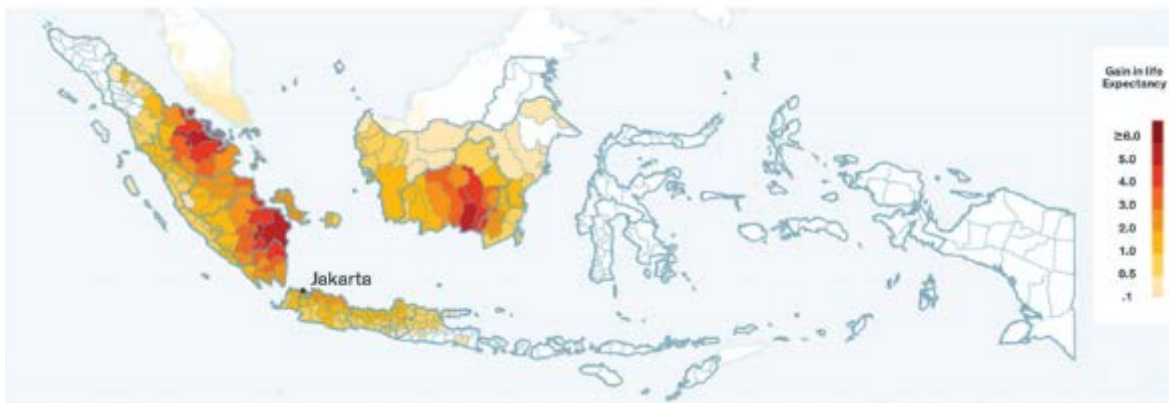
2.3 Socio-Economic Vulnerability

Exposure also correlates with socio-economic vulnerability given that people rarely choose to inhabit dangerous sites. Rather, due to lack of (affordable) safe land, and the need to generate income resulting in unplanned development contributes to varying degrees of exposure. Indeed, poverty remains as one of the main determinants of vulnerability across the world due to the fact that societal economic stratification, often determined by access to education and background, may lead to lessened access to resources, quality housing, education, health care, food (especially in times of emergencies) and other necessities for some, which could otherwise act as a buffer of resilience against disasters (Siagian, et al., 2012).

Depending on the context, gender is an important determinant of not only poverty, but vulnerability as well. Limited employment opportunities and inadequate pay, among other reasons, constitute to higher women's poverty in Indonesia as many women continue to work in the informal sector and receive lower wages than their male counterparts (Arif , et al., 2010). Women also experience higher time poverty due to higher share over household responsibilities, and discriminatory practices contribute to their heightened economic vulnerabilities (Arif , et al., 2010). In times of disasters, when a household loses its main income, assets or other monetary safety nets, women's role in a society may heighten their vulnerability if their access to opportunities (temporary or otherwise) remains lower than that of men. This may lead to negative coping such as prostitution, which further exposes women and girls to exploitation, gender-based violence and trafficking. Similarly, child marriages have been used to lessen a

household's economic burdens in Indonesia, and it has been suggested that disasters act as a catalyst which increase girls' probability of entering into child marriage (Dewi & Dartanto, 2019).

Access to education also provides protection from, and resilience against disasters in the longer term due to increased access to opportunities, wealth and knowledge which supports rapid recovery and helps to avoid negative coping mechanisms. A study conducted to measure the social impacts of the 2004 tsunami revealed that those who had received education tended to have higher income and greater wealth, which in turn supported faster recovery and helped to minimize economic impacts due to existing safety nets. The combined effects then resulted in higher levels of psycho-social health after five years, thus indicating higher levels of resilience as well (Frankenberg, et al., 2013). If access to education is compromised, it could also lead to the formation of cycles of poverty. In this context, remoteness is an important factor: children in remote and rural areas in Indonesia experience multidimensional inequality of opportunities in terms of accessing education and transportation services due to which climbing out of poverty is harder for some, especially in areas which are frequently affected by shocks (Aji, 2015). Those disabled may also experience and face these challenges more so than others. Still, one out of ten those living in poverty globally are disabled, who are also less likely to attend school due to lack of access or limits to learning. This heightens the importance of guaranteeing equity in schooling to lessen socio-economic vulnerabilities in Indonesia (Wibowo & Muin, 2018).

2.4 Physical Vulnerability

Access to economic, human and social capitals determining socio-economic vulnerabilities may also affect physical vulnerability in terms of knowledge about resilient housing design, to afford proper construction materials, and necessary funds to purchase safe land (or avoid expanding to hazardous areas). For example, in the case of Yogyakarta earthquake in 2006, the high damages were mainly caused by the high densities resulting from unplanned urbanization and lack of space, which also constituted to poor seismic resistance of residential buildings (Saputra, et al., 2017).

Furthermore, infrastructure interdependencies are elemental for understanding vulnerabilities and causal chains in which impact to one function has an effect on another, such as impaired electricity infrastructure vis-à-vis the needs of hospitals, or the importance of sustained road and port connectivity to the economy. A case study from Jakarta frames this discussion point well. During the February 2015 flooding, a decision was made to shut down electricity to protect the city's residents. However, it also cut off power supply to the water pumps which are essential in keeping water out of the city, thus leading to much more severe flooding lasting for days (Buntara, 2016). Failure to understand such dependencies by assessing interconnectedness to inform emergency management practitioners can lead to worsened disasters, and only works to increase physical vulnerabilities when new facilities are built on degrading systems without considerations to underlying conditions (Buntara, 2016). Thus, integrating wider systems thinking to inform development is elemental.

Finally, urbanization also contributes to high levels of pollution due to poor physical infrastructure. In Jakarta, inadequate drainage and solid waste management in the past have caused severe problems in terms of ground water quality and environmental degradation, alongside loss of green space which can act as an important buffer against flooding impacts (Diwangkari, 2018). As urbanization in Indonesia has primarily occurred in the coastal areas,

rapid land conversion has greatly exacerbated flood risks (Rudiarto, et al., 2018). Currently, Indonesia is gaining only 4 percent GDP growth for every 1 percent of urbanization due to congestion, pollution and heightened disaster risks resulting from inadequate investments towards mainstreaming disaster and climate risk reduction measures into development (World Bank , 2016). Managing these trade-offs is elemental especially in the context of the redevelopment of Jakarta in Borneo to guarantee that it does not bring adverse side effects such as loss of habitat and natural space, mangrove forests or other natural buffer zones, degradation of which will increase exposure and endanger the fragile ecological systems. Disasters and their impacts are already magnified by the on-going processes of environmental degradation (CFE-DM, 2018).

2.5 Future Disaster and Climate Risks

As briefly mentioned previously, climate change may have significant exacerbating effect to the impacts of hydrometeorological hazards given following changes in regional precipitation and temperature. Under a high emissions scenario, the mean annual temperature could increase by about 3.8 degrees Celsius on average between 1990 and 2100, and an estimated of 4,215,700 people could be affected by worsened flooding in the coastal regions following sea-level rise (WHO, 2015). Sea level rise is projected to occur at a rate of 5 mm per year, and one-meter rise could affect 39 percent of the country's GDP which is largely generated at the coastal regions (Ministry of Foreign Affairs, 2018). Conversely, droughts are becoming more severe and are now reported every 3 years during the dry seasons, mostly in the southern islands of Java, Bali and Nusa Tenggara (Ministry of Foreign Affairs, 2018).

These changes could have catastrophic impacts on food security and availability of safe water, and water deficits have already been reported in Bali and East Nusa Tenggara. Additionally, saltwater intrusion contributes to decreasing water availability in the coastal regions, and fluctuating levels of rainfall will affect agriculture in adverse ways. These changes could lead to potential food deficits of 90 tons annually by 2050, not to mention the changing ocean temperatures which can drastically reduce the availability of fish (Ministry of Foreign Affairs, 2018). Without adaptation, the future costs of climate change by 2050 could result in the loss of 1.4 percent of the national GDP, greatest share of which would follow decreased agricultural output (Hecht, 2016). In this context, it must be noted that water scarcity is already threatening areas wherein demand for irrigation is exceeding 100 m^3/s, mainly the island of Java (figures 6-7). This is important because Java produces over half of the rice output in the country (ADB, 2016), and also because the region is among the highest-risk areas in terms of droughts (figure 3). Thus, temperature increase and fluctuating rainfall may severely impair agriculture in areas already struggling for water annually.

Yet, it is important to consider the high spatial variability of these losses. In provinces where rainfall expected to rise, farmers could consider changing their crops to more resilient rainfed rice, whereas increased droughts in other parts require different approaches. Naturally, flooding would also be worsened in coastal cities and towns more exposed to rising sea levels. However, while the impacts have high spatial variability (figure 8), affecting the urban and rural areas differently, they also occur as a complex interconnected process (figure 9). When combined, all of these cascading impacts could result in massive-scale degradation of habitable space in both the natural and built environments (Government of Indonesia, 2009).

Finally, in terms of the prevalence of diseases, the increasing prevalence of dengue and other vector borne illnesses could increase the costs of healthcare provision and protective measures significantly in the metropolitan region (Hecht, 2016).

Figure 6. Irrigation water demand per river basin in Indonesia, Hatmoko, et al. (2012), cited in ADB (2016).

Figure 7. Groundwater availability and safe yield of groundwater by region, map of groundwater aquifer productivity in Indonesia (ADB, 2016).
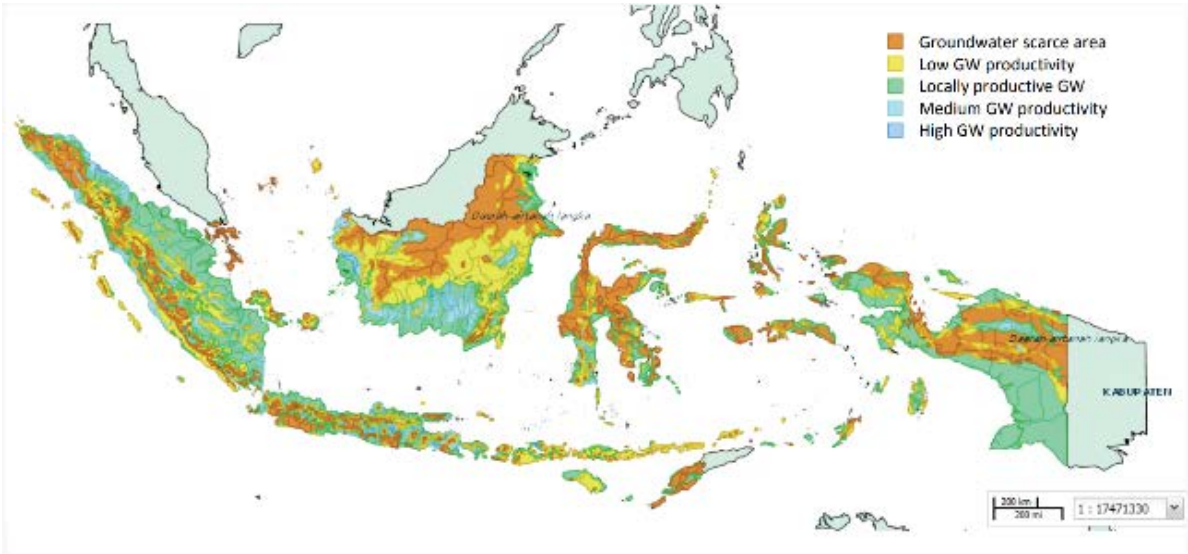
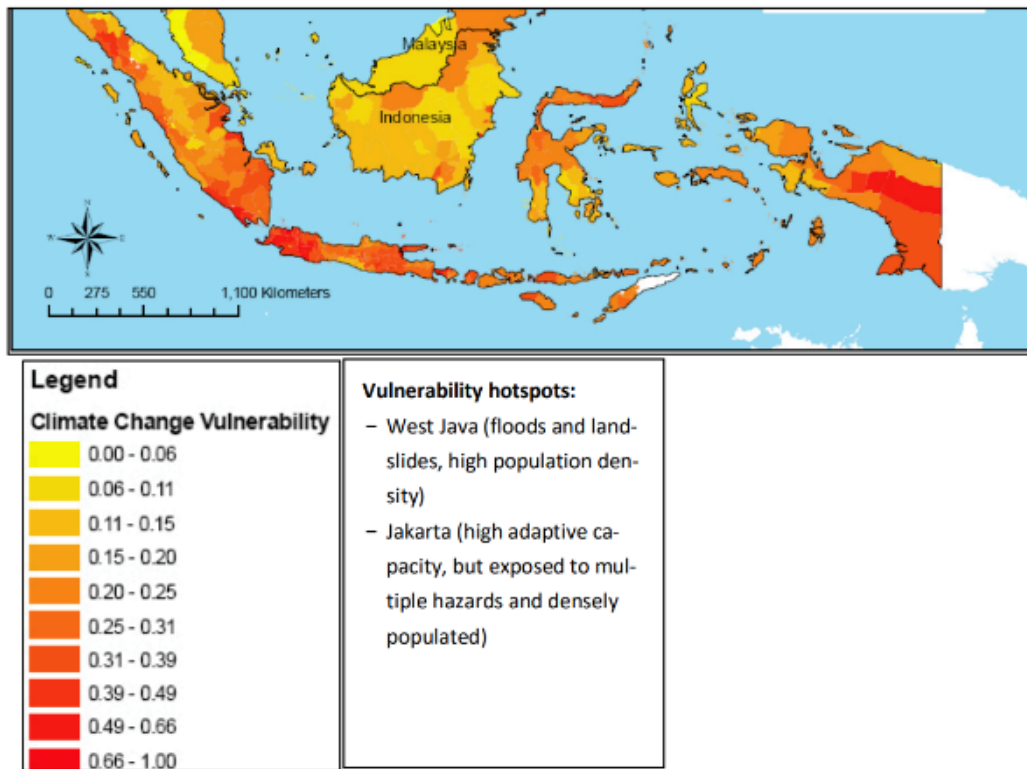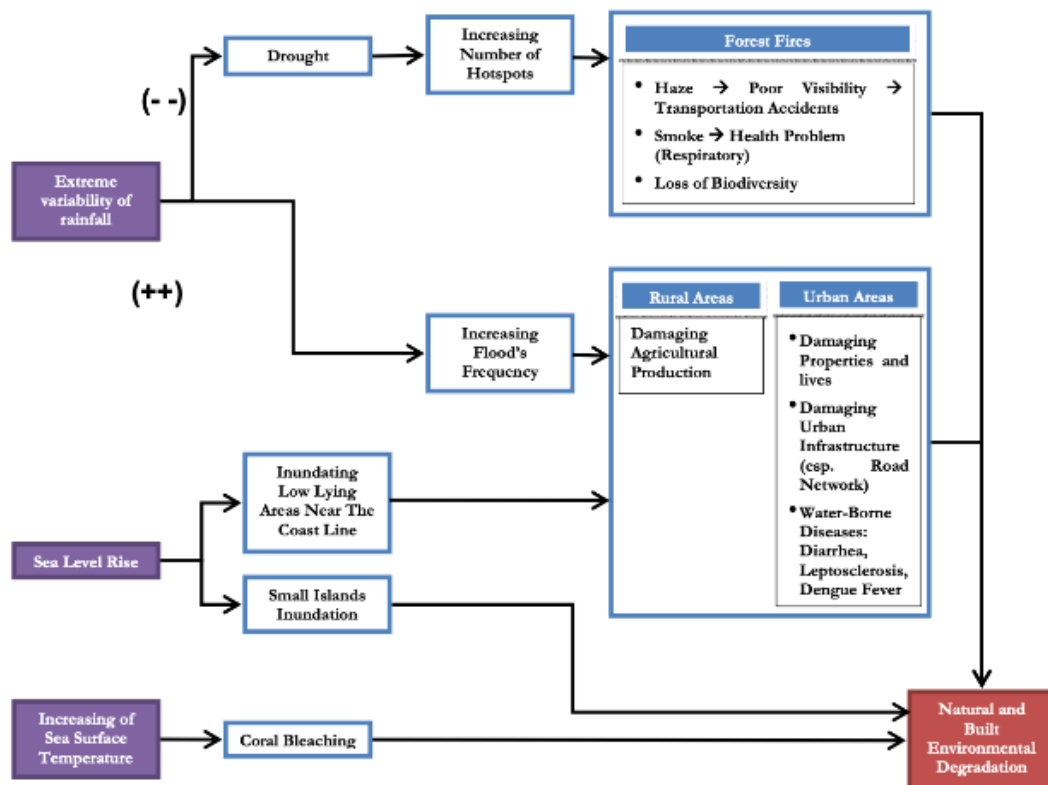*Figure 8. Variability of climate change vulnerability in Indonesia (Ministry of Foreign Affairs, 2018)*

Figure 9. Interconnectedness of climate change impacts leading to environmental degradation (Government of Indonesia, 2009)

3. Disaster Risk and Climate Action Interventions

As evidenced by the previous chapters, disaster and climate risk management in Indonesia is a daunting task. This section of the report intends to illustrate the current government's capacities in managing risks and sustainable development vis-à-vis the mandates of the post-2015 development agenda, namely the priorities as identified in the Sendai Framework for Disaster Risk Reduction, Sustainable Development Goals and the Paris Climate Agreement. Furthermore, suggestions will be made based on the collated evidence in efforts to identify most pressing challenges for the next decade, and appropriate priority actions to respond to them.

Priority 1. Understanding Disaster Risk Analysing, collecting and managing disaster and climate risk-related data (post-disaster and potential losses and probabilities) is essential for achieving a comprehensive understanding of disasters. Data is required for the processes of conducting risk and vulnerability assessments, in prioritizing investments for resilient development, as well as to support sustainable and risk-informed development planning in all the sectors of the society. Data should also be categorized as well as appropriately disaggregated to facilitate disaster trend projections and identification of impacts to different demographics, and all the information should be accessible to the public and authorities at all levels, stored within well-managed disaster information management systems. This would be the first step to facilitate reformative transformation from responsive, reconstruction orientated DRM towards a resilient, whole-of-society approach.

In Indonesia, the National Meteorological Organization (Badan Meteorologi, Klimatologi dan Geofisika. BMKG) is the main body providing real time hazard monitoring and maintaining data on hydrometeorological hazards, volcanic and seismic activity, and feeds them to the media, civil societies and humanitarian agencies in times of emergency (Australian Broadcasting Corporation, 2015). To increase access to risk information, the InaRisk platform was launched in 2015 as a web-based portal for visualizing spatial distribution of disaster risk assessment results in the country for DRR planning and monitoring (ADB, 2018). In terms of post-disaster and baseline data, the Indonesia Disaster Database system (Data Informasi Bencana Indonesia, DIBI) was developed in 2006 based on the DesInventar system, including communication forums to facilitate the process of collecting and validating disaster data, and data storage. It has further been expanded to cover provinces and districts, with local officials equipped with adequate skills to collect data, and to conduct provincial risk assessments based on available information (Wibowo, et al., 2013). At the national level, it is utilised to mainstream risk mapping and risk-informed planning, and within the provinces it supports localized, contextual DRR planning. Collected information also provides information for risk identification, policy-formulation, as well as funding prioritization based on disaster trends. However, given the regional disparities in technical capacities, human resources and funding, the tangible utilization of the available data varies greatly.

In 2014, a more advanced hazard monitoring (and early warning) system titled InAWARE was deployed by the BNPB, based on the Pacific Disaster Centre's DisasterAWARE platform in efforts to consolidate available hazard information from various national and international sources under one platform to be shared between and within national and provincial stakeholders (Pacific Disaster Center, 2014). During 2017 February flooding, the InAWARE was able to consolidate information from nearly 300 flooded zones across the city of Jakarta,

which were then uploaded to the national level reporting websites, and further facilitates both real time assessments and projecting trends in the future (PDC Global, 2017).

Increasing understanding and awareness of disaster risk by means of customized risk information tailored to specific population groups is crucial. Indonesia has put considerable efforts to build risk knowledge among young population by introducing DRR integrated curriculum, under official order of the Ministry of Education and Culture (MOEC) to the Governors and Head of Local Government/Municipalities in 2010 (Suharwoto, 2014), in line with the Comprehensive School Safety Framework (CSFF).

Priority 2. Strengthening Disaster Risk Governance to Manage Disaster Risk In recognition of the need to manage disaster risks and respond to climate change from a holistic perspective, the government has established a robust mechanism for disaster risk management, supported by a comprehensive policy framework. While the disaster management approach in the country has historically focused largely on response, the tsunami of 2004 instigated a comprehensive reform within the government to further the integration of holistic DRR (IFRC, 2017).

In terms of implementation, the Indonesian National Board for Disaster Management, Badan Nasional Penanggulangan Bencana (BNPB) is the country's central governing body for all disaster-related activities, represented at the national levels by district agencies (BPB Daerah). The BNPB coordinates all disaster related activities from preparedness, prevention and mitigation to response, and also directs and manages national DRM efforts (figure 10). The Indonesian National Armed Forces and Indonesian National Police are also important contributors to disaster response, and are represented in the Disaster Management Steering Committee operating under the BNPB (CFE-DM, 2018). Additionally, with a high focus on decentralization, in recognition of the magnitude of disasters vis-à-vis the vastness of archipelagic country, operations at sub-national level are run by provincial, municipal and district governments with the support of the BNPB.

Figure 10. Organisational structure of disaster management in Indonesia (CFE-DM, 2018)
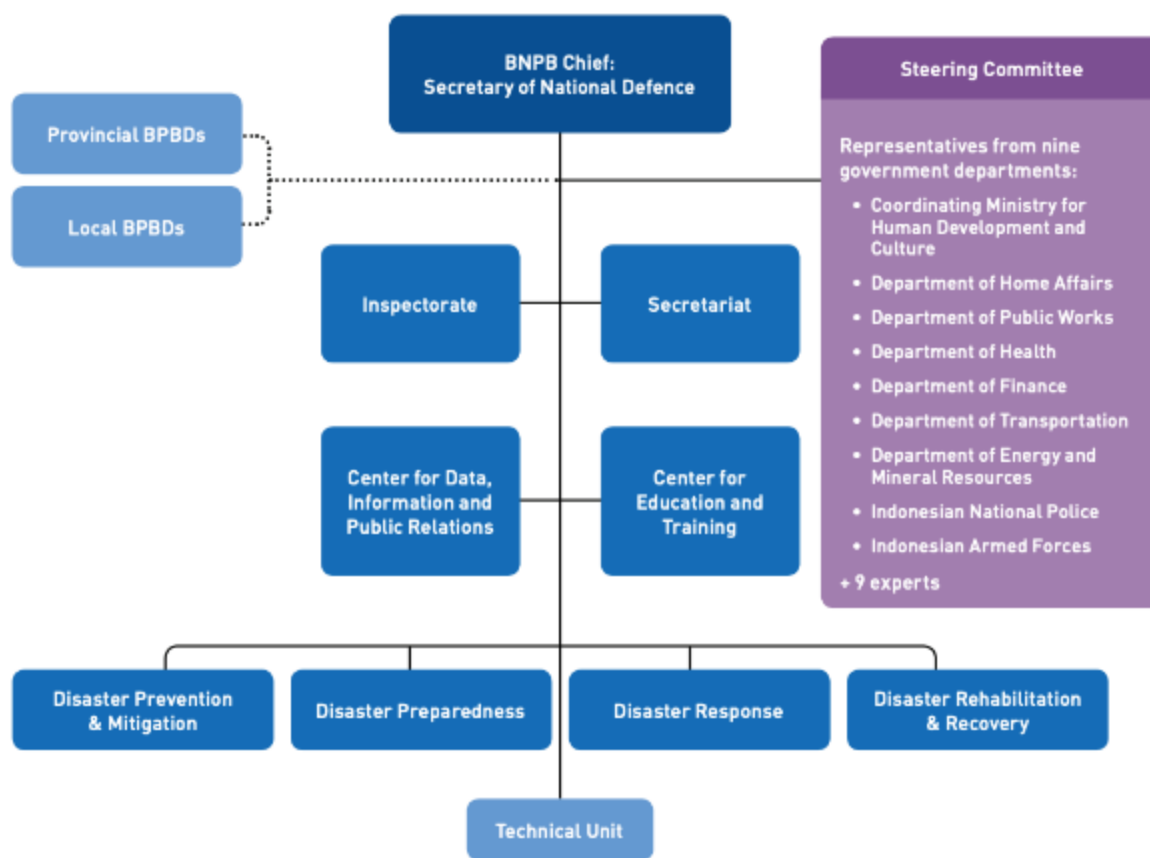
All the levels of the government have their own disaster management organizations, policies and budgets, and in the event of a disaster, municipalities are the first responders unless the event exceeds their capacities (BNPB, 2016). However, in practice, the decentralized co-governance remains complex for the actors involved. Even when the BNPB places local government in the forefront of developing national resilience, lack of budget, human resources and capacity limit the effectiveness of DRM activities (Srikandini, et al., 2018). A trend of marginalizing local governments and non-state actors is still on-going due to disparities between policy objectives and actual implementation of capacity building, provisions of needs-based budget and lack of cooperative approaches. This is reflected in the limited technical capacity to implement appropriate mitigation measures at the local level, while resource constraints, as local resilient building on both structural and non-structural measures, continue to result on heavy reliance on budget allocation from the central government (World Bank & GFDRR, 2017).

In terms of legislation, though, the operations are based on a robust framework, founded into the Law No. 24 of 2007 c oncerning Disaster Management by laying out provisions outlining national and regional responsibilities, rights and obligations, as well as the roles of businesses and international institutions in different phases of disaster management (IFRC, 2017). These were further expanded to integrate DRR considerations in 2008 within the Regulation 21 concerning DM, which mandates the formation of action plan for DRR at national and regional levels. Other important regulations implemented in 2008 relating to disaster management include the Government Regulation No. 22 (managing disaster assistance) and No. 23 (role of international agencies and foreign NGOs in DM) (BNPB, 2016).

In the past, plans such as the National Action Plan for Disaster Risk Reduction (2010-2012) and the National Disaster Management Plan (2010-2014) have been implemented, both with the strategic priority to mainstream DRR into policymaking and to support the implementation of the Hyogo Framework for Action (2005-2015). Currently, considerations for mainstreaming DRR in national development have been integrated into the National Medium-term Development Plan (Rencana Pembangunan Jangka Menengah, RPJMN for 2015-2019), which articulates growing commitment to finance DRR (BNPB, 2016). It also aims to internalize DRR into development planning at all levels, to reduce vulnerability of communities and to improve the capacity of governments at different levels in disaster management (Ministry of National Development Planning, 2015). Indonesia Disaster Risk Index or Index Rawan Bencana Indonesia (IRBI) were applied to indicate level of disaster risk at district and city level, thus supporting risk-informed development to reduce number of high risk and medium risk districts (BNPB, 2015). However, current provisions do not consider practical linking of the efforts to relevant sectors, which limits the coordination of initiatives across different fields of development (IFRC, 2017). Thus, translating policy concerning DRR to tangible action remains limited within regional, district and village governments due to lack of coordination and synergized targets and objectives across various legislative provisions.

For climate change-related concerns, the government has devised the National Action Plan for Climate Change Adaptation (2013-2025). It intends to mainstream into national development, provides guidance in cross-sectoral CCA interventions until 2025, supports the identification of immediate adaptation priorities and can be utilised by the local governments to guarantee synergized adaptation action across the country (Government of Indonesia, 2013). It is part of the wider national development framework, and has been integrated into strategic planning across various ministries.

Table 1. Indonesia's legislative plans and policies intended to improve disaster risk reduction and climate resilience

IMPLEMENTATION	PLAN/POLICY	SCOPE	PURPOSE
NATIONAL BOARD FOR DISASTER MANAGEMENT	Law No. 24 (2007)	National, regional, local, private sector	Foundation of national disaster management operations. Outlines the responsibilities, obligations and the roles of the levels of government, as well as the private sector and international institutions in all phases of the DM cycle
NATIONAL BOARD FOR DISASTER MANAGEMENT	National Action Plan for Disaster Risk Reduction (2010-2012)	National, regional other relevant stakeholders	Aimed to guide and support risk reduction policies developed at the national level in consideration of the mandates of the Hyogo Framework of action
NATIONAL BOARD FOR DISASTER MANAGEMENT	National Disaster Management Plan (2010-2014)	National, regional, other relevant stakeholders	A five-year planning document containing policies and strategies relevant to managing disasters. Intended to serve as a reference point for ministries, government agencies and all relevant stakeholders

IMPLEMENTATION	PLAN/POLICY	SCOPE	PURPOSE
ALL RELEVANT STAKEHOLDERS	National Medium-term Development Plan (2015-2019)	National	National development plan which integrates risk reduction as the main concern for cross-sectoral priorities
ALL RELEVANT STAKEHOLDERS	National Action Plan for Climate Change Adaptation (2013-2025)	Whole-of-society	National climate adaptation plan which contains sectoral priorities for all stakeholders from the government to civil societies and other stakeholders. Main instrument providing climate change-related policy direction.

Priority 3. Investing in Disaster Risk Reduction for Resilience Robust funding mechanisms for all disaster and climate risk reduction activities is elemental for facilitating development as envisaged in any given policy, and they must also support the sub-national level governments to guarantee that the local level resources are on par with the requirements for implementing national level strategies. In Indonesia, regulatory framework exists for post disaster financing under the Law No. 24 of 2007, providing an outline of the funding mechanisms and its operation with detailed descriptions of post-disaster phases. The financial responsibilities of central and sub-national level governments are also identified within the document, and further elaborated in the Regulation No. 22 of 2008, which mandates the central government to provide assistance to major disasters and recovery, derived from the General Treasury to be distributed through the Rehabilitation and Reconstruction Fund (World Bank, 2011). However, definition of a 'major disaster' is absent from the legislative provisions, thus rendering the situations in which funds can be released somewhat unclear.

Providing financial protection and funding DRR is indeed a complex challenge for Indonesia. To date, investments have targeted heavily on improving public and private infrastructure, and reliance on reserve budgets is high (World Bank, 2017). However, improvements have been made in terms of developing a more comprehensive, proactive risk financing system. They include the On-call Fund (Dana Siap Pakai) intended to release funding during emergencies, a thorough contingency funding mechanism for financing national level events, as well as a the Indonesia Disaster Fund intended to finance post-disaster reconstruction in collaboration with the UN and the World Bank (World Bank, 2017).

The government has recognized shortfalls within the systems focusing heavily on post-disaster funding and aid. For example, the 'on-call' funds are meant to be disbursed in the event of a National Disaster, otherwise the responsibilities fall on local governments. However, when the budget approvals and timing of disasters do not align, gaps begin to form in reconstruction needs (BER, 2019). Also, heavy reliance on the state budget can hinder further development in the aftermath of large-scale disasters as funds must be redirected towards recovery. Now efforts are in place to respond to such concerns, and to complement DRR financing with more money directed (up to 1 percent of the central government's spending) towards risk reduction initiatives (BER, 2019). In late 2019, the World Bank also approved a loan of US$ 60 million under the Indonesia Disaster Resilience Initiatives Project to support the government's efforts to improve holistic DRM (World Bank, 2019). However, in the absence of ex-ante financing policy, the impact of increasing post-disaster spending will remain limited unless budgeting proactive measures to mitigate damages and losses are not given equal attention (APEC, 2018). For risk transferring

purposes, the government is considering implementing so-called catastrophe (Cat) bonds utilized by Taiwan and Japan among others. Cat bonds would allow the spreading out of disaster costs across several years by transferring risks to capital markets to help securing financing for recovery and rebuilding initiatives (Ismail, 2018).

Despite the on-going improvements, disparities still exist in the financing of DM and DRR in Indonesia. For example, the funding for the BNPB during a five-year period between 2015 and 2019 received over US$ 645 million, whereas the budget of regency level disaster offices was significantly lower, averaging at around US$ 400,000 (Srikandini, et al., 2018). Thus, sub-national level governments face significant difficulties in delivering their DRR related responsibilities, and poor capacity further leads to weaker budget absorption at the local level due to problems in prioritization (Srikandini, et al., 2018). Given the practice of decentralized fiscal policy, DRR financing in Indonesia should be considered within this broader context requiring a reform in the management of public sector finance (World Bank, 2017).

Despite financial constraint, investing in resilience has evolved in recent years with considerable support from development partners. This is likely to continue increasing considering the current urban expansion where exposure to hazards is high. Examples are the Kupang City DRR and CCA action plans, supported by UNDP, that designated sectoral agencies as responsible entities for resilient urban development along with the budget allocation from the Regional Government Budget (APBD); the slum upgrading program of 7 sub-districts in 2016 of the Department of Housing and Regional Infrastructure of Yogyakarta municipalities (World Bank & GFDRR, 2017); and investment in urban infrastructures for flood defense under the National Capital Integrated Coastal Development (NCICD), a phase-wise program commenced from 2014 – 2023 and implemented in Jakarta as well as adjacent coastal areas (Committee for Acceleration of Priority Infrastructure, 2016).

Priority 4. Enhancing Disaster Preparedness for Effective Response to "Build Back Better" in Recovery, Rehabilitation and Reconstruction Indonesia maintains a comprehensive network of end-to-end early warning systems, including the Tsunami Early Warning System (InaTEWS) which comprises 170 broadband stations, 238 accelerometers and 137 tidal gauges. It is also complemented by 134 seismographs spread across the country (Intergovernmental Oceanographic Commission, 2018). InaTEWS can provide information about seismic activity within 5 minutes, including location, origin time, magnitude and depth, and provides tsunami warnings within the same time frame. Warnings are spread through SMS, email, Warning Receiver Systems and social media, alongside radio and fax. However, despite the existence of comprehensive systems, their functioning is limited. Due to limited budget to disaster management, the whole system cannot be maintained, and in 2018 it was reported that only 70 of the existing earthquake sensors could be supported (BBC, 2018). In 2018, the casualties following a tsunami caused by the Anak Krakatau eruption were partly attributed to be the faulty EWS. However, traditional tsunami detection systems (pressure recorder anchored to ocean floor which buoys to the surface when a tsunami passes) could have not predicted this non-seismic tsunami caused by the eruption (nor those caused by underwater landslides) (Griffiths, 2018).

The review conducted in 2019 by UNDRR-UNESCO-LIPI (Research Center for Population) also informed issues of the "end-to-end" early warning system which highlighted certain limitations of governance to operate the systems, the condition and quality of infrastructure, communication issues and aspects related to risk awareness, as well as preparedness and capacities to take action, in this case evacuate. Power outages, in warning reception centers at the local level, and telecommunication failures resulted in

limited reception of warning messages of at risk population; raising public awareness and strengthening people's capacity to self-evacuate is also a key challenge to overcome (UNDRR and UNESCO-IOC, 2019). Thus more investments to extend EWS coverage and enhance system effectiveness and efficiency are required, alongside improving people-centered components of EWS. Effective risk communication to change risk perceptions and trigger actions, use of indigenous knowledge and contextual understanding of local people to enhance community preparedness and ensure inclusive participation is essential in an end-to-end and people-centered early warning system.

In terms of warning dissemination, most people in Indonesia receive their disaster information via alternative media channels due to the flourishing social media landscape. While TV continues to dominate the dissemination with more than 11 national and 10 privately-owned channels (holding 97 percent of the market), the public are more likely to hear about disasters from social media (Australian Broadcasting Corporation, 2015). Jakarta is described as the social media capital of the world, exceeding Tokyo, London and New York in terms of daily tweets being sent, and the country is Facebook's fourth biggest market (Australian Broadcasting Corporation, 2015). Still, official media providers have an advanced response guidance to the coverage of disasters, and guidelines on disseminating information as mandated by the Law of the Republic of Indonesia No. 24 of 2007. However, very few agencies have a detailed operating procedure, and the approach to providing disaster information varies. This is due to the competitive nature of news outlets, which many seek to increase visibility and 'news-worthiness' rather than serving a utilitarian purpose (Australian Broadcasting Corporation, 2015).

In preparing for better response, Indonesia has made great strides towards achieving a comprehensive DM coverage that could provide timely and efficient response in any disaster situation. The country has been a strong proponent for improving the regional ASEAN response capacity, and has invested significantly in emergency response preparedness, especially against rapid onset disasters (Hodgkin, 2016). However, there remains a misalignment between national and local capacities to respond given the lower available resources and capitals, and due to the fact that the levels of risk vary greatly depending on the local communities and geophysical context. Additionally, challenges in coordinating operations of international organisations, alongside local and sub-national level governments, may cause confusion during the response of large-scale disasters due to lack of experience and knowledge about existing coordination structures. However, despite the challenges, the capacities are improving. Range of capable Ministries, including Social Affairs, Health, Education, Planning and Public works alongside the Military and the Police support response efforts, due to which national capacities have been increasing (Hodgkin, 2016).

Building Back Better (BBB) is also elemental to avoid reproducing unnecessary risks by replacing destroyed infrastructure and housing without considering the needed integration of DRR and CCA for improved resilience. However, one of the biggest challenges is to integrate the range of best practices and diverse requirements of localities into the phases of recovery, often led by a plethora of stakeholders, especially in conditions which are characterized by massive needs and limited resources. Ideally, recovery should not only restore, but also to develop a place in a manner which considers livelihoods, community needs and resilience by improving physical systems as much as reforming institutions and governance, to improve accountability and myriad of other dimensions which are associated with recovery processes (Fan, 2013). However, such as the case was Aceh recovery post-2004 tsunami, the rush to reconstruction, lack of experience as well as

cooperation and coordination resulted in less than ideal results. 'Better' must also be defined in consideration of local needs and resources with adequate community involvement to guarantee participation and ownership over local initiatives. As much as these challenges are hindering global efforts to build back better, they are also present in Indonesia, and must be addressed by comprehensive recovery and reconstruction framework which focuses on transformational BBB as opposed to reparations.

4. Coherence with Sustainable Development Goals and the Paris Climate Agreement

Disaster risk management, climate change adaptation and sustainable development share similar characteristics, overlapping strategic objectives and synergies. Thus, various existing policies, legislation, plans and frameworks should be harmonized across various levels of government to guarantee maximum efficacy and unity. Separate legislative provisions, strategies, frameworks and plans targeting DRR, CCA and sustainable development constitutes to overlapping, redundancies, repeated efforts and thus, wasted resources. Existing DRM frameworks should be revised in accordance to the post-2015 development agenda to identify how countries could best prioritize and synchronize their domestic efforts vis-à-vis on-going projects, available funding, risks and vulnerabilities and capacities to utilize the highest potential for holistic disaster risk management. Updated DRM strategies and focus areas and their synergies with priorities in other development domains should be reflected in the latest National Medium-Term Development Plan (RPJMN) 2020–2024, launched in early 2020 and currently subject to further review.

In terms of integrating the Sustainable Development Goals (SDGs) into development planning, Indonesia has made stellar progress in recognizing the issue as a whole-of-society one, with the intention to decentralize and drive the implementation progress from the sub-national levels to guarantee equally committed landscape of governance (Bhowmick, 2019). SDG commitments have been integrated into the national budget, and various other funding mechanisms have been explored to support the progress. For example, the Badan Amil Zakat Nasional (National Zakat charity collection body) has been collaborating with the UNDP to explore options of these funds may support local implementation of the SDGs, such as renewable energy generation (Bhowmick, 2019). The SDGs as a principle have been reflected in national planning for much longer as well, given the fact that the government is committed to accomplishing equitable well-being for all of its citizens in consideration of stability and conservation of the environment as identified in the national roadmap for SDG implementation (Ministry of National Development Planning, 2019). By 2019, 94 of the 241 SDG indicators were already aligned with targets of the National Development Plan (RPJMN), and the published guidance was to support all stakeholders, citizens and private sector alike to better plan and target programs to achieve the goals as envisaged by the national government implementation (Ministry of National Development Planning , 2019). However, challenges remain. For example, relocating the capital to Borneo, known for its rich rainforests, biodiversity, and the critically endangered Northwest Bornean Orangutans, avoiding the trade-offs associated with development (and its adverse side effects such as pollution and habitat loss) will be more crucial than ever to maintain the pathway towards sustainability.

Table 2. Some of the synergies between international agreements and different policies and commitments of Indonesia in various sectors

Sectoral Aim	Policies/programs with potential links to Sendai Framework for Disaster Risk Reduction	Policies/programs with potential links to Sustainable Development Goals	Policies/programs with potential links to the Paris Climate Agreement or Environment
National Development	National Medium-term Development Plan (2015-2019)	National Medium-term Development Plan (2015-2019) National Long-term Development Plan (2005-2025)	National Action Plan for Climate Change Adaptation (2013-2025) National Medium-term Development Plan
Agriculture and Resource Management	National Medium-term Development Plan (2015-2019)	Law No. 32 on Environmental Protection and Management (2009)	Law No. 18 on the Prevention and Eradication of Forest Degradation (2013)
Disaster and Climate Risk Reduction	National Medium-term Development Plan (2015-2019) Law No. 24 (2007)	National Medium-term Development Plan (2015-2019)	National Action Plan for Climate Change Adaptation (2013-2025)
Vulnerability Reduction	National Medium-term Development Plan (2015-2019) Law No. 24 (2007)	Law No. 6 on Villages (2014) National Urban Development Policy (2015-2045)	National Action Plan for Climate Change Adaptation (2013-2025)
Urban Development	National Urban Development Policy (2015-2045)	Indonesia Sustainable Urban Development Strategy (2017) National Urban Development Policy (2015-2045)	National Urban Development Policy (2015-2045)

In terms of finding synergies among CCA and DRR, the current policy provisions are somewhat inadequate. As of 2017 and 2018, there were no clear links between the DM legislative framework and legislation or institutions related to climate change adaptation, and these links were not explicit within sectoral laws either (IFRC, 2017). However, at the policy level, attempts has been made to enhance synergies in these domains for example, the action plans for the National DRR and CCA, as known as RAN-API-PRB were also formulated to serve as guidelines for the local governments to develop their local DRR and CCA action plans (known as RADAPI-PRB) (World Bank & GFDRR, 2017). In urban contexts, city development presents the backdrop for convergence of DRR, CCA and sustainable city considerations into a unified endeavour, which was further reflected in Jakarta's 2013-2017 Mid-Term Development Plan and Green Development policy and action plans for Batam, Kendari, Malang and Medan developed with technical support by ADB and in alignment with the National Urban Development Policy and Strategy 2015-2025. It would be important to harmonize environmental management, conservation and sustainable development across sectors by identifying existing synergies to avoid yet no mechanisms or institutions have been identified to support this progress.

In terms of adhering to the Paris Agreement, current policy projections have been improving, with ambitious goals to increase renewable electricity capacity three-fold between 2020 and 2024 (Climate Action Tracker, 2019). Additionally, Indonesia's biofuel blending mandate is among the most impressive in the world, with an aim that seeks 30 percent of the country's electricity sector to be supplied by biofuels. However, given that biofuel is largely sourced from palm oil production, from plantations that are exempt from key sustainability certification, the issue is complex (Climate Action Tracker, 2019). Following the European Union's announcement that palm oil would be the only commodity to be dropped from the EU's list of renewable energy due to its contributions to massive deforestation, the industry may face challenges in the future.

Indonesia's National Action Plan on Climate Change Adaptation (RAN-API or NAPCCA) lays down the blueprints for adaptation interventions and capacity building to be implemented in 2013-2025 focusing on four sectors: Economy Resilience (Food Security and Energy Dependency), Social and Livelihood Resilience (Health, Settlement, Infrastructure), Ecosystem Resilience, Special Area Resilience (Urban Area and Coastal and Small Islands Area) and supporting system (BAPPENAS, 2013), which are also reflected in the RPJMN 2015-2019. Review processes and evaluation of the NAPCCA, including coordination with line ministries and local governments, will be mandated to the Ministry of Development Planning (BAPPENAS, 2013).

5. Issues in the Implementation of Disaster Risk Reduction and Climate Policy
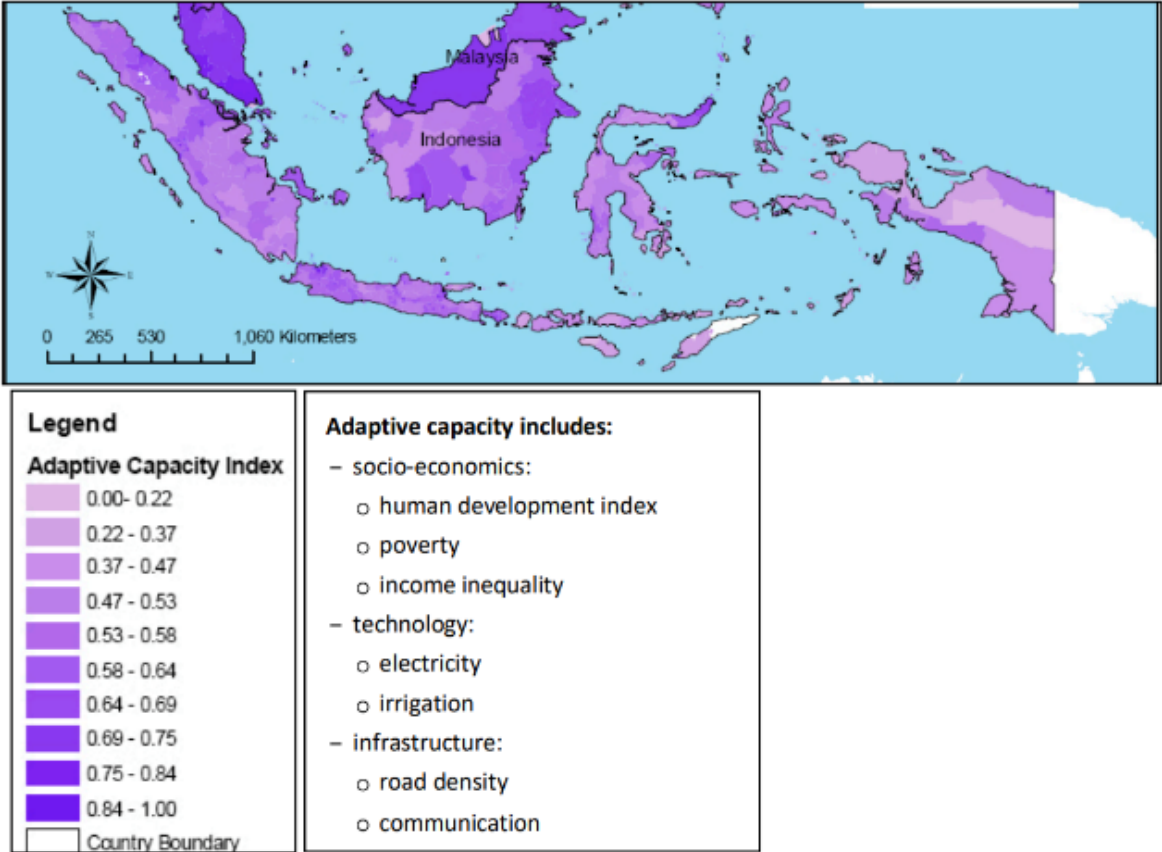
Given the limited availability of disaster risk data, especially from the sub-national level, national level policy guidance will remain limited unless envisaged targets can be contextualized at the local level by utilizing information. In the absence of appropriately disaggregated disaster data, covering aspects of vulnerabilities, capacities and available resources, the sub-national authorities may fall short in their efforts to implement policy goals as they lack abilities to prioritize. While plans are in place, - including Provincial Disaster Management Plans developed for all 34 provinces (BNPB, 2015), 61 districts and cities disaster management plans facilitated by BNPB, and multiple-hazard contingency plans formulated in 122 districts and cities (IFRC, 2017) - limited risk reduction activities, weak regulations and lack of local DRR strategic plans still need to be addressed prior to attaining tangible outcomes at the local level (Daly, et al., 2019). The issue is exacerbated by limited funding which leaves little room for the integration of DRR and CCA, and funds are mostly absorbed by the constant need to reconstruct. While funds have been targeted to DRR in Indonesia, larger structural issues could still hinder the overall progress. They include existing poor quality construction, inability to enforce building codes and lack of local capacities or resources, which – if left unaddressed – could further contribute to the cycle of hazards (Hodgkin, 2016). The government is fully aware of the issue, and takes consistent action by implementing on new regulations (such as integration of DRR into spatial planning), but this requires a long-term cultural change as opposed to the issue being treated as a rapid-fix one (Hodgkin, 2016).

Additionally, the responsibility of DRR in Indonesia is typically viewed as the sole responsibility of BNPB rather than one for the whole of society. Thus, the other institutions and sectors have not been properly sensitized in terms of existing regulations and they may lack the capacities to implement DRR considerations into sectoral or regional development (IFRC, 2017). Also, due to fiscal decentralization, managing the building of competent DRM institutions at all levels remains difficult. Also, the agencies in Indonesia must cover at least 12 main types of hazards and multi-hazards occurring at a rate of 4.3 events on a daily average, while the local capacities, available resources and human capital remain to be brought up to the national standard (World Bank, 2016). Similarly, the lack of capacities to implement climate adaptation measures vary drastically across the country (figure 11). Additional efforts are needed among existing multi-stakeholder DRR platforms to leverage and support collaborative actions and partnership among a range of DRR stakeholders in the country, thus bridging the gaps between policy, implementation and practices on the ground of the government, NGOs, CSOs, private sector, academia and within communities.

The existing legal and policy framework also contains very limited references to monitoring and evaluation to measure the success of implementation. While the BNPB has been assigned as the main body responsible over M&E in terms of DRR within the Regulation 8 of 2008 concerning the National Agency for Disaster Management, the extent to which it is able to evaluate initiatives across the country remains unclear (IFRC, 2017). The Baseline Status Report for SFDRR country implementation, developed by BNPB in 2015, indicated that Indonesia is yet to achieve systematic monitoring of SFDRR and acknowledged the gaps in coordination and information sharing among a broad range of DRR concerned agencies

and stakeholders (BNPB, 2015). Despite such challenges, SFDRR monitoring requirements present an opportunity for BNPB to augment an efficient progress tracking system in the country.

Figure 11. Adaptive capacity in Indonesia (Ministry of Foreign Affairs, 2018).

Legend

Adaptive Capacity Index

	0.00 - 0.22
	0.22 - 0.37
	0.37 - 0.47
	0.47 - 0.53
	0.53 - 0.58
	0.58 - 0.64
	0.64 - 0.69
	0.69 - 0.75
	0.75 - 0.84
	0.84 - 1.00
	Country Boundary

Adaptive capacity includes:
- socio-economics:
  - human development index
  - poverty
  - income inequality
- technology:
  - electricity
  - irrigation
- infrastructure:
  - road density
  - communication

6. Stakeholder Analysis

At the government's level, Ministry of Social Welfare has an important role in supporting the BNPB during disaster response as it maintains central warehouses for relief supplies, food and tents which are used as hubs for temporary distribution points wherever needed (CFE-DM, 2018). Similarly, Ministry of Health provides support in the form of medical services through nine crisis centers coordinated from Jakarta (as of 2018), and they also maintain joint warehouses for rapid response, managed with the WHO (CFE-DM, 2018).

Private sector also has an important role to play not only in preparedness, but also in mainstreaming DRR and CCA into development. While business participation often comes in the form of short-term relief as a form of philanthropy, logistics, transport, consumer goods and services, water and sanitation, engineering, construction as well as banking play a crucial role in overall societal resilience, which highlights the importance of bringing in private sector agencies into the wider sphere of disaster and climate risk management (Burke & Fan, 2014). However, in Indonesia, despite the efforts of BNBP to coordinate relevant stakeholders, inclusion and effective participation of the private sector has proved to be challenging. Many of the existing private actors, especially at the sub-national level, operate independently from disaster authorities, and often operate on ad-hoc basis and in an uncoordinated manner (Burke & Fan, 2014).

In terms of international stakeholders, numerous agencies have provided their important contributions to resilient development and disaster response in Indonesia. They include Asian Development Bank, providing monetary support to the needs of the rapidly evolving middle-income country, similarly to World Bank which has also funded important risk mapping and EWS-related projects. For response-related operations, alongside myriad of others, the IFRC, Save the Children, CARE and World Vision have all contributed to disaster management efforts in Indonesia. While recognising the complexities in balancing between local needs, donor interests and national development priorities, the National Platform for DRR was developed by the government to act as a multi-stakeholder body to coordinate DRR in the country to guarantee maximized resource utilization and impact (UNDP & BNPB, 2013). Such endeavours are indeed important given the magnitude of disasters occurring in Indonesia. The support of international donors and bilateral partners has been elemental in supporting reconstruction, recovery and preparedness, and contributes significantly to the country's ability to manage its disasters financially. For example, in October 2018 The World Bank announced funding of up to US$ 1 billion to the Government to supplement relief and reconstruction efforts in Lombok and Sulawesi following the earthquake (World Bank, 2018).

Technical institutes and academia have pivotal roles in developing technical knowledge, innovation and creating evidence-based DRR options with local applicability through engagement with other stakeholders in testing, utilizing and customizing tools and methods. Among key research and academic institutes excelling in disaster-relevant research are the Tsunami and Disaster Mitigation Research Center (TDMRC) of Syiah Kuala University in Banda Aceh, EcoDRR at Universitas Gadjah Mada (UGM), and the Center for Research on Disaster Mitigation (CRDM) of Bandung Institute of Technology (ITB). Platforms have been established to engage with CSOs, private sector and academia, including Indonesia's National Platform for DRR or Planas PRB to strengthen DRR cooperation and U-Inspire network to empower and mobilize young professionals in Science, Engineering, Technology and Innovation (SETI) for DRR.

Communities are also instrumental for local DRR given that the country is archipelago and diverse in term of population, culture, natural resources, and local wisdom which shape the means for effective DRR in each respective location. The government and NGOs have worked with communities across the country to support a number of communities in developing strong leadership for safer and resilient communities through extensive engagement in various programs. These include the National Program for Community Empowerment (Program Nasional Pemberdayaan Masyarakat: PNPM), a nationwide Government Community-Driven Development (CDD) that worked across all urban wards and rural villages of Indonesia. In addition to this was the REKOMPAK (Community Based Settlement Rehabilitation and Reconstruction Project-CSSRRP) which focused on supporting resilient recovery through utilization of community-based approaches (World Bank, 2019), and a strong volunteer network as well as volunteer teams from the Indonesian Red Cross Society or PMI, including community-based teams, to be mobilized for emergency operations when needed (BNPB, 2015).

7. Future Priorities

As evidenced in this report, numerous challenges constitute to the problems in integrating holistic DRR, CCA and sustainable development into policy and sectoral planning in Indonesia. This section intends to provide a brief and concise overview of the most pressing challenges vis-à-vis recommended priority actions, in recognition of the fact that issues addressed here do contain a level of subjectivity, perception of which may change depending on the organization, governmental body or agency.

7.1 Challenges

Disparities between local and central level governments form the most challenging obstacle to achieving sustainable development through the holistic integration of DRR and CCA. Unless sub-national level capacities, resources, skills and knowledge are brought up to par with the national standard, achieving the development priorities and targets will remain limited. While decentralization has its important benefits especially in the phases of response (given that local authorities and communities are always first on the scene), risk prevention and risk-informed land use planning, it loses its momentum if local governments are left on their own devices in terms of developing needed skills, or remain without monetary support.

Resourcing DRR and CCA at the local levels vis-à-vis constant needs to fund recovery and reconstruction following constant hazards contributes to the problem. Already, budgets are stretched thin in efforts to guarantee adequate preparedness for response and to balance sustainable recovery – sustaining funding for DRR and CCA will remain a considerable challenge in Indonesia. The support of international stakeholders and the private sector will be elemental within this process towards achieving whole-of-society risk reduction. Inclusion of said parties to the sphere of DRM will involve its own challenges though – guaranteeing that the investment priorities are harmonized to match the national priorities (especially in the absence of comprehensive disaster and climate risk data) will be a complex process.

Also, managing trade-offs between environmental degradation and development is a key concern for the government given the rich biodiversity and the importance of ecological systems to a plethora of vulnerable marine and terrestrial species. If construction is to expand on the island of Borneo, considerations must be given to preserving its current state to the fullest extent, with the intention to avoid further habitat losses and potential adverse side effects of unplanned expansion of urban areas, such as loss of mangroves. These ecological systems are also elemental for sustaining and protecting human life, while also holding inherent value, due to which they must be protected.

Rapid population growth and the increasing need for space, opportunities food and clean water is also likely to pose issues in the near future. The current growth boom is requiring more and more investments in education and employment opportunities for the younger populations, and unless achieved, poverty, malaise and antisocial activity are likely to increase on par with the levels of unemployment. At the other end, climate change and the regional impacts on fisheries and agriculture are degrading the country's ability to sustain crop outputs to a degree which could support the needs of the population. Thus, investments must also be made towards increasing the resilience of the agricultural and water sectors before the impacts exceed the available coping capacities.

7.2 Priority Issues

Against this background as illustrated in this report, some of the most urgent priorities can be identified for the upcoming decade. First and foremost, to facilitate the prioritization of investments and to increase the understanding of various disaster and climate risks affecting Indonesia, the availability and access to comprehensive risk and disaster information must be highlighted. While initiatives exist, significant gaps remain especially at the local level, where limited capacity to collect, monitor and analyze data limit its availability in centralized systems. To fully localize risk-informed and resilient development, and to integrate DRR and CCA considerations to areas and sectors where it is most needed, comprehensive disaster information from all levels should be made available not only to disaster managers, but also to public planners, ministries as well as the communities and business. Similarly, integrating community perceptions to risk, capacity and vulnerability assessments should be focused on, not only for the sake of participation as it is used as an attractive 'buzz-word', but because communities hold detailed and influential knowledge about the local risk context which can significantly advance project design in terms of its feasibility and tangible impact.

Secondly, managing sustainable development should be a key concern to avoid trading conservation and ecological stability to growth of industry. Expanding palm-oil plantations and flourishing exports are contributing to deforestation in the country, and balancing these concerns to avoid further degradation is necessary to fully implement the SDGs. Similarly, controlling the development of the new capital in a manner which does not contribute to further deforestation, pollution and loss of habitats for vulnerable species must be among the highest priorities given the importance of Indonesia's rainforest habitats globally.

Bridging funding gaps is also increasingly necessary given the constant needs for financing reconstruction and recovery, but also because the costs of adaptation and disaster risk reduction are increasing exponentially under the current emission projections. Current financial focus on disaster response is indeed necessary, but it should not draw funding away from DRR and CCA initiatives, which, when successful, could lessen the amounts of money required for post-disaster phases. Current decentralized DRM infrastructure and the potential benefits on making all infrastructure investments resilient could be very impactful if funded properly due to local potential and networks which could be utilized in mainstreaming DRR and CCA wherever funding so allows.

Alongside increasing sub-national level funding, increasing their capacity to operate is also necessary. Increased knowledge about local climate change impacts, for example, would be elemental to further the integration of national level concerns to local development. As of now, the heavy reliance on response capacities limits the abilities to address DRM and climate adaptation proactively in many of the more remote and rural localities.

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