

Towards Sustainable Development in Malaysian Natural Disaster Risk Reduction (NDRR)

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OIDA International Journal of Sustainable Development, Ontario International Development Agency, Canada

ISSN 1923-6654 (print) ISSN 1923-6662 (online) www.oidaijsd.com

Also available at <http://www.ssrn.com/link/OIDA-Intl-Journal-Sustainable-Dev.html>

Abstract: December 2014 recorded the worst unprecedented flooding in 30 years time, which affected the east coast part of Malaysia the most. Starting from mid December 2014 until January 2015, Malaysia had faced with the worst raining season in 50 years time. Therefore, people in Malaysia are getting more concerned that new build should be better managed to ensure sustainability towards the environment and its surroundings. It is really critical to deal with natural disaster management; the government and local authorities are those front lines that have the administration control over the undesired events especially in flooding. In Malaysia, management of flooding involves different stages and plans and each one of them will have their own significance. The government of Malaysia has conducted numerous actions to improve prevention, mitigation, response, relief and recovery of disasters throughout the country. The examples of actions are; amendments to current laws, improving early warning systems, come out with mitigation structure and create public awareness. Since the demand for the matter has been incredibly massive, it will put pressure on Malaysian business industry to come out with reasonable efforts to perform their best under any given circumstances. Looking at these circumstances, the professional approaches are always in request. This paper involves literature review and discussions to shepherding natural disaster risk reduction (NDRR) approaches that concerns the sustainable development, flooding, including the country laws. The paper is significant in three ways; i) delivering means to respond to flooding efficiently through careful analysis, design plan, strategic, tactical and operational implementation ii) preparing Malaysians business industry to have a coordinated flooding approach by providing background understanding, guidelines and handling misunderstandings iii) comprising sustainability and resiliency efforts in Malaysian flooding management in the process of urban design and strategies. The key findings of the paper are; a) sustainable development in flooding management could help in addressing flooding risks and its vulnerability in more detail b) country laws, guidelines and frameworks in NDRR plays an essential role in helping the communities in terms of; defending business or properties, handling difficult decisions, setting up long-term planning in flood management and flood risk assessment c) National Risk Assessment (NRA) should be implemented by the Malaysian government to ensure all planning phases involving flooding risk reduction are taken care of, including protecting crucial national infrastructure and keeping essential services running. The paper provides forethoughts regarding sustainability assessment, vulnerability, and impacts of floods, including the risks imposed towards the people, property, infrastructure, and land.

Keywords: Disaster, Flood, Malaysia, Risk, Sustainability

Introduction

Disasters are classified into three, which are natural disasters, man-made disasters, and subsequent disasters, and they are among the highest in Asia and the Pacific. Malaysia has experienced all those types of disasters [1]. Disaster management is defined as a collective term encompassing of all planning aspects for and responding to disasters, including both pre-disaster and post-disaster activities. It may refer to the management of both risks and consequences of a disaster. Disaster management is also about strong ability to plan and respond to an emergency [2]. Disaster management includes all parts of planning and responding to disasters, for instance; management of risks and disaster after effects. People react to disasters because of few reasons: (1) Protect (prevent and modify disasters); (2) Accommodate (change human use system to suit disasters); (3) Retreat (resettlement, forbid development in disaster zones, relocate); and (4) Do nothing. 1 and 2 are proactive actions and considered as an effective disaster management actions, while 3 and 4 are passive actions and do little job to be considered in the management [3]. There are six main components in disaster management which are; prevention, mitigation, preparedness, response and relief, rehabilitation, and reconstruction [2][5]. There is an overlapping and interrelated process of disaster management, and each process is not stopping or following each other [4].

Flooding and Its Impact

Flood means "a body of water, rising, swelling and overflowing land not usually covered. Flood could happen from overflowing of the bank of a stream, lake or drainage system of water to the nearest land as a result of a storm, ice melts tidal action and channel obstruction." There are no official classifications of a flood in Malaysia, but it is regularly and extensively categorised as monsoonal, flash or tidal floods. Furthermore, a flood is described based on the areas, characteristics, causes and duration [6]. Flood can begin naturally and also by human actions. Natural flood can cause a flash flood and land inundation. The flash flood is usually involving short rains but high in intensity, while heavy precipitation and widespread rain lead to land inundation. A human can cause flood when solid wastes are disposed into streams and rivers, sediments that come from construction activities or land clearance. All those can create bottlenecks and obstruction to the rivers. Flood can generally be classified into four types [7]; "Coastal floods - Fierce winds in tropical storms can drive ocean water onto low-lying coastal land. Coastal inundation can also be produced by tsunamis that are created by submarine earthquakes, landslides or volcanic eruptions. Flash floods - Gullies or normally dry creek beds found in semi-arid areas can quickly become powerful fast-flowing torrents during storms. River floods - Flooding along river margins is a natural event. Most floods occur seasonally, either when winter snows melt or combine with spring rains in temperate regions or heavy rains of the wet or monsoon season in tropical and sub-tropical regimes. Urban floods - As urban land is developed and paved, it loses its ability to absorb rainfall. In intense rainstorms, rainwater quickly becomes runoff. Inadequate man-made drainage culverts may overflow and flood low-lying urban settlements. Cloudburst - Sudden copious heavy rainfall in geographically small areas can cause floods". There are varieties of construction measures that can be used to reduce the flooding risk as follows; "Flood avoidance - Constructing a building and its surrounds at site level in such a way to avoid it being flooded (for example by raising it above flood level and re-siting outside flood risk area. Flood resistance - Constructing a building in such a way to prevent floodwater from entering the building and damaging its fabric. Flood resilience - Constructing a building in such a way that although floodwater may enter the building, its impact is reduced, for example; no permanent damage is caused, structural integrity is maintained and drying and cleaning are facilitated. Flood repairable - Constructing a building in such a way that although floodwater enters a building, elements that are damaged by floodwater will be repaired or replaced, also known as flood resilience" [8].

There are several impacts of flood including physical, social and psychosocial impacts. Physical impacts include death, injuries, building or infrastructure damages. These impacts are usually easily visible and easily measured [9]. Flood leads to the loss of life and assets, giving bad impacts to the country social and economical, the high cost of recovery and reduce the investment opportunity at the flood-prone area. Social impacts are divided into many areas such as psychology, demography, economy, and political impacts. Some of these social impacts have a long-term impression and also short-term [9]. Psychosocial impacts are related to psychology and social. When a flood occurs either on a large or small scale, flood victims will suffer mild or severe psychosocial effect. Apart from that, other impacts are the individual perception towards disaster will not be the same anymore, as things become personal issues. The affected people need to make adjustments to hazard so that it will reduce their vulnerability towards the flooding in the up comings. Some measures can be done after flooding such as [10]; Help and assistance – Help and assistance will be given to the affected individuals and building assets and property which possible. Improving existing infrastructure – The infrastructure that has been affected by the flooding should undergo a process such as upgrading, repairing and reconstruction. Another important thing is by improving the resiliency towards flooding in

the future. Business recovery – Help the organisation, administration, and stakeholders to resume their usual activities, and recover quickly from flooding. Supporting resources – Get relevant connections with the NGOs, government departments, and related agencies to make the process to become smoother. Learn from experience – Focus on rebuilding efforts that can reduce future risks, ensure building resilience and sustainability for a long-term process. Community understanding of the impact of flood decreases as the period between flood-events increases [11]. Therefore, there is such a need for advanced technology and instruments to reduce the impacts of the flood. When there is an absence of knowledge, assets and the right approach, those issues could not be tackled locally. A conceptual model is needed to assess flood damage to domestic properties from the evaluation of current knowledge [12]. The harm of the flood will dependably need the approach learning to guarantee that such assessments are both substantial and reliable. Works of literature to fix flood-damaged properties are broad-spectrum thus it is challenging to choose the right approach. Valuable guidance on redesigning the systems to tackle the issues should also be provided [13]. Flood damage measures must be considered when reinstating a property asset from the danger of future flooding. The new and existing construction or structure should be safer in facing the flood disaster threats, thus taking consideration of the successful practice is vital.

Understanding Malaysian History and Background

Great Britain has built up their colonies in Malaya previously amid 18th and 19th centuries. Starting from 1942 until 1945, Japan possessed the Malaya land. British then again ruled the Malay Peninsular apart from Singapore and shaped the Federation of Malaya in 1948, which became an independent country on 31st August 1957. The establishment of Malaya into Malaysia is on 16th September 1963, also known as Malaysia Day happened when the former British colonies of Singapore, together with Sabah and Sarawak on the northern coast of Borneo, joined the Federation. The addition of two states in the Federation, which are Sabah and Sarawak in 1963, and Malaysia is the member of Association of Southeast Asian Nations (ASEAN). Malaysia has thirteen states and three federal territories. Kuala Lumpur is the capital city of Malaysia, while Putrajaya is the government administrative center for Malaysia. Malaysia comprises of Peninsular Malaysia 50,700sq mi (131,313sq km), which includes the states of Perlis, Kedah, Pinang, Perak, Kelantan, Terengganu, Pahang, Selangor, Negeri Sembilan, Melaka, and Johor, and two federal territories (Kuala Lumpur and Putrajaya). In addition to that, there are other two states of Sabah and Sarawak on the Island of Borneo known as East Malaysia, including one federal territory known as the Island of Labuan, altogether 77,730 sq mi (201,320 sq km). Those two different geographical areas are isolated by about 403 mi (650 km) by the South China Sea. Peninsular Malaysia bordered with Thailand on the north, the South China Sea on the east, Singapore on the south, separated by the narrow Johor Strait, and Strait of Malacca, and the Andaman Sea on the west. Thailand and Singapore are the neighbours for Peninsular Malaysia while Sabah and Sarawak border are Kalimantan. Kalimantan is an Indonesian part of Borneo, while Sarawak surrounds the small part of Brunei.

Malaysia located at the heart of South East Asia and this country has a strong relationship with the foreign country as it is situated between the Indian Ocean and the South China Sea where it is the strategic place for traders and travellers. Malaysia received heavy rains all year round because of its beautiful tropical climate [2]. Malaysia lies between the latitude 2° N and 7° N of the equator and longitude 99.5° E and 120° E [14] and this county is 8 hours ahead of GMT. Malaysia is humid and hot country throughout the year with the average temperature between 20°C - 30°C (68-86°F) and the humidity level is around 90%. Peninsular Malaysia is having the wettest rainy season between September and December while Sabah and Sarawak are between October and February each year [15]. Malaysia situated outside the Pacific Ring of Fire. Therefore, Malaysia is generally has a minimal impact towards disasters found in neighbouring countries, for example, earthquakes and volcanoes eruptions. On the other hand, Malaysia is still vulnerable towards natural hazards including floods. It is a country with a population which already reaching 30 million people by 2014 [16]. In 2020, the population of Malaysia is reaching 32.4 million [17]. Malaysia consists of Malays, Chinese, Indians, and other ethnicities. All these different ethnics and religions live together as a community. Based on the estimation in 2010, the groups are Malay 50.1%, Chinese 22.6%, indigenous 11.8%, Indian 6.7%, other 0.7%, non-natives 8.2%. Malaysians speak a variety of language. Majority of them speaks Malay as the National Language, Chinese, Tamil, and English language are used widely. Malaysia is one of Southeast Asia's with the liveliest economies apart from having many years of modern development and political steadiness. Agriculture such as rubber, palm oil, and timber at one time became Malaysia biggest production, but now Malaysia is shifting to move its economy more towards service and manufacturing base. Not only have that, but Malaysia also got most of the revenue from oil and gas together with tourism. Malaysia is a successful nation in producing crude materials and now largely having a multi-sector economy [15]. Malaysia is now a middle-income country, and by 2020, Malaysia aims to have a high-income status through continuous booming economic conditions. Malaysia has good economic progress, which contributes to the social and urban development [16].

Malaysian Flooding Summary

Malaysia had faced with the worst raining season in 50 years time in December 2014 until January 2015. About 200,000 people become homeless as floods destroyed their home, and not less than 18 people have died in the flooding events [17]. There was much building, and public amenities were affected including schools, hospitals, roads and bridges, comprising private and public buildings. The process of repairing the roads, bridges and 215 slopes have cost about RM 1.09 million. Initial cost estimated to recover from the flooding is more than RM 2 billion [17]. Since flood frequently occurs in Malaysia, it is essential to distinguish between normal flood and a major flood. Although in the real case, the flood is a type of disaster and disaster cannot be classified as "normal." Events that involve major flood are also expressed as "unusual" or "extreme" events that render people helpless [18]. Based on the previous record, severe flooding will happen at three years interval. Malaysia has two different monsoons each year. First is Northeast monsoon from November to March and Southwest monsoon from May to September [19]. In Malaysia, the flood warning systems have been existed but have less impact in reducing the flood damage [19]. The Malaysian government has spent much money to reduce the flooding in the country. Under Malaysia's five year plans for development, allocations of money for design and construction of flood mitigation projects account for USD 4.564 (1st Malaysia Plan 1966-1970), USD 9.78 million (2nd Malaysian Plan 1971-1975), USD 32.6million (3rd Malaysia Plan 1976-1980), 65.2 million (4th Malaysia Plan 1981-1985), USD 97.8 million (5th Malaysia Plan 1986-1990), USD 228.2 million (6th Malaysia Plan 1991-1995), USD306.44 million (7th Malaysia Plan 1996-2000), USD 3.97 billion (8th Malaysia Plan 2001-2005), USD1.25 billion (9th Malaysia Plan 2006-2010) and USD 1.17 billion (10th Malaysia Plan 2011-2015) [20]. Management of flooding involves different stages and plans, and each one of them will have their significance [19]. The government of Malaysia has conducted numerous actions to improve prevention, mitigation, response, relief and recovery of disasters throughout the country [21]. The example of actions are; amendments to current regulations, setting up early warning systems and disaster alert system, come out with mitigation structure, create public awareness, develop fund for national disaster relief, follow standard operating procedures, programs conducted by Town and Country Planning Department and international collaboration [21]. Based on the flood that had hit Malaysia before, there were several problems identified to contribute to the seriousness of the flooding condition. The examples are [22]; lack of relevant national and state policies and action plans, regulations on urban planning and environment have not been adjusted to manage flood, lack of capacity and resources, lack of public awareness of flood variability and lack of flood-induced hazard mitigation. Records show that flooding is the primary disaster in Malaysia, affecting the highest number of people over the last period [23]. Therefore, Malaysia will study the disaster management models at the other disaster-prone countries, for example, Philippine, Indonesia, Japan, Korea and work with the United Nations disaster management division to formulate a better disaster management model for the future. In 2005, Malaysia adopted the Hyogo Framework for Action (HFA). HFA has come into existence where governments around the world have committed to take action to reduce disaster, and have adopted a guideline to reduce vulnerabilities to natural hazards. HFA assists efforts of countries and communities to cope better with the hazards that threaten the development. People involved in the construction management have to undertake active system in the involvement of specific issues like disaster recovery, business continuity planning, communication, human resource and environment. As for the country, there are two measures implemented by the Malaysian government, which are structural and non-structural measures [24]. Both structural and non-structural measures are carried out to reduce the likelihood and the impact of the flood in specific flood-prone locations.

The examples are as below (summarise by the author);

Structural measures: • Ponds and pump house • River improvement works • Infrastructure works • Barrage • Improvement and maintenance of main drains • Flood detention or retention ponds • Flood control dams • Canalisation works • River bounding • Storage ponds • Flood diversion channel or tunnel • Flood warning systems • Flood proofing	Non-structural measures; • Compliance with laws, acts, and guidelines • Awareness campaigns and education programmes • Flood catchment management • Relocation • Permanent flood control commission • Flood disaster relief machinery • Drainage master plan • River basin management and flood mitigation studies • Guidelines and design standards for flooding • Resettlement • Flood forecasting • Hazard mapping • Mitigation planning • Development of building codes • Development of training • Establishing reconstruction information centers • Assisting communities to promote sustainable development. • Land use planning
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Sustainable Flood Management

In ensuring the sustainability flood management comes into action, there should be a transformation of policies and strategies. The transformation is needed to provide fresh ideas and broader views on how to conduct and perform best for the future use [25]. The projects in flooding control should be assessed starts from the earliest stage to ensure a sustainable impact. Sustainability in future flood management requires the people involved to resolve the challenges that arise at the same time making strategies to make things better [25]. Sustainability would not only providing green infrastructure, but also provide multifunctionality in improving the performance of the assets [26]. Delivering those approaches requires identification on where this could be delivered, where could it be applied and to whom would they benefit [26]. It is expected that the sustainable flood management adapt by the urban development, including social, economic and environmental aspects while taking care of the land use, human environment and the natural resources [27]. The development of flood management should be able to upkeep and lead the long-term recovery efforts and sustainability [28]. The long-term planning for flooding hazards should have an effort to reconstruct and boost the built environment while putting attention regarding economic, environmental and social systems [29]. The scope should assimilate the long-term hazard mitigation, public safety and at the same time targeting resilience [28]. The works ranging from assisting economic improvement, building repair and reconstruction, infrastructure and environment restoration, sustainable and better land use, including other long-term recovery concerns acknowledged by the community involved [30]. Public and the stakeholders should be informed and aware of the on-going efforts, available funding and assistance that they can utilise or capitalise [28]. Based on John [31], managing disaster has grown where attention has been extended from response and recovery to public survival. Sustainability and survival ability are two features that are sharing the same notion, which is attaining persistent development concerning ecosystems, built environment, and humanity. As for the last 15 years, the emergency management involved in preparedness and response, now the focus has been changed into recovery efforts. These recovery efforts often take time and involve higher expenditure. The monitoring and evaluation of the disaster recovery and reconstruction process could be enhanced by applying the principles and practices of auditing and assessment to provide objective assurance that systems of governance, including risk management, operational performance, and financial control, are working.

Flood Approaches

Risk Analysis

Risk vulnerability versus risk analysis; in the NDRR research, vulnerability concept is vital. Vulnerability is defined as “the characteristics of a person or a group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural or man-made disaster noting that vulnerability is made up of many political–institutional, economic and socio-cultural factors” [32]. Risk Vulnerability Assessment (RVA) is the basis of the disaster risk management systems [33] and every authority should carry out this RVA. Different authorities could use different methods to select, analyse and evaluate potential disaster risks, vulnerabilities and their consequences [34]. If people have less concern about flooding, their vulnerability towards this disaster will be increased [35]. Flood risk management strategies should deal with few crucial aspects, such as risk-based assessment, effects of flooding, portfolio-based integrated management, analyses, evidence-based management, adaptations to changes, dealing with uncertainties and stakeholders, sustainable development [25]. No ultimate strategy could be used in reducing the flood risk. Therefore, mix or integrated approaches to flood risk management strategies are necessary [25]. The approaches are for example the management of the land use, structural defenses, and preparedness towards flooding. Stakeholders would be able to choose management options by having a clearer understanding of the flood perception and expectations. It could help in better sustainability for flood management measures [25]. Flood risk could become more severe because of a few main factors such as urbanisation in flood-prone areas, climate change and economic growth that can increase the welfare at risk [36]. It could comprise the structural and infrastructure defense, which is expensive and including the maintenance of those infrastructures which requires the involvement of the expertise [36].

Flood Resistance (FRe) and Flood Risk Management Plan (FRMP)

Flood Resistance (FRe) discussed by White [37]; FRe is needed to limit the damage caused by flooding. FRe has significant potential in flood risk management, but the use of FRe is still infrequent. It is a kind of flexible rounded approach; thus the use of FRe is encouraged for the property and community usage. Technological use in FRe could help in mitigating the flood risk into the smaller scale while taking care of the vulnerable buildings and vulnerable locations. Benefits of FRe are the ability to address uncertainty, minimising the flooding impacts and having the capacity for adaptation to flooding risk. There are few challenges in carrying out FRe, especially when it comes to justification of FRe for the building owners or stakeholders whom responsible for the payment. The state authorities that associated with the policies should give the support towards FRe. Hence, this could help to improve the flood defense as a whole. It is found that there is a lack of incentives given by the government agencies, authorities, planners and insurance to promote innovative technologies like what the FRe has. There is also a lack of knowledge in FRe where the implementation of FRe is insufficient regarding education and capacity building. In addition, Flood Risk Management Plan (FRMP) is another resistance efforts in managing disaster amongst the urbanised countries. FRMP used infrastructure to control flood and using laws and regulations to control actions. Flood defense in FRMP involves command and control in engineering works that usually used by the authorities [27]. In making the FRMP a success, it needs to be organised expertly and meet the objectives apart from reducing the vulnerabilities [27]. More great prospects of FRMP need to be studied comprising the social efforts, flood resistance and it impacts [38]. Apart from that, the FRMP that is based on resistance needs to be adapted, understand and would be able to enhance resilience to floods [38]. It is because FRMP has a complicated challenge to cover the scientific, practical and political dimensions [38]. The example of FRMP implementation includes few matters such as; managing the water cycle as a whole, integrating land and water management, maximising the use of floodplains and adopting a mix of flood mitigation strategies, ensuring a participatory approach, and adopting integrated hazard management [39].

Public Attitudes

This section will review the public attitudes within the case study selected from the previous literature such as university and school from a paper by Hirunsalee [40] and Cadag [41] This section discussed on research that focuses on reviewing public attitudes toward the additional roles of the university in disaster management to ensure that the university could benefit the society and could have something in return to the society [40]. This CSR approach comprises giving back to the society by using the university as a right approach in dealing with NDRR, such as designing the university to be more resilience than other public assets or amenities [40]. The university should have a more advanced infrastructure, great supporting teams and is able to handle emergency better [40]. Despite that the university should always have a contingency plan, the university disaster management should have effective communication and immediate humanitarian aid. The existence of an evacuation center by the university shows that the university has at least a reliable system [40]. However, this study finds that there were only a few

universities involved with these kinds of approach [40]. This situation is particularly onerous because the university should have provided the opportunity for learning, but also provide protection to the public in the event of the disaster [40]. By having a great CSR in flooding, the university image can be improved. The university ethics, legal requirement, and business practices will earn the public respects as well as protecting the environment [40]. Floods could cause damage to school facilities, disruption of classes, and deteriorate the learning environments [41]. If the flood does not cause much damage, normal activities still cannot be carried out because the flood victims might as well use the properties for shelters within a specified period [41]. The stakeholders may neglect small-scale disaster because of reasons like politics, budget and administration efforts to mainstream NDRR into the education sector, in collaboration with national and international organisations [41]. In this particular literature, the school that has chosen as the case study already attached to the School Disaster Risk Reduction and Management Councils (SDRRMC) together with the implementation of few others NDRR activities [41]. The concerns arise when there is still limited information provided to access problems associated with the small-scale disaster in school. There are challenges in NDRR in the education sector such as identifying the vulnerability of each aspect including people, properties, local capacities and knowledge management. Moreover, there is lack of training among the school teachers and the NDRR staffs, lack of guidelines to improve the current NDRR and maintain the efforts, including lack of funding [41]. There is high importance in education emergencies and recovery. Thus the involvement of the school teachers and NDRR staffs are required, including the voluntarily and resilience activities [41]. During the pre and post-disaster, the school usually get help from the external aids, thus conducting the NDRR program should reduce the over dependency on external help. There are some issues asked in the study, such as whether the schools knowingly constructed in flood-prone areas or schools constructed and designed to provide resilience [41]. The enforcement in land use planning, the importance of hazard maps is things that can make things better in NDRR within the school [41]. Some reasons that make floods becoming severe issues are like an excessive amount of rainfall, the intrusion of sea-water to land, land-subsidence, degradation of the drainage system, dam breaks and more [41].

Guidelines

Additionally, every disaster has to be carefully classified because of its different approach [42]. There is a need for disaster management knowledge, and the related personnel should undergo training in handling facilities during the disaster could help in controlling the floods. The real planning needs to be revised accordingly whenever necessary [42]. Specialisation in disaster management could improve the disaster measures and reconstruction efforts. Specialist personnel could be appointed to handle the required task to improve performance [42]. Every disaster management needs to follow the set of Standard Operating Procedures (SOPs). This SOP should include the framework, disaster management details such as population, demographics and resources and the SOP must be kept up to date when required [42]. There is a difference between the United Kingdom and Malaysia when dealing with legislation related to flooding. The United Kingdom should flow the flooding central legal framework while Malaysia needs to refer to the National Security Directive No.20. [43]. Since Malaysia do not have any original legislation for flooding management that can also be used as a reference, it is good to learn from the UK. With the existence of legislation for flooding management, it will help to create greater understanding among many stakeholders and different agencies in Malaysia. Suitable measures and reducing flooding impact can be made in a better way while protecting the community [43]. In the UK, there is a Flood and Water Management Act 2010, which provides comprehensive flood management. In this Act, the roles of each stakeholder and agencies can be referred to manage the flood and coastal risk [43]. This Act also is fulfilled the need for European Floods Directive 2007. It is stated that the member should have their policies, plans, and programs, which can do the administration organize flooding problems [43]. Aforementioned of the 2010 Act, flooding management in the UK is the same with Malaysia. Flooding laws can be found in legislation, for example the Water Act 2003, the Environment Act 1995, the Water Resources Act 1991 and the Drainage Act 1991, the Town and Country Planning Act 1990, the Building Act 1984, the Highways Act 1980 and the Civil Contingencies Act 2004 [43]. Malaysia National Security Council Directive No. 20 is a directive that can be referred to, but it is not covering the whole extensive issues of flooding in Malaysia. It needs to deal with several other legislation to manage flood, including Land Conservation Act 1960, Town and Country Planning Act 1976, Environment Quality Act 1974, Local Government Act 1976, Irrigation Areas Act 1953, Drainage Works Act 1954, National Forestry Act 1984 and Uniform Building By-Laws 1984. Different acts should be used to tackle different issues of flooding. Land use planning is governed under the Town and Country Planning Act 1976 (Act 172). There is also another policy that directly involved with the Hyogo Framework for action 2005-2015, which is The National Urbanisation Policy. On the other hand, Malaysia National Physical Plan (NPP) integrates the management of geo-hazards including flooding [44]. Disaster Management and Relief Committee in Malaysia is responsible for handling the emergency events that involve different groups from the central, state and local levels [28]. To come out with the flood redevelopment plan, first, the steps involved are to identify the policies, operational strategies, processes and the roles and scopes of all the stakeholders. The

contribution of stakeholders regarding ideas and response could help to make the right decision during hard times. Redevelopment plans could be carried out with the right involvement of the stakeholders on board. It is believed that the recovery phase after the disaster is the most critical stage as it encompasses managing numerous undertakings instantaneously [28]. The recovery efforts begin at the end of the emergency phase. It will be established by the standard strategies and policies that assist the recognized in recovery functions [28]. Among the undertakings are the reconstruction of damaged or affected buildings, local businesses, and individuals with inadequate capabilities. The real disputes today include a few points for example planning, stakeholders' management, restoration, reconstruction and delivery [28].

Disaster Recovery Misunderstanding

There are three major misunderstanding about disaster recovery [45]; First misunderstanding is the recovery phase can be performed spontaneously after the response phase ended. When referring to the process of emergency management as per figure, the recovery phase will take over after the response phase finished. The fact is, effective disaster recovery will come into place if the process starts along the way with the response phase. This is because, during recovery, essential data and planning should be gathered at earliest possible starting from the response phase itself. The response phase urgency to return to normal condition is now widening from human safety to business issues. The second misunderstanding is that all the recovery undertakings can be planned during the response phase. It is not true because, during an emergency, everything needs a fast decision and less time to plan. Lesson learned that had been designed even before flooding disaster can be used with adjustments during the recovery process. The third misunderstanding is the recovery phase objective is to endure the community getting back towards the exact condition before flooding. After disaster strikes, things will never get back to its normal condition again. Some will need substantial capital to recover and disaster will not only affect properties but also impact the issues of education, business, health and more [46]. After floods have subsided, it imposed an impact on humans and the environment. It is not wrong to get back to the previous state, but in the process of returning to the original state, improvements should be made and any recovery aspects made should be better than before. It is assumed that every disaster impact provides positivity input to flood victims. After a massive flood, reconstruction efforts need to be carried out by the parties involved in the affected zone [45]. Immediate flood relief works need to be done accordingly. While highlighting issues of reconstruction, the aid to flood victims needs to be prioritised [45].

Malaysian Disaster Management Legislations

The main agencies involve in disaster management in Malaysia [47] • Special Malaysia Disaster Assistance and Rescue Team (SMART), • Malaysia Metrological Services (MMS), • Drainage and Irrigation Department of Malaysia (DID), • Social Welfare Department • Non-Governmental Organizations • Malaysian Red Crescent Society • Civil Defense • International Cooperation	Water related legislation in Malaysia [6] • Water Act, 1920, The Mining Enactment, 1929 • Geological Survey Act, 1974 • Irrigation Areas Act, 1953 • Streets, Drainage and Buildings Act, 1974 • The Forest act, 1984, The National Code, 1985 • The Incorporation (State Legislature Company) Act, 1962 • The Drainage Works Act, 1985 • The Fisheries Act, 1985 • Environmental Quality Act, 1974 • Land Conservation Act, 1960 • Town and Country Planning Act, 1976 • Local government Act, 1976 • The Merchant Shipping Ordinance, 1952 • The Port Authorities Act, 1963 • The Emergency (Essential Powers) Ordinance No.7, 1969 • Selangor Water Supply Enactment, 1997 • Selangor Waters Management Authority Enactment, 1999
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Malaysian Laws Summary

There are few reports regarding the Malaysian government involvement in NDRR from the earlier time, and the author have summarise all of these as below;

Malaysia: end of International Decade for Natural Disaster Reduction (IDNDR) assessment report (1998)

Issues	Detail
Malaysia Major Disaster within 5 years (1993-1998)	• The collapse of Highland Towers Condominium (11th December 1993) • Landslide in Genting Highlands (30th June 1995) • Mudslide in Post Dipang aborigines settlements (26th August 1996) • Tropical storm “Greg” in Sabah (26th December 1996) • Widespread forest fires (January to May 1998)
Effected people and properties	• 361 died • More than RM200 millions properties were damaged • More than 2000 hectares land were burnt • Haze effecting people health
Measures taken	• Resettlement of people living along riverbanks and landslide prone areas • Constructions of retention walls at the landslides prone areas • Improving early warning system • Formulation and enforcement of laws and regulations with regard to hilly areas development • Proactive approach to tackle forest fires as well as the enhancement, awareness/education and beefing up helicopter fire units.
Ways to prepare for natural disasters	• Improvement in early warning systems • Construction of structural facilities to prevent and reduce the impact • Improvement in education and awareness to the communities • Drills exercise among communities
Malaysia achievements regarding IDNDR	• National Haze Action Plan • Special Malaysia Disaster Assistance and Rescue Team (SMART) • Policy and Mechanism of National Disaster Management and Relief (National Security Council Directive No. 20)
IDNDR contributions to Malaysia	• Put concerns on sustainable development, also providing effective disaster reduction • Promoting knowledge and technologies in promoting disaster reduction • Awareness and measures to prevent, mitigate and prepare to face natural disasters
Mitigation measures	Non structural • Strengthen disaster management system • Increase training activities • Promote public awareness on disaster prevention • Improve forecasting and warning system • Improve hazard mapping Structural • Landslide control measures and river embankment

Malaysia: Statement made at the Global Platform for Disaster Risk Reduction (2007)

HFA : Malaysia has adopted the Hyogo Framework for Action (HFA) in 2005

National Awareness Day: 26th December declared as Malaysia National Disaster Awareness Day
Challenges:

- It is always difficult to get all the relevant parties to work together
- Public perception is that handling disaster is the sole responsibility of the government
- Early warning provided by the government is not sufficient
- There is need of public awareness through formal and non-formal education
- Malaysia needs to have an integrated early warning system for any disaster threats

Malaysia needs a comprehensive disaster management approach to address the challenges of: Integrating cross cutting issues either at national, regional or international level

- Using science and technology in disaster management and the questions of financial assistance and national commitment
- Providing platform for economic sustainability to both victims and nations
- Creating effective public awareness and participation programmes
- Calling for coordination of national, regional and international organisation to lead in their respective field of specialisation
- Calling for developed countries to provide assistance in technologies, expertise, training and capacity building to developing and third world countries especially to those countries, which are prone to disasters.

Malaysia: Statement made at the Global Platform for Disaster Risk Reduction (2009)**Improvements in DRR;**

- National Slope Master Plan by Public Work Department's
- Ministry of Information, Communication and Culture has created a Disaster Unit in the Department of Broadcasting Malaysia
- The Government departments and institution of higher learning have organised awareness programs on natural disasters to the public
- National Disaster Relief Fund provides financial assistance to those affected by disasters.
- Government through the Central Bank of Malaysia provide RM 500 million (USD 140 million) of Special Relief Guarantee Facility (SRGF) aim at recovering businesses and rebuilding damaged infrastructure affected by disasters.
- Amanah Ikhtiar Malaysia (The Endeavor Trust of Malaysia) provides service includes microfinancing, compulsory savings and welfare funds targeting the poor and marginalised.
- Ministry of Natural Resources and Environment strengthen capacity and build awareness at all levels concerning climate change.
- The Government is also preparing the 2nd National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) to report the country's progress in addressing climate change.
- The National Hydraulic Research Institute of Malaysia (NAHRIM), which leads the country on climate change vulnerability and adaptation, has carried out a study on the impacts of climate change on the hydrologic regime and water resources of Peninsular Malaysia in 2006.
- Malaysia's regional cooperation on Disaster Management (ACDM) was established in 2003
- ASEAN Agreement on Disaster Management and Emergency Response (AADMER) was established in 2005.
- In early 2009, Malaysia was entrusted by member states to be the first Chairman of the Subsidiary Committee on Disaster Risk Reduction of the United Nations Economic and Social Commission for the Asia and the Pacific (ESCAP).
- Malaysia hosted the Third Asian Ministerial Conference on Disaster Risk Reduction in Kuala Lumpur from 2nd to 4th of December 2008.

National progress report on the implementation of the Hyogo Framework for Action (2009-2011) and Sendai Framework for Disaster Risk Reduction (2015-2030) will not be discussed further in this paper, as it requires supplementary discussions.

NRA Deliberations

Based on Lin [33], National Risk Assessment (NRA) is a new method that is targeting an issue that can affect the country including issues in DRM and often dealing with multifaceted disaster issues. In the European Union (EU), most members already delivered their own NRA following of the EU directive. NRA undertakings of each country would create a better understanding among countries. Thus the broad method for DRM can be better prepared. Earliest examples of NRA come from Dutch and British, and they are frequently used as a reference, and much can be learned from those countries. NRA is carried out to identify the possible threats and risks arrive from disaster and thus addressing the problems [48]. The issues occur are like coordination between different level of administration, stakeholders approach and complex organisation. Not only that, government lack of capacities and issues of privatisation also become concerned [49]. There are several benefits of NRA such as reducing vulnerability to disasters, improving policy and make better use of resources. Further in this section are the discussions on the National Risk Assessment (NRA) in the UK carried out by the Environment Agency [50]. NRA protects essential national infrastructure and keeping essential services running. NRA focuses on all planning phases involving flooding risk reduction. New developments at the high risk of flooding are not encouraged, the policy also emphasises safety and avoid in transferring risk to other places. NRA also focuses on the protection of national infrastructure and ensures the essential services keeps running. The Environment Agency will guide the developers to reduce impacts of flooding, making sure every planning is following the national policy and conducting the relevant test to see the development that needs to be carried out is safe. NRA requires the excellent flood response and recovery by working together with other agencies, planning and managing flood in advance and as detailed as

possible. While the government provides the relevant recovery guidelines, local authorities are expected to be responsible for the recovery of the community. This national assessment provides details related to flooding damage, costs involved, affected properties including their types and location. Somehow the current NRA in flooding does not look further into flooding impacts such as a threat to life, crops and livestock destruction, disturbance towards the public transportation, changes in long-term towards the environments, land use and land value. The assessment also classifies land at risk into categories; weather severity to cause a flood, the probability that it can beat the defense structures or lead to their failure. Moreover, NRA in flooding help in detecting and forecasting floods, giving the warning and doing appropriate communication about floods and do the flood forecasting and warnings could ensure when the floods will occur and the seriousness of the flooding. Not only that, it could help the communities in defending their properties, handling difficult decisions, setting up long-term planning framework in flood management national flood risk assessment in the UK. NRA should be carried out in Malaysia provides details related to flooding damage, costs involved, affected properties including their types and location. New developments at the high risk of flooding are not encouraged, the policy also emphasises safety and avoid in transferring risk to other places. The Environment Agency will guide the developers to reduce impacts of flooding, making sure every planning is following the national policy and conducting the relevant test to see the development that needs to be carried out is safe. NRA requires good flood response and recovery by working together with other agencies, planning and managing flood in advance and as detailed as possible. While the government provides the relevant recovery guidelines, local authorities are expected to be responsible for the recovery of the community.

Conclusion

Floods are successive and destroying occasions around the world, and their effects can be severe. The result of a flood can be distressing including physical damage, trauma, disturbance lives and worry. The occurrence of flooding impact is the sign of poor planning together with human activities. Moreover, the general rules and structure in the flooding management should be made clear. Meanwhile, a comprehensive and coordinated approach is necessary to handle the danger of disasters effects. The policy makers for the capacity for NDRR can use that valuable knowledge. Appropriate communication is vital for the communities as people can have the ability to use the information in regards to the flood prevention and mitigation. Not only that, the vulnerability of the area deemed necessary as it can help with applying the proper building codes together with the regulations for the construction management actions. The 'culture of prevention' between the NGOs and private sectors should be made known to reduce the impact of environmental hazards, for this case is flooding. In dealing with natural disaster management, the government and local authorities are those front lines that have the administration control over the undesired flooding events. By looking at these circumstances, the professional approaches are always in demand. Several measures can be done such as the set up of the base camp, collaboration with the locals, creating teamwork, widening the knowledge, providing skills and training opportunities, appointing leaders, comes out with volunteering teams. The response team would have the ability to provide relied efficiently upon, identifying the current or emergency needs, knowing the worst affected areas and taken care of the victims mental and health condition. The challenges involve lack of DRM from a different perspective, the discrepancy in the matter of role and responsibilities, lack of money, human resources and knowledge. This paper put concerns on few factors in dealing with NDRR such as incentives in any collaboration, stakeholders benefits, the significance of building agreements, independent facilitation, create understanding towards the information received and make informed decisions including opportunities in making new resolutions.

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