Disaster Risk Reduction in Malaysia

Status Report 2020

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UNDRR 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 Malaysia 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 National Disaster Management Agency (NADMA), Malaysia Civil Defence Force, Selangor State Disaster Management Office, and Institute of Geology Malaysia (IGM). The experts from Universiti Teknologi Malaysia (UTM), Universiti Kebangsaan Malaysia, Malaysia Red Crescent and MERCY Malaysia provided technical inputs during consultations. The list of people and agencies met is enclosed at the end of this report. UNDRR and ADPC acknowledges 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.

UNDRR (20120). Disaster Risk Reduction in Malaysia: Status Report 2020. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific

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

The first COVID-19 case appeared in Malaysia in early February 2020 but a local outbreak only emerged in March, prompting the introduction of a nationwide Movement Control Order (MCO) which helped significantly reduce the spread of the virus. The Government of Malaysia enforced a MCO starting on March 18, 2020 to break the chain of COVID-19 local transmission. Since the onset of the outbreak, Malaysia has established more than 140 quarantine centres in different parts of the country, with the National Disaster Management Agency (NADMA) monitoring the facilities.

The Government announced an initial financial stimulus amounting to RM 20.0 billion in February 2020 and later a RM 250 billion Economic Stimulus Package (ESP) called PRIHATIN. The package has provided governmental support to society, covering people of various backgrounds from students and families to business owners. A budget of COVID-related measures worth RM 17 billion has been included in 2021 budget for long term recovery and improving health care facilities.

The Crisis Preparedness and Response Centre (CPRC) was activated by the Ministry of Health (MoH) in close coordination with the NADMA to respond to the health emergency and improve disaster preparedness, all of which played a crucial role in responding to COVID-19. The CPRC coordinated the National Plan for COVID-19, receiving strong support on the implementation of the non-pharmaceutical interventions from the National Security Council (NSC).

The Ministry of Health (MoH) played a crucial role in ensuring maximum readiness to contain the spread of the virus. Among the earliest efforts taken by the MoH to prevent disease transmission was the enforcement of health screening at all points of entry. Another measure taken by the MoH to cushion the impact of COVID-19 was the setting up of a special fund known as the COVID-19 Fund, to raise money to be channeled to patients, particularly those affected financially due to the quarantine procedure.

NADMA collaborated with various stakeholders to assess impacts of COVID-19 to national development priorities, vulnerable groups and SME/MSMEs and building continuity between immediate measures and longer-term recovery. NADMA is developing a General Observers Report (GOR) on the COVID-19 response in Malaysia drawing on observations from quarantine centres around Malaysia and other inputs from the COVID-19 response undertaken by various agencies and its partners. The GOR will cover documentation of lessons learnt for better crisis preparedness planning in future.

The Malaysian government went to great lengths to ensure a comprehensive approach to risk communications and community engagement (RCCE), working to establish trust with the population and provide transparency regarding the COVID-19 situation, with the full support of WHO for a whole of government and whole of society approach.

Malaysia has made tremendous progress in strengthening capacities to respond to health emergencies and disasters in the last decade. This was accomplished through use of a step-by-step strategy for strengthening health security, well-established control and coordination mechanisms, a multisectoral and collaborative approach, and a robust

national surveillance system. Malaysia's well-coordinated responses to the current Covid-19 pandemic demonstrated its ability to put in place a clear vision and plans led by competent, empowered institutions acting on scientific evidence for the public good.

1. Introduction

Malaysia is a country located in Southeast Asia, separated into two distinct regions by the South China Sea; the Peninsular Malaysia and East Malaysia (states of Sarawak and Sabah), latter of which occupies the northern quarter of the island of Borneo. The total land area of the country comprises 329,847 square kilometers, of which the East Malaysia covers 60 percent, or 198,446 square kilometers. Sarawak covers a bit over a third (124,449 square kilometers) of the whole country (Sarawak Government, 2019). Approximately 59.5 percent of the total area is occupied by tropical forests (WWF Malaysia, 2019). Also, given its location on the equator, Malaysian climate is governed by tropical conditions, characterized by two distinct monsoon seasons: the northeast monsoon from October to March, and southwest monsoon between May and September. However, there are regional variations to temperature and rainfall determined by altitude. For example, the Cameron Highlands have an annual temperature of 18° Celsius (below the national average of 26° Celsius), and East Malaysia experiences rainfalls up to 3,000 to 4,000 mm annually, which is over twice as much as in Kuala Lumpur (FAO, 2011).

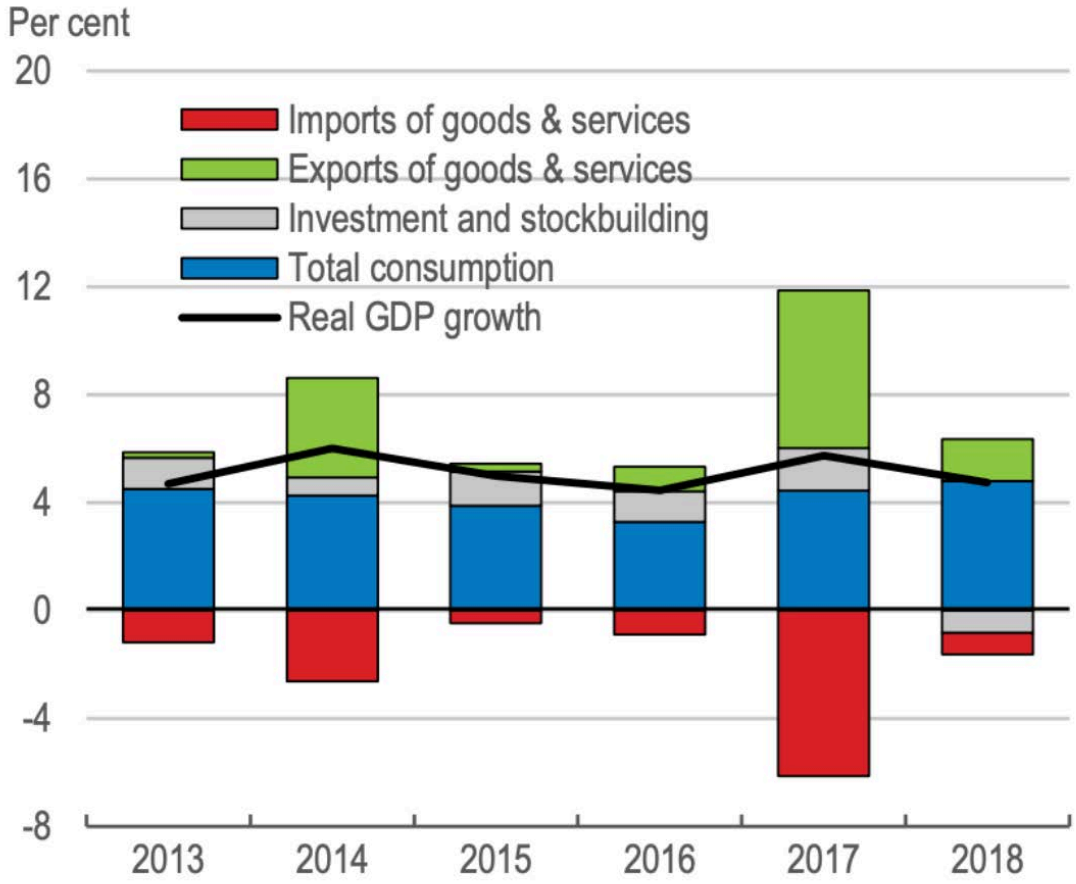
In terms of administration, the federation of Malaysia has been divided to 13 states and 3 federal territories, of which 11 states and 2 territories are located on the Peninsular Malaysia. Following a unique system, nine of these peninsular states are governed by a structure based on historical Malay kingdoms, ruled by monarchs titled Sultans (following agnatic primogeniture), Yamtan Besar in Negeri Sembilan, or by a Raja in Perlis (in latter of which the throne rotates based on agnatic seniority). Among these nine rulers, the federal head of state (Yang di-Pertuan Agong) is chosen to serve five-year terms on a rota. Other states and former British Crown Colonies each have a titular Governor. Officially the king, as the head of the state, must also act in accordance of the will of the cabinet and parliament, as Malaysia is a constitutional monarchy and parliamentary democracy at both, federal and state levels.

Since gaining its independence in 1957, Malaysia has also successfully diversified its economy from being largely reliant on agriculture to one that is commodity-based, hosting a robust industry supported by manufacturing and services which is now among the leading exporters of electrical appliances, parts and components in Asia and globally (World Bank, 2019). The country is also rich in natural resources, and significant shares of the export revenue is generated from palm oil, oil and gas (The Commonwealth Secretariat, 2019), and exports have indeed the highest contribution to GDP growth (Figure 1). As a result, 40 percent of the jobs in the country are linked to export activities, and such pathway has allowed the GDP to expand at an average rate of 5.4 percent since the Asian financial crisis of 1997 and 1998 (World Bank, 2019). It is expected to reach the status of a high-income country by 2024 now that less than 1 percent of the population are living in extreme poverty, following the government's high focus on improving wellbeing and equity. Yet, income inequality remains relatively high, with 40 percent of the population living vulnerable to poverty and external shocks (World Bank, 2019).

With regards to disasters, while Malaysia is located in the vicinity of the Pacific Ring of Fire, the country is relatively sheltered from hazards originating from the tectonic movements. Yet, it habitually faces threats arising from cyclones, floods, landslides, droughts, epidemics or environmental degradation. Such natural and anthropogenic stressors contribute to risks that may endanger the country's development aspirations, and the wellbeing of its population. Of these, flooding and landslides are the most severe concerns, as an estimated of 29,800 square kilometres of the country flood annually, and heavy tropical rates of

precipitation increases the likelihood of mass movements depending on the topography and soil conditions (NIDM, 2014).

Figure 1. The contribution of imports, exports, investments and consumption to GDP in Malaysia between 2013 and 2018 (OECD, 2019)



1.1 Demographic Characteristics

The 2010 Population and Housing Census estimated the total population to have reached 28.3 million people, an increase of 2 percent from the previous census conducted in 2000 (Department of Statistics, 2015). Nearly one sixth of the population (5.46 million at the time) resided in the state of Selangor, followed by Johor (3.35 million) and Sabah (3.21 million), with a total urban population of 71.5 percent (Department of Statistics, 2015). As of 2019, the population has been estimated to exceed 32.63 million people (Department of Statistics, 2019). The country is also immensely diverse, hosting numerous ethnicities and religions, with largest representation of Malays (61.8 percent), Chinese (21.4 percent) and Indian (6.4 percent) as the largest demographic groups (Department of Information, 2016). Additionally, indigenous peoples represented about 13.8 percent of the total population in 2015, who are collectively known as the Orang Asli (in the peninsular Malaysia) with 18 sub-groups (International Working Group for Indigenous Affairs, 2019). In Sarawak, the indigenous populations are referred to as the Dayak (Orang Ulu, 70.5 percent of the state's population) and in Sabah, 39 different native groups constitute to the Anak Negeri with various sub-groups as well (International Working Group for Indigenous Affairs, 2019).

Supported by thriving economy, Malaysia has also achieved a HDI value of 0.804 in 2018, which places the country into a very high human development category as 61st among 189 measured countries and territories (UNDP, 2019). The life expectancy has increased by 5.1 years, and expected years of schooling by 3.7 years between 1990 and 2018, illustrating rapid progress ahead of much of the East Asia and the Pacific (UNDP, 2019). Yet, inequalities persist. Challenges related to the inequitable distribution of access to education, opportunities and services are masked by the HDI, income inequalities are growing, and social mobility is limited. For example, only 5 percent of the people from the bottom income quintiles earn a bachelor's degree compared to 40 percent of the highest earning groups (Sander, 2015). Yet, 84 percent of the household heads in the middle to upper-income classes hold a Bachelor's degree or higher, indicating that it remains a prerequisite for wealth accumulation to which low income groups have limited access to (Sander, 2015). The country also comprises of a significant number of migrant workers, estimated at 3-6 million inclusive of both documented and undocumented workers (UNHRC, 2019) who contribute strongly to the economy of Malaysia. However, due to multiple factors such as debt to recruitment agencies, low pay, exclusion from social support and lack of enforcement of labour protection, the group is highly at risk of falling into poverty and experience deteriorating living conditions (UNHRC, 2019) thus, creating a significant pocket of poverty and marginalized groups in the country.

In the context of demographics, it should be noted that Malaysia is currently on track towards achieving a demographic dividend wherein the numbers of working-age populations (15 to 64) are relatively high compared to those dependent (children and the elderly), which could translate to boost to the national economy (Bizhive, 2015). However, this must be supported by a comprehensive strategic plan which intends to sustain investments made in education, the coverage of health care, and in extending employment opportunities for the working groups to benefit from the dividend. Currently, the youth unemployment rate rests at 10.9 percent which is more than three times the national average of 3.3 percent, which illustrates struggles in providing employment for the youngest generations that the domestic sectors struggle to absorb, especially in the more rural regions (Hunter, 2019). These issues must be rapidly addressed to guarantee maximum benefits of the high numbers of able workers with the capacity to contribute to the country's growth, and to avoid adverse impacts resulting from large numbers of unemployed, including worsened poverty, marginalization of youth and feelings of isolation leading to antisocial behaviours.

1.2 Economic Impacts of Disasters

Hazards and disasters may have pervasive impacts on national, regional and household-level economies depending on their scale and magnitude. Sometimes, the effects of catastrophic events may persist for years due to reconstruction and recovery needs, losses of livelihoods, lost assets and infrastructure, or conversely minor impacts accumulating over time may hinder growth as well. For example, flooding alone has caused annual economic damages of over US$ 60 million annually in Malaysia, and have had negative impacts on agriculture, especially, by decreasing the sectoral GDP by 0.22 percent per every one percent increase of flooded areas in the longer-term (Shaari;Karim;& Hasan-Basri, Does Flood Disaster Lessen GDP Growth? Evidence from Malaysia's Manufacturing and Agricultural Sectors, 2017). In 2015, monsoonal flooding in the East Coast contracted the GDP by 0.5 percent due to recovery spending needs and heavy impacts on agriculture, mainly palm oil (Kumar, 2015). Flooding in Malaysia has also found to affect the GDP of the mining sector negatively, which

may have severe implication to the economy (Shaari;Karim;& Basri, Flood Disaster and Mining Sector GDP Growth: The Case of Malaysia , 2015).

Also, catastrophic events such as the Johor flooding between 2006 and 2007 had persisting consequences. The costs and damages of said event exceeded staggering US$ 1 billion (Shaari;Karim;& Hasan-Basri, Does Flood Disaster Lessen GDP Growth? Evidence from Malaysia's Manufacturing and Agricultural Sectors, 2017), but the time-consuming recovery and reconstruction costs also contributed to longer-term losses. For example, in Kota Tinggi, it was evident that the disaster had direct and indirect impacts on tourism due to destroyed properties, facilities, heritage sites and due to losses following cancellations, resulting in a significant drop in the city's economy (Hamzah, ym., 2012).

Similarly, the 2014 flood event, affecting the East Coast region (Peninsular Malaysia), had an impact on 500,000 to 1 million people, causing losses and damages exceeding US$ 700 million without accounting reconstruction and recovery costs (Azimi;Zakaria;& Majid, 2019). It was estimated that due to disrupted production of palm oil, rubber production was estimated to drop by at least 30 percent, and numerous construction projects were abandoned by private operators in the aftermath of flooding due to mounting costs (Akasah & Doraisamy, 2015). The event also had severe impacts on household level economies, local businesses and subsistence agriculture. A study conducted in the town of Kuala Krai after the 2014 Kelantan flooding (which paralyzed the local economy for a prolonged period) found that small businesses suffered significant losses of sales due to destroyed kiosks, stalls and goods during the event (Nayan, ym., 2017). This translates to longer-term livelihood losses to those affected, thus potentially endangering their quality of life, food security and ability to participate in the wider markets due to lack of money. Also, Small and Medium Sized Enterprises (SMEs) contributed to 32 percent of the country's GDP and employed 59 percent of its working-aged people in 2013; and given that the exposure and vulnerabilities of SMEs to natural hazards tend to be higher due to their low coping and risk-transfer capacities, it is crucial to protect them to protect the economy of Malaysia (Auzzir;Haigh;& Amaratunga, 2018). A survey conducted among SMEs in 2016 revealed that flooding was the most common hazard to affect them between 2011 and 2016 (Figure 2), and the loss of sales or production has the highest economic impacts (Figure 3).

Figure 2. Experiences of disaster impacts affecting SMEs in Malaysia between 2011 and 2016 (Auzzir;Haigh;& Amaratunga, 2018).

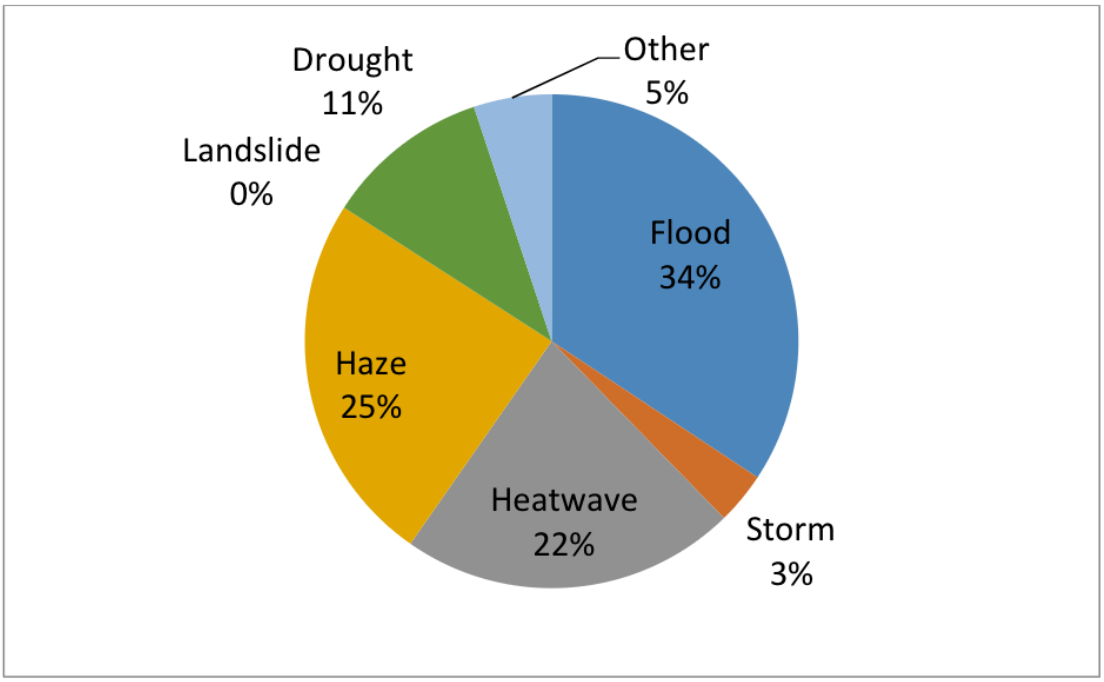
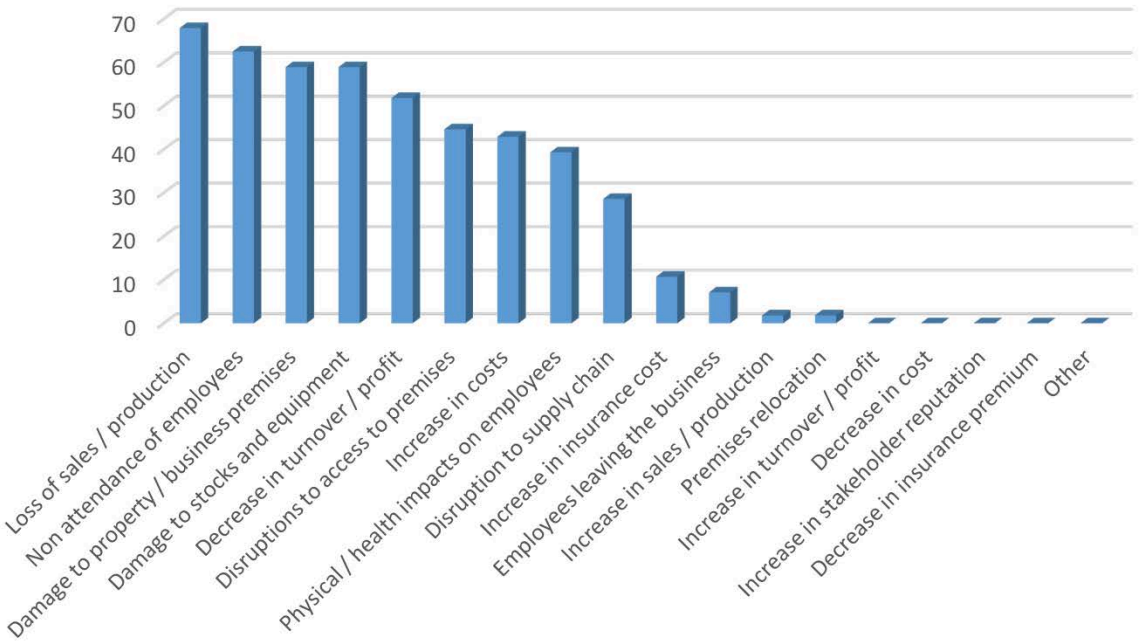


Figure 3. Most significant impacts of disasters (percent) among the surveyed SMEs in Malaysia between 2011 and 2016 (Auzzir;Haigh;& Amaratunga, 2018).



1.3 Social Impacts of Disasters

Disasters also have adverse impacts on people, their health and wellbeing, and overall rate of human development in any given society affected by hazards. Sometimes, lost healthcare facilities, schools or critical infrastructure may compromise the contingency of public services which affects peoples' ability to recover, or may compromise their lives in the longer-term if, for example, access to education is obstructed frequently. On the other hand, loss of family members, social support networks and disruptions to the routines of life may have significant psychosocial impacts such as persisting anxiety or trauma.

For example, the psychological effects of the Johor flooding of 2006 and 2007 varied from fear and hopelessness to depression to a differing degree depending on age and gender, specifically (Nasir;Zainah;& Khairudin, 2012). Women in the studied group were more likely to experience post-traumatic stress disorder (PTSD) than men (10-14 percent as opposed to men with 5-6 percent), and the negative experiences of the event pervaded through most aspects of the victims' lives (thus affecting their happiness, productivity and general wellbeing) given the nature of stress, physical exhaustion, and worry that was related to issues in physical health and due to prolonged reconstruction and repair of housing (Nasir;Zainah;& Khairudin, 2012). Children are also more likely to be affected by the loss of familiar surroundings, loss of parents or due to witnessing traumatic events, which may affect their mental health negatively, and disrupt participation to education in Malaysia (Mohamed, ym., 2017).

Limited access to schooling is indeed among the key concerns when addressing social impacts of disasters given that building children's knowledge and skills is essential for further economic development in any given country, on which disaster shocks may cause severe strain (Onigbinde, 2018). Destroyed school facilities or psychosocial issues affecting students could all result in lower schooling rates in worst affected regions, which could have long term consequences to educational attainment.

Physical health of people may also be endangered by disasters. For example, pollutants carried by flood water are likely to have an impact on individual's physical health due to contaminated water supplies or poor living conditions, especially in a setting characterized by crowdedness, poor diets and unhygienic conditions which are worsened by inundation (Mohamed, ym., 2017). Flooding can also disrupt hospital facilities or the access to them. This was evident in the case of 2014 flooding in Kelantan; six of the state's hospitals were severely affected, with Raja Perempuan Zainab II Hospital having to discontinue 80 percent of their services (Yusoff;Shafii;& Omar, 2017). Fuel shortages and hindered electricity infrastructure contributed to severe issues in sustaining the contingency of health services in the area, which naturally affected those with chronic illnesses and disabilities most (Yusoff;Shafii;& Omar, 2017).

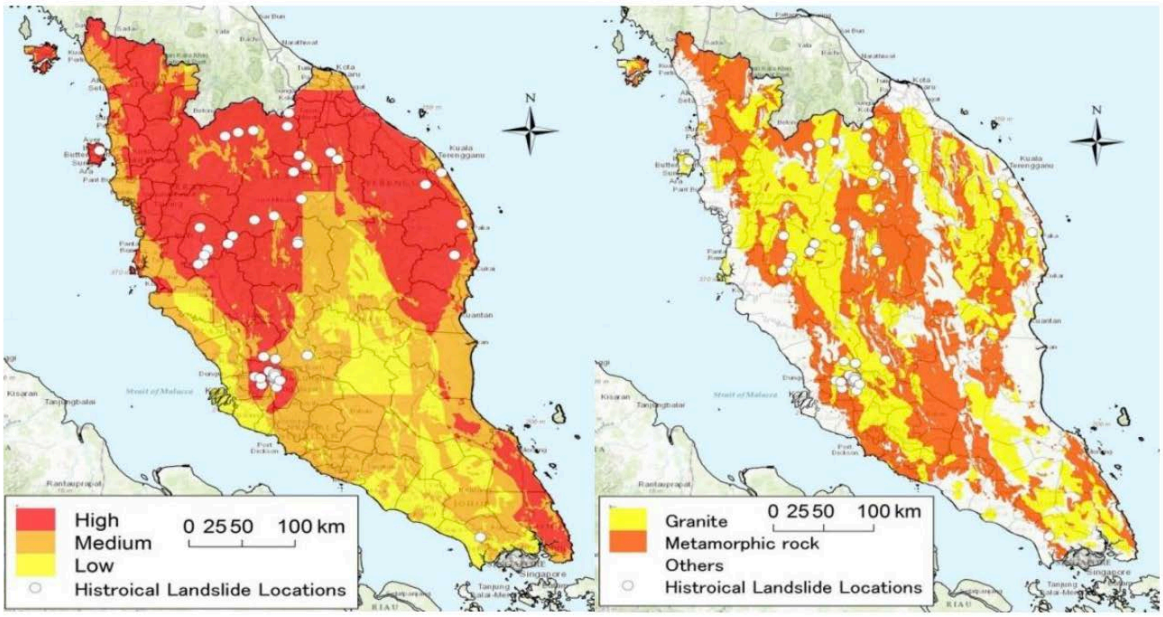
2. Disaster Risk Profile

2.1 Hazards and Climate Change

Despite the country's close proximity to the Pacific Ring of Fire, Malaysia lies in a relatively stable region in terms of geology. It is also too far south from major typhoon paths due to which storm impacts are often relatively minor (Chan, 2015). However, the country saw an increase in risk profile ranking since 2018, as indicated in the World Risk Report 2019, which ranked Malaysia at 71st out of 180 countries, as opposed to 82nd in 2018 (number 1 being the most at risk) (Bündnis Entwicklung Hilft, 2019). The country is also frequently affected by flooding, droughts, landslides, possible tsunamis and a wide range of anthropogenic hazards alongside epidemics. Of these, monsoonal floods are among the severe threats, made worse by unplanned urbanization, climate change and environmental degradation which erodes natural buffer zones (ADRC, 2018). Annually, approximately 9 percent of the country is affected by flooding events in areas inhabited by nearly 5 million people (Taib;Jaharuddin;& Mansor, 2016). The monsoon season may also bring in heavy winds and storms especially between May and November, and although they very rarely impact the country directly, states such as Sabah may be exposed and affected by the storm tails (Chang & Kasim, 2017).

In terms of seismic risks, even though earthquakes are uncommon, East Malaysia is located in a region exposed to impacts of tectonic activity. In June 2015, an earthquake with a moment magnitude of 6.0 occurred in Ranau, Sabah, which was the strongest event of its kind since 1976. While damages were minor, 18 casualties were reported due to rockfalls (ADRC, 2018). Associated with seismic activity in the country, mass movements and landslides are also a threat to infrastructure and people. Since 1973, landslides have caused damages exceeding US$ 1 billion according to some estimates, and rapid development expanding to hilly terrain has increased the risks in many regions (Abdullah, 2013). A research center of the Universiti Teknologi Malaysia (UTM) has identified a total of 21,000 landslide hotspots in the country, most of which are located in Peninsular Malaysia (PreventionWeb, 2018).

Figure 4. Landslide risk map of peninsular Malaysia (Public Works Department, 2009)



Vector- and water-borne diseases are also a concern to a nation located in the tropics. For example, Dengue has been recently reported (especially in Selangor), often occurring in urban and peri-urban areas in the late monsoon season throughout October and February in east Peninsular Malaysia, and from July to August in the west (IAMAT, 2019). Major incidents of infectious water-borne diseases, often arising during flooding, also affect the country. Hepatitis, typhoid and cholera are still endemic, even when they do not pose an on-going public health problem.

Climate change is likely to significantly exacerbate the impacts of not only vector-borne diseases, but also the impacts of hydrometeorological hazards affecting the country. Furthermore, sea level rise may compromise coastal infrastructure and availability of ground water in the coastal regions due to salinization. Given the scope of potential changes, adverse impacts are likely to be witnessed in the sectors of agriculture, forestry, biodiversity, coastal and marine resources, public health and energy (Tang, 2019).

Already, the maximum annual rainfall intensity has increased substantially; for example, the 1-hour, 3-hour and 6-hour periods of rain between 2000 and 2007 have risen by 17 percent, 29 percent and 31 percent, respectively, when compared to the period of 1970-1980 (Lee & Mohamad, 2013). Alongside rainfall irregularities, a warming trend has been witnessed over past decade, which may severely endanger the economic development alongside wellbeing of the people. For a country which draws 8.1 percent of its GDP from agriculture (rice, followed by palm oil), such changes may be detrimental in the longer-term without adequate adaptation measures. For every 2° Celsius temperature increase, the rice yields may be reduced by 0.36 tons for every hectare under current global CO2 outputs (Ho & Tang, 2019).

2.2 Exposure

While Malaysia ranks low in term of disaster risk, the level of exposure to natural hazards is rated at high level according to the the World Risk Report 2019 (Bündnis Entwicklung Hilft, 2019). Yet, hazards do not affect Malaysia and its population equally. Rather, exposure is largely dependent on local topography, soil conditions (in the case of landslides) or by regional weather and distance from the coast. For example, estimated areas affected by flooding annually comprise approximately 29,800 square kilometres, or 9 percent of the total area, within which nearly 5 million people reside (Taib;Jaharuddin;& Mansor, 2016). Of these, 300,000 people live within one kilometer from the coastline, and 600,000 within the 2 kilometer band (Lee & Mohamad, 2013). Altogether, as much as 60 percent of the country's population reside near or along the coastlines due to their reliance on socio-economic activities dependent on fishing or agriculture (Azimi;Zakaria;& Majid, 2019). The exposure is likely to worsen given that regional sea level rise in Malaysia is expected to be higher, reaching 0.25 to 0.5 meters by 2100 In Peninsular Malaysia, and potentially exceeding 1.06 meters in Sabah (Awang & Hamid, 2013).

Furthermore, landslides may have significant impacts to human lives, livelihoods and settlements in Malaysia. Despite the fact that many landslides studies have been carried out, and largely reported between 1999-2019 by authors including Sew and Chin (See-Sew & Yean-Chin, 2006), Jaapar (2006), See-Sew, et al. (2009); Komoo, et al. (2011); Kazmi, et al. (2017); and Motoyama, et al. (2016), reducing landslide risk and its cascading impacts remains a challenging task. Izumi et al. (2019) have reported 86 landslide incidents in Selangor in the period between 2015 and May 2019, which had substantial social, economic

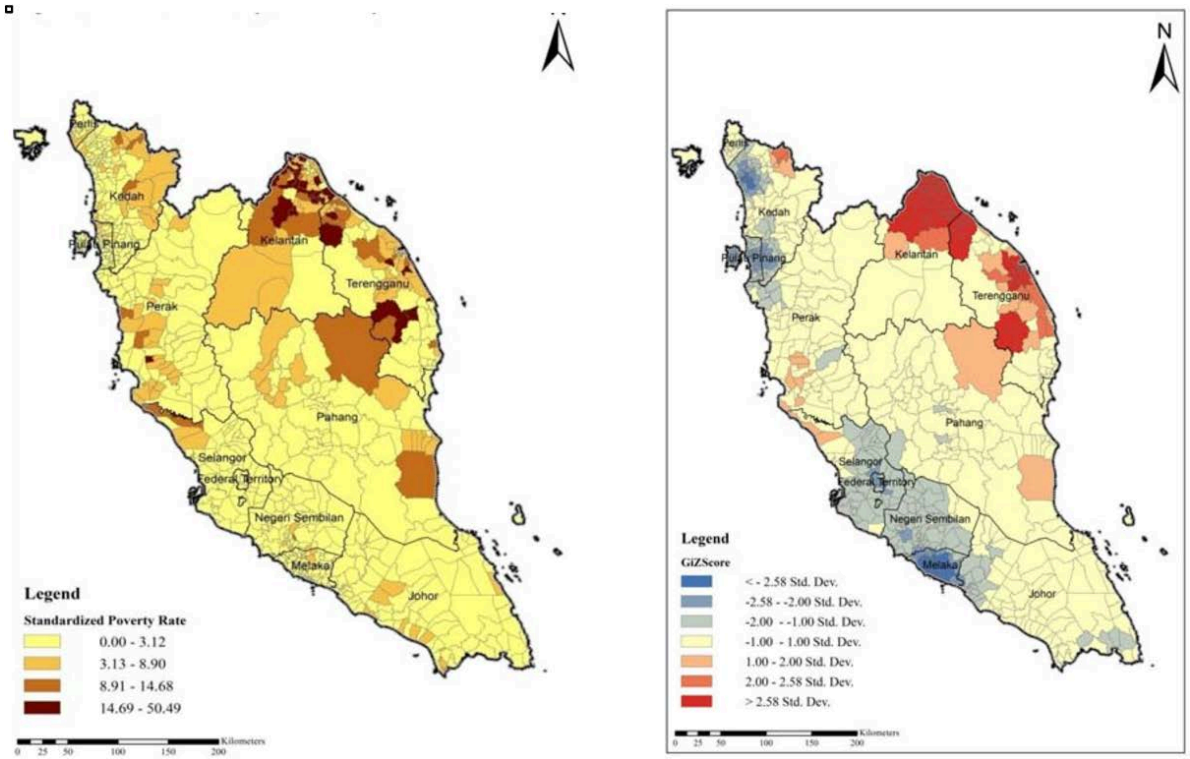
and environmental impacts. Earthquake risks also vary depending on the region, despite them being uncommon in the country. Central and western cities of Peninsular Malaysia have been found to be susceptible to high peak ground acceleration due to their proximity to the neighbouring and active Sumatran subduction zone (Loi;Raghunandan;& Swamy, 2018).

Exposure to various diseases also depends on regional characteristics. Experiences from past floods demonstrate that when humans become in contact with waste washed up by flood waters, cascading epidemics of cholera, E. coli and typhoid may be severe concerns in worst affected areas. Also, those residing in the vicinity of mosquito breeding sites and highly populated areas are more prone to contracting vector-borne diseases.

2.3 Socio-Economic Vulnerability

Poverty, or being at risk of poverty, is indeed one of the most important determinants of vulnerability to disasters. Not only associated with exposure, but poverty (especially in old age) is also associated with poor dietary habits, higher rates of chronic diseases and other health problems (Shahar;Vanoh;Ludin;Singh;& Hamid, 2019), which then renders individuals more vulnerable to the impact of hazards as well. Impacts of hazards and climate change to households and communities which suffer from chronic illnesses, malnutrition or low food availability, lack of housing and other side-effects of poverty are indeed expected to be the hardest hit by external shocks in Malaysia (Begum;Pereira;& Chamhuri, 2011). While poverty reduction and bridging inequality gaps among states and major ethnic groups have been on the country's development agenda since its independence, pockets of poverty remain, especially in the rural areas of Northern Kelantan and Hulu Terengganu (Figure 5).

Figure 5. Standardized poverty rates by mukin in Peninsular Malaysia (left) and the hot and cold concentrations in Peninsular Malaysia (right) based on a spatial autocorrelation analysis (Majid, Jaffar, Man, Vaziri, & Sulemana, 2016).



Some groups are also more affected by disasters depending on their livelihoods' reliance on the environment and weather which may be disrupted or change completely due to hazards and climate change. For example, farmers in many drought-prone areas of the country have poor irrigation practices and low level of crop diversification due to the high cost of such risk-transfers, which, when combined to low incomes, prevents adequate adaptation (IGES, 2017). Thus, they are more likely to be affected significantly by droughts as a result of not only their poverty and lack of coping capacities, but also because of the susceptibility of agriculture to changes in weather patterns. Similarly, small-scale fishermen in the country are disproportionately vulnerable due to their dependence on the availability of fish which may be affected by the acidification and temperature rise of the oceans. Especially those with lower income are more likely to be impacted due to their inability to diversify their income and adapt to changes, and they may be less willing diversify their income-generation due to lower levels education which tends to limit understanding of the impacts of climate change (Samah;Shaffril;Hamzah;& Samah, 2019).

Gender, ethnicity, age, religion, sexual orientation and other social factors and personal characteristics are also determinants of vulnerability and poverty, not because disasters would so choose, but because people do. Given that hierarchies of power and social perceptions in any given context may result in discrimination, said structures (sometimes institutionalized into legislation) may undermine the adaptive capacities, resilience and the availability of opportunities to some parts of the population, which then leads to exacerbated impacts to those excluded. For example, in the case of Kelantan flooding, the response and relief were largely gender-blind with no consideration to the specific needs of women in terms of private space (Hafizah;Noraida;Yudi;Rashidah;& Leila, 2017). Due to limited women's participation in disaster management planning, many of such dimensions are habitually left unaddressed by men (Hafizah;Noraida;Yudi;Rashidah;& Leila, 2017).

Comprehensive, inclusive and targeted social protection systems are required to systematically address varying degrees of socio-economic inequality and vulnerability across different population groups. Malaysia's current social protection systems, however, is still considered to be fragmented, underfunded and poorly targeted in which there is a lack of employee safety nets and income support for disadvantaged persons (such as the unemployed, single parents, persons with disabilities, and older persons) (UNHRC, 2019). This has resulted in the most vulnerable populations being overlooked, unable to access such services or too classified as too small of a group to benefit from sufficient and regular support (UNHRC, 2019). Despite this, significant progress has been made to enhance social protection and poverty reduction including the preparation of the 12th Malaysia Plan (2020-2024) and the adoption of Shared Prosperity and Leaving No-One Behind as key policy themes (UNHRC, 2019).

2.4 Physical Vulnerability

Vulnerability is also expressed in physical dimension (often linked to low income at household levels), where poor land use planning and development has resulted in low quality housing infrastructure concentrated in vulnerable location, which may be significantly disrupted by disaster events. In Malaysia, various hazards affect urban regions, including flooding. Many of the cities in the country are built on floodplains, and growing number of impermeable surfaces common to cityscapes are worsening the situation due to disrupted hydrological processes and drainage which then exacerbate the accumulation of rainfall (Amin & Hashim, 2014). Also, influx of rural to urban migrants has also increased the

numbers of urban poor and slum dwellers, which has also led to the growth of exposed and vulnerable urban settlements. As the costs of living in urban areas are increasing, low income households are often forced to inhabit poor quality, crowded housing which not only increases the risks of illnesses to spread, but also causes problems in terms of heightened fire risks, seismic vulnerability and exposure to the weather (Zainal;Nor;Ahmad;& Khalili, 2012). While rates of urban poverty are significantly lower than that of more rural regions in Malaysia, and while poverty has indeed decreased rapidly, urban poverty remains yet to be eradicated from the country (Chamhuri;Ferdoushi;Bashawir;& Mia, 2016). Also, the expansion of urban settlements to various hillsides and unstable areas characterized by unstable soil has also increased the vulnerabilities to landslides following road cutting and carving into steep slopes for development purposes (Amin & Hashim, 2014).

Environmental degradation is also an important dimension of physical vulnerability, given that loss of natural space, marine and terrestrial systems and natural buffer zones (such as mangrove forests and coral reefs) have negative impacts on the wider system. Currently, water pollution from factories, urban growth, degrading air quality and rapid deforestation all contribute to challenges which threaten development (Samin, 2015). Also, given that Malaysia currently accounts for 28 percent of global palm oil production, and is among the biggest producers and exporters of related products (MPOC, 2019), managing the sector sustainably vis-à-vis its environmental impacts (mainly land clearing and habitat losses) is important. To respond to such concerns, the government has been proactive in implementing protective measures nationwide. For example, the Malaysian Sustainable Palm Oil Certification is intended to be implemented in 2020, which requires growers to meet certain standards in protective measures and workers' rights (Ananthalakshmi, 2019).

2.5 Future Disaster and Climate Risks

As mentioned briefly in the previous section, climate change may rapidly exacerbate the impacts of hydrometeorological hazards, which should be a concern for a country such as Malaysia, with high numbers of exposed people and infrastructure to annual flooding and storm impacts. Furthermore, sea-level rise is likely to threaten coastal infrastructure to a varying degree (most severely affecting the states of East Malaysia) and the on-going degradation of ecological terrestrial and marine systems is diminishing not only biodiversity, but also the livelihoods of those dependent on the stability of the environment, such as fishermen and farmers.

Depending on the regions, projected changes in annual rainfall could exceed 10 percent, while mean annual surface temperatures increase (under the current GHG output) could reach nearly 2° Celsius by 2050 (Syazwan & Mohd, 2014). The impacts vary from prolonged water deficits for irrigation purposes (leading to significant crop losses in the northern regions, especially) to decreased river flows, 30 percent reduction in annual palm oil yields, major loss of biodiversity, and significant stress on public health due to diseases and heat (Syazwan & Mohd, 2014). Similarly, rice yields have been expected to be reduced by 12 to 31.3 percent by 2030, which could significantly affect farmers' income and affect the rice self-sufficiency level of the country itself (Vaghefi, Shamsudin, Radam, & Rahim, 2015). Additionally, some studies indicate that without adequate adaptation measures, the food shortage costs over time could reach US$ 987.3 million by 2065, which represents a shortage of 40 percent from the national targets (Ahmed, Al-Amin, Mohamad, & Chenayah, 2016).

Climate-sensitive diseases, including those heat-related, vector- and water-borne may also become more common given that warmer and more humid temperatures allow more prolific breeding seasons for important vectors species such as the Aedes mosquito. The prevalence of malaria, meningococcal meningitis, dengue, Japanese encephalitis and water-borne diseases like cholera are projected to increase following these changes, and the decreasing availability of safe water during periods of drought may lead to a spike in diarrheal diseases, especially in the more rural regions (WHO, 2006).

3. Disaster Risk and Climate Action Interventions

Despite the relatively low levels of disaster risks in Malaysia, managing disaster risk reduction (DRR), climate change adaptation (CCA) and sustainable development still require significant support and investments from all relevant stakeholders. Furthermore, efforts to reduce poverty to increase resilience, and investing in the sustainable management of natural resources must maintain their on-going momentum. The following chapters provide an overview of the country's process vis-à-vis the mandates of international agreements and frameworks (Sendai Framework for Disaster Risk Reduction, Sustainable Development Goals and the Paris Climate Agreement), highlight some of the key issues and provide suggestions for improving the further implementation of DRR, CCA and sustainable growth.

Priority 1. Understanding Disaster Risk Analysing, collecting and managing disaster and climate risk-related data is the cornerstone for achieving a comprehensive understanding of disasters to help in the processes of conducting risk and vulnerability assessments, in prioritizing investments for resilient development, as well as to support sustainable and risk-informed land use planning. 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.

In Malaysia, the National Disaster Management Agency (NADMA) hosts a Disaster Portal (Portal Bencana) which contains up-to-date information on regional flooding, and since 2013, it has covered all disaster and hazard-related information from the entire country (CFE-DM, 2019). The Portal is an integrated gateway for information, cataloguing real-time events and displaying them by utilizing GIS technology, available to the public as well as authorities who need to monitor disasters (NADMA, 2019). It also provides a reference hub for the government and private agencies who require information about current and past disaster impacts for their operations in planning and development. However, it was not possible to evaluate the effectiveness of the portal in terms of adequate spatial and social impact disaggregation within this report. To fully utilize the available data to the required extent as mandated by the Sendai Framework for Disaster Risk Reduction to determine the extent of social vulnerabilities, capacities and exposure across the country, data should contain not only disaster types and impacts, but also the sex and age of the affected, their location, regional poverty etc., collected by local level authorities as well. Furthermore, it remains unclear how well the data is used by sectoral agencies and other stakeholders.

Since the launch of the online Sendai Framework Monitor in 2018, Malaysia has reported a strong level of publicly accessible and valuable disaster damage and loss data dating back to 2005. Further efforts to strengthen this data collection and reporting process also includes designing a new national damage and loss database in 2020 based on the DesInventar software, which, once created and populated with data, will be publicly accessible and can be utilized to assist in informing DRR policy and planning.

Also, other initiatives for mapping and monitoring hazard and disaster-related data exists in the country. For estimating landslide risks, the Slope Engineering Branch has increased the availability of information focused on slope conditions, and established a hazard ranking

system (Slope Management and Risk Tracking, SMART) which covered more than 25,000 different slopes across the country within its catalogue by 2013 (Abdullah, 2013). However, the cross-compatibility of such standalone initiatives with the Portal Bencana could not be assessed either. At the local government level, Selangor State, the only state with a dedicated disaster management unit, is currently implementing a project with the Disaster Preparedness and Prevention Center (DPPC) of Universiti Teknologi Malaysia (UTM) that has not only identified flood and landslide risks, but also will utilize the scientific risk assessment information to plan local disaster management measures (Izumi, et al., 2019).

Priority 2. Strengthening Disaster Risk Governance to Manage Disaster Risk For guaranteeing effective and tangible operations occurring within all of the phases of the disaster management cycle from preparedness, mitigation to response and recovery, disaster and climate risk management must be rooted into robust policy and legislative frameworks. This is especially important in terms of institutionalizing disaster risk reduction (DRR) and climate change adaptation (CCA) measures to guarantee that their tangible implementation can be reproduced at all levels of the government, and that considerations for the funding of such efforts is represented at the decision-making level.

In Malaysia, national guidelines for disaster management are based on the Directive No. 20: National Policy and Mechanism on Disaster Management and Relief, which is the foundational directive for the operationalization of DRM in the country. It establishes a coordinated mechanism for pre, during and post-disaster phases, determines roles and responsibilities of all agencies involved (from search and rescue to health, logistics and media) as well as outlines funding considerations (Ministry of Health, Labour and Welfare, 2015). The country has also implemented numerous other guidelines such as the ASEAN Agreement on Disaster Management and Emergency Response, the ASEAN Standard Operating Procedures for Regional Standby Arrangements and the Coordination of Joint Disaster Relief and Emergency Response Operations alongside a myriad of supporting laws (CFE-DM, 2019). The most recent ones include the 1998 Prevention and Control of Infectious Diseases Act, 1998 Fire Services Act, Malaysia Civil Defence Force Act 1951 (Amended in 2016), and the National Security Council Act of 2016. However, the scope of policies intended to address disasters is rather limited, especially in terms of DRR and CCA given their heavy reliance on response and recovery. While the Eleventh Malaysia Development Plan for 2016 to 2020 highlighted disaster and climate resilience as one of the cornerstones for sustainable and resilient development to occur (Government of Malaysia, 2016), it seems that only few other policy revisions have been made to date.

In terms of operationalization, all disaster-related activities in Malaysia are currently run by the National Disaster Management Agency (NADMA), supported by Malaysia Civil Defence Force, the Royal Malaysia Police, Fire and Rescue Department, and the Social Welfare Department, among others. NADMA extends its organizational infrastructure for disaster management through a Committee System operating at three levels from federal to states and districts. At the national level, the Federal Disaster Management and Relief Committee formulates policies and strategies, implementation of which is the responsibility of Disaster Management and Relief Committee (DMRC) State and District level offices (CFE-DM, 2019). The State Disaster Management and Relief Committees are also responsible for managing state-level disasters, followed by District Disaster Management and Relief Committees which are responsible for their own localities. During an event which exceeds local and state capacities, the Federal Disaster Management and Relief Committee manages national disaster response.

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

IMPLEMENTATION	PLAN/POLICY	SCOPE	PURPOSE
NATIONAL DISASTER MANAGEMENT AGENCY	Directive No. 20: National Policy and Mechanism on Disaster Management Relief	National, States and Districts	Guideline to disaster management and rescue. Includes a mechanism for managing roles and responsibilities of the agencies involved in disaster management activities in Malaysia
GOVERNMENT OF MALAYSIA. ALL RELEVANT STAKEHOLDERS	Eleventh Malaysia Plan (2016-2020)	National	Guided by the Malaysian National Development Strategy, the plan integrates considerations for DRR and CCA into national development aspirations.
NATIONAL SECURITY COUNCIL	National Security Council Act (2016)	National	Grants powers to the Prime Minister to override existing arrangements for coordination and cooperation if so necessary in an event concerning national security, based on the advice of the National Security Council.
FIRE AND RESCUE DEPARTMENT OF THE FEDERATION, DEPARTMENTS OF STATE	Fire Services Act (1998, amended in 2009)	National, States	Supports effective functioning of the Fire and Rescue Department

Priority 3. Investing in Disaster Risk rReduction for Resilience Disasters have wide implications to social and economic development of a country due to their potentially widespread impacts – but also because they require funding to manage. Disaster financing requires various options from the government (and private sector) to avoid losses and impacts to lives and livelihoods in the forms of investments into infrastructure, trainings, insurance schemes, preparedness and response, data management, and so on.

However, little detail is available about the exact financing of DRR and CCA in Malaysia. It is known that Central and State Governments, through their respective agencies, are responsible over the allocation of funds for DRM and DRR based on their budgets, and the National Disaster Relief Trust Fund is the organization channelling donations in the case of a specific, large-scale disaster (NADMA, 2017). The funds are budgeted annually through the Economic Planning Unit, and the amount depends on the size of a state. Furthermore, Malaysia Civil Defence Force (MCDF) is one of government agency responsible to enhance preparedness and resilience of community towards disaster with their Public Preparedness Program all over Malaysia. In 2019 MCDF spent RM 686,000 (USD 16,700) for the MCDF Public Preparedness Program and RM 2,062,992 (USD 501,274) for disaster response and preparedness course in three (3) MCDF training centres. However, no details about exact national-level expenditures are available online for this review.

To build resilience to disaster risks, governments has made considerable investment for flood risk reduction over the years. Structural mitigation projects, alone, have increased from RM 1.79 billion in the period 2001-2005 to RM 5.81 billion in 2006-2010, including investment in major projects such as the Stormwater Management and Road Tunnel (SMART) in the Kuala Lumpur city centre to reduce impacts of flash floods (Mansor, 2019). More than RM 4 billion was envisaged for budget allocations to implement and maintain various projects, starting with 16 flood mitigation projects in 2018 (Mansor, 2019). Such investment is in line with the current 11th National Plan for 2016-2020 that aspires to strengthen DRM and resilience to climate change and natural hazards, as well as improve flood mitigations (CFE-DM, 2019). On-going projects include the Integrated River Basin Development Project (PLSB) in Kelantan State, which was badly affected by 2014-2015 widespread flood, is focused on stabilization of river banks, construction of reservoirs and environmental-friendly drainage systems (Jega, 2018), alongside multi-phase flood mitigation plans (RTB) basin development projects including construction of levees along Pahang River and related works in Pahang State (Bernama, 2018).

Priority 4. Enhancing Disaster Preparedness for Effective Response to "Build Back Better" in Recovery, Rehabilitation and Reconstruction For disaster response, Standard Operating Procedures have been developed for each disaster based on the National Security Council's Directive No. 20, covering incidents from flooding, earthquakes, tsunamis to droughts, haze, industrial and petrochemical accidents. As of 2017, nuclear and HADR (Humanitarian Assistance and Disaster Relief) SOPs were still under development (NADMA, 2017). The disaster management follows a top-down, hierarchical mechanism with National Disaster Management Agency (NADMA) as the lead (established in 2015[1]), responsible over all activities related to disasters and coordination of operations. The Federal Disaster Management and Relief Committee (FDMRC), then, operates the strategic managing and handling of the response to national disasters and emergencies, convening in the National Disaster Operations Control Centre (CFE-DM, 2019). The operations have been scaled from Central Level (responsible for complex disasters within two or more states) to State Level (disasters contained within the states) and to District Level (localized incidents, managed by local authorities). MCDF has been tasked as secretariat to the committee to ensure the effectiveness and efficiency of the committee at the state and district level. Overall, there are 79 agencies involved in disaster management, most supporting operations in disaster preparedness and response, while the NADMA, Public Works Department and Department of Irrigation and Drainage also cover some considerations for integrating measures targeting mitigation and preparedness (Chong & Kamarudin, 2018). For regional preparedness, Malaysia is home to the ASEAN's Disaster Emergency Logistics System (DELSA), launched in December 2012 to host regional relief stockpile of items needed in times of disaster response, as well as to support logistics capacity of the AHA Centre and ASEAN Member States (CFE-DM, 2019).

In 2015, the government outlined a new role for the MCDF as the disaster management secretariat at state and district levels to enhance the preparedness and resilience of communities (MCDF Disaster Management Secretariat, 2016). Also, by 2019, more than 2.1 million Malaysians had registered as MCDF volunteers under programs such as the Civil Defence Volunteers, Civil Defence Emergency Response Team, Malaysia Civil Defence Force Education Institutions Team, Malaysia Civil Defence Force Undergraduates Team and Malaysia Civil Defence Force School Cadets. Those who register as volunteers will be given training on emergency and disaster management, especially on how to minimize

1 Consolidated the Disaster Management Division of the NSC, Post-Flood Recovery Unit of the Prime Minister's Department and the Special Malaysia Disaster Assistance and Rescue Agency (SMART)

disaster risks to themselves and their communities. Enhancing disaster preparedness based on “From People For People” concept as a tool of empowerment will increase public awareness more effectively (MCDF, 2016). The more sustained the relationship between community-participants and the government agencies is, particularly when there are more direct and frequent interactions with high-level agency managers, the more likely the sense of empowerment is to be achieved (Buckwalter, 2014).

With regards to early warning systems, the Malaysian National Tsunami Early Warning System was established in 2004 following the Indian Ocean Tsunami, with 23 sirens installed throughout the coastal regions (PreventionWeb, 2005). Also, the Department of Irrigation and Drainage (Hydrology and Water Resources Division) maintains a monitoring system covering hydrologic data with 300 remote telemetry units across the country. The system also includes 84 flood warning boards and 217 flood sirens alongside real-time flood forecasting and warning systems in nine of the country’s river basins (CFE-DM, 2019). The Flood Forecasting and Warning System has the capacity to also disseminate messages via SMS, phone and websites to notify communities.

Additionally, Building Back Better (BBB) is among the cornerstones of the SFDRR, with the intention to move away from reconstruction and recovery towards improving systems in the rebuilding phases to improve their resiliency against disasters. Ideally, BBB should also consider livelihoods, culture, ways of living, institutions and operational frameworks which can support resilient and sustainable long-term recovery. However, lack of consideration for long-term planning have hindered reconstruction and recovery phases. For example, in the case of Kelantan flooding, reconstruction process only achieved 1,176 housing units with the budget allocated by the government and NGOs, (less than half of what was required), and no considerations were made for integrating livelihoods or other measures which would support the recovery of the daily life of the affected (Chong & Kamarudin, 2018). Building back better remains to be fully institutionalized and operationalized in the Malaysian disaster management framework.

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

Harmonizing the synergies among various legislative pieces under the umbrella of holistic DRR, CCA and sustainable development is increasingly necessary due to the fact that all these efforts share some characteristics. By identifying synergies among major international agreements, it is possible to reduce overlapping responsibilities and doubled efforts through informed and intelligent policymaking. However, due to the nature of rapidly evolving "best practice" and country needs, policies are often formed on ad-hoc basis which leaves gaps among these three dimensions.

In terms of sustainable development and progress towards achieving the Sustainable Development Goals (SDGs), Malaysia is not starting a new pathway towards sustainable growth, but rather its continuing on a foundation that has been set up decades ago. With the intention to provide equitable growth and provision of basic infrastructure, services, and utilities to all of its citizens while mainstreaming environmental conservation, Malaysia began this process early in the 1970s (Prime Minister's Department, 2017). The country seeks to establish an enabling environment by multi-stakeholder collaboration, by conducting studies and research on identifying gaps and priority areas for interventions, by localizing the SDGs at the sub-national levels, by mobilizing resources and funding from numerous sources and by strengthening data readiness at all levels (Prime Minister's Department, 2017). These priorities are also reflected in the 11th National Plan for 2016-2020 with clear implementation strategies and outlined outcomes.

Malaysia has also sought to ensure that it plays an active part in meeting the commitments to the Paris Agreement, and seeks to reduce its overall GHG emissions by 45 percent by 2030 by changes in the management of agriculture, energy sector and land use (Ng, 2019). Palm-based biofuels and bioenergy are expected to significantly contribute to the reductions by 2020 when palm oil mills will be equipped with biogas capture facilities. However, despite the fact that the 5.4 million hectares of palm oil plantations have been considered to be the country's second largest CO2 sink (Ng, 2019), some controversies remain. The European Union has issued a resolution to phase out the use of palm oil as biofuel due to its impacts on deforestation and habitat loss by 2030 (Keating, 2019), and the demand for palm oil is likely to dwindle as environmental concerns grow. Balancing this with sustainable development to avoid further deforestation and adverse impacts to fragile ecosystems caused by cultivations will be an immense challenge for the upcoming decade.

Additionally, while sustainable development and green growth are adequately represented at the national level policy and strategic planning, it seems that whole-of-society approaches for risk reduction have been overlooked due to high focus on responsive emergency planning in Malaysia. Current policies relating to DRM are mostly from two decades ago, and DRR remains to be mainstreamed into wider development planning and policy, apart from the national level aspirations as reflected in the Eleventh Plan. Some efforts have been made to further integrate and harmonize DRR and CCA policymaking in the country to support sustainable and resilient planning. For example, Putrajaya, Kuala Lumpur and Melaka City have been chosen as 'role model cities' under the resilient cities campaign (on-

going since 2011) to lead the way towards change in urban planning. Backed up by the National Urbanisation Policy, and the National Physical Plan, it is envisaged that resilience of cities in the country could be improved significantly by risk-informed development, and by the incorporation of green spaces to support DRR and CCA. The latter would also contribute to the protection of natural environments and reduction of GHG emissions (bin Hashim, 2018). For example, in Putrajaya (the new federal government's administrative centre), large areas are designated to green spaces, and an artificial lake is built for water management and localised climate control. Furthermore, artificial wetlands will be constructed to support the lake system through water filtration (bin Hashim, 2018).

In Melaka City (a world heritage site), the state of Melaka has increased its investments in resilient and sustainable planning to support growth that can respond to the pressures of urban expansion and associated risks, including coastal erosion, flash flooding, landslides and depleting environmental resources (Jamaludin & Sulaiman, 2018). The city's resilience initiatives now focus on improving its performance vis-à-vis multiple hazards as opposed to merely responding to hazard impacts, and has implemented disaster risk reduction programs, the Green City Action Plan (in cooperation between Indonesia, Malaysia and Thailand Green City Initiatives), developed the Local Council for Sustainability, and the Green Technology Council (Jamaludin & Sulaiman, 2018). However, there is still a need to develop a country-wide resilience framework that would integrate governance, health and wellbeing, economic development, social protection, infrastructure and environment under one resilience agenda (Jamaludin & Sulaiman, 2018).

Table 2. Some of the synergies between international agreements and different policies and commitments of Malaysia in 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	Eleventh Malaysia Plan (2016-2020)	Eleventh Malaysia Plan (2016-2020) National Policy on Science, Technology and Innovation (2013-2020)	Eleventh Malaysia Plan (2016-2020)
Agriculture & Conservation	-	National Agrofood Policy (2011-2020) National Policy for Biological Diversity (2016-2025)	National Policy for Biological Diversity (2016-2025) National Ocean Policy (2011-2020)
Disaster and Climate Risk Reduction	Malaysia Action Plan for Disaster Risk Reduction (under development)	Cross-cutting policy-agenda	National Climate Change Act (under development) National Policy on Climate Change (2009)

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
Vulnerability Reduction	Eleventh Malaysia Plan (2016-2020)	Plan of Action for Nutrition of Malaysia III (2016-2025) Eleventh Malaysia Plan (2016-2020)	National Policy on Climate Change (2009) National Adaptation Roadmap (under development) National Coastal Zone Physical Plan
Urban Development	National Physical Plan 3 (2015) National Urbanization Policy	City Action Plans (Kuala Lumpur, Putrajaya)	City Action Plans (Kuala Lumpur, Putrajaya) National Physical Plan 3 (2015)

5. Issues in the Implementation of Disaster Risk Reduction and Climate Policy

Despite its rapid success and economic growth, Malaysia continues to face challenges in terms of policy implementation on many fronts. For example, in the case of policies targeting solid waste management, vast gaps remain between national level policy and what is done on the ground. Lack of monitoring and evaluation, comprehensive law enforcement, lack of local capacities and the vastness of the waste management problems itself render much of the interventions ineffective according to some evaluations (Abas & Wee, 2014). The main problem arises from the disparity between policy level intention and mechanisms in place for effective implementation, including enactment of regulations and increased roles and responsibilities of stakeholders, households and individuals to address the problems – a larger societal change is also required, for example, to improve the recycling rate by instilling a sense of social responsibility to nurture and preserve the environment (Abas & Wee, 2014).

Also, while significant efforts are in place to mainstream DRR considerations into urban planning occurring at the national and sub-national level, even within local government's units, non-compliance to existing guidelines and development plans continues to hinder resilient development efforts (Amin & Hashim, 2014). However, NADMA is spearheading a national-level effort to develop a national legal framework for DRR, and numerous other plans are in place to support the achieving of the post-2015 development agenda, and the Development Vision 2020. Yet, lack of contextualized data from detailed local risk assessments, ineffective implementation of development policies and lack of support and full commitment from local authorities contribute to the issues in implementation (Amin & Hashim, 2014). Disparities between plans at the national and state or district levels must be addressed rapidly, not only in terms of urban planning resilience, but also for wider DRR and CCA integration in all sectoral development. A common challenge among significant number of countries, including Malaysia, is the struggle with lack of human capital and resources at the local level to fully integrate the national policies as envisaged by central government, and to fully operationalize the decentralization agenda necessary for tangible and impactful integration of DRR and CCA; local capacities and available budgets must be brought up to certain standard vis-à-vis the national aspirations.

6. Stakeholder Analysis

Stakeholder partnerships are also immensely important for successful disaster management in many of the world's most regions most affected by hazards given that often scale of catastrophic, transboundary disasters may exceed national coping capacities. Similarly, the multilateral and bilateral partnerships may offer their contribution to support human and economic development and provide strategic benefits in terms of security. At the national level, agreements with private and public institutions providing their assistance to national efforts to further comprehensive, proactive disaster and climate risk management is beneficial.

Malaysia is a member of the Association of Southeast Asian Nations (ASEAN), aim of which is to ensure regional safety and prosperity of its citizens and to shelter them from the impacts of disasters through joint and coordinated approach in disaster risk management. Also, the United Nations Country Team collaborates closely with the Government, chaired by the UN Resident Coordinator and having representatives of many of the UN Organizations which run regional projects under the guidance of the Government (CFE-DM, 2019). Also, INGOs such as the International Federation of Red Cross and Red Crescent Societies have an affiliate member, Malaysian Red Crescent Society, operating in the country, and it has played a significant part in disaster management for over 60 years in the country by assisting in response and relief provision, as well as providing trainings and assisting in healthcare provision (CFE-DM, 2019). Of the NGOs, the Malaysian Medical Relief Society (MERCY) is also important contributor to the country's resilience building, and its mobile clinics, basic medical health check-ups and dental health services for the underprivileged communities have had a significant impact in the past (CFE-DM, 2019).

Moreover, the science and technology stakeholders are becoming increasingly important for Malaysia to implement science- and evidence-based DRR measures. In this respect, NADMA is currently upgrading its Science Expert Panel (SET) that was established in 2015 to the Science and Technology Expert Panel (STEP) by expanding its membership to include more academic institutes, private sector and technical agencies or departments. In addition, STEP will not only provide scientific information when required by NADMA, but will also assist in stakeholder coordination and implementation monitoring of national DRR strategies and policies (Matsuura & Razak, 2019). STEP also provides scientific guidance on disaster risk management for policy consideration, and supports the operational activities of the National Platform for Disaster Risk Reduction (MyDRR), led by the NADMA (Che Omar, 2019). With support from the STEP, NADMA has developed the Science and Technology Plan for DRR, a subset to the National Science Plan, to comprehensively and systematically address knowledge gaps on current and emerging hazards in the country, including taking an integrated approach to disaster risk reduction and climate change adaptation, to ensure sustainable development. Similarly, the Disaster Risk Reduction Research Alliance Committee (DRR Research Alliance) was established in 2017 under the auspices of the Academy of Sciences Malaysia (ASM), with aims to serve as a platform to bring together key researchers and other stakeholders in DRR to conduct flagship projects led by ASM (ASM, 2018).

Communities and the people are the most important stakeholders in disaster management and risk reduction not only because their members are often the first responders, but also because the success of adaptation and risk reduction interventions depends on the peoples' willingness to integrate needed measures into their daily life to build a culture of

preparedness. A structured and organized public preparedness program, such as MCDF Public Preparedness Program, will catalyse communities and the people in disaster management and risk reduction (Buckwalter, 2014). MCDF has created a Civil Defence Emergency Response Team – Community (CDERT-C) under its Public Preparedness Program to minimize disaster impact to communities by providing them with a platform for government-community communication (MCDF, 2016). Furthermore, the Government, with the support of the University of Technology of Malaysia, has taken steps on improving Community-based Disaster Risk Management (CBDRM) by pilot projects for the communities vulnerable to flood disaster in Kundang, Selangor, wherein 100 participants from 10 different villages were provided contextualized training to facilitate better understanding of DRR, how to integrate best practices and how to develop risk profiles at the village level (Razak, 2019).

The Kuala Lumpur Multi-Hazard Platform is an output of the project on Disaster Resilient Cities: Forecasting Local Level Climate Extremes and Physical Hazards for Kuala Lumpur. The project is supported by the Newton-Ungku Omar Fund (NUOF), administered by Innovate UK and the Malaysian Industry-Government Group for High Technology (MIGHT). Many hazards associated with climate change have the greatest impacts in urban areas where most people and property are concentrated. Severe and extreme weather events are projected to increase losses challenging Governments and insurance systems world-wide. Communication, transfer and development of climate-related knowledge is most effective when it is sensitive to context, diversity of decision types, decision processes and the requirements of constituencies. This project has adapted carefully selected meteorological and hazard models for tropical conditions in Malaysia and Southeast Asia. These have been integrated onto a common platform i.e. the Kuala Lumpur Multi-Hazard Platform, designed for managing and communicating risks and enhancing disaster resilience. The Multi-Hazard Platform, located in the City Hall of Kuala Lumpur (DBKL), will support DBKL to strengthen the management of flash floods, landslides, sinkholes, strong winds, urban heat and air pollution in the city as the climate changes. The Kuala Lumpur Multi-Hazard Platform can be replicated to address major hazards in tropical cities of Malaysia and the Asia Pacific.

To empower the role of Malaysian youth and young professionals in science, engineering, technology and innovation, particularly in DRR and climate change, U-INSPIRE Malaysia @ UKM platform was established in 2019. The platform aims to build towards disaster resilience at the national, regional, and global level. The platform is hosted at Universiti Kebangsaan Malaysia's Southeast Asia Disaster Prevention Research Initiative (SEADPRI-UKM), under the auspices of the Asian Network for Climate Science and Technology (ANCST), with support from the National Disaster Management Agency Malaysia (NADMA Malaysia) and the Malaysian National Commission for UNESCO (Bhuiyan & Abdul Halim, 2019).

7. Future Priorities

As evidenced in this report, it is clear that despite its relative sheltered history from the catastrophic impacts of hazards and disasters, apart from a few specific flooding events, Malaysia, like other countries, could face significant challenges in managing disaster and climate risks during the upcoming decade. 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 and may change from sector to sector.

7.1 Challenges

Among the most important challenges for Malaysia to tackle during the upcoming years are the inefficiencies within the rigid and hierarchical, top-down disaster management system. While Standard Operating Procedures or robust command and control may be applicable to some situations, it is inevitable that their inflexibility renders them obsolete when facing the challenges of 21st century where "bottom-up" information plays an important role with the revolution of social media and awareness among public will impact the government reputation and goodwill (Abdul, et al., 2017). Disasters are becoming ever-more complex, occurring at various levels and extending throughout prolonged periods of time (such as droughts), management of which requires adaptable, innovative approach supported by most recent technology and generous funding, capable authorities and adequate resources for proactive measures as well. Relying on top-down and response-oriented management models can be hazardous in the absence of strong local leadership, which should be developed constantly to strengthen decentralization of disaster management efforts, in recognition of the fact that in any given event, the local capacities largely determine the success of immediate response.

In this context, the integration of risk reduction concerns to sectoral development and national policy is currently at a low level. It seems that disasters are treated as a separate issue from the wider development, as a responsibility of emergency managers and other related authorities. Expanding the concerns for disaster and climate risk reduction (alongside sustainable development) as issues, which are a responsibility for the whole-of-society, is crucial to achieve to fully operationalize the post-2015 development agenda. Funding is also among the key cornerstones to facilitate this transformation towards resilient and sustainable growth. As of now, it remains unclear how much is spent on DRR and CCA mainstreaming. Increasing the transparency in public finance and guaranteeing adequate allocations to proactive measures remains a challenge to be addressed. However, there is no official DRR Law in Malaysia, and there is no robust legal basis for line agencies to coordinate activities. Furthermore, budget measures for DRR are not properly established, and integration of DRR and CCA policies remain to be rooted into a coherent strategy.

Furthermore, managing growth sustainably requires more attention than ever. For example, the Government of Malaysia has pledged to keep 50 percent of its total area under forest cover, but to date, the area covered has already decreased to 54.5 percent, which leaves very little room for any significant expansion palm oil plantations (Varkkey, 2019), which poses the challenges of competing interest between preserving forest cover and agriculture sector.

7.2 Priority Issues

Among the most important issues to be addressed by the government would be to expand the financing of disaster and climate risk reduction into budgeting at all levels. The current, response-oriented system seems to leave only marginal attention to risk reduction concerns at all fronts, and while it is true that Malaysia has been relatively sheltered from the impacts of catastrophic disasters, the looming impacts of climate change should facilitate rapid transformation towards having a proactive perspective in disaster governance. Also, in recognition of the high importance of the localization of sustainable development, and DRR and CCA efforts, increasing investments should be made to enhance capacity of local authorities to fully operationalize the post-2015 agenda at the sub-national levels and within communities. Similarly, representatives from, and the members of communities and villages should be increasingly involved in this process to further the whole-of-society approach to disaster and climate risk management.

Also, while the 11th National Plan for 2016-2020 integrates considerations for disaster and climate resilient development, Malaysia still lacks comprehensive adaptation and mitigation plans and strategies. No details are available online about the exact funding of these efforts, and no specific objectives or goals have been found in national policy as of 2019 (Varkkey, 2019). In the context of agriculture and rice cultivation, it has been stated that due to the sectors vulnerability to increasing temperature and dwindling rainfalls, climate change should be among the key concerns of policy-makers in the country to support farmers in their efforts to prepare for and mitigate the potential future impacts (Vaghefi, Shamsudin, Radam, & Rahim, 2015). However, only very limited efforts are in place to comprehensively mainstream DRR and CCA into sectoral initiatives, a shortfall which should be rapidly prioritized. Learnings from the on-going planning for resilient cities in Putrajaya, Melaka and Kuala Lumpur could contribute to national-level planning significantly and could also serve as a starting point for mainstreaming evidence-based resilience aspirations into wider development.

Moreover, the national emergency response mechanism requires strengthening. While standard operating procedures, strict implementation of guidelines and rigid hierarchical models for emergency management have been favoured by many governments during the past decades, the new 'wicked problems' arising from immense complexity of modern systems in response and recovery have illustrated that contemporary disasters require the ability to innovate, adapt and the capacity to work in harmony across scales and institutional boundaries. A new National DRR Strategy to set a strategic vision and priorities for DRR is crucial in the current context in which disaster risk and climate-induced hazards are becoming increasingly prominent. A new strategy should be formulated, based on disaster and climate risk assessments, to enhance synergy within DRR and climate change adaptation, especially in vulnerable sectors (such as agriculture, water management, and urban planning) and provide a blueprint for comprehensive DRR action plans to incorporate into annual and medium term (5-year) development planning, thus moving from haphazard and fragmented efforts to more focused actions and tangible results. Alongside this, the Directive No 20, which places specific focus on DRM institutional arrangement and guidelines for emergency response operations, should be updated to elaborate on the roles and responsibilities of government functionaries including district level authorities on DRR, DRR funding and the necessary provisions to support, facilitate, and coordinate the implementation of proactive risk reduction.

8. References

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6	Lt Kol. Mohamad Fazli Sardi	Assistant Director/ Researcher Malaysian Civil Defence Force
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