MALAYSIAN UNIVERSITY PRE- AND POST-FLOOD RISK REDUCTION STRATEGIES

A thesis submitted to The University of Manchester for the degree of
Master of Philosophy
in the Faculty of Science and Engineering

2023

NURASHIKIN BINTI MOHAMMED THOHIR

SCHOOL OF MECHANICAL, AEROSPACE and CIVIL ENGINEERING

Abstract

This thesis is guided by the Sendai Framework's objectives and guiding principles. The purpose of this study is to develop broad strategies for Malaysian universities' flood risk reduction efforts. The situation at Malaysia's universities should improve, as little could be done while the flooding continued. Even when flooding occurs on a small scale within the confines of a university, complications arise. For example, the community panics, emergency assistance is delayed, and the university administration provides scant information necessary to ascertain the source of the problem. The author's objective is to identify gaps in the provision of, and awareness of, flood disaster risk reduction (DRR) concerns at a Malaysian university and to propose practical strategies or solutions. A convergent parallel mixed-methods design will be used to collect qualitative and quantitative data. The interview questionnaire is based on a theoretical construct of risk perception, whereas the questionnaire survey is based on sociodemographic variables derived from a risk and risk perception literature review. A questionnaire survey was distributed to students from three UiTM campuses in Malaysia, and semi-structured interview sessions with university administrators were conducted at five UITM campuses in Malaysia. Numerous pre-and post-flooding strategies developed at Malaysian universities will serve as input for future research examining DRR, not just in terms of risk perception, but also in terms of individual vulnerability to risk or the source perception, namely knowledge. The findings indicate that the literature review will yield a variety of strategies and recommendations to assist in the development of comprehensive plans for flood DRR in Malaysian universities. This research indicates that students who have a strong understanding of disaster preparedness, a high-risk perception, and the capacity to plan for disasters are better prepared for disasters than students who perform poorly, have a low-risk perception, and have low self-efficacy. Theoretical constructs in risk perception serve as the primary framework for developing a university strategy in Malaysia. Risk perception is related to strategies collected in all facets of NDRR for Malaysian universities. As a result, Malaysia's university sector has adopted a proactive approach to flood risk management rather than a reactive one. DRR at the university could be enhanced further by implementing more effective strategies and enhancing decision-making.

List of Contents

Word Count: 104,673

Lists of Tables

Lists of Figures

Published Works

1. Nurashikin, M., Edwards, R., and Gale, A. (2018). Optimisation of flooding recovery for Malaysian universities. *Procedia engineering*, *212*, 356-362.
2. Nurashikin, M., and Edwards, R., (2018). Towards Sustainable Development in Malaysian Natural Disaster Risk Reduction (NDRR). *OIDA International Journal of Sustainable Development*, *11*(08), 41-54.
3. Nurashikin, M., Edwards, R., and Rumaizah, M. N. (2019). Reducing Flooding Impacts to the Built Environment: A Literature Review. In *MATEC Web of Conferences* (Vol. 266, p. 02001). EDP Sciences.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

i. The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the "Copyright") and she has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.

ii. Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made **only** in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.

iii. The ownership of certain Copyright, patents, designs, trademarks, and other intellectual property (the "Intellectual Property") and any reproductions of copyright works in the thesis, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author, and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.

iv. Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=24420), in any relevant Thesis restriction declarations deposited in the University Library, The University Library's regulations (see http://www.library.manchester.ac.uk/about/regulations/) and in The University's policy on Presentation of Theses.

Acknowledgements

First, I would like to express my heartfelt appreciation to my supervisors, Dr. Rodger Edwards, and Professor Andrew Gale, for their excellent guidance, support, and patience throughout my studies. Their vast expertise and extensive experience have aided me in academic studies and everyday life.

Additionally, I would like to express my gratitude to my sponsors, the Ministry of Higher Education Malaysia and UiTM Malaysia, for their technical assistance during my education. I want to express my appreciation to all members of the University of Manchester; their kind help and support have made my studies and life in the United Kingdom enjoyable.

Finally, I would like to express my gratitude to my lovely mother, my beloved father, who passed away on May 22nd, 2021, my spouse (Ikhwan), and my two children (Nada and Lena). Without their incredible patience and encouragement over the last few years, I would not have been able to complete my studies.

CHAPTER 1

1 Introduction

This chapter discusses the overall importance of the research, which leads to the subsequent section's formulation of the literature review and methodological design. The practical approach chosen by this study is to answer the research questions undertaken during the research process.

1.1 Background

Natural disasters are difficult to predict. With natural disasters becoming more common and frequent as the climate changes, development must prioritise planning for the worst-case scenario (Tipson, 2013). While natural disasters strike both developed and developing countries, the consequences vary significantly according to the development level (Cannon, 1994). As a result of the increase in natural disaster losses, policymakers, practitioners, and research community members worldwide are looking for an effective and efficient ways to mitigate or eliminate them (Palliyaguru, Amaratunga, and Baldry, 2014). Appropriate measures could aid the community in responding more effectively to disasters.

The aftermath of a natural disaster may catalyse longer-term, and more positive change. Reduced disaster risk is an economical way to mitigate future losses, particularly for developing countries (Chatterjee et al., 2015). According to Barakat (2003), disasters have a more significant impact on the built environment of developing countries than on developed countries. As a result, stakeholders should refrain from simply waiting for natural disasters to strike. According to historical data, hydro-meteorological (atmospheric, hydrological, or oceanographic) disasters occur five times more frequently in Asia than geological disasters (Guha-Sapir, Below, and Hoyois, 2016). Malaysia's task is to limit the consequences of natural catastrophes, notably floods, while the economy grows.

1.2 Research Significance

A general disaster management manual by the Malaysian government applies to all types of disaster in Malaysia, but it is not convenient (Saifulsyahira et al., 2016). It is due to the lack of specialisation in solving a problem. Malaysian ways of handling flooding, along

with the country large financial spending is not convincing enough to reduce the flooding impacts. Post-flooding projects and risks are hard to manage because the lack of knowledge. The recovery phase involved a hard battle and lack in support system (Butler et al., 2016). Executing plans for flood disasters across a larger university institution is a puzzling task. The actions vary from easy to hard jobs. Some challenges involve within the university are for example, the budget cut, economic recession, and the policy that keep changing from time to time. Decision-making on university issues is also complicated, especially during recovery and redevelopment (Comfort et al., 2001). Decision-making within the university involves a long process and requires different levels of flood committee or stakeholders, which leads to difficulty in getting fast results and decisions.

The Sendai Framework for Disaster Risk Reduction (2015–2030) emphasises the importance of disaster studies. The Sendai Framework's targets and guiding principles for the author of this thesis. While this study focuses on developing strategies for Malaysian universities using the DRR approach, the framework serves as the primary reference for developing the study's headings and subheadings.

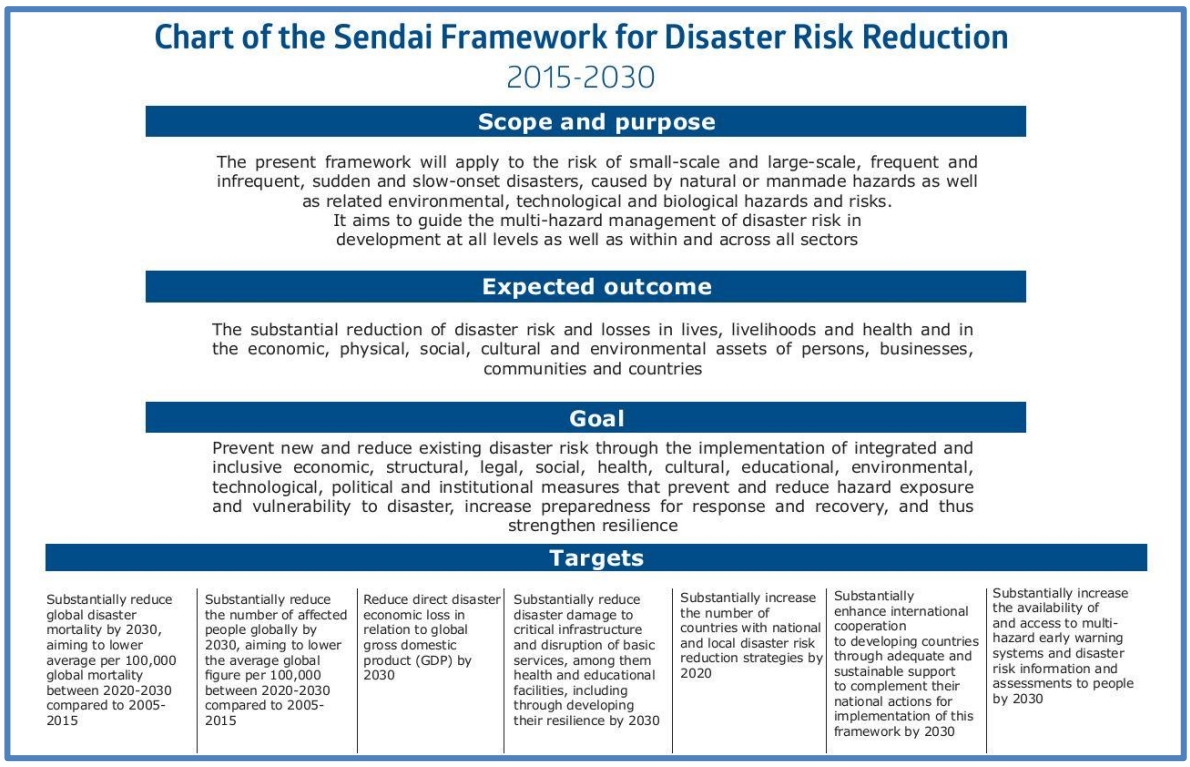

Figure 1: Scope and Purpose, Expected Outcome, Goal, and Targets of Sendai Framework for Disaster Risk Reduction (2015-2030).

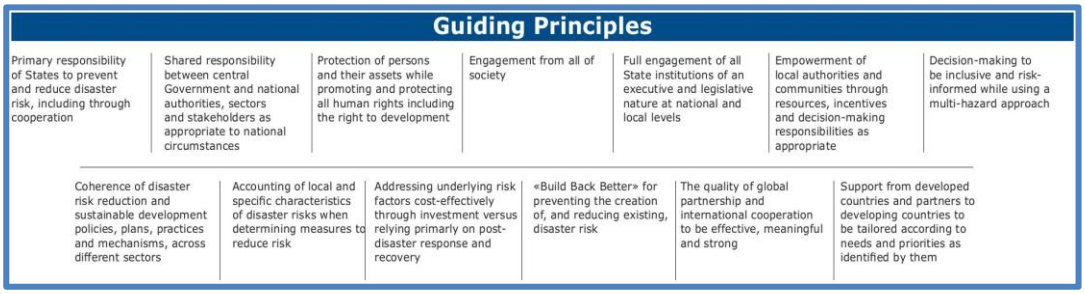

Figure 2: Guiding Principles of Sendai Framework for Disaster Risk Reduction (2015-2030).

MARA University of Technology (UiTM) was chosen as a field study. It is Malaysia's largest institution of higher learning, with 35 campuses and branches located throughout the country. It could encapsulate the entire image of Malaysian university endeavours. The university is well-known in Malaysia; thus, it would benefit if it had a higher-quality and more advanced approach to flood recovery. Additionally, university own substantial amounts of intellectual capital (library, instructional materials, and current research), as well as pricey research equipment and other infrastructure. Flooding can potentially inflict significant damage and disruption, and it is not hyperbole to assert that the negative consequences of such disasters might be catastrophic. Without considering the human implications, the loss of vital research equipment combined with a long lead-in period for replacement might effectively bring research programmes to a standstill. As a result, the prior study is practically meaningless.

In Chapter 3, the study develops a method for bridging this gap. The process is critical for identifying ways to strengthen pre- and post-flood risk reduction strategies for Malaysian universities. The literature review's findings suggest approaches to various aspects of management that can be synthesised to improve university planning. Additionally, it will discuss how universities are currently implementing, integrating, and mainstreaming NDRR into developing university policies and processes to improve recovery options. Furthermore, a quantitative method based on questionnaires and a qualitative approach based on interviews would assist in accomplishing this.

The study demonstrates the critical nature of establishing a context where people can share their perspectives and collaboratively learn from one another. This research aims to promote a resilient and sustainable approach to recovery and reconstruction to create a more safe and secure university environment. The study is expected to benefit policymakers, practitioners, and university community members, including administrators, students,

faculty, and building users. They should gain a better understanding of the NDRR's role in flooding. It may also assist the author in contributing some inputs and thoughts to see further improvements in Malaysia's flooding situation. In any case, let the public view this study as a first step toward closing the "recovery gap," as there is a glaring omission of what has been done to assist Malaysian universities in the aftermath of disasters. There has been no comprehensive assessment of the issues and problems raised and explained thus far. The author uses the term "NDRR" to confine the discussion to natural catastrophes. The NDRR continues to be buried behind a vast region of DRM. Additionally, NDRR plans aim to mitigate the harm caused by flooding, drought, and other natural disaster hazards.

1.3 Research Gap

Disaster preparedness should be a priority, even more so in densely populated areas (Sherly et al., 2015). Individuals gain knowledge from their disaster experiences, but they quickly forget (Kreps, 1984). They will have sustained additional losses and suffering by the time another disaster strikes (Hamin, Othman, and Elias, 2013). Additionally, repeated flooding events can have a long-lasting effect on communities (Bhattacharya-Mis and Lamond, 2014). Continued flooding would result in the recurrence of previously avoidable problems, rendering DRR ineffective (Cosgrave, 2014). Worse outcomes are possible if flood planning is neglected and people react when flooding occurs (Gardner et al., 2007). Floods wreak havoc on the built environment and communities. Thus, the management team should have a flood plan in place, and the buildings must be prepared to withstand the threats (Batica and Gourbesville, 2016). Flooding can also cause operational disruptions and detrimental effects on university operations (Gardner et al., 2007; Carlisle, 2008). Additionally, it may result in property damage, class disruption, and deterioration of learning environments (Cadag et al., 2017). Floods occasionally occur when institutions are unprepared (Wedawatta, Ingirige, and Proverbs, 2014), and those most vulnerable are typically those whose lives are entirely improvised (Hamin, Othman, and Elias, 2013). This thesis also provides weaknesses in various vulnerable aspects, coping skills, and potential intervention methods. It emphasises the need to consider vulnerability as a dynamic process that concurrently concentrates on vulnerabilities, coping capacity, and a possible feedback mechanism that intervenes to lessen vulnerabilities (Few, 2003).

According to Beaton et al. (2007), no previous study on university students' preparation for natural disasters during their formative years had been conducted. Cities should be more resilient to risks and recover more quickly (Rani et al., 2017), and the author

believes that institutions such as universities are critical for each city's development. Any disasters that occur on a university campus should not be overlooked, as a university or campus's ability to recover from disasters is comparable to that of cities and communities (Sheffield, Gregg, and Lee, 2016). A university serves as a model for how educational institutions should behave in the event of a disaster, and it serves as a role model for the communities in it (Comfort et al., 2001). Families and students are primarily concerned with the institutional environment's security (Sheffield, Gregg, and Lee, 2016). Roosli and Collins (2016) argue that organisations, including universities, should participate in disaster recovery planning before the occurrence of a disaster. If such incidents occurred, they would significantly impact higher educational institutions, forcing them to acknowledge their weaknesses and vulnerabilities (Sheffield, Gregg, and Lee, 2016). Universities and colleges must take a leadership role in educating, guiding, and assisting post-disaster activities and efforts. A disaster management plan would help the higher educational institution respond appropriately to and mitigate the effects of a disaster (Carlisle, 2008). Even though this will be a prolonged struggle, the university must carry out DRR efforts while mitigating flood damage and quickly resuming normal operations.

Numerous opportunities exist to advance disaster management in flooding, whether in higher educational institutions or residential properties. Academic institutions must acquire knowledge about disaster risk reduction (DRR) to apply it to national and local policies and actions (Wahab, 2013). Additionally, government agencies are tasked with university in educating the public about disaster risk reduction (Sellnow and Sellnow, 2010). Local governments must aid educational institutions in their recovery efforts following disasters (Sakurai et al., 2018). Future generations' needs and contributions must be included within the inform planning and policy development, to mitigate the negative consequences of future hazards (Mort et al., 2018). Understanding of planning and policy is critical for this study. This also has policy implications for disaster management since nations' development processes advise proactive steps to minimise catastrophes.

Malaysia requires legislation, or at the very least, a central management body that oversees the safety and compliance of Malaysian higher education with all applicable regulations. This includes the welfare of the university community, the safety of university settings, the preparedness of individual for disasters, recovery-related amenities, and the availability of recovery teams (Hamin, Othman, and Elias, 2013). Higher authorities are responsible for the recovery regulation, which was not mentioned in the Malaysian National Security Council (NSC) (Khalid and Shafiai, 2016).

Numerous comprehensive guides and rules exist internationally for disaster recovery and reconstruction, but none exists in Malaysia (Roosli and Collins, 2016). Malaysia requires a unified legal structure adaptable to the community's needs rather than a patchwork of contradictory legislation governing flood risk management. Malaysia's disaster risks may increase due to social, economic, and technological evolution (Hamin et al., 2013). This is also true in the case of university disasters, where the flood management is in the dark. Universities should implement disaster recovery and response plans or policies they deem appropriate for their institutions. However, many of them are overly broad in scope and insufficiently tailored to their current state of disaster risk (Fillmore et al., 2011). Even critical infrastructure and assets are not adequately protected from flooding risks (Zevenbergen et al., 2018). To assist people in obtaining more accurate information and making more informed decisions, practical and feasible measures are required (Zevenbergen et al., 2018). Apart from a documented manual of risks and safety measures and job descriptions for personnel during flooding, the Malaysian Ministry of Education has not included in the NDRR any framework to guide higher educational institutions in terms of disaster management.

1.4 Research Questions

This thesis aims to identify gaps in provision, awareness, and existing knowledge regarding flood disaster risk reduction (DRR) concerns at a Malaysian university and propose practical strategies or solutions. This mixed-methods study will guide how DRR in floods is implemented within the institution by improving disaster preparedness and developing more effective ways of dealing with future flooding disasters through an improved decision-making process. A convergent parallel mixed-methods design will be employed to collect qualitative and quantitative data in parallel, analyse them individually, and then combine them. In this study, a questionnaire survey and a face-to-face interview will be used in conjunction with the theory to affect disaster management plans positively and how the Malaysian university community perceives risk. The literature evaluation will examine ideas and recommendations that will aid in the creation of comprehensive plans for disaster risk reduction in Malaysian universities. The purpose of collecting both qualitative and quantitative data is to investigate the state of knowledge regarding complicated issues affecting higher education institutions (universities) in Malaysia in response to disaster management through literature and existing theories, while clarifying the university community's risk perception of institutional control and the respondents' current knowledge of flood disaster risks.

Research Question 1: What is in the literature review worth exploring to provide strategies to assist Malaysian universities in conducting further exploration and development in flood DRR?

Research Question 2: What is the relationship between respondents' risk perceptions with their prior knowledge associated with NDRR at the study settings?

Research Question 3: How can the various data sets gathered aid in the development of future practises for managing pre- and post-flooding disasters at Malaysian universities?

The above research questions and keywords are based on Creswell (2013); the qualitative study will include keywords like exploring, generating, developing, creating, providing meaning, or explaining personal experience. On the other hand, quantitative study keywords provide factor determinants, identifying relationships, causes, influences, and effects. The right keywords are chosen to help the reader understand the study's mixed-method design.

1.5 Research Scope and Limitations

This research focuses on reducing the risk of natural disasters (NDRR). Flooding is the primary focus of this research on natural disasters. The study will then determine the recovery process for flooding real problems by assessing and analysing the factors that contribute to risks and their solutions and how this can be managed effectively. After conducting the necessary analysis, the study progress to the point where all feasible and suitable options are explored further. Inter-disciplinary research was undertaken in disaster management, civil engineering, the built environment, project management, law, knowledge management, risk management, and facility and asset management. The study's contributions will also have limitations; for example, there are numerous disasters, but this research will focus exclusively on flooding. Apart from that, when dealing with government agencies, there is a limited amount of information available, as some will be retained for internal use only. Chapter 3 discusses the study's limitations in greater detail.

The chosen field of study, MARA University of Technology (UiTM), may not have any unique flood-resistant design. Since Malaysia is affected by a variety of natural disasters and flooding, the findings may not be applicable or accurate due to the existence of other

disasters. However, it is hoped that the general information will provide more precise information in future usage. Certain agencies retain pertinent information to assist with this study, and the relevant information is kept confidential. Occasionally, the only data published online is that which can be used. Another issue is a shortage of research on university participation in disaster risk reduction.

Most of the information pertains to real estates, such as residences and business assets. As a result, a literature review, including "grey literature," will be conducted. Grey literature is unpublished or unpublished research that has been published in a non-commercial format, such as government reports, policy statements, issues papers, conference proceedings, pre- and post-prints of articles, theses, and dissertations, research reports, newsletters, bulletins, and fact sheets.

1.6 Malaysia Flood Reality

Malaysia has a long history of development activities. The country's growing urbanisation is causing a set of problems. Natural disasters occur because of development efforts that disregard natural laws. Community concerns are usually caused by the development's impact on the environment or issues with environmental management. In addition, rapid population growth has resulted in high land usage circumstances. The Malaysian environment is changing now, and it is becoming unpredictable. Floods occur unexpectedly. Flash flood tragedies are frequently related to the urbanisation process. Flash flood disasters frequently occur in Malaysia due to risky development operations such as excavating shallow drains. Malaysian rivers are always clogged with sedimentation. The government is attempting to apply the resilience concept to disaster risk management, specifically the flash floods that frequently strike the country's major cities. The concept of resilience will include the well-being of society in the face of accelerating environmental change. When conflicts approach a tipping point, countries' internal knowledge infrastructures are frequently targeted, both directly and indirectly. While the media often emphasises the destructive effects of violent war on research and knowledge infrastructure, significantly less attention is paid to the sound effects of conflict dynamics and peacekeeping studies (Bush and Duggan, 2015).

Malaysia asserts that the country is prepared for flood season due to the nearly annual monsoons. It is true that some part of the country receives more rainfall than others, the essential issue is that the government must be prepared for the unanticipated consequences of a flood disaster. Regardless of which state or period a flood occurs, with Malaysia's

climate change, megacity expansion, and deforestation, flooding is most likely to become regular (Khailani and Perera, 2013; Islam et al., 2016). Malaysians can no longer view severe rainfall as a one-off event. Rather than that, someone should establish flood mitigation methods and do all necessary to lessen the flood's effects on civilisation. Since the 11th Malaysia Plan (2016–2020), Malaysia has made measures to mitigate the effect of disasters through adapting to climate change and improving disaster risk management (Rani et al., 2020). Regrettably, the government has not acted quickly enough and has given little thought to climate change through its legislation and governance.

Today, there is no planning or preparation for the future repercussions of climate change, particularly considering the recent state-wide flooding that happened in December 2021, affecting eight different states in Malaysia, and claiming over 50 lives. The Malaysian government does not yet have a comprehensive plan to deal with future flooding. This study was inspired by the author's observations of her university campus surroundings in Malaysia from 2009 to 2012, notably during the monsoon season, when flash floods continue to occur on the campus and throughout Malaysia. However, additional considerations can be made to guarantee that the NDRR projects are carried out effectively (Sharma, 2019). Even if rules and processes are in place in the aftermath of a flood, recovery efforts are insufficient (Tahir et al., 2016). As a result, the author of this thesis sought to discover more about what further could be done to aid the university community in being more efficient and serving as a model for other organisations and communities (Altbach et al., 2004). Not only that, but this research tried to identify how best to maximise the institution's flood DRR efforts. Not only do the public need to understand how higher education institutions interact during a flood, but also need to understand how the community responded to the flood disaster and their attitudes toward the concerns (Abdullah et al., 2018).

However, the green or sustainability certification will increase the total construction cost, which becomes the turndown factor among property developers (Abidin, 2010). Sustainability and energy efficiency in Malaysia are not as popular and less preferable other than the high cost involved. Firstly, the Malaysian energy efficiency benchmark and the cost savings benchmark are low, thus not viable financially. Most companies carry out sustainability efforts to create the right image and play their role in CSR. Secondly, Malaysia has fewer professionals dealing with sustainable building and mostly relies on international experts. Thirdly, clients' preferences are not towards sustainability because of the high cost, lower incentive received, and lack of investment to sustain the maintenance for the long run. Finally, it is of less interest to the end-user towards sustainable property as they have a lack

of awareness and communication regarding sustainable development and appropriate building usage. Since Malaysia has a lack of green certification execution, for the benefit of the potential in the future, a prerequisite in the arranging procedure would be to expand the number of green construction projects. There should also be fully integrated planning in the realisation of sustainability efforts in Malaysia, including transportation, waste management, building design, water management, and the overall surroundings and the built environment. The proposed implementation of sustainable building started with all new government buildings, local authorities, and private construction.

1.7 Flood in Malaysia

Numerous factors contributed to the Malaysian flood disaster, including natural elements such as climate change, which altered weather patterns, rainfall, and humidity, and human-caused factors such as drastically changing land use from forest to various forms of development, drainage system weaknesses, a lack of environmental ethics practise, and a lack of preparedness among governmental agencies and affected communities (White, 2018). Malaysia's current floods in December 2021 and January 2022 demonstrated a rising number of individuals publicly criticising state and federal administrations, deciding that the government has failed. Even more disrespectful is that certain government institutions commit acts of self-defence against one another. Malaysian flood victims were cut off from the food supply. As a result, inadequate cooperation in supporting flood victims occurred, which was highly stressful. Certain victims were compelled to wait on roofs and break into establishments to obtain food. During the recent flood incident, electrical and internet connections were also lost, complicating search and rescue efforts.

Flood disaster management is a broad term that refers to various operations carried out by the government, the community, and other stakeholders to address the flood catastrophe that happened before, during, and after the flood (Islam et al., 2016). Previous floods contribute to this awareness by regularly encouraging students to practise critical thinking, communication, creativity, and teamwork in disaster mitigation (Johnson and Brown, 2011). As the author argues, a basic understanding of disaster mitigation is crucial for decreasing flood-related fatalities. One strategy for achieving this goal is to combine formal and informal education throughout all Malaysian educational institutions. The NDRR educational and learning processes must be done correctly, both in official and casual settings. Students must obtain accurate information on floods as a foundation to prevent panic in the case of a natural catastrophe. Non-formal education that incorporates NDRR teaches students how to protect themselves and respond effectively in a disaster. The

emphasis at this stage is on disaster preparedness, which includes lessons learned from prior flooding occurrences. Students must be taught to think critically, speak clearly, and collaborate successfully. As a result, both the Malaysian government and university communities should promote student engagement in NDRR. Organising community service programmes, such as volunteering in social situations, is an example.

As early as 1971, flooding engulfed a large portion of Malaysia (Khalid and Shafiai, 2015). Malaysia has had no fewer than 15 severe flood occurrences since 1920 (Setola, Luiijf, and Theocharidou, 2016). According to records, flooding is Malaysia's major calamity, impacting the most significant number of people in recent years (Wahab, 2013). Floods often occur in Malaysia during periods of heavy rainfall, impacting huge rivers, most notably on Peninsular Malaysia's east coast. According to Malaysian experience, flooding would badly impact the locations (The Star, 2014), particularly during the monsoon season. Changes in land use (Hamid et al., 2015), extreme rainfall, seawater intrusion onto land, land subsidence, deterioration of a drainage system, and dam breakdowns are all elements that lead to floods becoming major problems (Cadag et al., 2017). Other significant causes of flooding in Malaysia include a loss of storage, increased runoff resulting from development, inadequate drainage systems, localised persistent severe rainfall, tidal backwater, and poor river capacity (Leman et al., 2016). Flooding in Malaysia has been steadily increasing in terms of danger, most likely due to the physical qualities of the country's hydrological system being altered by human activity. The activities include, but are not limited to, continuous construction inside the current densely populated flood zone, encroachment into flood zones, deforestation, and development on the hill slopes (Weng, 1997). Apart from continuing to place a premium on structures and homes even in flood plain regions, development in river catchment areas can significantly exacerbate the flooding problem (Billa et al., 2006).

Severe flooding is anticipated to occur at three-year intervals based on historical data (Ho, Ghazali, and Chong, 2002). They documented the unprecedented flood disasters that struck vast swaths of the east coast in December 2014, with the worst-affected states being Kelantan, Pahang, Terengganu, and Sabah (Leman et al., 2016; Hamid et al., 2015). The flood was the biggest in 30 years, causing interruption to the transportation network, economic losses, damaged crops, and mortality (Rani et al., 2017; Setola et al., 2016). Between December 2014 and January 2015, most of Malaysia was hit by seasonal rain and severe winds. Schools, highways, bridges, sewers, hospitals, and various other public and private structures sustained damage or destruction. The disaster's actual cost is still being determined, but preliminary estimates place it at GBP 379 million, making it the most

expensive flood in Malaysian history (Setola et al., 2016). The most recent data were from flooding events from year 2012 to year 2022. Based on the Department of Statistics Malaysia in 2022, the overall losses due to floods were GBP 1 billion which equivalent 0.4% of the Malaysian Gross Domestic Product. Living quarters losses GBP 290 million, vehicles and manufacturing GBP 200 million, business GBP 100 million, agriculture GBP 180 million, and public infrastructure GBP 360 million.

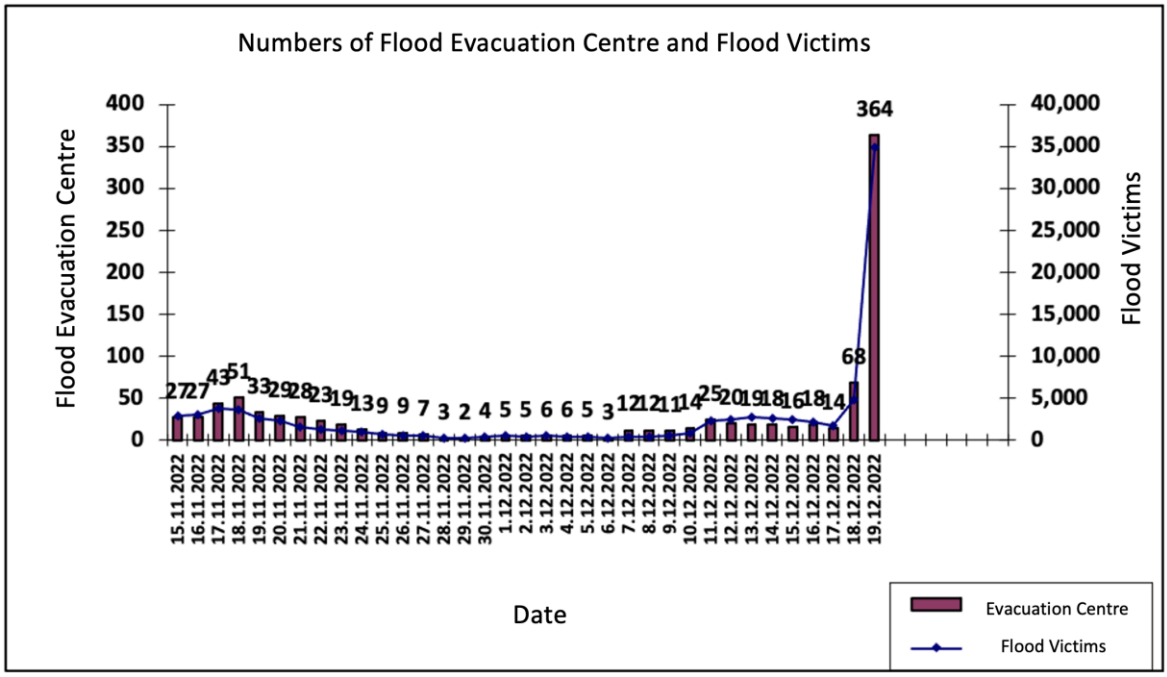

Figure 3: Numbers of Flood Evacuation Centre and Flood Victims for 2022 (Source: Department of Statistics Malaysia, 2022).

Table 1.1- Information on Flood Events throughout Malaysia in 2021 (Source: Department of Statistics Malaysia, 2022).

States	Number of Flood Events	Average Maximum Rain Value (mm)	Duration of Maximum Rain (hours)	Maximum Flood Depth (m)
Perlis	3	72	4	1.0
Kedah	88	107	24	0.6
Pulau Pinang	30	121	24	1.5
Perak	119	92	24	1.2
Kelantan	29	170	144	3.0
Terengganu	36	203	96	1.5
Pahang	95	153	96	6.0
Selangor	120	116	72	1.50
Melaka	21	115	9	1.21
Negeri Sembilan	56	117	9	1.5
Johor	92	130	72	2.0
Sabah	85	117	288	3.0
Sarawak	270	158	96	5.0
WP Kuala Lumpur	4	182	12	1.0
WP Labuan	9	146	4	1.0

Malaysia in 2021 recorded about 1057 flood events. The floods that occurred in the states of Kelantan, Terengganu, Pahang, Sabah and Sarawak were caused by heavy rain in November to December 2021. Floods in states on the west coast such as Kuala Lumpur, Pulau Pinang, Perak, Selangor, Melaka were identified as flash floods because those states were facing with heavy rain coupled with the increase in rapid developing areas causing flash floods to worsen.

Floods may have beneficial effects, such as serving as a supply of groundwater (Sen, 2018). While floods can provide certain advantages, the author feels that in Malaysia, where rainfall occurs throughout the year, flooding causes more harm than good to the people and the environment. Recent Malaysian research has been unable to demonstrate the intricacies of each type of flood that occurs in the country. Additionally, while there are no official flood classifications in Malaysia, they are frequently and broadly classified as monsoonal, flash, or tidal floods. The most frequent risks are tidal, riverine, and flash floods (EM-DAT, 2016). Malaysia has no less than 3.5 million residents who live in flood plain zones, defined as locations with lowland next to a river, constructed of river sediments, and subject to floods (Weng, 1997). Additionally, it is critical to differentiate between a typical flood and a catastrophic flood. While flooding is a form of catastrophe, disasters cannot be categorised as "typical" (Koh et al., 2015). A "regular" flood causes flooding in places that does not cause harm to the public. Frequently, "normal" floods obliterate low- or shallow-surface

flooding. Floods, for example, might result in stagnant water in a field, low or flat areas, parking lots, and highways. This occurrence occurs when torrential rains fall within a short period. After a few hours of flooding and stagnant water, the situation will return to normal. Everything is under control (Madebwe, 2016). Significant flood occurrences are sometimes referred to as "strange" or "severe" events because they leave people powerless (Koh et al., 2015).

Malaysian scholar Chan Ngai Weng conducted a significant study in this field. Her perspective is presented multiple times in this literature review section since the author discovered that her research findings are still applicable today, even though the country has made few gains since then. While Malaysia's traditional flood control measures are mostly centred on civil engineering, battling, and coping with monsoon flooding is a significant concern (Weng, 1997). In Malaysia, floods frequently occur, yet the events and their repercussions are quickly forgotten as the economy grows. Environmental problems always arise afterwards (Weng, 1997). The emergence of adverse flooding effects results from insufficient planning in conjunction with human activity (Pereira et al., 2010). Numerous elements contribute to Malaysia's flooding intensity. There is a shortage of relevant national and state policies and action plans, a scarcity of competence and resources, and a lack of public awareness of flood variability and flood-induced hazard reduction (Roosli and Collins, 2016). Existing environmental and urban planning laws and regulations have been inadequately reinforced to address flood hazards.

Malaysia's government has made adequate efforts to improve the country's disaster prevention, mitigation, response, relief, and recovery capabilities (Said et al., 2011). In Malaysia, disaster management is often centred on crisis response both during and after the crisis (Centre for Excellence in Disaster Management and Humanitarian Assistance, 2016). Amendments to existing regulations, the establishment of early warning and disaster alert systems, the development of mitigation structures, public awareness campaigns, the establishment of funds for national disaster relief, the use of standard operating procedures, and Town and Country Planning Department programmes, as well as international collaboration, are just a few examples of actions (Said et al., 2011). The basic rules and structure of the flood control system should be defined (Billa et al., 2006). A comprehensive and coordinated response is necessary to combat the possibility of catastrophic consequences (Pereira et al., 2010). Flood damage may be avoided if complete remedies are implemented, particularly those strikingly realistic in dealing with unforeseen flood catastrophes (Hamid et al., 2015).

In previous years in Malaysia, many structural and non-structural interventions were implemented to address flooding concerns, but the bulk of them had little effect (Rodzi, Zakaria, and Ahmad, 2016). Additionally, while Malaysia has implemented several flood mitigations measures, the country is still incapable of surviving another flood strike ultimately. This is very much attributable to the frequency and severity of flooding (Said et al., 2011). Therefore, it is vital for Malaysia to have a coordinated response in the event of a catastrophe to ensure the security of its citizens in the future in the event of a similar calamity (Said et al., 2011). Professional techniques are constantly in demand in these scenarios (Roosli and O'Brien, 2011). While Malaysian universities are not entirely immune to floods, it is encouraging that significant efforts have been made within the Malaysian university NDRR strategy. The research will detail Malaysian university disaster management practises, including emergency preparedness, implementation, enhancements, and design.

1.8 Thesis Structure

This thesis is divided into six chapters: an introduction, a literature review, a methodological section, data analysis, discussion, and conclusion section. These chapters are organised to guarantee a logical flow and the accomplishment of the stated aims and objectives. The following is the organisation of this study. This chapter discusses the study's context and introduction. It began with an introduction and identification of difficulties connected to NDRR and its adaptation, emphasising educational institutions (universities). This research was founded on building science and the environment. It included the factors that influence the relevance of the study, the research gap, the research questions and objectives, and the research scope and constraints.

The second chapter of this research will be devoted to the study's theoretical component, relating to the literature review conducted for this study. All data in this chapter will be derived from secondary sources such as references and reading materials. Additionally, it will include a glossary of words, a basis for existing knowledge or theory, discussion of prior research, comparisons to current research, and expert perspectives. Additionally, this section will discuss the concept of proper historical context for the concerns, supported by pertinent material for each. The literature evaluation shall be focused and devoid of excessive detours. This chapter offers a literature survey, emphasising Malaysian history and universities. The chapter will discuss flooding in Malaysia and how it is controlled. Additionally, the difficulties have been recognised. Further, the Malaysian

approach to resilience and sustainability is highlighted. A thorough literature assessment is conducted to recommend additional improvements and tactics for Malaysian institutions to implement.

The third chapter will explain the research process and collecting data from the field study and other sources. It contains information on the institutional overall context, specifics about the research conducted, the items being researched, and the relevant methodologies employed. This chapter will detail and explain the research methodology, research questions, designs, and processes used in the study. This chapter will discuss the data analysis techniques that were employed. It is divided into two phases: theoretical (literature review) and field (questionnaire survey and interview sessions).

The fourth chapter will provide an examination and assessment of the data. This chapter will give the questionnaire survey and interview outcomes survey data. The data will be properly analysed and presented using the right tools and procedures. This chapter will focus on the displayed data and descriptive analysis. Appropriate charts will be given to ensure that the information is presented clearly. There is a discussion of evaluations, surveys, investigations, and feasibility.

The fifth chapter discusses how objectives will be met will be described further. All discoveries and accomplishments are detailed. Additionally, all the details are validated, and their relevance is considered an integral aspect of the research. Additionally, this chapter will give the ultimate structure.

The sixth chapter is a concluding chapter also summarises the research findings. The conclusions will be developed based on the study's results and outcomes. This chapter summarises the findings and discusses the most notable discoveries and any new or emerging themes and ideas for future study emphasis. The conclusion will be based on the data analysis findings and outcomes. This chapter will also provide appropriate recommendations. Additionally, the research's ramifications in several areas are identified, as are its contributions to society will benefit future generations. Finally, difficulties concerning research limitations will be discussed, along with their resolutions. The summary findings will be presented together with their interpretation. Additionally, the results will be compared as necessary.

CHAPTER 2

2 Literature Review

This chapter summarises the primary concepts explored during the investigation. It reviews current disaster knowledge by delving into disaster studies, disaster models, and fundamental disaster terminology. The chapter examines the link between disasters and development, evaluating the relationship between hazards, development, and existing disaster management practices. These review topics are crucial for creating a more nuanced grasp of the subject and developing the theoretical or conceptual framework around which the study will be built.

The qualitative research (literature review in this chapter) identifies the issues under consideration such as flooding, NDRR, and which aspects are significant from a theoretical standpoint. Qualitative research has several advantages. For instance, it sheds further light on the social interactions between the individuals and organisations under study. Additionally, because qualitative data is inherently ambiguous, the author of this thesis may construct her own version of social reality based on participants' subjective perceptions of social events (Bryman, 2016, as cited in Bempah and Øyhus, 2017). This chapter's material was acquired through a qualitative research approach. The researchers' approach selection was inspired by their goal to observe the world through the eyes of the subjects (Bryman, 2016, as cited in Bempah and Øyhus, 2017). Additionally, the approach was used in the design of the field study research, as it is ideal for investigating the "why," "how," and "what" questions that frequently arise in such investigations (Yin, 2009, as cited in Bempah and Øyhus, 2017).

2.1 Disaster Key Terms

2.1.1 Disaster

The word "disaster" is continually reinterpreted according to the context. According to the author, a catastrophe is an unforeseeable event that causes physical, economic, or environmental harm and the affected community's capacity for adjustment is impossible. Furthermore, disasters are discussed in terms of their kinds, causes, and consequences.

Disaster is ***"...a result of the combination of hazard exposure, conditions of vulnerability that are present, and insufficient capacity or measures to reduce or cope with the potential negative consequences..."*** (UNISDR, 2012). Disaster research has a long history. Thus, natural catastrophes may be characterised biologically, climatologically, complexly, geophysically, hydrologically, meteorologically, or technologically (EM-DAT, 2019).

Disasters often take two forms, which are natural or human-caused, and they can last a long time (OECD, 2015). Disaster studies, on the other hand, use a variety of methodologies and approaches, and the results are frequently inconsistent (Hallegatte and Przyluski, 2010). This research primarily focuses on hydrological hazards, which have a significant potential to impact human society (in Malaysian settings) negatively. Other dangers not directly connected to physical processes are glossed over, such as sickness, epidemics, and chemical pollution (Tan et al., 2015). Numerous important features describe natural hazards independent of their source or origin, including their severity, frequency of occurrence, and the region or area in which the event happens. (Westra et al., 2014).

Disasters are defined as sudden circumstances that are complicated, resulting in mortality, property destruction, or environmental degradation and hurting the local community's (Smith, 2013). Disaster management requires coordinating resources, equipment, and labour from numerous agencies over a relatively long period. This is because catastrophic events have a long-lasting adverse effect on flood victims' physical and psychological health (Tierney, 2003).

Individuals and society experience catastrophes differently based on their level of exposure, susceptibility, and capability to mitigate, adapt to, and recover from any adverse repercussions (Brooks, Adger, and Kelly, 2005). While high-income countries have suffered more monetary losses, low- and middle-income countries have suffered more Gross Domestic Product (GDP). Developing nations have also incurred disproportionate fatalities due to their inadequate infrastructure and response capabilities (Liew, 2009). As a result, it is critical to apply novel approaches to disaster mitigation, lowering susceptibility to catastrophes and those exposed to them (Renaud, Sudmeier-Rieux, and Estrella, 2013). The author agreed that flood disaster preparation and management initiatives are vital because they assist individuals in making the most prudent and convenient choices possible during natural catastrophes.

2.1.2 Natural Disaster

This study is entirely devoted to natural disasters, including floods. Natural disasters are described as ***"... natural processes or phenomena that may result in death, injury, or other adverse health consequences, property destruction, loss of livelihoods and services, social and economic upheaval, or environmental degradation..."*** (UNISDR, 2017). According to other research, natural catastrophes are also referred to as "Acts of God" (Shaluf, 2007). They are defined as an unforeseen event of tremendous scale or severity (Ontario Ministry of Natural Resources, 2001). Natural disasters are defined by the United Nations as events that need local response capabilities and have a detrimental impact on a country's social and economic progress (United Nations, 2006).

According to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), there are three categories of natural disasters. They are hydro-meteorological in nature, geophysical in nature, and biological in nature. Hydro-meteorological catastrophes are caused by natural phenomena occurring on atmospheric, hydrologic, or oceanic scales, such as flooding, storms, landslides, and droughts. Biological catastrophes originate organically or are spread biologically via biological vectors such as diseases and insect infestations (United Nations, 2006). According to an article in Bioexpedition (2013), natural disasters are only called catastrophes in populated areas; if they occur in deserted areas, they are not considered catastrophes. It is a well-known fact that no nation, even the most developed, is immune to natural disasters and loss (Liew, 2009). Nonetheless, each country has a plan to address natural calamities (Khalid and Shafiai, 2015).

From the author observation, natural catastrophes come in a variety of forms and for a variety of reasons. Historically, earthquakes, landslides, floods, droughts, and cyclones have been the most common natural calamities. Natural calamities also include tsunamis, volcanic eruptions, and wildfires. According to Parker and Handmer (2013), natural catastrophes include floods, earthquakes, and landslides, whereas man-made disasters include transportation and industrial accidents. Parker and Handmer (2013) describe a natural disaster that may cause a technological system failure. According to the author, this sort of calamity momentarily exceeds the ability of human societies, groups of people, or natural surroundings to respond, resulting in catastrophic destruction, economic loss, disruption, injury, and perhaps death. While natural disasters are unavoidable, the harm they do may be mitigated with sufficient preparation. Not only may natural disasters be

detrimental to development, but development failures can compound risk by increasing community sensitivity to environmental hazards and eroding coping mechanisms. Particular stages of development may raise additional issues.

2.1.3 Disaster Risk Reduction (DRR)

Gaillard and Mercer (2013) summarise that disaster risk reduction (DRR) needs a firm foundation of knowledge and actions. It encompasses scientific information held by a particular organisation or agency. In DRR, knowledge is the most valuable resource. Following Gaillard and Mercer's (2013) guidelines for integrating stakeholders, actions, and knowledge in disaster risk reduction, the author of this thesis will conduct this research using local knowledge.

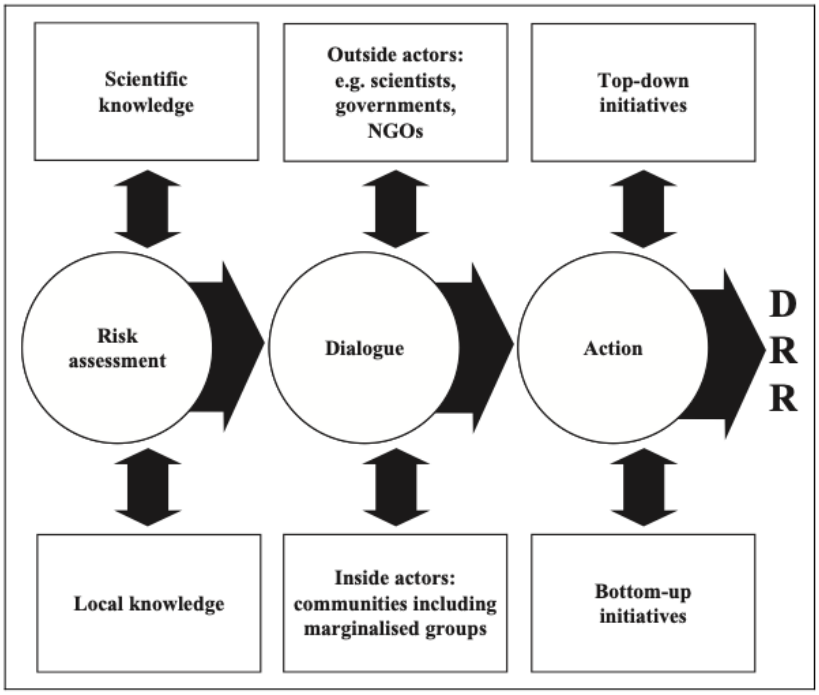

Figure 4: Framework for integrating Knowledge, Actions, and Stakeholders for Disaster Risk Reduction (Adapted from Gaillard and Mercer, 2013).

DRR is defined as a strategy for minimising catastrophe vulnerabilities and avoiding or managing public risk from natural disasters (Twigg, 2007; Renaud et al., 2013). Other examples of DRR include land management, preparation, and early warning systems (UNDRR, 2019a). According to the Capacity for Disaster Reduction Initiative (2016), DRR should comprise three components: preparedness, response, and recovery. DRR is an economically viable investment in averting future losses, particularly in developing nations (Department for International Development, 2005). DRR entails the participation of society, the government, experts, and the private sector to mitigate the damage caused by disasters

(UNDRR, 2019a). The DRR will assist in the formation, maintenance, and sustainability of safe and resilient communities.

2.1.3.1 Disaster Risk Reduction (DRR) Initiatives

Disaster Risk Reduction (DRR) has its own set of priorities (UNDRR, 2019b). The following is a list of projects aimed at mitigating disaster risk. This thesis examines several crucial elements from those projects that will serve as subjects for the coding process.

i) The International Decade for Natural Disaster Reduction - Provide a framework for action in science and technology, particularly in industrialised nations. Additionally, it focuses on the country's disaster preparedness (Lechat, 1990).

ii) 1994 First World Conference on Disaster Reduction and the Yokohama Strategy for a Safer World - The conference stresses the role of governments in every developing country. The priority is to save the community from natural disasters. Besides, it also encourages the need for natural disaster legislation or enactment, including better knowledge of the population's natural disaster risks, understanding their organisation, and their natural environment (Schipper and Pelling, 2006).

iii) 1999 International Strategy for Disaster Reduction (ISDR) - The International Strategy for Disaster Reduction (ISDR) found difficulties in wiping out all the disaster risks. However, there are different approaches that could be taken, based on technical, traditional, or previous experience. Public involvement and awareness of all aspects become the aim, along with the authorities' approach. ISDR assists the community in becoming more resilient to environmental threats by strengthening relationships with experts and stakeholders while reducing financial and social challenges (Enarson, 2001).

iv) 2002 The Johannesburg Plan of Action Report of the World Summit on Sustainable Development - The United Nations Conference on Environment and Development provides the programme of action for achieving sustainable development. It emphasises basic principles towards achieving sustainable development. Appropriate steps taken involve international collaboration and good governance. Being approachable to the emerging community issues, for example, people's needs, following the law, anti-corruption, gender equality, and making a sustainable environment a priority for future investment are all needed for the foundation of sustainable development. Developing countries must cooperate and support each other in critical areas such as monetary matters, technology

advancement, trading, debt management, culture, security, human rights, freedoms, respect, stability, and decision-making towards improving sustainable development (Scherr and Gregg, 2005).

v) 2005 Second World Conference on Disaster Reduction and the Hyogo Framework for Action (HFA) (2005-2015): Building the Resilience of Nations and Communities to Disasters - It is widely recognised as a guideline in disaster risk reduction, fostering teamwork and enhancing it. A total of 168 nations are gaining a more practical approach to DRR initiatives. The HFA highlights five priority areas for work in disaster risk reduction. The first step is to guarantee that disaster risk reduction is a national and local priority. Second, it is necessary to identify, analyse, and monitor catastrophe risks and improve early warning systems. Thirdly, it is critical to use knowledge, innovation, and education to foster an overall culture of safety and resilience. Fourthly, the actions should aim to mitigate underlying risk factors as well. Fifth, disaster preparation must be bolstered to guarantee appropriate reaction at all levels. The HFA raised public and commercial sector knowledge of risk management. After the 1989 International Framework for Action for the International Decade for Natural Disaster Reduction, the 1994 Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness, and Mitigation, and the 1999 International Strategy for Disaster Reduction, the HFA is being implemented as a follow-up to the 1989 International Framework for Action for the International Decade for Natural Disaster Reduction, the 1994 Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness, The objective is to accomplish disaster risk reduction, minimise fatalities, and enhance economic, physical, social, cultural, and environmental conditions, as well as the whole community network (Basher, 2006).

vi) 2007 First session of the Global Platform on Disaster Reduction - The UN The General Assembly established a worldwide forum on disaster risk reduction to assist in implementing the HFA. As a result, it enables all stakeholders participating in HFA to share their experiences, identify remaining gaps, and give guidance for HFA implementation. DRR was created to increase public awareness about disaster risk reduction, exchange lessons learned, and steer the International Strategy for Disaster Reduction system. The session discusses the difficulties and possibilities associated with disaster risk reduction as a national goal. Following that, DRR will be integrated into sector agendas, and the Hyogo Framework for Action will be assessed. The UN International Strategy for Disaster Reduction (ISDR) system action 2008-2009 will be implemented to enhance the HFA's implementation (Maskrey et al., 2007).

Malaysian statement made at the Global Platform for Disaster Risk Reduction (2009) regarding the country improvements in DRR are as below.

i. National Slope Master Plan by Public Work Department's.
ii. Ministry of Information, Communication and Culture has created a Disaster Unit in the Department of Broadcasting Malaysia.
iii. The Government departments and institution of higher learning have organised awareness programs on natural disasters to the public.
iv. National Disaster Relief Fund provides financial assistance to those affected by disasters.
v. Government through the Central Bank of Malaysia provide GBP 90 million of Special Relief Guarantee Facility (SRGF) aim at recovering businesses and rebuilding damaged infrastructure affected by disasters.
vi. Amanah Ikhtiar Malaysia (The Endeavor Trust of Malaysia) provides service includes microfinancing, compulsory savings and welfare funds targeting the poor and marginalised.
vii. Ministry of Natural Resources and Environment strengthen capacity and build awareness at all levels concerning climate change.
viii. The Government is also preparing the 2nd National Communication to the United Nations.
ix. Framework Convention on Climate Change (UNFCCC) to report the country's progress in addressing climate change.
x. 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.
xi. Malaysia's regional cooperation on Disaster Management (ACDM) was established in 2003.
xii. ASEAN Agreement on Disaster Management and Emergency Response (AADMER) was established in 2005.
xiii. 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).
xiv. Malaysia hosted the Third Asian Ministerial Conference on Disaster Risk Reduction in Kuala Lumpur from 2nd to 4th of December 2008.

vii) 2011 Programme of Action for the Least Developed Countries (LDC) for the Decade (2011-2020) - The Istanbul Program of Action (IPoA) carried out the general aim and strategy for the next ten years. Sustainable development of LDCs also focuses on productive capacities. This programme acknowledged the increase in natural hazards, leaving considerable challenges to the LDCs. It also provides support to the LDCs to apply and incorporate DRR into their plans and policies (UN, 2015; Diarra, Diallo, and Katjomuise, 2017).

viii) 2012 United Nations Conference on Sustainable Development Rio+20 - This meeting establishes the DRR for continued discussion of a post-2015 framework that will serve as guidance beyond the expiration of the Hyogo Framework in 2015. The summit discussed clear and realistic plans for sustainable development and principles for green economic policies. Sustainable development finance is established via an international procedure overseen by the United Nations General Assembly. Numerous theme issues are explored, including energy, food security, the seas, and sustainable cities (Anton, 2012).

ix) 2014 Third International Conference on Small Island Developing States and the SIDS Accelerated Modalities of Action (S.A.M.O.A.) Pathway - The S.A.M.O.A. Pathway recognises the continued vulnerability of small island developing nations to catastrophic consequences. Climate change may exacerbate disasters, impeding progress toward sustainable development. Catastrophes may jeopardise small island governments' attempts to build resilience, strengthen prevention, and reduce vulnerability via increased knowledge and preparedness to react to and recover from disasters. It recognises the need to assist and invest in these countries to achieve sustainable development. The conference recognises the importance of disaster risk reduction. It helps the team adhere to the Hyogo Framework for Action and encourages Small Island Developing States determinations in several areas, including providing access to technical assistance and financing for early warning systems; promoting collaboration and venture in disaster risk reduction; assisting in contingency planning; and providing policies and programmes related to disaster risk reduction. The conference will discuss various topics, including climate change, renewable energy, disaster risk reduction (DRR), oceans and seawater, and sanitation. (Shultz et al., 2016).

x) 2015 Third United Nations World Conference on Disaster Risk Reduction and the Sendai Framework for Disaster Risk Reduction (2015-2030) – 6,500 delegates

attended the conference, while 50,000 attended the related Public Forum. It became the world's first substantial covenant, with seven global goals and four action objectives. The Sendai Framework for Disaster Risk Reduction (2015–2030) succeeds the HFA as the primary instrument. It recognises that the state has the primary duty for mitigating catastrophe risk, albeit with the assistance of other stakeholders. It advocates integrating catastrophe risk and business continuity. The conference summary outlines several international objectives to be accomplished over the next 15 years: a significant reduction in global disasters, a reduction in the number of people affected, a reduction in economic losses, a substantial reduction of disaster damage to critical infrastructure and disruption of essential services, an increase in the number of countries with national and local disaster risk reduction strategies by 2020. This new framework for disaster risk reduction establishes new goals for future action. It is meant to significantly reduce catastrophe risk and related losses in terms of lives, livelihoods, and health. It promotes practical growth, establishes defined objectives, and prioritises DRR efforts (UNISDR, 2015).

Malaysia's international responsibilities under the Sendai Framework require a strong focus on mitigation initiatives. The Sendai Framework is an international agreement that establishes fundamental criteria for the world's most acceptable disaster management methods, focusing on mitigation rather than rescue and recovery activities. Malaysia's national disaster management strategy has started to shift its emphasis toward catastrophe mitigation (NADMA, 2021). According to the cost-benefit analysis, for every 0.75 GBP spent on government mitigation programmes, an average of 4.48 GBP is saved (FEMA, 2020). According to the Sendai Framework for Disaster Risk Reduction (2015–2030), the most successful stage of disaster management for minimising disaster risk is the pre-disaster stage. This is consistent with the development of the disaster management concept, which formerly placed a premium on catastrophe emergency response operations and has since shifted its emphasis to pre-disaster measures, including preparation. Preparedness is an activity that reflects the disaster response's overall efficacy. Developing a catastrophe preparation plan is a significant endeavour that must be performed (NADMA, 2021).

The Sendai Framework is a worldwide, non-binding, voluntary agreement agreed on at the third United Nations (UN) World Conference on Disaster Risk Reduction. While the Sendai Framework recognises the state's critical role in mitigating catastrophe risk, it also recognises that this duty should be shared with other stakeholders, including local governments, the business sector, and others. The Sendai Framework emphasised the importance of science and technology in assisting policymakers in making risk-related

choices and examining shared responsibilities in disaster risk reduction, such as developing public-private collaborations and establishing risk transfer mechanisms. The Sendai Framework has been accepted at both the United Nations and national levels, detailing critical activities governments must take to minimise national catastrophe risk. The essential steps are to increase awareness of disaster risk, invest in disaster risk reduction and resilience, strengthen disaster risk governance, enhance overall readiness, and improve area redevelopment via response, rehabilitation, and rebuilding programmes (Amaratunga et al., 2020).

2.2 Malaysia Background

In the 18th and 19th centuries, Britain established colonies in Malaya. Japan invaded Malaya's territory from 1942 until 1945. The British then reclaimed control of the Malay Peninsula, save for Singapore, and helped establish the Federation of Malaya in 1948, which became an independent republic on August 31st, 1957. Malaya was incorporated into Malaysia on September 16th, 1963. Additionally, it is referred to as Malaysia Day. It occurred when Singapore joined the Federation with Sabah and Sarawak on Borneo's northern shore. In 1963, the Federation gained two new states, Sabah and Sarawak, and Malaysia joined the Association of Southeast Asian Nations (ASEAN).

Malaysia is divided into thirteen states and three federal territories, referred to collectively as "government areas". Kuala Lumpur is Malaysia's capital city, while Putrajaya serves as the country's administrative capital. Malaysia is made up of 131,313 square miles of Peninsular Malaysia, which includes the states of Perlis, Kedah, Pinang, Perak, Kelantan, Terengganu, Pahang, Selangor, Negeri Sembilan, Melaka, and Johor, as well as two federal territories (Kuala Lumpur and Putrajaya). Additionally, there are two additional states on the island of Borneo known as East Malaysia: Sabah and Sarawak, and one federal territory known as the Island of Labuan, totalling 77,730 square miles. The South China Sea separates these two distinct geographical locations by approximately 403 miles. Peninsular Malaysia is bounded on the north by Thailand, on the east by the South China Sea, and on the south by Singapore, divided by the short Johor Strait and the Strait of Malacca, and on the west by the Andaman Sea. Peninsular Malaysia's neighbours are Thailand and Singapore, whereas Sabah and Sarawak share a border with Kalimantan. Kalimantan encompasses the Indonesian portion of Borneo, whereas Sarawak encompasses the sliver of Brunei.

Asia is home to most of the world's population, 60%. 48% live in metropolitan regions, while the remaining 52% live in or near coastal areas (Pereira et al., 2010). Malaysia is in the centre of Southeast Asia. As a result of its location between the Indian Ocean and the South China Sea, the country has developed strong ties with other countries. It is an important location for merchants and travellers. Malaysia is positioned between the equator's latitudes of 2° and 7° North and longitudes of 99.5° and 120° East (Tourism Malaysia, 2016) and is eight hours ahead of GMT. Malaysia is a humid and hot country all year, with average temperatures ranging from 20°C to 30°C (68°F to 86°F) and a relative humidity of around 90%. Malaysia is a country with a population of 31 million people as of July 2017. (Indexmundi, 2018). Malaysia's population is expected to reach 32.4 million by 2020. (Department of Statistics Malaysia, 2017).

Malaysia is a multicultural country where Malays, Chinese, Indians, and indigenous peoples of Sabah and Sarawak coexist peacefully (Asia Planet, 2016). All these many races and beliefs coexist peacefully in this neighbourhood. According to 2010 estimates, the groups are made up of 50% Malay, 22.6 percent Chinese, 11.8 percent Indigenous, 8.2 percent non-natives, 6.7% Indian, and the remaining 0.7%. Malaysians, likewise, speak a diversity of languages. Most of the population speaks Malay as their native tongue, with Chinese, Tamil, and English also being commonly spoken. However, they are not forbidden from using, teaching, or studying additional languages. Malaysia's economy is one of the most vibrant in Southeast Asia, having benefited from decades of modernisation and political stability.

Malaysia has experienced significant economic success, which has aided in the social and urban development of the country (Pereira et al., 2010). Agricultural items such as rubber, palm oil, and timber were formerly the primary exports of Malaysia, but the country is currently moving its economy toward a service and manufacturing foundation. Not only that, but Malaysia also derives most of its revenue from oil and gas and tourism. Malaysia has successfully produced raw resources and has evolved into a multi-sector economy (Asia Planet, 2016). Malaysia is already a middle-income country, and by 2020, the government intends to achieve high-income status through sustained economic growth.

Malaysia is physically isolated from the Pacific Ring of Fire, which means that natural disasters such as earthquakes, volcanoes, and typhoons are rare. As a result, Malaysia is often unaffected by calamities in neighbouring nations, such as earthquakes and volcanic eruptions. Thailand has experienced flooding, the Philippines has seen mudslides and

landfalls, and Indonesia has experienced earthquakes and flooding. With seasonal monsoon rainfall reaching over 3000 mm, floods are the most severe form of catastrophe that Malaysia experiences, particularly monsoon floods and flash floods. This is because this country has intense rainfall throughout the year due to its tropical environment (Shaluf and Ahmadun, 2006). Monsoons occur twice a year in Malaysia. November to March is the east monsoon season, whereas May to September is the south monsoon season (Billa, Mansor, and Rodzi, 2004; Billa et al., 2006). Both monsoons provide torrential rainfall (Zakaria and Mustaffa, 2014). Despite this, the severity of such an occurrence is frequently more significant than anticipated (Rani et al., 2017; Ahmad et al., 2014). Before the study goes deeper, it is important for the reader to develop some knowledge on the country that the author is referring in this thesis.

2.3 Flood

It has been reported that flooding is the most often occurring natural catastrophe globally (Cruz et al., 2007; Jha et al., 2012). Flooding impacts the most significant number of individuals on the planet (Asian Disaster Reduction Centre, 2012). According to research (Perry, 2007), flooding occurrences have influenced over the previous several decades and, in some cases, have reached historical levels (Komori et al., 2012).

Disasters, primarily floods, are classed carefully due to their varying methods (Abulnour, 2014). First, coastal floods are triggered by powerful winds that push ocean water onto low-lying coastal land. They can also be caused by earthquakes, landslides, or volcanic eruptions. The second type of flood is a flash flood when gullies or typical dry beds in semi-arid locations transform into fast-flowing rivers during storms. The third form of the flood is a river flood, which is the most severe variety (Guha-Sapir, Below, and Hoyois, 2016). The fourth sort of flood is an urban flood, which occurs when land is urbanised and paved, reducing its ability to absorb rainfall. Rainwater quickly becomes runoff after solid rainstorms. Inadequate drainage culverts constructed by humans may overflow and flood low-lying urban communities. When heavy rain occurs in metropolitan areas, surface water flooding, pluvial flooding, or water flooding will occur due to the brief but intense precipitation (European Water Association, 2009; Jenkins et al., 2018). To gain a better understanding of this type of flood, it is frequently necessary to identify its characteristics, which include the magnitude of the rainfall event, the topography or geological location, drainage works, the design of the built environment, and the sewer system, as well as social and economic exposure.

Nonetheless, urban flooding is more anthropogenic than ever, implying that environmental contamination and pollutants associated with human activity are at an all-time high (Glińska-Lewczuk et al., 2016). On the other hand, the fifth form of flood, the cloudburst flood, can occur due to intense rainfall occurring suddenly in geographically confined areas. It's relatively challenging to categorise common or significant floods because they have varying meanings for various individuals (CPWF, 2013). Much of the current literature on flooding focuses on determining the kind of flood. There are several sorts and classifications, but it remains difficult to reach a single agreement on this subject.

Floods can have both direct and indirect effects on their surroundings, with the latter often affecting a greater region (Zevenbergen et al., 2018). A flood might disrupt the community's equilibrium and make it difficult to re-establish normalcy (Hamin, Othman, and Elias, 2013). Additionally, it had the most significant societal consequences (Guha-Sapir, Below, and Hoyois, 2016), resulting in a high recovery cost and diminishing investment prospects in the flood-prone area (Department of Irrigation and Drainage, 2017a). Several elements contribute to the high impact of floods, including demography, social economics, age, and family income (Burningham et al., 2007). Global society has come to accept floods as they are. However, people begin to view flooding as a danger when industrialisation progresses and alters land-use patterns, economic structures, livelihoods, and political structures (CPWF, 2013).

Flooding is the most recognised sort of natural catastrophe now occurring in Europe, and the way floods are managed in Europe has revealed possibilities for improvement in flood management (European Environment Agency, 2005). The events surrounding these occurrences have grown in scope throughout the years in Europe, including financial catastrophes (Zevenbergen et al., 2008). Taking England as an example, one in every six of the country's 5.2 million houses is still at risk of flooding (Environment Agency, 2009; Wedawatta, Ingirige, and Proverbs, 2014). The UK has previously suffered large floods, most notably in 2005 and 2007, and the 2009 flood in Cumbria (Wedawatta et al., 2014). The Cabinet Office's Civil Contingencies Secretariat (2011) makes the case that the United Kingdom is not immune to natural catastrophe strikes. The United Kingdom is at risk of floods, resulting in death and property destruction. Floods accounted for approximately half of the natural catastrophes dealt with by the British Red Cross in 2014. Around 10% of England's population, 1.8 million houses, and 130,000 commercial premises are in flood-

prone regions, according to the Department of Environment, Food, and Rural Affairs (DEFRA, 2001).

Compared to other regions, Asia accounts for more than half of worldwide flood damage. Asian floods frequently occur in parts of the Asian tropics formerly known for rice cultivation; hence, they are populations that have been managing floods for centuries (CPWF, 2013). Asia is heavily afflicted by floods, with certain nations particularly hard hit, including China, India, the Philippines, Iran, Bangladesh, and Nepal. Due to rising flooding challenges, coastal districts in Asia's south, east, and southeast are defenceless (Cruz et al., 2007). According to the World Water Assessment Programme (2006), Asia is home to 60% of the world's population, with 48% of the people living in cities and the remainder in flood-prone coastal zones. Asia has seen 1730 natural disasters over the previous decade, resulting in a loss of around GBP 577 billion, accounting for 39% of all-natural disasters worldwide and over 50% of total catastrophe costs (Guha-Sapir et al., 2014). Prior research has not adequately accounted for all aspects of flooding's detrimental consequences in diverse places or nations. Perhaps underdeveloped countries will devise the most comprehensive strategies for flood damage.

2.3.1 Malaysian Flood Agencies

Several agencies are involved in the flood recovery process, including the search and rescue process. Among them are Special Malaysia Disaster Assistance and Rescue Team (SMART), the Royal Malaysian Police (PDRM), Malaysian Fire and Rescue Department (BOMBA), Malaysian Armed Forces (ATM), Civil Defences Department (JPAM), Social Welfare Department (JKM), People's Volunteer Corps (RELA), the Malaysian Red Crescent (BSMM), the Ministry of Health (KKM), Malaysia Metrological Services (MMS), Drainage and Irrigation Department of Malaysia (DID), Non-Governmental Organisations (NGOs), international cooperation (Shaluf and Ahamadun, 2006; Khalid and Shafiai, 2016), National Security Council (NSC), Natural Resources and Environment (NRE), Department of Environment (JAS), Malaysian Public Works Department (JKR), Ministry of Agriculture, land office, district office, rescue agencies, National Disaster Management systems (NDMS) (Ahmad et al., 2014), National Security Division (BKN) at Prime Minister's Department, Department of Minerals and Geosciences (JMG), Department of Meteorology (MetMalaysia), National Hydrology Institute of Malaysia (NAHRIM), and Medical Relief Society (MERCY).

These entities each have a unique role in mitigating flood risks and enhancing recovery activities. For instance, the Department of Meteorology (MetMalaysia) provides a weather forecast website to enable the public to access current weather conditions while also enhancing the efficacy of meteorological services to mitigate catastrophe risk (Khalid and Shafiai, 2016). The Malaysian National Hydrology Institute (NAHRIM) oversees water management. It was established to assist and advise the community on water and the surrounding environment (Gardner et al., 2007). MERCY Malaysia is a non-governmental organisation that helps disadvantaged populations in crisis and non-crisis circumstances through medical aid, health-related development, and sustainable risk reduction.

The government is now attempting to consolidate all connected entities under a single roof, the National Disaster Management Agency (NADMA). Yusoff et al. (2018) define NADMA as an agency tasked with responding immediately to a flood. The Malaysia Catastrophe Preparedness Centre (MDPC) became the primary flood coordinator and future disaster assistance in a strategic endeavour (Malaysia Institute of Architects, 2015). MDPC comprises all Malaysian states, consisting of organisations, communities, and individuals, and aims to develop their abilities in all spheres. For instance, they maintain the safety of people and essential property, offer welfare, manage disaster preparedness operations, and give timely information on the causes and consequences of catastrophes (Hashim, 2018). In partnership with MDPC, the Disaster Management and Relief Committee created Flood Preparedness and Response in Malaysia (Hashim, 2018).

As disaster relief in Malaysia is top-down, the Disaster Management and Relief Committee will coordinate federal, state, and district efforts. It ensures that all elements are analysed to contribute to the management effectiveness of the issue (Rani et al., 2017). For example, they would meet annually, frequently before the start of the monsoon. According to Weng et al. (2015), the National Committee on Disaster Management (NCDM) is responsible for the federal government's management of national-level disasters. The committee was renamed the National Flood Disaster Management Committee (NCFDM) if the subject is flooding. The State Committee on Flood Disaster Management (SCFDM) is responsible for state-level calamities at the second level. The District Committee on Flood Disaster Management regulates district-level calamities (DCFDM) at the third level. An unofficial village committee controls a hamlet or small town's flooding.

Malaysia's Department of Irrigation and Drainage (DID) is the most visible agency, as it publishes the "Urban Stormwater Management Manual for Malaysia" to control

flooding (Department of Irrigation and Drainage Malaysia, 2012). It was released in two volumes. The first version was published in 2000 and contained the most up-to-date standards, practices, technology, and best engineering practises from other nations. The manual's second version, issued in 2012, incorporates the most up-to-date stormwater best management methods. A crucial component of stormwater management strategies is included in the guidebook. The guidebook will assist in guaranteeing public safety, mitigating flooding-related annoyance, ensuring safe passage during floods, stabilising landforms, and preventing erosion, mitigating runoff's environmental effect, and enriching the urban landscape and ecology.

The DID is based on Operation Procedure No. 29 of the National Security Council. DID issued Circular No.2/2003 titled "Guidelines for the Management of Flood Disasters During the Monsoon Season and Flash Floods" (Hussaini, 2007). DID's flood management programmes are guided by the concepts of Integrated River Basin Development and Integrated Flood Management (Department of Irrigation and Drainage, 2017a). DID is in charge of notifying the public when the flood level surpasses a predetermined threshold and determining when flood relief begins. Malaysia possesses an impressive array of hard and soft technology, as well as expert testimonies. They include, but are not limited to, a high-tech SMART (acronym for Stormwater Management and Road Tunnel) flood tunnel system, flood and hydrological research institutes such as Malaysia's National Hydraulic Research Institute (NAHRIM), and public flood information websites. While it is encouraging to see Malaysia has a plethora of accountable agencies, the extent to which they can assist flood victims remains an open question.

2.3.2 National Disaster Management Agency (NADMA)

The author of this thesis provides fun facts about NADMA's organisational involvement in the country's response to the recent crisis. All data was gathered from the NADMA's official website (https://www.nadma.gov.my/). According to the National Disaster Management Agency (NADMA), Malaysian monsoon floods are frequently centred in Kelantan, Terengganu, Pahang, and Johor due to persistently heavy rainfall (all the states mentioned by NADMA are covered in this study). Each year, the monsoon season lasts from November to March, implying that flood season will occur annually.

Between 2016 and 2019, 110,207 flood victims representing 31,433 families were evacuated to 975 evacuation centres located throughout the country during the monsoon season (NADMA, 2021). The government cannot manage disasters alone, even more so in

a big disaster. NADMA wants to engage with relevant non-governmental organisations (NGOs) that will receive financial assistance through clusters to participate in disaster management programmes. NADMA will collaborate with other authorities, including the Malaysian Department of Irrigation and Drainage (DID), to draw new rules and laws emphasising disaster prevention and mitigation efforts. NADMA has developed various programmes and activities to assist communities in enhancing their socio-economic resilience. In 2018, NADMA made numerous efforts to establish a national disaster risk map, an integrated disaster management system (including flood evacuation centres), disaster warning information via SMS, a disaster risk reduction thrust, the establishment of a central disaster management committee, and the application of the build back better principle during post-disaster reconstruction.

Disaster risk maps are instruments available to help prevent new disaster risks, mitigate the effects of existing disaster risks, and manage residual risk. Risk scores are calculated using demographic data, critical infrastructure, and essential locations, and they are based on vulnerability. The development of this map will aid policymakers at the federal, state, and district levels as well as security and response forces in preparing for and making decisions that account for disaster risk (NADMA, 2021).

In this case, the government's disaster risk agency (NADMA) should be given expanded authority over the execution of national disaster risk management, including the collection of data from technical government institutions. It should be analysed regularly in advance of anticipated floods to ensure that the government and the public are prepared in the event of a disaster. The National Security Council Directive No. 20 establishes the power and responsibility of NADMA (MKN Instruction 20). Additionally, NADMA is accountable for ensuring that all relevant agencies adhere to NSC Directive 20. NADMA is responsible for organising all actions and collaborations preceding, during, and following catastrophes, including disaster risk prevention and mitigation, preparedness and response, and disaster rehabilitation and rebuilding. The comprehensive scope of NADMA includes the coordination of all actions and partnerships before, during, and after disasters, including disaster risk reduction and reduction, disaster preparedness and response, and recovery and rebuilding.

Historically, Malaysian national disaster management has been more reactive, focused on the rescue and rehabilitation of disaster victims. However, mitigation strategies to avoid or mitigate the impacts of catastrophes are more effective and efficient than

reactionary attempts to deal with disasters. According to studies and consensus among domestic and international disaster management professionals, disaster mitigation and prevention are more cost-effective than disaster response (NADMA, 2021). In catastrophic flooding on a broad scale, the concept of shared responsibility across political, religious, and ethnic differences is essential to ensure public safety, limit future risks, and strengthen local resilience.

2.3.3 National Security Council (NSC)

In Malaysia, disaster and relief management is governed by National Security Council (NSC) Directive No. 20: Disaster Management and Relief Committees: Policy and Mechanisms (Hamid et al., 2015). Malaysia established proper criteria for disaster management and relief in 1994, and this policy offers precise guidelines for land disaster management. This policy adaptation and execution process is fundamental to Malaysia's integrated emergency management system. It contributes to mitigating the repercussions of multiple risks, preserving life, minimising environmental damage, responding to crises, providing assistance, and organising recovery efforts as necessary. On the other hand, tsunamis are not mentioned because they have received relatively little study thus far (Said et al., 2011). The policy entails integrating NDRR concerns into national development through interconnected norms and responses, connecting scientific and governance interfaces, bringing together researchers, practitioners, and other stakeholders, and increasing education and awareness (Pereira et al., 2010).

The NSC performs these tasks through the Disaster Management and Relief Committee, which comprises government officials at all levels. They coordinate flood relief efforts on a national, state, and district level to minimise damage and prevent fatalities. Malaysia builds its natural disaster management system in response to its considerable disaster risks as a regional leader in humanitarian assistance and disaster relief (HADR). Malaysia's government established a new National Disaster Management Agency within the Prime Minister's administration in September 2015 (Kaos, 2015). A director-general heads this new agency. Civil Defence (JPAM) was transferred from the Home Ministry to the Prime Minister's Department and was later merged into the newly formed organisation. Comprehensive legislation and enforcement are necessary to mitigate the effects of natural disasters.

In reaction to the Malaysian catastrophe, Malaysian authorities passed NSC Directive Number 20 in 1997. Its establishment is designed to highlight the critical nature

of post-disaster management. Apart from resource management, it discusses strategies for long-term recovery (Gardner et al., 2007). The National Security Council is responsible for catastrophe preparedness, prevention, response, and healing. According to Khalid and Shafiai (2016), the NSC is responsible for supervising the country's disaster management system and ensuring that adequate relief equipment is available in the event of a flood disaster (Khalid and Shafiai, 2016). The directive establishes a framework for disaster management measures, encompassing all forms of natural disasters (National Security Council Malaysia, 2011). Numerous strategies for flood planning have been implemented in Malaysia, including Khalid and Shafiai research (2016). These include pre- and post-disaster planning, as well as disaster response and recovery. This plan was developed by Malaysia's National Security Council (NSC) and outlines the standard operating procedures (SOPs) that Malaysian agencies charged with pre-flood preparedness should follow. This method applies to both structured and unstructured data (Khalid and Shafiai, 2016).

Malaysia's National Security Council is responsible for few functions in crisis and disaster management. In the aftermath of domestic and international calamities, the National Security Council serves as the focal point for crisis management. Coordination, regulatory functions, and public awareness-raising concerning catastrophic risk reduction are all included in crisis and disaster management. The Council oversaw the work of the Committee on Disaster Management and Relief, which is comprised of officials from many government ministries. They coordinate flood relief efforts at the federal, state, and local levels to minimise flood damage and casualties. Governments complete projects by submitting a task report and an assessment. Academic support is necessary to establish novel policies and institutions, such as municipal and physical planning (Roosli and O'Brien, 2011).

According to research, accountable enforcers in Malaysia responsible for disaster management efforts harmed the country's disaster management efforts due to their ignorance of NSC Directive 20 (Roosli and O'Brien, 2011). Due to national security concerns, the NSC Directive 20 report is not available to the public, although it is distributed to office users. These acts will negatively influence the effectiveness of the policy (Roosli and O'Brien, 2011). Even though a specific regulation following NSC Directive 20 was written, it was never adopted. Significant changes to the policy or directive are required to address contemporary administrative problems. Frequently, there is a lack of understanding of the technique. The accountable individual lacks the requisite abilities to assist disaster victims while juggling employment obligations and critical resources are unavailable. According to reports, the responsible parties were not adequately informed about the policy.

As a World Conference participant, Malaysia has endorsed the Hyogo Framework for Action by NSC Directive No.20 (Sarkar et al., 2013). This order was issued by the Malaysian government's disaster management plan and approach for the systematic integration and coordination of land-based disasters. Malaysia will face theoretical difficulties without a unified regulatory framework for flood risk management, as solutions will need to be tailored to the unique needs of each area. During floods, policies and priorities must remain consistent to facilitate flood control (Asian Disaster Reduction Center, 2005). According to the order, disaster management in Malaysia requires the cooperation of multiple government departments to provide assets, equipment, and human resources necessary to assure compliance with HFA criteria. However, it is not to be used in connection with other enactments relating to the country's catastrophe management (Ahmad et al., 2014). The NSC's ability to administer and manage the system is essential to ensure that Malaysia's flood recovery continues properly (Khalid and Shafiai, 2015). The NSC is being established for various positive purposes, one of which is to assist in building a "caring society" (Roosli and Collins, 2016). According to Roosli and Collins (2016), the NSC is concerned. For example, the community is unaware of NSC, and NSC's work exacerbates the strain caused by misconceptions, a lack of training, and insufficient resources. The challenges stem from the absence of a document setting forth standards for communication and collaboration (especially in the exchange of information) among agencies charged with cross-agency responsibilities for flood governance and management. The NSC falls short in information sharing across many government agencies because there is no formal mandate defining how communication and collaboration should be conducted (Othman et al., 2013).

2.3.4 Malaysian Flood Governance

Several pieces of legislation may contain provisions complementary to one another, but there is limited time to identify them (Ahmad et al., 2014). In light of the increased frequency and severity of flooding, these actions may prove insufficient. Even though the law is critical in reducing flood risk, it may be difficult to distinguish clear obligations among the parties involved in flood management due to the likelihood of overlapping legislation. Since many rights and obligations are governed by special legislation, it is impossible to state whether they are included or excluded (Ahmad et al., 2014). Looking at the United Kingdom (UK), there are considerable disparities between the UK and Malaysia regarding flood regulation. Rather than deviating from the core statutory framework governing floods, the United Kingdom should confer with the National Floods Commission (NSC) (Hamin et

al., 2013). Since Malaysia does not have any pioneering flood control legislation that has become a model, it would be good to take a page from the UK's book. A flood management law would contribute to increased understanding among a wide range of stakeholders and different government organisations in Malaysia if it were to be implemented. The Flood and Water Management Act, 2010 in the United Kingdom is responsible for establishing a comprehensive flood management system. This Act specifies the responsibilities of each stakeholder and regulatory agency in the management of flood and coastal risk (Hamin et al., 2013). This Act also complies with the European Floods Directive 2007 (also known as the Floods Directive 2007). European Commission (2017) argued that members should develop their policies, strategies, and programmes, which the administration might then employ to solve flooding issues in their communities.

Table 2.1- Malaysia Disasters Law and Enforcement Water-related Legislation in Malaysia

(Source: Department of Irrigation and Drainage Malaysia, 2017b).

Legislation
Water Act, 1920
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
The Mining Enactment, 1929
Selangor Waters Management Authority Enactment, 1999

2.3.5 Flood Adaptation

During a disaster, decisions are made from various perspectives, including cultural, economic, political, environmental, technical, and organisational, over an extended period (Nakagawa and Shaw, 2004). All efforts are directed toward mitigating disaster risks.

However, because these activities occur concurrently at several levels within the same institutions, the whole process becomes more challenging (Comfort et al., 1999). Adaptation is the process of mitigating risk by minimising the harm to everything of value posed by the outcomes of an adaptation, process, or action, while rapidly recovering culturally and economically from disasters using existing resources and social connections. Recognising the significance of flood disasters, communities in high-risk areas have devised adaptation methods to aid residents in coping with and limiting the effects of disasters. Indeed, adaptive processes are contextualised in a way that varies according to time, region, and even community (Kasperson and Kasperson, 2013). Adaptation strategies are critical as a means of preparing for and managing flood disasters because they enable individuals to reduce the risk of danger on a large or small scale through their efforts and knowledge, such as switching to concrete construction materials, adhering to the community's early warning system, and changing land use, among other strategies.

Although the disaster occurred in the same place, its intensity and effect are determined by the population's level of vulnerability and resistance. Flood events necessitate the implementation of appropriate adaptive measures and disaster preparedness. Proper action can be taken by recognising the dangers, risks, and factors that contribute to floods (Field et al., 2012). Adaptive activities are classified in various ways depending on the time, space, technology, or certain principles involved in an activity to reduce the vulnerability of the community (Field et al., 2012). An adaptive approach should be made on time, including immediate, short-term, and long-term adaptive processes. Two approaches to immediate adaptation are based on considering both physical and human elements. It encompasses social and cultural influences as well as a variety of other variables, such as politics and religion. Numerous non-governmental organisations are constantly collaborating to assist in a crisis (Nelson, 2011).

The phrase "adaptation" refers to the actions that must be conducted in response to flood concerns and dangers (Diener, Lucas, and Scollon, 2009). Industrialised countries adapt more rapidly than undeveloped countries, and this situation occurs as a result of financial restrictions and high costs. Additionally, adaptation includes distribution, technology, information transfer, and the capacity to adjust to changing circumstances on the ground (Huq et al., 2004).

2.3.6 Human-Environment Interactions

Disaster management aims to prevent deaths, alleviate human suffering, educate the public and government officials about dangers, and minimise damage to crucial infrastructure, property, and economic resources (Khan and Khan, 2008). Preparedness can take the form of establishing an emergency response plan that outlines what the public and government should do in the event of a disaster (McEntire and Myers, 2004). Developing a disaster management system may begin with the establishment of a federal community or community preparation policy (Lewis, 2003). They are incorporating varied stakeholder input results into a unified understanding of flood risk. Community members who have been impacted by flooding can voice their needs and lobby for their involvement in decision-making. The majority of stakeholders advocate for effective and long-term flood management. The participation of stakeholders facilitates the development and execution of effective and sustainable flood control initiatives (McEwen et al., 2018).

Human-environment interactions are highly complex and significantly impact the environment, either directly or indirectly. At-risk groups are equally susceptible due to their diversity of socioeconomic origins (Messner and Meyer, 2006). The disasters struck unevenly among areas or individuals within a community that shared a common country (Scandlyn et al., 2010). This is because various factors contribute to an individual's acceptance of an effect. At the community's most significant level, its vulnerability will have a worse outcome than communities with a lower vulnerability rating (Pelling, 2003). From the author’s perspective, the government should make emergency resources accessible, such as people, emergency money, facilities, and critical infrastructure. The readiness indicator measures the current early warning system's efficacy. It might provide warnings about impending flooding, show warning signs, and distribute information (O'Sullivan et al., 2012). To protect property, alerts might be generated by frequently updating data on current meteorological conditions, flood-related information, mitigating activities, and official warnings from the principal communications centre (Bhattacharyya, 2012).

Whether in the public or private sector, networking is a vital component of modern organisations' development (Agranoff and McGuire, 2001). Public policy is no longer a stand-alone process involving only state actors; instead, it is the outcome of networking, cooperation, and partnership across many facets of government (Bodin, 2017). Perceiving catastrophe management as a shared issue may result in a skewed network of interactions between several parties. Disaster management activities must be organised around a clear

vision and goal that integrates the three sectors of government, business, and society (Perry, 2007). Sharing duties across sectors necessitates transparency and responsibility, which it will exhibit collaboratively throughout the crisis management process. The governance viewpoint and values are crucial in disaster management activities (Rogers and Hall, 2003). A robust capacity to respond to catastrophe hazards is linked to community capacity-building programmes. The primary goal is to produce people competent in predicting, responding to, and recovering from disasters (McBean and Rodgers, 2010). Additionally, it provides technical and non-technical assistance, enhancing the community's active participation in disaster management and strengthening its capacity to identify hazards and vulnerabilities. Education and training on environmental conservation and catastrophe risk reduction, primarily floods, are essential. The information supplied is customised to the specific conditions surrounding a potential crisis occurrence and is based on previous disaster experiences (Shreve and Kelman, 2014). Apart from strengthening community resilience through a moderate approach, the community was also exposed to threats, regardless of whether floods had happened in the region previously. Thus, short- or long-term adjustment plans may be devised based on the objectives and methods of execution through research, education, and advanced programmes targeted at improving public awareness of the impact of catastrophes (Ronan and Johnston, 2005). Finally, the negative repercussions of the flood tragedy would be protracted, making rehabilitation difficult for victims. As a result, the government should take the lead and develop appropriate precautions against future flood catastrophes to minimise property damage and fatalities (Ronan and Johnston, 2005).

2.3.7 Disaster Risk Management (DRM)

Identifying and mitigating hazards by developing an appropriate action plan is critical for disaster risk management (DRM). It is an integral part of the process of detecting risks. By utilising DRM, all the hazards associated with the project are identified, and consideration is given to mitigate them. Defining Disaster Risk Management (DRM) as ***"... a systematic process of using administrative directives, organisations, operational skills, and capacities to implement strategies, policies, and improved coping capacities to lessen the adverse impacts of hazards and the likelihood of disaster..."*** The platform for space-based information for disaster management and emergency response (United Nations Space-based Information for Disaster Management and Emergency Response, 2019). Catastrophe management is a comprehensive term that incorporates all disaster planning and response parts, a high capacity for disaster preparation and response, and events that involve both pre-

and post-disaster activities, including events that occur before and after a disaster (Shaluf and Ahamadun, 2006). According to Van Asselt and Renn (2011), a disaster risk management system should assist in limiting the effects of disasters, increasing society's resilience, and being capable of coping with any disaster-related activities (Abulnour, 2014). DRM can be used on a national, regional, or local scale. Through the use of DRM, it aids in establishing who is accountable for each plan and its execution. Stakeholders would be liable for ensuring that the DRM is well-coordinated at all levels of the organisation (Rivera, Tehler, and Wamsler, 2015). Hard work is required to improve catastrophe management (Lin, 2018). The DRM strategy may facilitate the resolution of this complex scenario, particularly by obtaining pertinent information for the authorities' use (Rivera et al., 2015). Due to the interconnected nature of disaster management (Abulnour, 2014), DRM should prioritise both long- and short-term initiatives (Rautela, 2016). It encompasses measures aimed at preventing or mitigating damage caused by natural disasters. Both components include a whole procedure (Carlisle, 2008).

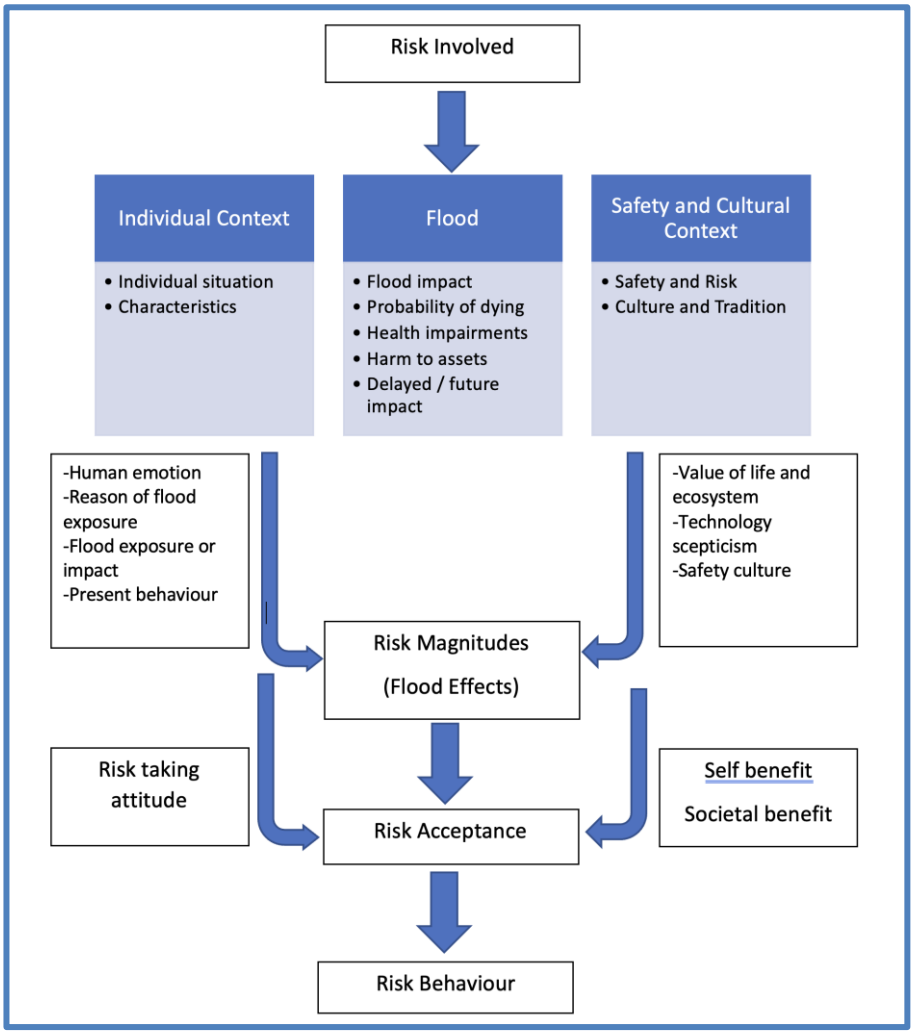

Figure 5: Subjective Evaluation of Risks

(Revised by the Author, Adapted from Rohrmann,1999).

The author uses this evaluation of risk to identify risks' perceptions from both individual context and social or cultural context or point of view. The risks may have a different magnitude, but they still lead to the risk acceptance, thus identifying people's behaviour.

2.4 Crisis and Emergency Management

A calamity is a worldwide issue that has unanticipated implications. Specific individuals or groups of people are more susceptible or in danger during or after a disaster for various reasons, including their social status, age, gender, physical condition, health, or economic status, including poverty (Morrow, 1999). Before a disaster occurs, the government should assess the resources needed to mitigate the event's short- and long-term effects on vulnerable groups, preferably during the disaster preparedness stage. The government has population statistics and can predict how vulnerable a community will be during a crisis based on its demographics and geographic location (Benson, Twigg, and Rossetto, 2007).

Action should begin at the level of readiness, where it compiles a collection of efforts made to implement effective measures through planning. The government or authorities should compile a list of all conceivable activities, programmes, and systems that might be executed before an emergency to strengthen the reaction phase (Wisner, Adams, and Adams, 2002). Among the challenges confronting flood victims are the loss of housing or refuge, the loss of livelihood due to agricultural land damage, the destruction of commercial premises, the lack of necessities such as food, drink, and clean water, the disruption of schooling, and health concerns (Baker, 2012).

Due to the worldwide implementation of scientific knowledge, international collaboration, and technology, each endeavour is individually adapted to the geographical and socio-economic environment in which it is executed. Despite worldwide efforts and technical advancements, managing flood risk remains a significant problem for all flood-prone countries (Howes and Tah, 2003). Throughout history, a variety of flood risk reduction strategies and technologies have been created to aid in the prevention of floods in various places worldwide. Numerous advancements in science and technology have been made in multiple aspects of flood control, yet worries about flood risk remain unsolved. Lindell (2013a) asserts that emergency management presents a problem for higher education institutions since catastrophe preparedness requires substantial organisation,

communication, and coordination of both resources and people. Apart from that, most situations necessitate a swift reaction (Coveleski, 2014). An institution should provide a realistic framework for risk management implementation to foster community resilience.

While most flood-prone countries have adopted a range of structural flood control measures, many have failed to institutionalise flood preparedness and disaster management activities. This is because the community immediately acknowledges the advantages of structural operations but not those of non-structural ones (Lebel et al., 2012). However, additional research on the proportional contribution of all mitigation strategies to reducing total flood risk in flood-prone areas may be beneficial in determining the optimal solutions, as existing flood control systems emphasise both structural and non-structural flood management strategies (Schanze et al., 2008). Despite the immediate benefits of structural flood control measures, the long-term benefits of improved and maintained performance cannot be justified. Specific locations within flood control projects flood within a few years of installation due to unpredictable changes in the floodplain and structures (Shah et al., 2018).

There are a few examples of structural and non-structural measures that are worth trying and require further actions.

Table 2.2: Structural Measures for Malaysian Government for Future Exploration (Self-Authoring).

Pump house	Flood control dams
Soil stabilisation	Canalisation works
River improvement works	Flood diversion channel or tunnel
Infrastructure works	Flood warning systems
Barrage	River bounding
Improvement and maintenance of main drains	Floodproofing
Flood detention or retention ponds	Flood resilient systems

Table 2.3: Non-Structural Measures for Malaysian Government for Future Exploration (Self-Authoring).

Training development	Flood control commission
Flood relief machinery	Reconstruction information centres
Master plan study	Promoting sustainable development
Laws, acts or guidelines	Guidelines or design standards
Awareness campaign or education programs	Land use planning
Flood catchment management	Risk assessment tool
Development control	Online data or storage system
Relocation or resettlement	Spatial data or temporal data
Drainage plan	Soil map or topography
River basin management	Geographic Information Systems (GIS)
Flood forecasting	Flood risk modelling
Attention to weather and rainfall	Water control
Hazard mapping	Transportation structures
Mitigation planning	Electrical
Building codes development	Waste amenities

Since the communities are hardly avoiding the flooding, it is good that they protect the surroundings while adapting to flooding events. Therefore, a few terms, such as "live with rivers" (Fleming, 2002), "make space for water" (Warner, Edelenbos, and van Buuren, 2012), the concept of "living with floods", and communities are asked to "be resilient" (White et al., 2013; White et al., 2018). The resilience definition given by the Cabinet Office (2011) is the "ability of the community, services, area, or infrastructure to detect, prevent, and, if necessary, withstand, handle, and recover from disruptive challenges".

Resilience is now becoming an institutional goal in hazard management (Tweed and Walker, 2011). Flood resilience includes several measures, for example, mobile perimeter barriers, door guards, and changes in building fabric (White et al., 2018). The use of technologies in flood resistance and resilience could lessen the flood impact. The role of individuals and involved parties such as flood enforcement agencies is a clear direction for the community to improve resiliency, especially towards important infrastructure (Pitt, 2008). The construction's resilience measures are adaptable depending on the type of flooding that the institution is subjected to. The Malaysian government always provides proper steps towards resiliency towards flooding. The Malaysian government carried out

some initiatives, for example (Hamid et al., 2015); rebuilding communities through partnerships with the local universities and NGOs; restoring energy, water, and communication infrastructures; rebuilding the local economy; restoring the environment; and providing immediate recovery and relief.

Creating an efficient legislative framework for flood risk management (FRM) was viewed as a method of bringing together the public and institutions that had previously been impacted by floods. Additionally, future floods are expected to be more frequent and severe. Apart from that, present methodologies for flood risk assessment appear to be flawed, resulting in accidentally inadequate planning of flood risk reduction measures that failed to function during flood catastrophes (Scott et al., 2013). Researchers are currently examining flood risk reduction approach and technologies to find gaps and strengthen existing systems. The historical context of strategic adjustments has been widely explored to maximise the approach's efficacy and durability across time, both in terms of technology and societal progress (Shah et al., 2018).

Numerous flooding incidents emphasise the critical need to do a practical flood risk assessment that considers the long-term benefit. Modern flood risk management practises and technologies have evolved in response to vast flood experience, correcting the flaws of previous solutions (Hall and Solomatine, 2008). Due to worldwide knowledge and experience exchange, stakeholders today have access to an impressive array of technologies for use in flood-prone areas. It is widely recognised that no one-size-fits-all technique is adequate for mitigating flood risk. Rather than that, all flood-affected locations require a combination of flood risk management approaches regardless of their location. Along with land use planning and structural defences, this strategy may incorporate flood readiness by deploying early warning systems and emergency management. A SWOT analysis of the disaster preparedness programme should identify the program's strengths, weaknesses, opportunities, and threats. The program's efficacy is measured by how well it achieves its goals, including increasing community knowledge while alleviating their concerns (Shah et al., 2018).

During the previous few decades, the number, scale, and complexity of disasters and emergencies increased dramatically. Alexander (2002) described an emergency plan as ***"...a coordinated set of practises for managing a bad occurrence, whether expected or unforeseen, in the future..."*** Emergency planning is a process that involves the development and evaluation of plans through practice. Although each emergency is different, it gets easier

to anticipate, forecast, warn, and plan for them (Alexander, 2015). As a result, raising knowledge of emergency preparedness and the planning process is vital to manage, overcome, and recover from disasters (Alexander, 2015).

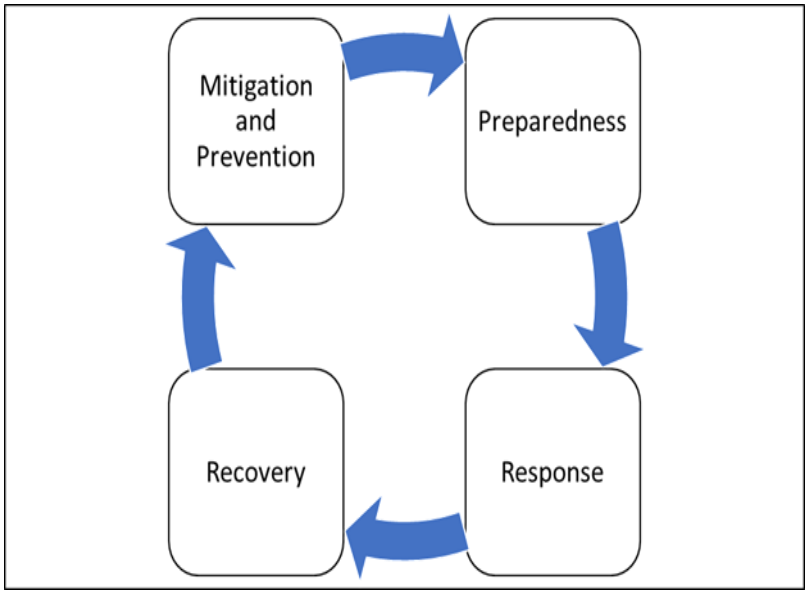

Figure 6: The Process of Emergency Management
(Adapted from Stojic, 2013; NHP, 2017).

The emergency management process is depicted in Figure 6, which includes phases of readiness, response, recovery, mitigation, and prevention. This procedure is intended to facilitate the development of emergency management. First, it is critical to comprehend the disaster management cycle (Fillmore et al., 2011). Disaster management consists of six primary components: prevention, mitigation, readiness, response and relief, rehabilitation, and reconstruction (de Goyet, Marti, and Osorio, 2006). Malaysia's disaster management system incorporates several critical components, including catastrophe preparedness, prevention, aid, emergency response, and recovery (Shaluf and Ahmadun, 2006). Since the "process of emergency management," also known as the "strategic framework on integrated flood disaster management," may have multiple stages depending on how it is interpreted, the author condenses all possible stages into the following: Preparedness also includes "redundancy", "prevention" "protection", response also includes "resourcefulness", "emergency actions", "assistance and emergency response"), and recovery (also includes "lessons learned" and "restore".

2.4.1 Disaster Management Process

There are several overlapping and interrelated catastrophe management processes, and none of them stops or follows the others (Shaluf, 2008).

i) Preparedness – Measures were taken prior to a flood to ensure an efficient response. The measures entail preventing floods or mitigating the damage from floods that are unavoidable. It is a phase in which the public is informed about what to do in the event of flooding and flood dangers, but no strategy to improve flood response is in place (Khalid and Shafiai, 2015; Setola et al., 2016). Preparedness is pre-planning flood mitigation measures to ensure an efficient reaction (Leman et al., 2016). Preparedness might take the form of risk assessments, developing an emergency plan for institutional usage, coordinating with authorities as a preliminary action plan. Additionally, it is about educating the public about flood dangers. Generally, preparation strategies should be managed by organisations, particularly those responsible for vital infrastructure and disaster-related operations. An individual's emergency response plan is one that they own. Communities with stronger social skills and experience with flood disasters will find it easier to carry out greater preparedness (Kapucu and Özerdem, 2011). Individuals or the community require numerous resources to recover or survive in the aftermath of a flood disaster. Supporting resources are drawn from both inside and outside the afflicted area. The resources could come from human resources, funding, logistics, critical supplies, and technical help (Kapucu and Özerdem, 2011). When a flood strikes, communities can take the necessary measures to minimise mortality, property damage, and environmental degradation (Smith, 2013).

ii) Response - Efforts taken to mitigate the consequences of floods. A disaster management standard operating procedure (SOP) can ensure that activities are conducted in a timely, organised, transparent, and beneficial manner. The reaction phase entails formulating an emergency response strategy and delivering strategies and activities (Khalid and Shafiai, 2015). The response focuses only on search, rescue, and evacuations (Setola et al., 2016). Additionally, it entails executing predetermined steps to mitigate the consequences on the community and its assets (Leman et al., 2016).

iii) Reconstruction - Efforts to assist affected communities in rebuilding. Following a flood, quickly returning to "normal" conditions helps lessen social and economic effects (Hussaini, 2007). Before a flood, it is critical to plan for post-flood recovery (International Recovery Platform Secretariat, 2012). Recovery provides measures to support the community to rebuild, reduce risk, and offer flood-proofing for future reconstruction (Leman et al., 2016). Francis and Bekera (2014) come up with the terms "restorative capacity" or "transformative" and "rapidity". It is about how fast the post-disaster situation returns to normal or enhanced reliability in the recovery operations and system. Recovery would be

involved in further stages, which are the response, recovery coordination, and mainstreaming (Pitt, 2008).

iv) Prevention and Mitigation - reducing the presence of the hazard and vulnerability. This phase involves management's involvement in reducing the risks of the flooding effects by having more in-depth flooding analysis, more assessment on existing measures on flooding, and more investigation into the recurring issue.

2.4.2 Learning from Experience

Attitudes are influenced by experience. Personal experience, the influence of other significant individuals, the effect of culture, mass media, educational institutions, religious organisations, and emotional factors can all alter attitudes toward philosophy's object (Schudson,1989). An attitude is a positive or negative reaction to an imminent occurrence that has not yet resulted in action. Attitudes will affect flood-prevention initiatives. The more optimistic a community is, the more powerful its reaction to flooding disasters will be, both during the preparation and response stages (Kapucu, 2008). One may argue that experience is innate to a person and is acquired via everyday experiences or occurrences. Flood protection attitudes can be classified into favourable and unfavourable (Lock et al., 2012). The study's optimistic conclusion is that the community can prepare for the possibility of a flood disaster by preparing emergency equipment to be brought in the event of a flood disaster, securing valuables in a secure location, actively participating in disaster risk reduction planning, and adopting a responsive attitude to action. When indications of a flood disaster manifest, they decide to rescue themselves. How the danger is evaluated determines the extent to which an individual is aware (Keller et al., 2006). It is observed that people make risk-averse choices due to emotions gained from direct or indirect encounters. Even adverse experiences can result in constructive decisions that enhance one's future capacity to reduce risk.

However, such a policy shift entails a transformation in the role of grassroots communities, from passive beneficiaries of technical assistance from government agencies to active participants in the decision-making and execution of non-structural interventions. This sort of transition necessitates a paradigm shift in the minds of residents living in flood-prone areas, as well as politicians and specialists charged with plan execution (Bera and Danék, 2018). In the aftermath of this calamity, non-structural alternatives have also garnered considerable attention. There is universal agreement that rising flood frequency results from climate change. Simultaneously, structural remedies may be insufficient to

avoid future damage, but non-structural solutions that include indigenous knowledge, experience, and risk perception may mitigate the danger (Birkmann et al., 2010).

Numerous studies have revealed that direct or indirect experience and confidence in authorities and experts are vital variables affecting people's views of the dangers connected with natural disasters (Bronfman et al., 2016). Additionally, public policy may influence awareness and preparedness, assisting in the education of citizens and enhancing preparedness actions (Neupane, 1999). Nonetheless, public policy has minimal influence on fear levels, but it does affect awareness and readiness. These attributes affect social attitudes toward risk mitigation; individual experience and external awareness programmes aid in recognising an individual's risk perception. Policy changes need a transition in the community's role from passive users of technical help from government agencies to active decision-makers. To do this, residents in flood-prone regions should be actively engaged (Neupane, 1999).

2.4.3 Flood Preparedness

Government agencies, private firms, and other organisations participating in disaster management shall take the following steps, either alone or in collaboration. The steps include identifying, documenting, monitoring, and updating the disaster-prone locations based on the disaster events (Pal and Ghosh, 2017). Preparedness is a critical component of the disaster recovery process, and increasing readiness is a vital component of proactive disaster risk reduction measures conducted before a disaster. Preparedness refers to the efforts that enable governments, organisations, communities, and people to respond effectively and rapidly in the event of a disaster (Patel et al., 2017). A comprehensive strategy for disaster management must encompass the entire disaster management cycle: prevention, mitigation, readiness, response, and recovery. This disaster preparedness method is the outcome of the interaction of three components: risk assessment, vulnerability analysis, and capacity augmentation for management. Changes were also made to the disaster management method and approach by shifting from top-down to bottom-up. It enables the community to participate in DRR (O'Brien et al., 2006).

The preparation of the community is frequently inextricably linked to other parts of disaster management initiatives. Numerous pre-disaster planning actions are required to guarantee that a given readiness stage is reached. Over time and as society develops, the level of community readiness might diminish (Kapucu and Özerdem, 2011). As a result, it is necessary to periodically assess a community's degree of preparedness. Regular

monitoring can also assist in maintaining and improving the community's readiness level. In the framework of flood risk reduction, the community should either get sufficient information and instruction from authorities or behave responsibly on their own when confronted with flood occurrences (Van Aalst, Cannon, and Burton, 2008).

Simultaneously, the government must provide appropriate information to raise community awareness of flood threats and ease public worry. Critical infrastructure preparation, disaster aid, food, temporary housing, and clean water are components of an organised and coordinated approach to catastrophe readiness (Twigg, 2004). On the other hand, an institution (in this case, a university) must be capable of assessing flood risk, analysing socioeconomic data to determine whether regulatory restrictions exist, and estimating environmental damage. Institutions should be attentive to all feasible flood protection techniques to develop a more effective disaster management strategy (Masur and Posner, 2011).

2.4.4 Physiological Effects

The study of psychological well-being is viewed as a means of extending its concept to various fields of disaster. Apart from redeveloping flood-affected areas, one of the issues is re-establishing the trust of flood victims towards the government and helping them alleviate their burdens. Flood victims' psychological well-being demands further investigation and attention because communities may continue to suffer if their psychological needs are not met (Krishnan, 2016).

Psychological well-being is critical for disaster victims who have lost property and have been forced to relocate. This situation necessitates the victim's adjustment to the new position, which takes considerable mental and physical effort. It was discovered that flood victims face negative psychological symptoms such as stress, despair, and anxiety. Some flood victims involved suffering from psychological stress due to living below the poverty line, poor levels of education, being unemployed because of the disaster impacts, losing a house, and uncertainty about the path of life (Vigil and Geary, 2008). All these are long-term consequences for flood victims and yet they receive little attention from authorities. As such, one of the primary post-flood agenda items that should be further investigated is the psychological well-being of long-term flood victims. Individuals will attain a high level of well-being only when their basic psychological requirements are addressed. They concluded that motivation affects psychological well-being in social settings such as the workplace,

educational institutions, or home. Simultaneously, negative well-being results from a failure to achieve dimensions such as motivation, integrity, life satisfaction, or psychological well-being (Crabtree, 2013).

Emotional reactions, including fear, worry, concern, depression, or sadness, are associated with individual psychological aspects. The emotional condition is characterised by unpleasant emotions or fear of something horrible happening, in this case, flooding. Anxiety or fear is considered a regular aspect of life and can affect anyone in the event of an emergency (Sanderson et al., 2020). Therefore, the authorities should make efforts to provide strategies to alleviate anxiety or concern caused by flooding risks and all issues it may cause. Taking the serious issue of physical effects, including mental health, the author of this thesis examines the extent of the community's concern over flooding issues. It includes focusing on basic knowledge, emotional states, and cognitive and physiological responses. The methods for assessing the community (university students via a questionnaire survey) are descriptive but employ a quantitative technique (Makwana, 2019).

One of the government's attempts to enhance disaster security is to educate the community about catastrophe risk. Students as the younger generation in anticipating and responding to calamities is seen as critical (Ronan and Johnston, 2005). During a flood disaster, one of the tasks of teenagers is an emergency response. Adolescents are always active in preserving lives and property. The focus of attention is on efforts to increase disaster preparedness in school settings; the duty of doing this fall on the university community and policymakers directly involved in education. Early preparation will enable the community to be better prepared for a disaster. There needs to be disaster preparedness education that can be applied to both the community and the teaching staff at universities or institutions. If floods occur regularly, students will develop an early sense of preparedness to face the threats of impending floods (Ronan and Johnston, 2005). Most people gain knowledge about disasters through education and personal experience. Additionally, it is beneficial to enhance disaster education in the respected schools to develop a younger generation that is prepared to face disasters.

2.4.5 Volunteering as Supporting Roles

Volunteers' roles and functions can be aided by their knowledge and abilities in disaster management. Volunteers have the potential to earn community trust. The more help is given by the government to the volunteers, the more help is given to disaster victims. They

are required to play a role in disaster management to meet its expectations, most notably to save human victims, and volunteers receive recognition from the organisation and society (Barsky et al., 2007). Constraints to volunteers may also come from outside, in the form of a challenging environment governed by other volunteers or the government of NGOs that has an impact on the work. Volunteers at the flood site are responsible for supplying food, medical aid, psychosocial assistance, and any necessary approach to help the flood victims. The volunteer role depends on their dedicated responsibilities (Beigbeder, 1991). Disaster management volunteers should be equipped with skills, knowledge, and work motivation to help them perform various duties to assist impacted people, even though the volunteers participating are not as many but share the same purpose (Clary, Snyder, and Ridge, 1992).

Volunteering duties are beneficial to communities impacted by flooding events, indicating that their efforts were successful because each task was carried out with sincerity and honesty. Volunteers should have a few indicators such as workability, technical ability, conceptual ability, and social skills. Volunteers are constantly attempting to improve their capacity to carry out disaster management activities (Getz, 2004). The preceding description indicates that natural ability of interest and volunteer experience influence effectiveness in a role because they get the job done quickly and accurately by utilising resources owned by an organisation to accomplish organisational goals (Quarantelli, 1997). There are supporting factors that affect the role of volunteers in flood management, such as traits that empathise with disaster victims, a desire to be recognised, valued, and trusted, and a desire to gain new experiences for survival. Positive inspiration assists in gaining knowledge and experience and can be beneficial to those affected who organise all their available talents, energy, and time to rescue victims.

2.5 Built Back Better

The sustainability and natural catastrophes are inextricably linked to the built environment. It is also a division of the general environment, which is tied to nature; one will affect the other in many instances. Surveyors, planners, and land administrators are just a few of the built environment professionals dealing with the situation. Practitioners constantly interact with clients and provide services such as consulting, design, planning, project management, and technical investigations. Each year, the built environment becomes more complicated.

The built back better idea is a disaster recovery technique that focuses on reducing vulnerability and increasing community resilience in the face of physical, social,

environmental, and economic exposures and shocks. This idea can help lessen reliance on the government while also minimising considerable losses in a calamity. Resettlement of catastrophe victims to new disaster-free towns is one of the activities highlighted by the "BBB" principle. For any physical project, the National Disaster Management Agency (NADMA) will attempt to ensure that a suitability study is undertaken and that all units constructed meet the criteria and specifications established by the technical department for each construction project (NADMA, 2021).

2.5.1 Sustainable Built Environment

Sustainability encompasses a broad spectrum of concepts. The critical point, though, is to strike a balance in all growth aspects. Numerous other scholars have developed multiple definitions for the built environment. Nonetheless, it is frequently defined as the physical environment humans create to carry out their tasks (Dixon, Connaughton, and Green, 2018). The built environment encompasses all structures and infrastructure classified as civil engineering and administration (Designing Buildings Ltd., 2016).

"…The built environment includes home, school, workplace, parks or recreation areas, business areas, and roads. It extends overhead in the form of electric transmission lines, underground in the form of waste disposal sites and subway trains, and across the country in the form of highways. The built environment encompasses all buildings, spaces, and products that are created or modified by people. It impacts indoor and outdoor physical environments, as well as social environments and subsequently our health and quality of life..." (Srinivasan, O'Fallon, and Dearry, 2003).

The built environment's activities have evolved throughout time due to an updated global sustainability agenda and the adoption of new regulations and solutions (Lorenz, Dent, and Kauko, 2017). Recently, emphasis has shifted to the supply side of sustainability. It is about improving current difficulties without jeopardising future generations' capacity to satisfy their demands (International Institute for Sustainable Development, 2016). Young's (2012) studies discuss a few aspects of the guiding principles of the built environment. Sustainability should be included in the built environment's economic, social, and environmental components of all transactions. The built environment, which includes structures and assets, is viewed as a valuable resource that should be used rather than removed. Building components that are demolished may harm the environment. Sustainable land use and renewable energy should be combined to provide a protected built environment, while improving land use is critical for building sustainability (Young, 2012).

Additionally, the built environment is responsible for many services, including water, infrastructure, transportation, real estate development, and amenities (Ness and Xing, 2017). According to prior research, all areas of sustainability should consider the usage of new technology. The technology should be reliable in terms of system security and should generate sustainable energy (Omer, 2012). It would be ideal if the built environment could collaborate with other critical sectors, including planning, climate change, infrastructure, and construction (Construction Industry Council, 2016).

Until now, research has been unable to establish a method for addressing the built environment's concerns sustainably. The difficulties arise due to increased emphasis on greening the environment but a decreased effort to make things sustainable in all aspects, including management, building, manufacturing, and operation (Allen and Davey, 2018). According to research done by Lisø (2006), the impacted organisation must have the competence and capacity in terms of technology and human resources to meet such difficulties. This is because the created environment's functioning may be altered. It encompasses the design of the structure while also analysing the susceptibility of the region in which it is constructed, the building's location, identifying the obstacles, and proposing adaptation alternatives (Lisø, 2006). Similarly, Haapio (2012) claimed that stakeholders should address all aspects of the built environment and environment, including the built environment, communities, and services, to achieve sustainability.

2.5.2 Construction Project Management

Construction project management includes the administrative management of all aspects of planning and construction for the projects. It is practised in different areas, such as site projects, the construction industry, and the general society (Weaver, 2010). Construction project management necessitates values in administration and service delivery by incorporating a regular duty to humanity for the benefit of future endeavours (Weaver, 2010). Most of the research into construction management focuses on the improvement of work practises and the process of decision-making (Seymour, Crook, and Rooke, 1997).

In the past, the demand for effective construction project management by today’s current type of organisation has become huge. Researchers attempted to evaluate whether the intense effort of proper construction project management is helpful enough to deal with the worst consequences of a calamity or severe disruption of the building projects caused by

natural disaster attacks. There is a need for the necessary interdisciplinary research behind the studies, including in construction management, which often lacks the ability to reduce risks (Gough and Gough, 1997).

"No construction project is risk-free. Risk can be managed, minimised, shared, transferred, or accepted. It cannot be ignored" (Latham, 1994).

A construction project may be more dangerous, risky (Zou, Zhang, and Wang, 2007), and vulnerable than other types of projects (Flanagan and Norman, 1993). Among the activities involved are managing different stakeholders, production delivery, and dealing with the environment (British Standards, 2006). In a study by Pereira, Tiong, and Komoo (2010), it is reported that the protection of the environment is considered a tough decision in meeting economic needs while preserving nature. A more substantial approach is by understanding how construction management should respond even before a disaster strikes (Low et al., 2006).

Construction practitioners should be involved in DRR aspects, for example, in improving building codes, materials, and technologies for hazard and risk (Chang et al., 2010). Others have highlighted the relevance of construction management in the reduction of disasters and risk, including reconstruction, planning, prevention, and reduction. The current situation demonstrates that people are getting more apprehensive about setting up a new building and dealing with all sorts of construction actions. Therefore, those buildings should be managed in the best way possible by having great practise in reducing as much of the impact of disaster risk as possible (Parnham, 2000).

There is an urgent need to improve the sustainability performance of buildings (Lafarge Malaysia, 2015). There are three critical things to ensure that construction carries out the sustainability efforts: sustainability assurances, being prepared for any drawbacks from the sustainability move, and preparing for future sustainability endeavours (Allen and Davey, 2018). The key players in the construction industry should address those matters involved in achieving a sustainable built environment (Lisø, 2006). Collaboration with the industry's key players helps to better manage the life-cycle impacts of construction management projects (Cemex, 2016). All these issues must be well thought out in the early stages of construction management projects where the ecological effects are significant.

2.6 Risk Management Challenges

Risk conceptualisation in the social sciences is founded on the idea that social processes affect the causes and effects of risk. These risk concepts cover psychological, social, economic, and cultural perspectives. As a result, social risk is concerned with risk evaluation and strives to link objective and socially produced trouble. In this study, the risk is viewed as having both a physical and a social component.

2.6.1 Perspective and Views on Disaster Recovery

Perhaps the most thorough account of recovery strategies is to be found in the work of Lindell (2013b). This paragraph reviews the disaster recovery perspective from Lindell. Disaster recovery has various undertakings, whether it is following the stages or randomly executed. It is like an art form, free to choose any option, try and error, but dependent on knowledge to not make things worse. Disaster assessment is closely related to the emergency response phase and identifies the physical disaster impacts. Short-term recovery is linked to activities that require a short amount of time to secure the impacted area, provide shelter to victims, and help individuals or businesses. Reconstruction monitors activities for the disaster evaluation, including short- and long-term reconstruction, which need proper care and coordination to meet the disaster recovery goal. The community should learn from experience and improve towards a more disaster-resilient approach. The community should have the ability to mitigate disaster hazards through building designs, construction methods, and materials. The recovery strategies also involve a few broad areas, including psychological recovery, business recovery, higher levels of government, and recovery or mitigation committees. Lindell (2013b) provides six pre-recovery operations plans.

Firstly, it describes a disaster recovery organisation. Secondly, the plan must provide temporary accommodation for the affected community (Bolin, 1982). Thirdly, it should be able to handle anything associated with recovery operations, such as damage assessment, debris disposal, repair, restoration of infrastructure, and reconstruction (Schwab et al., 1998). Fourthly, pre-planning should protect disaster victims. These protections include monitoring contractors, retail control prices, and jurisdictions' organisational supremacies and assets. Fifth, the plans include the recovery plans at the historical sites (Spennemann and Look, 1998). Finally, providing adequate time in the recovery planning process to develop policies to meet the goal is critical. The planning will help the communities continue to function well. There are many ways to plan for the flooding recovery in advance. This study suggests

a few ways to deal with flood recovery, such as conducting a flood risk analysis, developing the country's National Risk Assessment (NRA), investing in flood resistance projects, and warning systems, exercising a structured recovery management plan, and putting concerns on risk perception, communication, and knowledge management. Each of these areas is worth exploring because it has a positive impact on the overall recovery process.

2.7 Malaysia Flooding Challenges

Malaysians are mostly less concerned about disasters than their British counterparts because the community considers disaster-like flooding the responsibility of the authorities and the government to deal with the issue. The responsible party faces the difficulty of carrying out the recovery process due to the lack of national plans and policies. In addition to that, urban planning and the environment are still not ready to face the flood situation, lacking capacity and resources, resulting in weak follow-up actions. Local governments may also face challenges in terms of capability and participation in disaster management (de Goyet and Morinière, 2006).

It could take months between levels of administration to receive the correct information, especially when it involves differing policies from different local authorities (Gunatilleke, 2006). Risk analysis and flood assessment are considered complex processes (van den Honert and McAneney, 2011). Small-scale disasters might be neglected for reasons like politics and budget (Wisner and Luce, 1993). The public also has less awareness about the diversity of flood impacts and mitigation purposes (NSC, 2011). In the Malaysian recovery and response phase, for example, aiding and support to victims is slow. There are also not enough resources, such as equipment for rescue purposes and an uncomfortable evacuation centre for the victims (Roosli and Collins, 2016).

The coordination management between government agencies is not smooth, considering flooding happens in Malaysia regularly (Said et al., 2011). Logistic activities and managing financial aid are also difficult to operate in the affected area (Rani et al., 2017). Poor management resulted from stakeholders' having different standpoints, no clear roles and responsibilities, lack of resources, being scarce in financial abilities, and knowledge (Calgaro and Lloyd, 2008). Roosli and Collins (2016) believe that even if there were some regulations, they would not be well adjusted to manage the flood. Resources which were prepared earlier might be demolished or unattainable after significant flooding, also causing communication impairment (Sheffield, Gregg, and Lee, 2016). Disaster recovery would

depend on time. It requires fast decision-making and a limited time of operation. Therefore, interruptions in data collection and accessibility to the impacted area would affect the phase (Pourezzat, Nejati, and Mollaee, 2010).

2.8 Flood Risks Issues

Natural disasters must be addressed as recurrent problems, not as unanticipated crises. Collaboration between the public and other sectors is essential to mitigate negative consequences (Comfort et al., 1999). Natural disasters, particularly hydrogeological disasters, are among the most perplexing environmental problems of the modern period. Enhancing disaster readiness through emergency planning activities and encouraging residents to adopt specific protective behaviours is just as vital in a disaster-prone location as lowering risk through engineering or architectural work that makes areas safe.

Hazardous situations can quickly result in danger, undesired events, and adverse outcomes. Risks may be generated for many years before the occurrence of a catastrophe. Threats could jeopardise lives and regional economic development, resulting in high financial costs, property, personal items, and infrastructure destruction (Proctor, 1998). Several areas require prioritisation, including establishing a communication system and standardising the goal and objective of DRR among stakeholders or participants within institutions, identifying the stakeholders involved, conducting continuous assessments of the institutional condition, soliciting feedback from the community involved, and modifying actions (Comfort et al., 1999).

Flood catastrophes are garnering more international attention; thus, adaptation is a vital component of policies, practices, and programmes to mitigate the consequences of these disasters on vulnerable people. Adaptation encompasses both human and environmental systems and frequently refers to the products, processes, and activities of society due to system modifications, reforms, and reorganisation to achieve functional connectivity with the environment (Folke, et al 2005). This insight applies to the literature on disaster risk management regarding how and why catastrophes occur, who is impacted, and what strategies, measurements, and interventions can be used (Birkholz et al., 2014). The risk management literature has emphasised perception's crucial role in shaping how individuals and society react to risk during the last several decades. Beyond the immediate effects of disasters, risk perceptions and risk-taking behaviours may worsen the social, political, and economic ramifications (Burns and Slovic, as cited in Birkholz et al., 2014).

Typically, recovery efforts are directed toward restoring the environment to its pre-disaster form. There is no instant remedy to issues that occur to mitigate future disaster susceptibility (Comfort et al., 1999). This research is founded on an understanding of fundamental theory, which enables the examination and comprehension of complex challenges involving Malaysian higher education institutions (universities). The purpose is to determine the strengths and weaknesses of the coping mechanisms in place to address flood threats in the university region.

2.8.1 Flood 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…"*** (Birkholz et al., 2014).

The Risk Vulnerability Assessment (RVA) is the basis of the DRM systems (Lin, 2018), and every authority should carry out this RVA. Different authorities could use different methods to select, analyse, and evaluate potential disaster risks, vulnerabilities, and consequences (Abrahamsson and Tehler, 2013). If people had less concern about flooding, their vulnerability to this disaster would be increased (Vu and Ranzi, 2017). In an analysis by Islam and Walkerden (2017) in Bangladesh, flood risk management strategies should deal with a few critical 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, and sustainable development. No ultimate strategy is used in reducing the flood risk.

Therefore, mixed, or integrated approaches to flood risk management strategies are necessary (Islam and Walkerden, 2017). The approaches are, for example, the management of land use, structural defences, and preparedness for flooding. Stakeholders would be able to choose management options by having a clearer understanding of flood risk expectations. It could help with better sustainability for flood management measures (Islam and Walkerden, 2017). Flood risk could become more severe because of a few main factors, such as urbanisation in flood-prone areas and climate change (Matczak et al., 2018).

2.8.2 National Risk Assessment (NRA)

National Risk Assessment (NRA) is a new method that is developing worldwide. Any country can now carry out an NRA to identify the possible threats and risks that arise from disasters, thus addressing the problems (OECD, 2015). The NRA would be targeting issues that could affect the country, including disasters (Lin, 2018). Coordination between different levels of administration, stakeholders' approaches, and complex organisational structures are some of the issues that arise. There are several benefits to the NRA, such as reducing vulnerability to disasters, improving policies, and making better use of resources. The NRA undertakings of each country would create a better understanding among nations and, thus, the broader method for DRM is better prepared (Lin, 2018).

2.8.3 Risk Management Plans (FRMP)

To date, several studies have investigated flood risk management plans (FRMP), which is one of the resistance efforts in managing disasters amongst urbanised countries. FRMP used infrastructure to control floods and to apply laws and regulations to control actions. Flood defence in FRMP entails command and control in typical engineering works used by authorities (Jong and Brink, 2017). The example of FRMP implementation includes issues such as managing the water cycle, integrating land and water management, maximising the use of floodplains, adopting a mix of flood mitigation strategies, ensuring a participatory approach, and adopting integrated hazard management (Consoer and Milman, 2018).

The FRMP covers insurance coverage and consultation on flood risk (White et al., 2018). Adaptation and mitigation could occur together within the FRMP, with non-structural activities such as flood management and forecasting. FRMP is the responsibility of everybody, including the private sector and the surrounding communities. To make the FRMP a success, it needs to be organised effectively and meet the objectives, aside from reducing the vulnerabilities (Jong and Brink, 2017). More significant FRMP prospects must be investigated, including social efforts, flood resistance, and its consequences (Morrison, Westbrook, and Noble, 2018). Apart from that, the FRMP based on strength needs to be adapted, understood, and would be able to enhance resilience to floods (Morrison et al., 2018). It is because FRMP has the difficult challenge of covering scientific, practical, and political dimensions (Morrison et al., 2018).

2.9 Flood Risk Perception and Communication

2.9.1 Risk Perception

Since risk perception can be applied to various calamities, it will be limited to floods (Messner and Meyer, 2006). Risk can be reduced by ensuring that individuals and organisations are prepared for all possible natural disaster consequences. A well-prepared community needs less concern about risk. Risk perception is determined by risk attributes, which are the outcome of fear, knowledge, and the degree to which one controls the threat (Slovic, 2000). These attributes affect social attitudes toward risk mitigation (Neupane, 1999). Procedures for risk perception entail identifying, collecting, sorting, and analysing signals associated with natural disasters and generated by interpreting various sorts of information (Wachinger et al., 2013). Risk perception is used to define the link between concerns, preparedness, and awareness. Numerous techniques can be used to better understand a community's crisis, one of which is learning from the communities themselves. Additionally, the author contends that this enables the identification of individuals' perspectives. This section examined recent findings and concepts from the field of risk perception research. Risk perception studies are necessary for decision-making and successful resolution of risk communication issues.

The features of risk perception are intuitive judgments made by groups or individuals in the face of ambiguous or restricted information. Risk perception is sometimes linked to fear, knowledge, and one's degree of control over the threat (Johnson, 1993). The more people are concerned about the potential for catastrophe, the more they will demand precautionary measures. Individuals perceive risk differently. There are numerous variables, but nevertheless, the emphasis is on risk, warnings, and communication. Multiple factors influence risk perception, including environmental and societal characteristics, the availability of information, personal preferences, and warning systems. All of this contributes to the pre-decisional process and risk perception (Lindell and Perry, 2012). Individuals' perceptions of risks are influenced by social and psychological processes, resulting in various behaviours. Risk perception is influenced by a variety of different kinds of information. It is then transformed by an individual's knowledge and affected by cultural and socioeconomic circumstances. Individuals' intuitive judgement in the face of ambiguous and restricted information is the defining feature of risk perception (Wahlberg and Sjoberg, 2000).

After assessing the hazards, individuals often have three options: to accept the risk, mitigate it, or avoid it entirely. The selections are based on a balance between perceived risks and benefits associated with disaster risk reduction initiatives. Risk perception is affected by community opinion about the effectiveness of technical and environmental measures implemented to mitigate risk (Twigg, 2004). Diverse sources of knowledge are influenced by an individual's expertise, cultural, and social factors. Public perceptions of the efficacy of technical and environmental controls employed to limit risk implications are variable (Bera and Daněk, 2018). The awareness results in a reduced or increased level of concern, which results in the level of preparation. Furthermore, public policy can help educate citizens and improve preparedness measures (Neupane, 1999). Risk perceptions and faith in the government and specialists substantially impact catastrophe preparedness and reaction. As a result, substantial advancements in perception analysis techniques have occurred in recent decades, allowing us to better understand how people respond in the face of a threat (Bronfman et al., 2016).

Disconnection between risk perception and risk communication has the potential to be detrimental. There must be a connection between the provided information and the actual situation. Perceptions of risk and communication with flood-affected people are critical components of disaster management, as they are in this study (Ranke, 2016). This is because it could be used for future research and policy development, which are the primary factors to consider during catastrophe planning. Additionally, it may be applied to future flood management's readiness and preventative phases (Kammerbauer and Minnery, 2019). The community, including potential or actual disaster victims, shapes its sense of risk (Kammerbauer and Minnery, 2019). To avoid misinterpretation, risk information should be addressed locally, and governments should make significant efforts to assess, communicate, and manage flood threats (Kammerbauer and Minnery, 2019). Current and future stakeholders' perceptions of flood risk and the level of safety they expect may also be critical for ensuring the long-term viability of flood management measures, which is essential because risk perceptions and safety expectations play a significant role in management option selection. On the other hand, current knowledge is insufficient for projecting future stakeholder types and attitudes toward flood risk management programmes. Future research should concentrate on techniques to communicate flood risk to current and future stakeholder groups and communities (Shah et al., 2018).

Table 2.4: Theoretical Constructs in Risk Perception Literature (Self -Authoring).

Theoretical Constructs	Author(s)
"Cognitive limitations of decision makers force them to construct a simplified model of the world to deal with it"	(Slovic et al., 1974)
"Decision-making choices are limited by their perception towards alternatives available"	(Kates, 1971) (White, 1972)
"Express perceptions and risks through their descriptions of the risks, and behaviour"	(White, 1972)
"Variables of bounded rationality - limited alternatives, confusion of risks and denial of uncertainty, crisis orientation, and the tension between individual and collective management"	(Slovic et al., 1974)
"Protection motivation factors: the perceived severity of a threat, vulnerability, the perceived effectiveness of any recommended response, and perceived ability to implement a response"	(Birkholz et al., 2014)
"Developed to understand how people cope with fear and threats through communications"	(Rogers, 1975)
"Depends on the perceptions of the role of public authorities"	(Birkholz et al., 2014
"A contemporary development in the fields of vulnerability, adaptive capacity and resilience"	(Birkholz et al., 2014)
"The importance of vulnerability concepts in natural hazard and disaster research"	(Cutter, 1996) (Pelling, 1997) (Cutter et al., 2000) (King and MacGregor, 2000) (Cutter et al.,2002)
"People capacity to anticipate, cope with, resist, and recover from disaster"	(Schneiderbauer and Ehrlich, 2004)
"Vulnerability not made up of many politics, economic and socio-cultural factors"	(Schneiderbauer and Ehrlich, 2004)
"Vulnerability as root causes and dynamic pressures"	(Blaikie et al., 1994)
"Localised unsafe conditions lead to a disaster"	(Blaikie et al., 1994)
"Vulnerability components: exposure to a hazard, susceptibility to harm, and adaptive capacity"	(Few, 2003) (Messner and Meyer, 2006) (Adger, 2006) (Birkmann, 2006) (Smit and Wandel, 2006) (de Bruijn et al., 2007) (López-Marrero, 2010)

“Risk perceptions as a key component of vulnerability assessments”	(Cutter, 1996) (Cutter et al., 2003).
“Crisis perceptions’ as part of the cultural arrangements of a society and ability to cope with flood events.”	(Few, 2003).
“Importance of risk perceptions as determinants of vulnerability”	(Messner and Meyer, 2006) (Kuhlicke et al., 2011)
“Ability to adjust become more effective at dealing with hazards”	(Smit and Wandel, 2006) (López-Marrero, 2010).
“Perception-related strategies improve communities' adaptive capacity”	(López-Marrero, 2010) (Grothmann and Reusswig, 2006) (Terpstra and Gutteling, 2008).
“Social capacity – concept of risk perception link to preparedness motivation”	(Kuhlicke et al., 2011) (Kuhlicke and Steinführer, 2013.)
“Community resilience as priority for disaster risk reduction worldwide”	(Schelfaut et al., 2011).
“Incorporate resilience as aspiration and promoting sustainable flood memory”	(McEwen et al., 2012).
“Cultivation of shared learning”	(Ashley et al., 2012).
“Accept different perspectives on risk and provide alternative responses to flood threats”	(Birkholz et al., 2014).
“Resilience as a useful operational concept”	(Schelfaut et al., 2011).
“Resilient communities can reorganise in the wake of disruptive events”	(Folke, 2006) (Folke et al.,2010).
“Better risk communication in flood management strategies”	(Schelfaut et al., 2011).
“Risk perceptions in improving the resilience of people and communities”	(Burns and Slovic, 2012).
“Individual's judgements and decision-making processes are shaped and constrained by their social environments”	(Drake, 1992).
“Behavioural options because of power dynamics and access to resources and knowledge”	(Kates, 1963; Tierney, 1999) (Slovic, 2000).
“Describes how people make decisions under uncertainty based on their evaluations of potential losses and gains”	(Tversky and Kahneman, 1982).
“Significant influence on economic theories around financial decisions”	(Kyle et al., 2006).
“How people assess the probability of an uncertain event”	(Tversky and Kahneman, 1982)

“Role of emotion in influencing a person's estimate of the frequency of a hazardous event”	(Johnson and Tversky, 1983).
“Media influenced to the overestimated risks”	(Johnson and Tversky, 1983).
“Influence of the risk or benefit perceptions that people have on hazard”	(Finucane et al., 2000).
“Complex interplay between emotion and reason”	(Slovic, 2010) (Slovic et al.,2004).
“Influence on rational thinking, leading to irrational behavioural outcomes”	(Slovic et al., 2004).
“All human behaviour can be modelled as variants of optimisation problems”	(Jaeger et al., 2001).
“Rationalist approaches did not effectively consider the social structures and organisations within which perceptions of risk developed”	(Tierney, 1999) (Short, 1984) (Douglas, 1985) (Johnson et al., 2004)
“Exploring the role of contextual factors in shaping risk and perceptions of risk”	(Mustafa, 2002)
“Risks are socially constructed and linked with the dynamics of the social system — culture, institutions, organisations, values, and beliefs”	(Drake, 1992) (Oliver-Smith, 1996) (Tierney,1999) (Weichselgartner, 2001) (Johnson et al., 2004)
“What may be considered a hazard in one social context may be seen as a resource in another”	(Weichselgartner, 2001)
“Understanding of risk highlighted the role of the media in contributing to social perceptions of risk”	(Short, 1984)
“Media coverage could contribute to biased judgement of risks”	(Johnson and Tversky, 1983)
“Dramatic media coverage results in everyday hazards perceived as less dangerous”	(Short, 1984)
“Understanding the power dynamics and the influence of organised interest groups over risk management policy”	(Clarke and Short, 1993)
“Cultural theory of risk”	(Douglas and Wildavsky, 1982)
“Concept of risk in society”	(Douglas and Wildavsky, 1982)
‘The unique human capacity to classify experiences, encode such classifications symbolically, and teach such abstractions to others”	(Oltedal et al., 2004)

“Cultural bias (shared values and beliefs) and social relations (patterns of interpersonal relations)”	(Douglas, 1978)
“Way of life describe an individual's attitudes and actions: individualistic, egalitarian, hierarchical and fatalistic”	(Douglas and Wildavsky, 1982)
“Outcomes of risk perception can help to better prescribe risk management and communication strategies and lessen the societal costs of major disasters”	(Burns and Slovic, 2012)
“Different stakeholders can support different management in flooding or support the same interventions but for different reasons”	(Haasnoot et al., 2013).
“Long-term engagement based on communication strategy between those at risk, policy makers, and stakeholders”	(Baan and Klijn, 2004) (Terpstra and Gutteling, 2008) (Kuhlicke et al., 2011) (Burns and Slovic, 2012).
“Public flood defence measures can affect willingness to adopt personal protective measures”	(Grothmann and Reusswig, 2006) (Terpstra and Gutteling, 2008)
“New decision support frameworks for policy makers”	(Raaijmakers et al.,2008)

Age has been linked to perceived risk for a variety of natural hazards. Additionally, individuals who had resided in their current location for more than a year were more aware of their surroundings. Spending time in the region may also contribute to a lack of flood awareness in younger age groups, where prior experience may play a role. Age, or presumably experience staying at the same location, does not always imply increased knowledge, as evidenced by the fact that those in the higher age group may become less conscious of their flood hazard (Burningham et al., 2008). Individual age has a substantial impact on behaviour. Individuals who have matured can control their emotions and behave appropriately when confronted with floods. It is believed that an individual's age affects their capacity to engage and socialise with others. Individuals that are more mature have a better chance of obtaining information. Some studies find that men are more resilient than women. Men have a higher level of resilience than women because they are more adaptive, responsive, and rational and have a more significant influence on decision-making during floods (Chase-Lansdale, Wakschlag, and Brooks-Gunn, 1995).

Community's potential to manage disasters effectively through the adaptation process, preserve essential functions within the community, and restore them to pre-disaster

conditions. Disaster experience is one of the protective variables capable of promoting resilience. Low self-esteem in students indicates a lack of resilience (Abramson et al., 2015). Inadequate community assistance will also contribute to flooding victims' lack of resilience. Inadequate or unavailable public and social services, disruption of educational facilities, may produce anxiety in the form of emotional reactions such as restlessness, panic, insomnia, feelings of insecurity, irritability, and sadness while thinking about the flood tragedy. To exercise effective emotional management, individuals must maintain a calm state of mind and minimise excessive anxiety. The responder's age influences emotional regulation; the older the respondent, the more controlled they are in terms of emotion. Communities living in disaster-prone locations must develop resilience through spiritual influence, increased positive favour, and healthy relationships with others (Matthews, Zeidner, and Roberts, 2004).

Additionally, education level has been linked to risk perception. It has been shown that people with less education have a stronger sense of risk (Lindell and Hwang, 2008). An individual's educational history will influence their life patterns. That is, the higher an individual's education level, the more advanced his or her understanding, behaviour, motivation, and attitude toward disaster will be. According to the study's findings, the educational background of the research respondents was sufficient. A certain level of education will exhibit a systematic procedure, particularly in thinking. This is because they are educated to analyse problems throughout their education. For example, university students are taught to evaluate the difficulties and then form judgments about them. The students will begin attempting to solve the situation they face. This systematic approach may indirectly increase individuals' preparedness and responsiveness when disasters strike. The respondent's age and gender are examples of sociodemographic data that were obtained during the questionnaire survey process. Participants were asked to respond to four sociodemographic questions and experiential questions on whether they had been harmed by flooding (Miceli, Sotgiu, and Settanni, 2008).

The flood tragedy directly impacts the population and public awareness of the monsoon flood catastrophe. An attitude is a response that can be positive or negative. In a positive attitude, the trend of behaviour is toward liking, anticipating, or liking a particular object. In a negative attitude, the tendency of action is toward avoiding, hating, or disliking certain things. On the other hand, attitudes are predominantly unfavourable (Kahneman and Snell, 1990). Respondents' attitude toward flooding was similarly negative, owing to their inability to determine what to do in the event of a flood. When a flood happens, they prefer

to play with water, particularly students, and vice versa; a positive attitude tends to approach and anticipate objects, showing that respondents prioritise weather and flood information. It is helpful to improve the community's awareness of the disaster. Risk perceptions are shaped by an individual's understanding of the threat, self-attitude toward risk, prior experience, exposure to awareness, ability to mitigate, and demographic variables (Ahlan, Lubis, and Lubis, 2015).

Socio-demographic and experiential characteristics as suggested for research based on Miceli et al. (2008) are, for example, identifying flood threat perception by knowing community level of education (diploma or university degree), the proximity of the home or individual place to the nearest watercourse, having sustained damage during a flood, or having received information about hydrogeological risks, assets damaged or destroyed, home or building damaged or destroyed, any loved ones hurt, and feelings of worry or concerns (Miceli et al., 2008). The author of this thesis also provides questions associated with the respondents' socioeconomic and demographic variables.

2.9.1.1 Rationalist Paradigm

The rationalist paradigm involves few other theories such as limited rationality, protection motivation theory, revealed preferences theory, psychometric theory, and heuristic of affect. Rationalist perspective have to response to various challenges, such as interdependence of factors that could affect decision-making about flood risk protection (Slimak and Dietz, 2006). Risk perceptions result from a logical individuals' perceptions of the impact of disaster on their living and advantages they face when impacted by flooding. The rationalist based on cost-benefit analyses rather than other critical component of their views as assessment (Kick, et al., 2011). To reveal quantitative assessment levels, risk needs a cognitive construct that can be psychometrically described. It offers qualitative features of multiple kinds of flooding threats simultaneously. The qualitative risk characteristics were not investigating the relationship between risk perception and sociodemographic variables. Most of study analysed on the risk impact and disaster experiences (Albano, Mancusi, and Abbate, 2017).

The author believe that rationalist paradigm always includes risk characteristics such as community location (proximity to flood area), flood and community characteristics, flood magnitude, direct community experience, sociodemographic profiles, including community awareness, and community level of flood information or knowledge (Smith, 2013).

Engineers, health physicists, statisticians, and epidemiologists have typically defined risk probabilistically in terms of real danger, as determined scientifically and "objectively," versus risk as "perceived" by the general public. According to realists, scientific knowledge is rational, objective, and uncontroversial and is concerned with the truth about the physical world as described by specialists. According to the realist perspective, objective reality may be determined empirically: objective threats are detectable and assessable environmental characteristics. According to this perspective, perceived risk is critical in driving people to avoid physical hazards associated with disasters and prepare for them. The assumption is that the greater the perceived threat, the more actions will be taken to reduce the harm. Government agencies in charge of disaster management have nurtured and perpetuated this impression of a perceived threat.

2.9.1.2 Constructivist Paradigm

Constructivist paradigm includes risk characteristics such as accessing community with no previous flood experience, political influence towards risk perception, religious approach in DRR, and how the community perceived their culture and history of their locality in facing flood risks (Flint and Luloff, 2005). The constructivist paradigm involves few other theories such as cultural theory, practice theory, network theory and same as rationalistic paradigm is heuristic of affect (Flint and Luloff, 2005). The constructivist paradigm rejects threat assessment as an objective, system-independent phenomenon. Flood risk perception is seen through this lens as socially produced and intimately tied to the processes of social system change. Risk is seen as a contextual occurrence in the constructivist paradigm. How institutions impact the public's perception of risk and the interaction between socioeconomic disparities and risk exposure. It is feasible to predict a person's likely sense of danger based on their cultural connection and social knowledge. This theory focuses on how the architecture of a functional social expression expresses and reinforces an individual's sense of danger (Renn, 1992). In cultural theory, the idea of risk in society is seen in a larger context, including moral values and concerns. Two types of sociological theories fit within the constructivist paradigm of research on risk attitudes: those that emphasise the community's interaction (practise approaches) and those that emphasise the interaction of society and individual practises (network theories). Individual behaviour is inextricably linked to societal institutions and the power dynamics that underpin them. This behaviour is influenced by social interactions and activities daily (Young and Collin, 2004).

Individual ignorance of the hazard becomes significant when there is a lack of faith in the authorities. Confidence in flood control systems and conviction in their efficacy is often the outcome of prior flood experiences. The research of flood risk perception is contextualised culturally. The examined community's cultural context provides context for and complements the understanding of the psychometric findings. Risk assessments take various forms: technical, financial, environmental, and feminist. Gender theory accounts for men's and women's differing perceptions of flood danger. Historical component in modern flood risk research is absent.

It is observed by the author that, religious fatalism, optimism, and despair contribute significantly to the development of risk attitudes. Fatalism and denial are both instances of non-protective reactions resulting from an inadequate risk assessment, such as a response to the quantity, consciousness, and response costs in conjunction with a contemporary high-risk evaluation. Fatalism, optimism, and denial help alleviate the negative emotional consequences of perceived risk, such as fear. Religious and cultural factors may influence the demographic traits that are being studied. The constructionist approach is based on a firm belief in the importance of social explanations for risk perception. According to this view, risk assessments are relative and socially created, deriving from the culture in which they are placed and reflecting its values and social organisation. To understand how people perceive risk, it is necessary to consider the social and cultural contexts in which hazards occur and how these variables shape people's attitudes, beliefs, and behaviours.

Table 2.5: Summary of Approaches to Risk Perception.

(Adapted from Birkholz et al, 2014).

Summary of approaches to risk perception			
Paradigm	**Approach**	**Description and attributes**	**References**
Rationalist	Revealed preferences	• Curious about how society weighs the benefits and costs of technological risks• employs historical empirical data on accidents and health for a wide range of public activities to determine the social cost deemed acceptable in the benefit-cost analysis	(Starr, 1972)

		of technology risk assessment.	
	Psychometric paradigm	• Asserts that risk is a subjective construct that can be psychometrically described to reveal quantitative levels of judgement. • Concentrates on cognitive variables that influence risk perception. • Concentrates on individual risk assessments and the distinctions between "lay" or "expert" risk perceptions.	(Fischhoff et al., 1978) (Slovic, 2000)
	Heuristics and judgement	• Curious about how people estimate and rate various types of hazards?	(Tversky and Kahneman., 1982) (Tversky and Kahneman.,1983) Johnson and Tversky., 1983)
Constructivist	Cultural theory of risk	• Describes how people make decisions in the face of uncertainty based on their assessments of potential costs and benefits.	(Douglas, 1978), (Douglas and Wildavsky , 1982)

	Social construction of risk	• Argues that people frequently rely on mental "guidelines" when faced with uncertain risks or risk events, which can result in bias/error; • Argues that likely risk perceptions can be determined through cultural adherence and social learning; • Argues that social organisation structures endow and reinforce the perceptions an individual holds;	(Short, 1984), (Clarke and Short, 1993) (Oliver-Smith, 1996) (Tierney, 1999) (Johnson et al., 2004).

2.9.2 Risk Perception and Risk Attitude

In empirical investigations, flood risk perception is represented via fear and alertness and is often related. Preparedness, establishing an attitude toward risk and identifying variables that impact adopting preventative actions in connection to the degree of flood risk perception are distinct concerns in the flood risk perception study. Most of the emphasis is on variables that alter risk perception, followed by elements that have no apparent effect on the researched phenomena, and lastly, on the group of worrying risk perception factors (Wahlberg and Sjoberg, 2000). Public awareness rose due to information distribution and public education, comparable to the incidence of floods and the actual reality of flooding (Paul and Routray, 2010). Gender is another element that determines how people perceive flood danger. There is no doubt that women generally perceive a greater flood danger than men (Slovic, 1997). Women exhibit more anxiety in reaction to perceived threats as mentioned by Sjöberg (1998) and Poortinga et al. (2011).

2.9.3 Risk Communication

Risk communication must consider the context of people's lives and their relationships with their neighbourhood and environment (Sime, 1997 as cited in Burningham et al., 2008). Nowadays, flood risk management strategies and technology are becoming more prevalent in various parts of the world (Shah et al., 2018). It is critical to evaluate how people react to flood-related difficulties. This study identified factors that should be considered in future flood risk management measures. This study acknowledges the challenges in institutional communication and the community's engagement in comprehending and interpreting flood risk information. Governments at all levels are involved in risk communication (Kammerbauer and Minnery, 2019). A few crucial factors in risk perception and communication were adopted by Lindell and Perry (2012) and Bodoque et al. (2019). It encompasses warnings and alerts, risk communication design, risk response, property protection, accurate information distribution, decision-making in advance, leadership, and threat perception. Risk management is evolving from a risk-based strategy to one that is more integrated and integrates risk communication to enhance resilience. Risk management is struggling to prepare and respond promptly. As a result, the risk communication strategy improves flood risk perception over time. This enables individuals to develop a more substantial capacity for dealing with floods with greater seriousness in the future (Bodoque et al., 2019).

Risk communication enables the localisation of risk perception. Risk communication aims to increase awareness and comprehension by utilising emergency management measures to safeguard the community. An impromptu risk communication technique should quantify the community's awareness of its activities in the face of flooding. After that, the risk communication strategy should be reviewed by a pre-or post-survey or interview (Bodoque et al., 2019). The community should have access to accurate risk information. To assist the community in reacting appropriately, the data must be significant and easily understandable. Risk mitigation strategies and all the developed procedures should be evaluated continuously. The objective of flood risk communication is to ensure that all public members receive the same information and respond accordingly, while also minimising potential threats. Due to adverse reactions to a past flood tragedy, communications could not be compromised. If public members do not receive adequate information, they may become dissatisfied. Members may lose trust in the authority's ability to convey information due to inaccurate or inconsistent information published in the newspaper or on social media (Kellens, Terpstra, and De Maeyer, 2013).

There must be a dynamic between the authorities and the public during the decision-making process regarding the social and political communication effort. The authorities should employ several communication strategies based on the assumption that the public is at risk if there is a lack of understanding of a situation. Flooding is connected to subjective risk factors such as feelings and emotions, trust issues, concerns, and fear (Comfort, 2007). Risk perception can assist in resolving these challenges by providing helpful information about dangers communicated to the public via warnings. Several aspects contribute to an understanding of the warning system's significance. Warning systems must be well-designed to communicate information about threats effectively. During the flood planning phase, the institution should be able to give a broad warning to the targeted community. The information presented should be relevant to making the best use of readily available resources. The community must be made aware of the officials who provided risk information and warnings to assure the credibility of the information (Pokrywka, 2016).

Risk management requires a good perception and communication approach to ensure that the NDRR is done smoothly. Risk perception is related to emotions, behaviour, and communication about the disaster (Birkholz et al., 2014). Somehow, there are limited capabilities during flood management. Still, the public could reduce social disruption by protecting themselves and their property in the best possible way. Large-scale flooding might have affected a few neighbouring countries (Brinke et al., 2017), which requires learning and helping one another in different kinds of aspects. Failure to communicate in the right way will lead to the failure of the DRM (Lin, 2018).

University should take a more proactive approach to risk management by focusing on a broader area of concern and problems should be handled holistically. All the Malaysian flooding plans and the latest methods for tackling the flooding problems should be known and adapted where possible, and this needs to be kept updated. Forecasting and early warning systems are the steps that are required in managing all-natural disasters, including flooding.

2.9.4 Knowledge Management

Lack of knowledge will result in poor behaviour in disaster prevention, insufficient preparation for disasters, and will lessen the individual's resiliency. Disaster preparedness education needs to be applied to both the community and the staff at the university institutions. Flooding that occurs regularly will help in developing the institutional capacity to deal with flooding threats (Levac, Toal-Sullivan, and OSullivan, 2012). The community

must be educated about disaster risks, especially for the younger generations. Younger generations, like students, are a vital element of society and contribute significantly to social life. Empirical knowledge of flooding can evolve into descriptive knowledge if an individual can describe all the related disaster characteristics, attributes, and signs. Practical knowledge can also be acquired through repeated personal experiences (Eiser et al., 2012). For example, someone who frequently encounters flooding would naturally receive information about how to deal with flood difficulties and take actions to lessen or even improve preparation in the event of flooding.

The community's knowledge and preparedness for coping with floods demonstrates that among all people, there are still individuals who are unaware of flooding and are unaware of the precautions or procedures to be taken before, during, and after flooding. The need for additional research by providing treatments such as training and education on community readiness for floods, in this case, disaster simulations, to mitigate the damage is apparent. Knowledge is an essential organisational external asset, although it is not related to the economic process (Wong and Aspinwall, 2006), and it will provide a solution to the organisational way of learning and delivering its values (White et al., 2018). Knowledge management is influenced by how information is administered, managed, and shared (Ahmad et al., 2014). Further, it would be able to share tacit knowledge among the employees, provide best practice, and reduce rework (Robinson et al., 2004).

Knowledge is defined as a ***"…data mix, experiences, practices, values, beliefs, standards, contexts, and expert insights that provide a conceptual arrangement to evaluate and incorporate new data, information, and experiences…"*** (McEntire, 2007). In the same book, knowledge management also defined as a ***"…systematic and organised approach to improve the organisation's ability to mobilise knowledge to enhance decision-making, take actions and deliver results in support of the underlying business strategy…"*** (McEntire, 2007).

Previous research by UNICEF (2014) has established that ample knowledge about risk and vulnerability exists for the country and its communities to empower and protect, reaching towards full potential. Knowledge management could increase the security and strength of the community by increasing their awareness of DRR (Mejri and Pesaro, 2015). In the case of flooding recovery, knowledge is involved, such as information on the satisfactory service level during flood recovery, any standards required, and a channel to make complaints (Medd et al., 2015). Knowledge management could help the general

population during a flood (Seneviratne et al., 2010), but the information should be easily accessible and available. A new set of knowledge and skills is crucial to ease the recovery process the next time the same incident occurs (Medd et al., 2015). Through knowledge, understanding of risks towards disaster recovery could be made better (Apronti et al., 2015).

Benadusi (2014) argues that knowledge in NDRR could have been criticised for its capability to move the responsibility of NDRR from the government to society. Learning is sparse when there is poor handling of floods and management after-the-flood (Othman et al., 2013). Knowledge acquisition is not made a prerequisite, and thus it becomes the main barrier to organisational learning, especially in construction methods (Khalid and Shafiai, 2015). The best knowledge base from which to select construction methods could come from construction field practitioners. A person in charge of responding to a disaster requires better capacity-building that improves in terms of knowledge (Thayaparan et al., 2015). Disaster management requires professionals in the built environment who have a strong background of relevant knowledge to improve the responsiveness to disaster risks (Thayaparan et al., 2015).

2.9.5 Knowledge, Action and Motivation

The primary and the determining factor of flood is knowledge. There has been an increase in preparedness and understanding regarding disasters. Dealing with flood disasters is less complex if an individual has the proper knowledge. The level of knowledge possessed by a community will determine how to shape the community's attitudes and concerns regarding disaster preparedness. Education, training, and experience all contribute to the acquisition of knowledge (Gherardi and Nicolini, 2000). The greater someone's level of knowledge, the stronger the effect on the quality of ability developed in the activity to accomplish the organisation's goal. Apart from field experience, individuals get information through reading and sharing experiences. Experience is critical in NDRR that involves the ability to think creatively. Knowledge is one of the indicators of achieving a goal. An increase in an individual's knowledge will increase the individual's behaviour. This is because individuals who acquire new information beneficial to them and their family members will begin to process it. Additionally, individuals will consider the positive and negative sides of new knowledge to evaluate it better (Brown and Palincsar, 2018). The final stage of this process is for the individual to execute the information they have gathered. Individuals who have received knowledge about a disaster or disaster preparedness are more likely to behave positively than those who have never heard such information.

Knowledge is a critical domain for determining individual activities. Based on experience, knowledge-based behaviour appears to last longer than non-knowledge-based behaviour (Hoidn and Kärkkäinen, 2014). The primary focus should be on disaster preparedness knowledge among disaster-prone communities. It will enable communities to take effective action in the aftermath of disasters and knowledge is the primary motivator for the community to act. The more the community's awareness, the more influential the activities or actions made during the stages of flood management (Few, 2003). The community gathered knowledge about flood preparedness or countermeasures in this study through personal experience with previous flood events and mass media such as television and newspapers. Awareness of disasters is the primary motivation for someone to engage in protection or preparedness activities. Numerous examples demonstrate that disaster preparedness is frequently overlooked by those who lack direct experience with disaster aid. Motivation begins with the desire to exert control over another person's actions. High motivation affects how much effort a person devotes in the situation (Kreps, 1984). For someone with higher work motivation will exert more significant effort to complete each task. The motivation to engage in disaster management can be combined with all other efforts to satisfy their motivation, allowing them to operate relatively effectively. Knowledge should give them better information and allow them to react much more logically (Sönmez, Apostolopoulos, and Tarlow, 1999).

2.9.6 Knowledge Management Flood Forecasting and Early Warning Systems

Real-time information on the current threat of a flood is published online via the official government webpage for the public to keep updated (Leman et al., 2016). Authorities, in general, must set up an arrangement to circulate disaster-related information as soon as it becomes available (Rice and Spence, 2016). The information presented by the early warning system should be in a language that is easily understood by the targeted audience (Hussaini, 2007). For organisations and agencies involved, the delivery of risk information should be communicated through relevant media (Spence et al., 2013).

However, having data available online does not make it useful (Frisby, Veil, and Sellnow, 2014). In this era of technology, the delivery of information using social media needs to be maximised for information retrieval and effective information delivery (Houston et al., 2015). The use of social media in delivering up-to-date information is also essential so that information can be communicated quickly and effectively and achieve more excellent targets. For example, by using the hashtag (#) (Marris, 2017). Besides, communities need

precise information to know the dangers they face and to plan emergency measures (Rice and Spence, 2016). Additionally, there are fewer guidelines for distributing information using social media (Sutton et al., 2015).

2.10 Stakeholders' Involvement in Flood Recovery

Stakeholders' involvement in the management of flood risks is a better way of reaching a successful flood policy. Worst-case scenarios could occur if flood planning is deemed unimportant and stakeholders only react when flooding occurs. Therefore, it is necessary to understand the stakeholders' backgrounds, their roles and responsibilities, and the challenges that they are facing. Stakeholders are an individual who ***"…has the power to implement an action or to obstruct it, and those who should have power…"*** (Green and Penning-Rowsell, 2010). Stakeholders are not only bound to decide, but also to learn to improve the process, and it should be reflective (Green and Penning-Rowsell, 2010). The public are known as silent stakeholders. The public should be one of the strategies to improve sustainability because they need a strong foundation in their conduct to create good quality change (United Nations Environment Programme, 2005).

2.10.1 Stakeholders' Roles and Responsibilities

Stakeholder involvement is a social process that works to provide a shared resolution in tackling problem-related matters (Green and Penning-Rowsell, 2010). Stakeholders need to prepare earlier for any unpredictable flooding (Masetti and Vatovec, 2016), as they are responsible for the success of the recovery phase. Therefore, each job and its obligations, including their commitments, would be able to enhance the institutional capacity to improve the flooding recovery aspects (CPWF, 2013). Besides, the establishment of relationships among stakeholders is necessary to identify unique functions (Lebel, Khrutmuang, and Manuta, 2006). Stakeholders should be able to manage the resources available and carry out any possible action to reduce flooding risk. They are also responsible for any long-term progress and provide rectification where necessary. Furthermore, the ability of a stakeholder to exercise influence is a critical skill required for an institution (Le Quesne and Green, 2005). Stakeholders also have their own respective division of responsibilities. For example, some are involved with decision or execution, so proper analysis is carried out to come up with institutional mapping (Green, Johnson, and Parker, 2007). Stakeholder engagement has become a central part of integrated flood risk management and administration (Renn, 2008).

2.10.2 Stakeholders' Challenges

Sometimes stakeholders' participation is troubled by difficulties and challenges. For example, decision making measures to reduce flood hazards have been ruled by expertise (Johnson and Priest, 2008). Authority issues and the disparity between stakeholders' participation during the process are not adequately managed as required following the literature and flood risk management (Allmendinger and Haughton, 2009; Thaler and Priest, 2014), as it is a more practical approach to achieve agreement in policy arrangements (Thaler and Hartmann, 2016). Researchers agreed that stakeholders' involvement is a cooperating procedure to provide an answer to a specific issue (Green and Penning-Rowsell, 2010). Other issues identified are the absence of institutional help, lack of available resources, and an absence of communication and information sharing between the stakeholders (Thaler and Priest, 2014). Not only that, but also including the existence of unique interests and views of the stakeholders and flood risk management strategy (Levin-Keitel, 2014). When dealing with recovery or reconstruction projects, only some of them have the knowledge and ability to get involved in the whole process of sustainability change (Papargyropoulo et al., 2012). Involvement with stakeholders would go beyond the budget. It will, however, increase the chances of disaster risk reduction by directing reconstruction projects toward local development and communities (CPWF, 2013).

2.10.3 School-Based Study and Adaptation for Universities

DRR can start at a school or other educational institution. Appropriate educational materials would assist students in supporting disaster management (Apronti et al., 2015) are given DRR education to reduce their vulnerability to disaster. Furthermore, it should be ensured that education includes useful tools for applying knowledge while ensuring students' safety and resilience (Apronti et al., 2015). Given this situation, it is surprising that the author found a beneficial article published by the U.S. Department of Education in 2011 (National Clearinghouse for Educational Facilities, 2011). It has provided valuable information on flooding at school. The details where things like the impacts of flooding on schools, how to reduce damage, getting ready for emergencies, and how to recover from a flood are all being discussed (National Clearinghouse for Educational Facilities, 2011). The study is limited by the lack of information on each style point presented to produce clarification. Therefore, the author will try to elaborate on each point as it pertains to adaptation to the university situation and undertakings.

The DRR in the education sector aims to reduce disaster impact and minimise disruption in education services. Thus, analysing school safety is vital at the school level (Sakurai et al., 2018). The paper by Sakurai et al. (2018) mentions school efforts in DRR, following a case study from Banda Aceh, Indonesia. School management must adjust the school plans according to the national guidelines. Integration of DRR into the school is being done through the curriculum, courses, project work, teaching, study materials, and posters. The use of a framework is necessary, including the manual and guidelines that can be used by the teachers and students. The identification of a school's preparedness level is vital. The school must provide an evacuation drill and provide a relevant budget for disaster management activities. There is a success in the evacuation that is derived from the school's long efforts in DRR education. It consists of co-curriculum activities, adapting it to the local context, involving the people and authorities, including academic members. It, however, needs collaboration among disaster researchers and considers disaster education (Sakurai et al., 2018). Japan already has a strong foundation in making DRR known to educational institutions like schools. They focus on building strong foundations for the students' awareness of disasters. It is done through practise and teaching. The Japanese Ministry of Education is very keen on assisting in developing DRR at all levels of their educational institutions (Shiwaku et al., 2016). In Japan, there was already a School Health and Safety Act in 2008. The act requires the school to apply disaster emergency planning and carry out safety checks and evacuation drills. The goals are to ensure that students can save their own lives and the lives of others at a young age, to improve knowledge in DRM, particularly in school settings, and to provide the highest level of safety at school (Shiwaku et al., 2016).

2.10.4 Public Participation

The basic concept of a phenomenon is best conveyed through the community or public participation (Rappaport, 1987). Sustainable flood disaster management needs the involvement of multiple stakeholders and concurrent community participation. Participation of all community segments in disaster management is critical to success. Their increased involvement will result in an improvement in the capacity to mitigate flood risk (Bendimerad, 2003). Flood disaster management must be organised and collaborative to overcome the disaster. Thus, for the sustainability of successful flood disaster management, it is necessary to develop a sense of crisis knowledge, compassion, dedication, public roles and responsibilities, and continuity of cooperation and collaboration within the context of a governance network (Lee, 2019).

Environmental awareness should necessitate a strong sense of circular society. Environmental awareness is influenced and motivated by various elements, including history, culture, experience, age, degree of education, and rural or urban status (Hart, 2013). Environmental problems are not confined to any one race, class, society, or region but are inextricably linked to poverty, unemployment, and prejudice. As a result, environmental issues are not too delicate to be discussed publicly. If environmental concerns occur, the blame is frequently placed on the project developer, with the government bearing little responsibility. As a result, individuals may feel insecure in addressing environmental challenges (Bryant and Mohai, 2019).

Environmental problems are far too severe and complex to be completely resolved through scientific, technical, and legal means. Environmental challenges and difficulties are straightforward, and they are a significant issue in society. This element exists because people can easily see and feel the dangers associated with an environmental crisis around them (Fischer, 2000). Political beliefs, race, socioeconomic status, or religion have no bearing on environmental impact. The community or public will have an interest in an environmental issue, particularly if they become victims or suffer adverse consequences. Therefore, the community's awareness of the need to protect and safeguard the environment is influenced by its knowledge, beliefs, culture, and habits. Everyone has the right to speak about environmental issues (Lindell and Prater, 2003).

Public involvement is often a secondary objective established through individual or group activities within an organisation. It is the right of the public to be directly involved in environmental concerns in their community, as it is consistent with democratic values that emphasise everyone’s right to information (O'Faircheallaigh, 2010). Increased public sensitivity to environmental issues can represent a balanced development strategy involving the economic, social, and ecological sectors. That is, the need for public participation and accountability in all aspects of environmental planning, development, and administration is considered, resulting in a positive step toward sustainable development (Hester, 1998).

The public's function as an environmental interest group is critical because they have the power to influence policymaking decisions to place a greater emphasis on environmental aspects of well-being. The public can act as constant observers, monitoring both the environment and the efficacy of institutional or government management initiatives. Nonetheless, the public's active participation in efforts to preserve and conserve the environment is contingent upon their level of awareness of the environment, knowledge,

beliefs, culture, and daily social behaviours (Adger et al., 2003). Public participation and cooperation on environmental concerns should be emphasised because the public is aware of the conditions of their living environment. While the public is aware of the need to engage in environmental issues, their degree of involvement remains low. The public remains hesitant to participate formally or systematically in most processes that allow for their participation, especially within government structure plans (Innes and Booher, 2004). In such a condition, the government or the authorities could not make significant recovery or preventative efforts that could fulfil the needs of the community. To prevent this from happening, the community can share and contribute valuable information to help avert the establishment of more severe environmental concerns than the ongoing development (McLoughlin, 1985). To ensure a sustainable relationship between the community and the authorities, they should be closely involved in the planning and implementation of development and projects.

Public engagement is frequently perceived through their diverse opinions. Public involvement may help projects achieve legal criteria and project approval guidelines. Public participation and accountability in all stages of development are positive steps toward sustainable development. This component has received insufficient attention throughout the creation of policies, planning, and implementation of system development projects. Public involvement is typically viewed as a requirement and is generally implemented through individual or group activities (Beierle, 2010). Any environmental issue is detrimental to every human, regardless of their location in the world. Public participation in environmental concerns is predicated on community understanding and concern about environmental degradation caused by human activities. Public engagement, mainly when they are members of a relevant body or organisation dedicated to environmental protection, may include conducting environmental awareness campaigns, volunteering, influencers and more. To save the environment, the public should work cooperatively with the government by participating in all organised nature conservation programmes, whether by providing support, aid, or most significantly, by maintaining the ecosystem's harmony (Alshuwaikhat and Abubakar, 2008). While there are indicators that awareness of the community's environment has boosted support and involvement in this country, participation in such concerns remains modest. The level of awareness and public involvement in environmental concerns is still low, owing to a lack of education and exposure to environmental issues, including flooding (Blewitt, 2012).

2.10.5 Promoting Public Participation

There are a few ways to promote public participation and involvement in environmental concerns. The government and its agencies, including NGOs, should take proactive measures to raise awareness and understanding among all segments of society about the necessity of getting involved in local environmental issues. developing more effective and structured methods and perspectives to formulate development strategies and a better environment (Zimmerman, 2000). Top-down planning should be minimised, while bottom-up planning should be emphasised to create ideal space and opportunity for the public to engage in environmental issues and conservation (Urwin and Jordan, 2008). Government agencies should always provide descriptions and explanations to the public about issues involving development and the environment to avoid disputes between community groups, project developers, and government agencies responsible for ensuring the safety and sense of acceptance of all projects implemented. Additionally, the authorities should streamline their processes and regulations to simplify and encourage public participation. (Boyle, 1998).

All information, discussion, and consultations between agencies, governments, parties, the private sector, and the public must be holistic, integrated, and transparent, with a greater emphasis on the impact of development on health, the environment, and the socio-economic condition of the local community (Eccles and Krzus, 2010). The government should maintain a comprehensive database and provide information that is continually updated and make it freely accessible to assist the public in making references or taking necessary action to address the flood issue (Price and Vojinovic, 2008). The government should publicise all laws and regulations and national development plans and activities in a comprehensive manner across all mass media channels to enable the public to become involved in environmental issues (Bertot, Jaeger, and Hansen, 2012). Public knowledge and participation in environmental conservation are vital, and those actions will determine the future and ensure the survival of the environment.

2.10.6 Flood

When heavy rain happens in urban areas, surface water flooding, pluvial flooding, or water flooding (European Water Association, 2009) will happen because of short but heavy precipitation (Jenkins et al., 2018). To understand more about this type of flood, often the characteristics are identified, such as the scale of the rainfall event, topography or geological location, drainage works, design of the built environment, sewer system,

including social and economic exposure. Nevertheless, urban flooding is more anthropogenic than ever, which means environmental pollution and pollutants that originate from human activity (Glińska-Lewczuk et al., 2016). Much of the current literature on flooding particularly pays attention to identifying the flood type. There are many different types and classifications, but it is still hard to establish one single agreement on this matter.

Floods could cause direct and indirect impacts on the surroundings, with the indirect effects usually imposed on the larger area (Zevenbergen et al., 2018). A flood could affect the community balance and make it difficult to return to its normality (Hamin, Othman, and Elias, 2013). In addition to that, it caused the most considerable social impacts (Guha-Sapir, Below, and Hoyois, 2016), resulting in a high cost of recovery and reducing investment opportunities in the flood-prone area (Department of Irrigation and Drainage, 2017a). There are contributing factors that result in an increase in the impact of flooding, for example, demographics, social, economics, age, and family income (Burningham et al., 2007). Society at the global level has learned to accept floods as they are. Flooding is the most widely recognised type of current natural disaster in Europe, and handling of floods in Europe have highlighted areas for improvement in terms of management of floods (European Environment Agency, 2005). The event of these occasions has expanded throughout the years in Europe with the ensuing addition in financial misfortunes (Zevenbergen et al., 2008). Taking England, for example, one over six from 5.2 million properties still face the probability of flood (Wedawatta, Ingirige, and Proverbs, 2014). In the past, the UK has experienced significant flood occasions, especially in 2005 and 2007, including the flood in Cumbria during 2009 (Wedawatta et al., 2014).

2.10.7 Built Back Better

Consequently, these changes contribute to the growing challenges for professionals. It is concerning applying the best ways to reducing the impact of natural disasters, appropriate recovery options, building resiliency, emergency construction practice, and sustainability in construction. Sustainability in the built environment means contributing to the world physically through the advancement of science and the environment, incorporated into anything designed, built, or constructed. Studying in the built environment can stretch into broader study areas, for example, construction, engineering, and environmental studies. Besides, this involves the proper space being discovered for the benefits of the people and their surroundings.

Sustainability translates into a wide range of ideas. However, the most important thing is to balance development in every aspect. ***"…The built environment includes home, school, workplace, parks or recreation areas, business areas, and roads. It extends overhead in the form of electric transmission lines, underground in the form of waste disposal sites and subway trains, and across the country in the form of highways. The built environment encompasses all buildings, spaces, and products that are created or modified by people. It impacts indoor and outdoor physical environments, as well as social environments and subsequently our health and quality of life..."*** (Srinivasan, O'Fallon, and Dearry, 2003).

2.10.8 Construction Project Management

It includes the administrative management of all aspects of planning and construction for the projects. It is practised in different areas, such as site projects, the construction industry, and the general society (Weaver, 2010). Construction project management necessitates values in administration and service delivery by incorporating a regular duty to humanity for the benefit of future endeavours (Weaver, 2010). Most of the research into construction management focuses on the improvement of work practises and the process of decision-making (Seymour, Crook, and Rooke, 1997).

In the past, the demand for effective construction project management by today's current type of organisation has become huge. Researchers attempted to evaluate whether the intense effort of proper construction project management is helpful enough to deal with the worst consequences of a calamity or severe disruption of the building projects caused by natural disaster attacks. There is a need for the necessary interdisciplinary research behind the studies, including construction management, which often lacks the ability to reduce risks (Gough and Gough, 1997). ***"No construction project is risk-free. Risk can be managed, minimised, shared, transferred, or accepted. It cannot be ignored"*** (Latham, 1994).

A construction project may be more dangerous, risky (Zou, Zhang, and Wang, 2007), and vulnerable than other types of projects (Flanagan and Norman, 1993). Among the activities involved are managing different stakeholders, production delivery, and dealing with the environment (British Standards, 2006). In a study by Pereira, Tiong, and Komoo (2010), it is reported that the protection of the environment is considered a tough decision in meeting economic needs while preserving nature. A more substantial approach is by understanding how construction management should respond even before a disaster strikes (Low et al., 2006).

Construction practitioners should be involved in DRR aspects, for example, in improving building codes, materials, and technologies in hazard and risk (Chang et al., 2010). Others have highlighted the relevance of construction management in the reduction of disasters and risk, including reconstruction, planning, prevention, and reduction. The current situation demonstrates that people are getting more apprehensive about setting up a new building and dealing with all sorts of construction actions. Therefore, those buildings should be managed in the best way possible by having great practise in reducing as much of the impact of disaster risk as possible (Parnham, 2000).

2.10.9 Disaster Recovery

Perhaps the most thorough account of recovery strategies is to be found in the work of Lindell (2013b). This paragraph reviews the disaster recovery perspective from Lindell. Disaster recovery has various undertakings, whether it is following the stages or randomly executed. It is like an art, free to choose any option, try and error, but dependent on knowledge to not make things worse. Disaster assessment is closely related to the emergency response phase and identifies the physical disaster impacts. Short-term recovery is linked to activities that require a short amount of time to secure the impacted area, provide shelter to victims, and help individuals or businesses. Reconstruction monitors activities for the disaster evaluation, including short- and long-term reconstruction, which need proper care and coordination to meet the disaster recovery goal.

The community should learn from experience and improve towards a more disaster-resilient approach. The community should have the ability to mitigate disaster hazards through building designs, construction methods, and materials. The recovery strategies also involve a few broad areas, including psychological recovery, business recovery, higher levels of government, and recovery or mitigation committees.

CHAPTER 3

3 Methodology

3.1 Introduction

This chapter's report structure is determined by the strategy selected for the planned study. Given that the reader may be unfamiliar with mixed methods research disaster research, or background, it is advantageous to provide guidelines for structuring the thesis. While a concurrent study's quantitative and qualitative data collection sections may be presented separately, the analysis and interpretation sections combine the two data collection methods to find convergence or similarity between the results. The author organises the study into distinct phases. This methodology section discussed the study's design and execution from beginning to end. It began by outlining the study's objectives and providing details about the research sample and methodology used. Each choice was exhaustively justified and described. The explicit forms of data collection methods were provided, and a summary of the steps involved in acquiring each method and its associated data. Following these phases, Chapter 4 provides a detailed explanation of the analysis method. The ethical considerations and constraints section clarifies any points made in this chapter. Following Chapter 5, future research to overcome the limitations and proposals were revisited.

3.2 Research Design

The term "research design" refer to the process of conceptualising a design. Research is a vital component of the design process since it provides information and inspiration (Sanders, 2005). This thesis adopts Maxwell's (2005) contextual study design. The contextual research design identifies crucial areas to focus on, making them less likely to be overlooked and allowing for a more methodical and organised approach. Additionally, it demonstrates various relationships between design components and serves as a structure or model for mixed method design. It is critical for the author of this thesis to be specific about the study design as it help in presenting the strengths, limits, or implications if any (Maxwell, 2005).

The primary objective of this type of analysis is to examine a phenomenon theoretically while concurrently developing explanations based on evaluations or

observations (Johnson and Christensen, 2008). A case study should be conducted if the research questions seek to elucidate the causes or reasons for an event (Yin, 2009). These approaches include a semi-structured interview with university employees, a non-experimental survey of students, and an analysis of documents offered by the university administration and a compiled literature review.

The systematic review's bounds are defined by the inclusion and exclusion criteria. Numerous considerations can be utilised to determine inclusion or exclusion. Typically, the systematic review's methods section includes information on the inclusion and exclusion criteria as a paragraph or table. Other criteria for inclusion or exclusion may include sample size, or sampling procedure. When a single study is described in many publications, the findings may be integrated, or the most recent data may be included. Questionnaire survey is using inclusion and exclusion criteria. Inclusion criteria includes male or female respondents, only for interested respondents, selected geographical location, and selected study design. The exclusion criteria include the date of the survey, no reported outcomes to the respondents, no peer review on the questions.

There are few qualitative research criteria presented by Creswell (2007). There are nine approaches towards identifying the qualitative research criteria which includes natural setting, instrument, data sources, inductive data analysis, respondents' details, evolving design, hypothetical and explanatory input, and rounded approach. First, the study is conducted at the site where the respondents might experience the issues being analyse. The questionnaire survey and face to face interview will take place at different university campuses. The author of this thesis collects the data individually without any help from the third party. The themes created in this study derived from more than one source of data, which includes interviews, surveys, and a little bit of document analysis. This study includes the inductive and deductive data analysis. Since this study will include participants, the author of this thesis is separated from that group. This means that participants involved are only students and staff at the selected campuses, at not including the author as an individual. Since there are a lot of challenges in completing this study as it is not being done before in Malaysia, the author of this study may use an emergent design. It is where the author personally shifts the study design to response to the research enquiries and achieve of the goal. In addition, the author also uses a theoretical lens research criterion. It is where the author uses a selected ways to view the study, for example this study uses social constructivism lens to view the input from the data collection. Finally, is using a holistic

approach in a complex research condition through multiple perspective. To do this, the author carried out an additional field studies to gather different type of information.

This thesis adopts the Creswell and Plano Clark research design (2011). This study employs a convergent research strategy. Qualitative and quantitative data are gathered concurrently. Both data collection methods are examined, contrasted, and evaluated considering their respective conclusions. The term "Convergent Design" is utilised to produce the above research questions. This implies a convergence of qualitative and quantitative findings (Creswell, 2007). Different data collection methods will reflect the drive of the study. For instance, this research is expected to gain an improved understanding of respondents' perspectives on flooding in a university setting, to explain the current university approach to natural disaster risk reduction (NDRR), to explain respondents' perceptions of flooding on their campus, and to present lessons learned. All these examples will create better understanding towards flooding at the Malaysian universities and worth for further explanation.

Research problems may be designed to be fixed, adhere to a certain standard of research methodologies, or follow a certain logic to discover solutions to the problems. The design of this research was straightforward, identifying it as a design of critical concern requiring a resolution. The problems at stake were unlikely to be overlooked, and the author may have approached them methodically. Additionally, this study design emphasises various linkages between design components. It is critical to define the study design explicitly so that the author may present it openly, with all its strengths, consequences, and limits readily apparent (Maxwell, 2005). The research approach for this study included qualitative and quantitative data gathering. The data and interpretations of both methodologies were contrasted. Convergent design is a term by Creswell and Plano Clark (2011).

Creswell et al. (2003) as cited in Castro et al, (2010) explained that there are 3 designs of concurrent mixed methods; First is concurrent triangulation, second is concurrent nested, and third is concurrent transformative designs. Concurrent triangulation designs could increase the accuracy of between variables by combining qualitative and quantitative data. This research utilises "Concurrent Triangulation Design" from Creswell et al. (2003). This design uses a qualitative and quantitative approach, and the strategies call for a collection of data and data analysis. At the last stage, the information results from both techniques are compared. When research is merging quantitative and qualitative approach, it is going to

include social science concept and qualitative theory. These products are utilised in this analysis in which the results of an evaluation of every technique can also be compared, at the same time going through triangulating process again. The author purposely designs a study together with the presumption that the research program may change later. This is because each technique might be changed as soon as the situation changed. The initial step in developing research is by doing aims are converted into statements affected by the variables being evaluated. Moreover, the author additionally dealing with the functional aims referred to as problems or theory being examined and acts as a continuous process.

The author discusses the contextual elements that influenced the research design for a variety of reasons. Maxwell (2005) explicitly states the critical concerns surrounding which judgments must be taken as research design. As a result, these concerns are less likely to be overlooked and addressed systematically. It emphasises the collaborative aspect of qualitative and applied research design decisions and the many linkages between design methodology. It serves as a model to form of a qualitative study design, one that effectively conveys and supports the primary design decisions and their relationships (Maxwell, 2005). It is critical to be specific about the study design and to lay it out in plain sight so that its strengths, limits, and implications are readily apparent.

According to Edmondson and McManus (2007), field research studies contain critical components. The components include research questions, past work, study strategy, and contribution to the body of knowledge. The research questions should be focused on a study and narrowed down to a manageable and valuable issue. It is tackling theoretical and practical challenges (Schneider et al., 2019). After the investigation, the research questions can be addressed. Prior work comprises conducting a literature evaluation to comprehend the theoretical and empirical research papers associated with this subject. It assists in identifying undiscovered areas, pertinent constructs, and unresolved questions. The research design specified the data to be collected, the tools to be used, the procedure to be followed, the data analysis to be conducted, and the site to be used. Contributions to the literature include creating a theory as a study outcome. They are produced from novel concepts, insights, or results suggested by the author (Salkind, 2010).

The author conducted in-depth interviews with ten (10) interviewees from five (5) UiTM campuses. These individuals serve as a senior management, executives, and managers. Additionally, the author limited the field study to a few public institutions (UiTM) due to the time constraints and limited budgets involved. The study is not intended to

produce highly statistically representative data sets but rather to aid in comprehending respondents' and interviewees' responses. It is sufficient to the point where the author and the respondents could express the desire for change for a better DRR in the community. These studies are frequently conducted by consultants hired by governments or agencies, particularly those from developed countries.

3.3 Concurrent Triangulation Strategies

The most well-known and often used of the six fundamental mixed-methods models is concurrent triangulation. Concurrent triangulation is a strategy that entails collecting quantitative and qualitative data concurrently and comparing the two databases to ascertain whether there is convergence, difference, or any combination of the three (Steckler et al., 1992, as cited in Creswell and Creswell, 2017).

This strategy usually combines quantitative and qualitative approaches to mitigate the disadvantages of one method while maximising the benefits of the other (or conversely, the strength of one adds to the strength of the other). When this technique is applied, quantitative and qualitative data are collected continuously, throughout a single research endeavour, rather than in two distinct phases. In an ideal world, the weights associated with the two approaches would be equivalent. However, it is not unusual for one to prioritise the other.

This classic mixed methods approach is helpful since it is well known to most researchers and can produce well-validated and justified findings in their respective domains. Additionally, because both qualitative and quantitative data are collected concurrently, the concurrent data collection strategy results in a shorter data collection duration than one of the sequential alternatives (Creswell and Creswell, 2017).

This method has several drawbacks. Analysing a phenomenon thoroughly using two independent methodologies demands substantial work and understanding. Furthermore, it may not be easy to compare the results of two analyses that utilise different data formats. Any discrepancies in results may leave a researcher unsure of how to resolve them, although procedures such as additional data collection, revisiting the original database, gaining new insights from the disparity in the data, or developing a new project to address the discrepancy are emerging in the literature (Creswell and Creswell, 2017).

Given the study's limited data collection methods, it is critical to understand how they interact and fill in the gaps. It encompasses a wide range of factors in the DRR study, including applying knowledge, actions, and stakeholder involvement (Gaillard and Mercer, 2013). As a result, the primary data gathered through a literature review, an interview, and questionnaire surveys were to ascertain the current situation on the selected Malaysian university campus. Only a few Malaysian theories can be adopted for this research purpose. Thus, seeking more information, such as other countries' approaches and disasters, was relevant to the information gathering process. The literature review encompasses the entire framework's development period (risk assessment, dialogue, and action). It is then supplemented with an interview and questionnaire survey procedure that clarifies the actual situation based on community knowledge (as local knowledge) and interaction with inside players via face-to-face interviews. Due to the study's exclusion of other stakeholders, focusing exclusively on the people on campus, information about external stakeholders such as researchers, government, and non-governmental organisations is acquired through the literature review process.

A component of building an NDRR action plan for the institution was enlisting the assistance of bottom-up and top-down initiatives. Thus, the information gained from the literature research or desk work was combined with the risk perceptions and opinions expressed by interviewees and questionnaire respondents. These are compiled and analysed to determine the most effective method of resolving flooding issues on college campuses. What needs to be addressed first is what concerns people and how their perspectives and current understanding will aid in developing a well-designed strategy that meets society's needs. It contributes to an enhanced understanding of the risk assessment procedure by harvesting indigenous and scientific information. The author was inspired to create a framework that could be used by a variety of individuals to handle flooding issues within the university institution. To accommodate the study's time constraints, the author reduced the scope of the investigation to focus on the framework as mentioned earlier. The data gathering process concerns knowledge and the interrelationships between knowledge and the knower. That is the significance of the context in which knowledge exists, reflecting the study's social constructivist paradigm.

3.4 A Proposed Conceptual Framework for Malaysian University NDRR Strategy

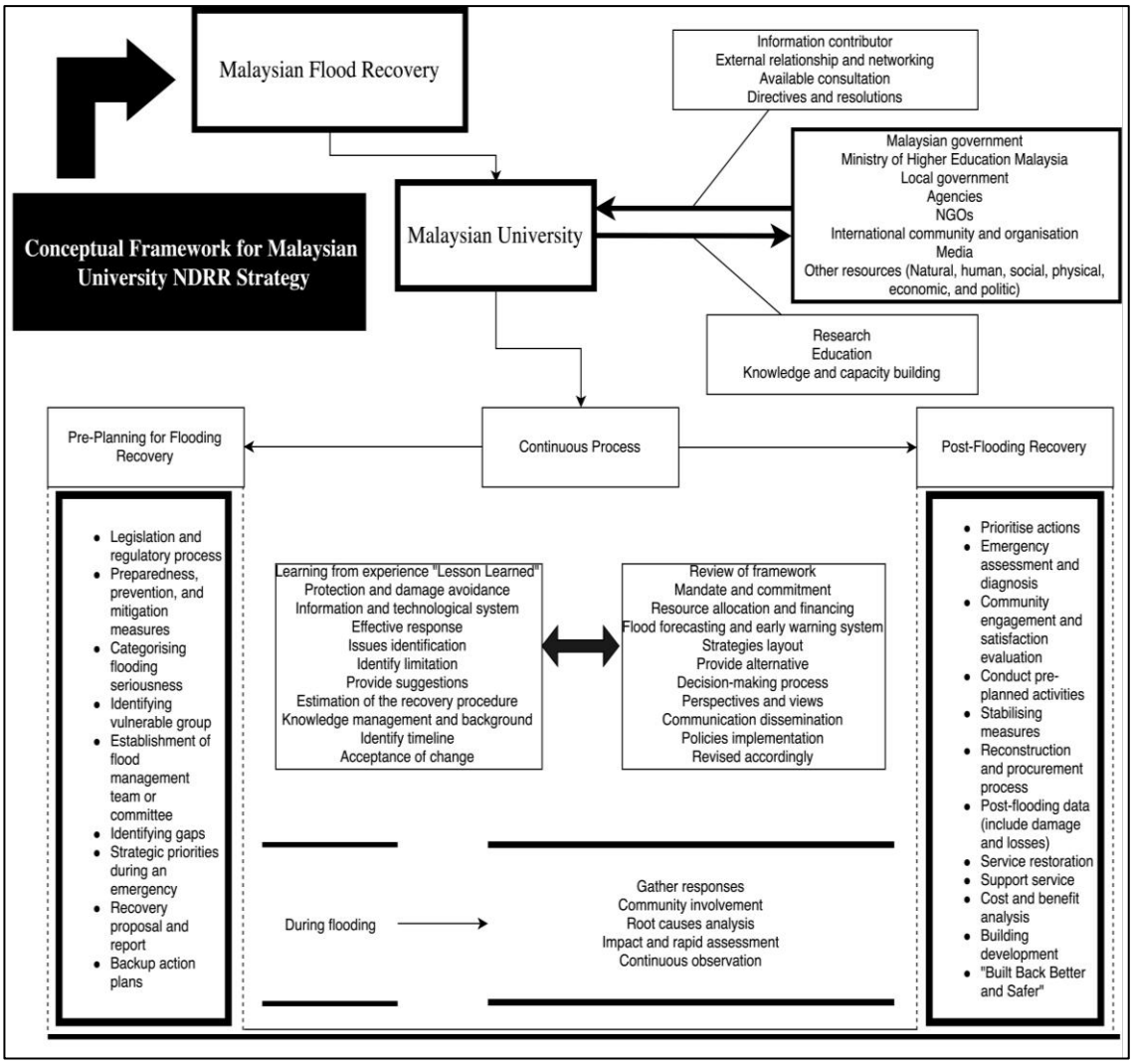

Figure 7: A Proposed Conceptual Framework for Malaysian University NDRR Strategy (Self-Authoring).

The framework could assist the decision-makers in achieving the recovery objectives. It would work as a guide for assessing information on the university NDRR objective, process, and other components associated with the university governance. This is consistent with a report by Rotimi and Wilkinson (2014) who reported that without a developed framework, reconstruction and redevelopment programmes might be carried out on an ad hoc basis and with little favour for community needs. They claimed that when a framework, reconstruction and redevelopment are missing, this would lead to unplanned circumstances that give less fulfilment to the community.

This initial conceptual framework derived from this study started to the earlier phase of data collection till the end. It is gathered by using the mixed-method approach. Meaning

that, all the information gathered and presented are from literature review gathering and filed study data gathering. All this approach in getting data is valid. This conceptual framework is not validated by the experts yet, but the author of this thesis tried to validate it by connecting this conceptual framework on some typical cases, such as flood and class interruption at the university. For a clearer approach, the author of this thesis maps the research questions, objectives, and hypothesis on the conceptual framework. This would also help in operationalisation to some extent. Conceptual framework is ultimately an aid for getting clarity on the relationships between the variables which otherwise cannot be easily indicated.

Malaysian universities will have a framework to refer and be able to assess their current performance to face with future flooding. It could also help in mobilising support when needed. The framework is an efficient way to manage the resources available and guide the stakeholders to make a correct decision within the time frame. The framework could support university policies and initiatives. It is created to incorporate the basic structure and description of the organisational activities model. Additionally, it could contribute to building community safety and resilience.

The proposed framework by the author Figure 7 is an early groundwork that requires further exploration towards the development of a stronger and useful guide in governing the flood recovery mission. It is based on the reflection of numerous standpoints and interdisciplinary approach. The framework adopts principles and styles specifically designed for Malaysian universities. Although the framework is proposed with the Malaysian flood conditions in mind, the components are common enough to become a reference model for most flood circumstances at any institution. Since it is still a conceptual framework, it would help in assisting and supporting the current general disaster SOP that the Malaysian university currently has.

The framework provided by the author might serve as a foundation for further research within the area, and future researchers may approve or disapprove the framework delivered. Even though the framework requires validation, criticism and comments, the study will start to provide a preliminary framework to get things started. The author hopes to propose this to the higher administrator, or it is a starting point where the other institutions could make it as a reference to manage their NDRR. All comments for further development of the framework are welcome. Finally, expanded research on the framework was proposed to encourage and guide future research works in this field.

The development of a framework is associated with future disaster prediction, negative impact on the society, and limited decision-making time. The most obvious finding to emerge from the analysis is that Malaysian university had missed having an integrated framework to deal with NDRR impacts, especially flooding. A literature review in flooding risks reduction helps the author to gather understanding and structuring the framework for the Malaysian university use. The framework is also based on the author's recommendation, and it is built from scratch, taking inputs from the literature review and the case study. An institution could develop a framework by assessing the institutional capacities towards NDRR in flooding.

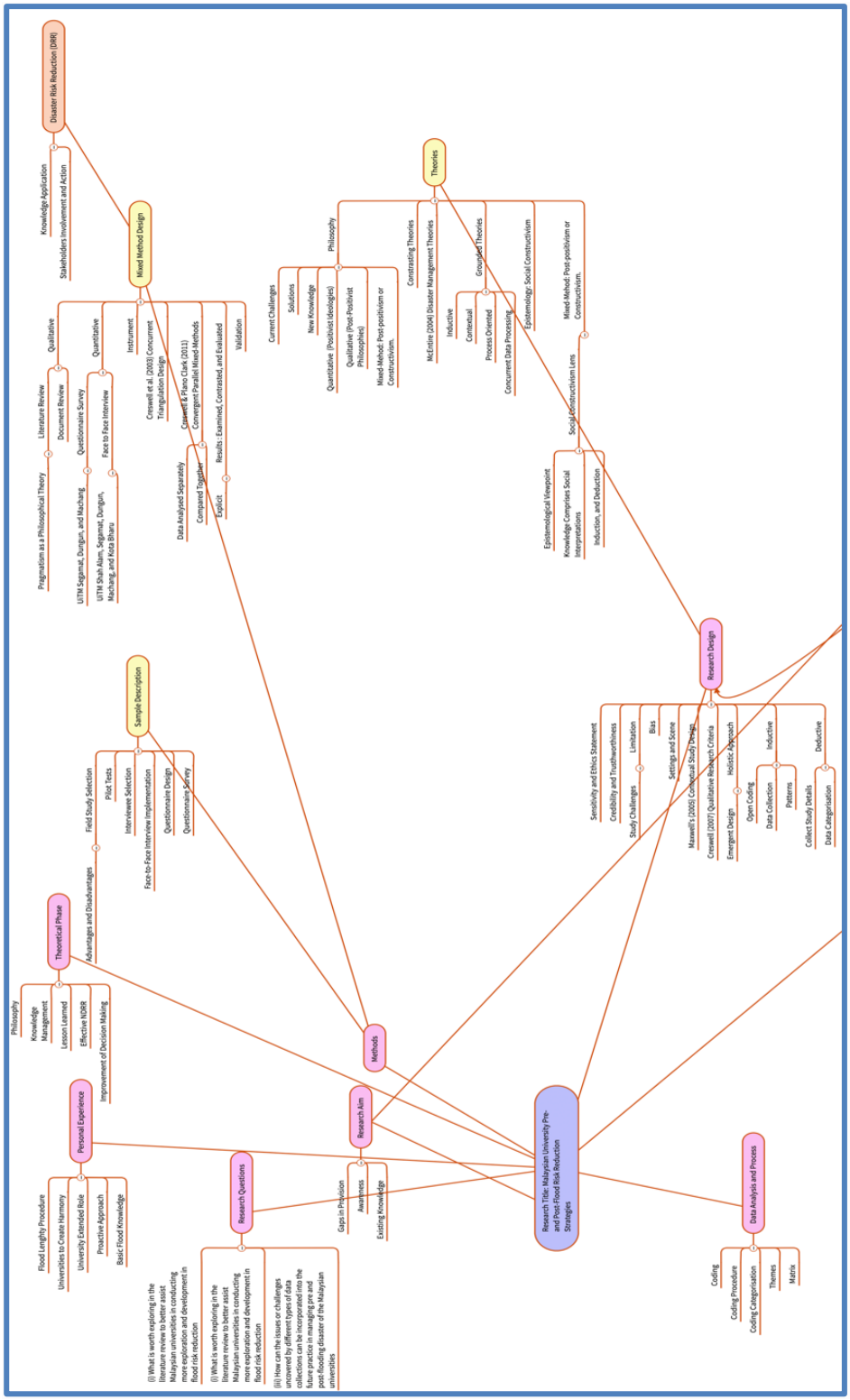

Figure 8: Methodology and Research Design (Self-Authoring).

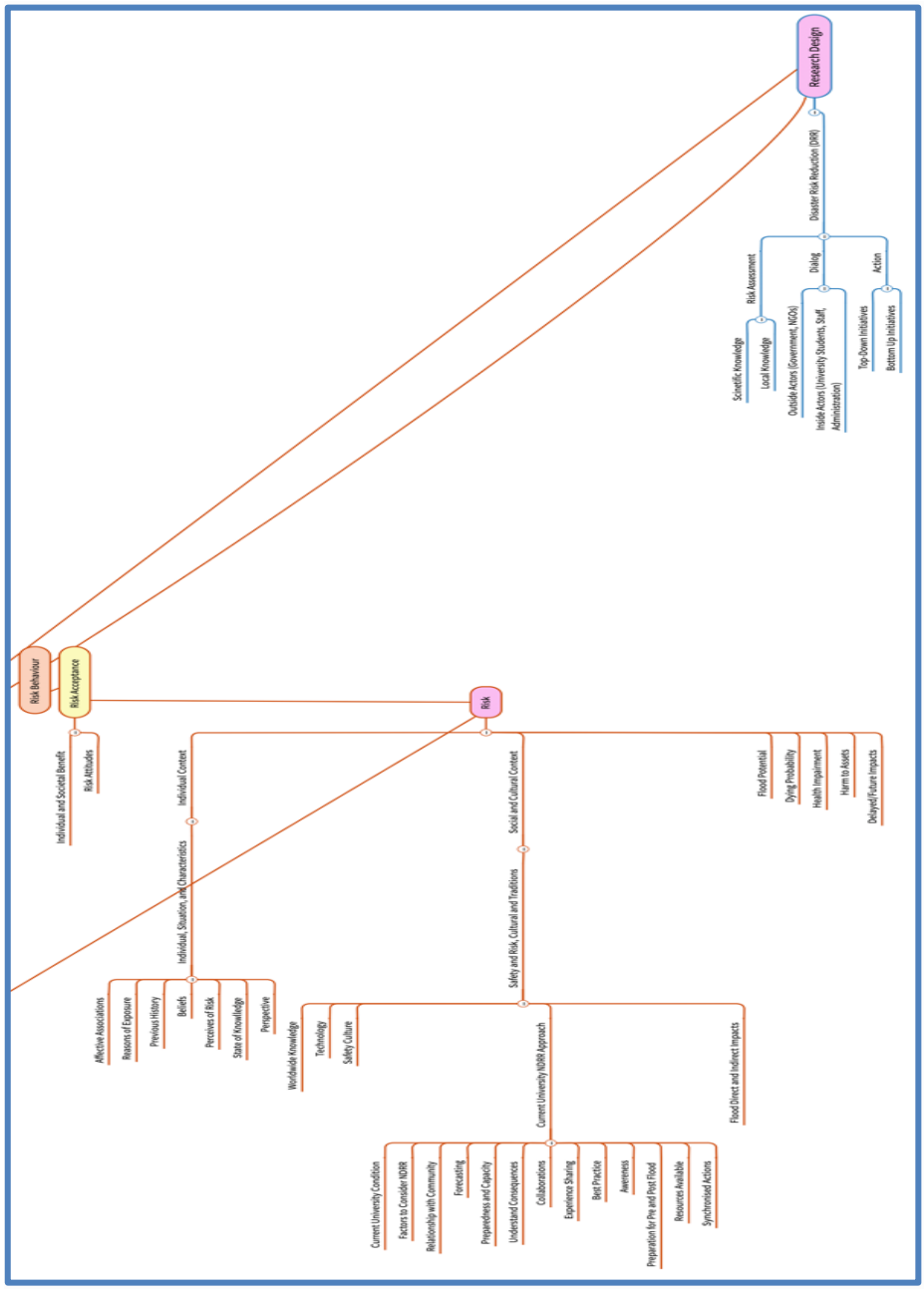

Figure 9: (Continuation from Figure 8):

Methodology and Research Design (Self-Authoring).

3.4.1 Informed Consent, Anonymity and Confidentiality

Before commencing this study data collection involving the chosen field studies, ethical clearance was sought from the University of Manchester, United Kingdom in 2017. The author of this research had to fill in the overseas travel risk evaluation form given by the University of Manchester. The author had to travel from the United Kingdom to Malaysia for 3 months to conduct the field study. UiTM Malaysia (a Malaysian university) provided an approval letter to do academic research to get access to the university management and

administration. UiTM Malaysia welcomes the study efforts to make better improvements for university use.

Since research interviews often explore sensitive material, the author must be aware of ethical issues. Written consensus should include the respondents right to decline to answer a question, stop the interview at any time, postpone, or withdraw from the study without any effect. Privacy could be a multifaceted issue in some qualitative research forms, and respondents' identities can be hide using qualitative methods. In addition, all the questionnaire respondents and interviewee at the field study were spoken about the basis of this study in advance, and their involvement was voluntary, and all responses would be kept confidential. Consent to respondents need to contain a well-defined clarification of these issues (Corbin and Morse, 2003). Before the interview started, the interviewee was told how their answer could be used, including direct quotes where necessary. The interviewee could change their willingness to participate at any time. Besides, they could avoid any questions they did not want to answer.

The ethical considerations involved in this study were all planned earlier. The priority involved was to protect all the participants in the study. None of their background or details was published. All participants were not forced to contribute in the study if they did not want to. For example, in conducting a questionnaire survey, students were asked to speak truthfully and openly regarding the questions being asked, which may be considered sensitive because they may be revealing things related to their campus or institution. Students were not identified by name to ensure that they feel assured in saying truthfully without worrying about institutional consequences. If the students or interviewee told the author to remove their answers or responses, their data would be removed, and none of their answers would be taken. However, none of them asked to withdraw their participation. The author has individually kept all survey and interview results and feedback, and no one apart from the author can access to the raw information. The information gathered was held until the author deleted it after the study was completed. More details on informed consent, anonymity and confidentiality could be found on face-to-face interview implementation page 149 and questionnaire design page 152, including the subsequent subheadings.

In this study, the author of this thesis made clear on her roles. First, the author of this thesis declares that no disagreements or conflicts of interest exist concerning this research. Flooding and other natural disasters continue to capture the attention of most scholars nowadays. Flood was chosen for this study because it is a lengthy procedure that requires

ongoing support. Additionally, flood concerns necessitate preparedness to maximise recovery efforts. Clarke (2003) argued that universities are critical actors in the successful application of inspiration, innovation, and talents and the application of knowledge. Each higher education institution has a unique set of issues that are incomparable to those encountered in any other type of disaster management process. The author of this study believes that the problems confronting higher education institutions are frequently disregarded for further discussion. As a result, the peculiarities of the university necessitate a more comprehensive strategy.

A critical first step for Malaysian universities is to become more proactive in fostering a culture of DRR and management, given the country's significant vulnerability to flooding. Given that no facility or institution is utterly impervious to floods, this study is critical in developing measures to safeguard the well-being of students and staff on the university campus and its physical infrastructure. Throughout the thesis, the author assists communities (students) in acquiring basic flood knowledge. The author also seeks to understand how people assess and respond to natural disasters. Apart from addressing the issues of university flooding, the author of the thesis wanted to create public participation while increasing their knowledge and awareness of the issues. Community knowledge about disasters could aid in the development of a more effective disaster management plan. Therefore, it is vital to educate the university community on NDRR to prepare for catastrophes. Thus, the research conducted by the author will contribute to a greater public understanding of how individuals assess and respond to natural disasters and how these efforts might be integrated into the creation of better institutional disaster management systems.

Southeast Asian governments, including the Malaysian government, have continuously reviewed their current flooding approach, and searched for ways to improve disaster risk management (DRM). From the author's observation, pre-and post-flood, an educational institution's DRR approach is constantly at risk. As a starting step, the university may emphasise disaster preparedness education and its accessibility to the community. Some universities offer disaster courses or subjects; some are not widely known among other institutions. To ascertain how DRR measurements are implemented, the author designed survey questions and interviewed questions to feature any potential improvements. From the primary justifications, the author of this thesis argues that Malaysian universities should be aware of the consequences for university communities if flood control measures are not strengthened. As a result, Malaysian universities should develop a fresh start in raising

awareness and developing DRR strategies further tested. The author brings the two data collection databases together and integrates them. The mixed-method approach fits the purpose of this thesis because the qualitative research methods (literature review or desk study) are insufficient to understand the problem (Creswell, 2013) fully. Therefore, the author had to explore different instruments, types of data to collect, talk to people, and compare different data collection results and steps in the analysis, including statistics and themes (Creswell, 2013). The findings are explained in terms of contemporary discoveries and risk perception principles. Through the author's clarifications and recommendations, it is hoped that the Malaysian university will do more in-depth research into flood DRR to aid in decision-making.

3.4.2 Credibility and Trustworthiness

The author tries to respect the time committed to this study and the roles as a sponsored student. It gives the author great pride in representing the university community (students and faculty) and feeling responsible for improving Malaysian universities' current flood response strategy. Several approaches were carried out, for example, examining the literature review findings to ascertain any contradictions. Personal experiences and assumptions were referenced and explained to ensure they originated with the author and not with the university administration or other individuals. Any pertinent direct quotation was used to depict the situation mentioned above accurately.

Each chapter and component were thoroughly detailed and explained to guarantee its relevance for inclusion in this study. Additionally, they were constantly resorted to ensure the dependability of each chapter. This, however, clarified the interdependence of many explanations to aid the reader's comprehension. Someone unfamiliar with the research could easily comprehend what was presented throughout the study chapter. The coding portion is not just based on technique but also an explanation from an existing literature review to eliminate bias. This study's design was to connect as many segments of the university community as possible, including students, administrators (staff), and literature reviews. Collecting each approach contributes to the relevance of the study objectives and goals and enables direct contact with the institutions.

The author, respondents, and institution all need to have trust for the study to proceed. Without mutual trust, no information would be provided, and the author would be unable to access the respondents' experiences or knowledge. The university administration's

willingness to discuss the university's existing strategy and state aids in determining the best potential path to improvement. The author presented the research's objectives to participants before data collection to minimise uncertainty. Additionally, there were constraints throughout the second phase of the investigation, preventing the author from continuing with the same approach as before. As a result, the author had to devise a new method of communicating and acquiring facts and information.

One of the most glaring constraints was the author's requirement to limit the questionnaire survey participants to students. Initially, the author intended for it to be answered by any of the university building's occupier. Still, coding for various building occupants was a lengthy process, and the ratio of students to other building occupants is quite huge. Students dominated interactions with university building occupants. Concerning this limitation, it was a more appropriate technique for the study, as the author could concentrate on what was critical. The critical aspect is recognising and comprehending, not amassing a broad cross-section of the community. Including students as respondents helped significantly, as they were delighted to receive the questionnaire, as they do not receive this type of participation in research daily. This focused sample enables a more detailed study design. Compiling data from individuals within the same group (students or staff) may result in more transparent, targeted, and manageable findings. Diverse responses from students provided the author with intriguing details. However, evaluating and comprehending them was a different matter. This investigation uncovered a wide variety of characteristics within institutions. As a result, the capacity for establishing meaningful comparisons between the selected campuses and other educational institutions was enhanced. Additionally, certain activities or challenges may arise due to contemplating a complex topic.

3.4.3 Limitations

Higher educational institutions deal with various forms of data, analyses, and concerns. Due to limitations, critical data was omitted from the study. A study in the education sector should include additional evaluation techniques, such as determining the efficacy of educational institution efforts. The author determines which data should be included in this investigation's overall analysis and research questions. There was a dispute about knowledge theory and evidence-based judgments (Johnson, 1990). The mixed-method approach enables the integration of each technique and alleviates the limitations associated with each method (Bernard, 2017). The information obtained during the interviews, particularly the human impact on flood management, was not corroborated by the provided materials. Additionally, analysing any discovery is complicated because groups differ in

framework, functional purpose, and processes for natural disasters. However, the author must be aware of the existing theory's shortcomings.

It is to gain knowledge about how to improve NDRR strategies. This way, the author of this thesis might determine how to assist people more effectively during a flood catastrophe. This study aims to ascertain how people perceive the risk of floods. Additionally, the survey sought to establish the public's level of trust in the university administration's response to the floods (Bamberg et al., 2017). The author does not attempt to clarify construction laws or code compliance in this study. This is because Malaysian universities are always built-in compliance with applicable laws and regulations (Yatim, 2009).

As discussed by many researchers in a variety of studies in the disaster field, flood disasters can have a variety of consequences, including damage to buildings and infrastructure, loss of property, and fatalities. The author of this thesis will not go too far in explaining the background of flood water, its impacts on the environment, and the engineering approach to tackle the situation. Instead, the author will focus on the Malaysian situation, especially for the university institution in its flooding approach. Different educational institutions will function in different ways (Kezar, 2011). These would differ in constituents, operational procedures, organisational structures, and cultures across higher education institutions in Malaysia and throughout the world. Additionally, certain activities or challenges may arise due to a complex topic. There were restrictions on specific instances where available data was insufficient. It was also time-consuming due to the varied locations of the campuses under studied. The research placed a high expectancy on community current knowledge and expectation on how to perceive risk. Risk perception would be a concept of unresolved local concerns. For instance, respondents describe how they have been impacted by a flood disaster, their current awareness of flooding issues, and how this knowledge could help the institution enhance its NDRR programmes. The purpose of this analysis was to increase public awareness of flood threats, the behaviour patterns that result from them, the cause attribution, and the possibility of public involvement in future institutional decision-making. The instrument assumed that respondents could disclose their personal beliefs appropriately without any influence from outside forces. Since the research is retroactive in nature, the research was constructed in part from the helpful recollections of various campus officials. There are two approaches to learning a complicated scenario: exploiting the gaps and inconsistencies in online information resources and creating a proof chain (Yin, 2009).

3.4.4 Bias

This is an exploratory study. The author was required to conduct trend analysis on the data acquired from various data sources. Additionally, the author gathered as much material as possible and concluded with a theory. Additional analysis and observation could result in a more favourable outcome when the results are paired with other quantitative and qualitative data (Tellis, 1997). An exact sample eliminates bias (Cooper et al. 2001). As a result, the sample will be validated. There is no guarantee that a larger sample size would significantly improve public parameters. The most critical aspect is the precision of a sample, which is far more significant than its size (Oppenheim, 1992). For instance, the author selected various campus sites to prevent prejudice and increase reliability. Additionally, the campuses are dispersed.

The practise of thinking, self-discussion, and deliberation of individual perspective-taking help significantly reduce the impact of bias and judgments (Moustakas, 1994). The author must identify and acknowledge potential biases encountered throughout the field study. Understanding bias and keeping track of possible preferences enable the author to avoid personal thoughts interfering with qualitative data (Johnson and Christensen, 2008). The findings of questionnaires and interviews can be analysed in various ways to determine their degree of similarity. The author reviewed all the survey and interview transcripts several times. Bias is a significant issue when collecting data for research, particularly when closed-ended questions are used (Kirakowski, 2000). The author was required to consider the scope of the study's evaluation. The study would concentrate on and be concerned with the DRR phases. Certain outcomes may pertain to the institutions' preparedness and emergency response to flooding-related issues. The study was evaluated using various essential keywords, including systematic, objective, examination, and drawing lessons (ALNAP, 2006). To begin with, the study was meticulously organised using a systematic approach. This chapter discussed the approaches. The author's objective was to have a broader viewpoint to arrive at more factual conclusions and credible proof. As a result, three distinct data-gathering methods were used throughout the study. The examination included a discussion of the relevance of each analysis or action performed. Each stage had its significance and cause for concern. Finally, the author of this thesis drew lessons from experience to improve future policy and practice.

The author used a qualitative approach to create evidence, identifying impediments, explanations, and ideas for overcoming them. It was to improve the research outcomes

through questionnaires and literature reviews to identify any potentially hazardous factors. A model is created by combining the designs deemed most acceptable for this study. This research employs the "Two-Phase-Design" technique. It will divide the analysis into qualitative and quantitative stages. The author of this thesis used quantitative analysis to ascertain the statistical relationship between the respondent's responses to the questions. Phase 1-Qualitative: The author conducted a macro study to gain a more understanding of the problem, particularly in what way universities handle NDRR. Each paradigm assumption was successfully recognised to empower each level. Biographical information from survey was used to classify related focus groups in the literature interests. The study's findings were likewise to be presented in phases. Phase 2-Descriptive comparisons and their link to Phase 1 were used to clarify the quantitative data. The final debates focus on quantitative outcomes and the intricacies revealed by qualitative outcomes, consistent with earlier theories. Any results that were inconclusive or contrary to expectations were also discussed.

The questionnaire survey will include respondents with and without flood knowledge. When gathering respondents' responses to flooding issues on their campuses, the hypothesis was that if respondents' impressions of flooding are favourable, they will seek additional knowledge about food-related issues. The terms used in the questionnaire were easily understood by the public and did not contain jargon to accommodate students from diverse backgrounds. To minimise uncertainty, the author stated the purpose of this research to the participants before data collection. The author stayed true to the students' responses without personal bias or prejudice. The author was conscious that a relationship between the author and the institution (as the study was funded by the university chosen) could result in accidental social bias. Based on perception of societal expectations (Fisher, 1993), someone may provide less accurate responses to questions. The author ensured that this study's outcome was derived entirely from students' describing or responding to their actual experiences. Their answer sheets were deemed to derive from an "unknown" source. There is no trace of their background or details. Their responses were treated with strict confidentiality. The students were expressly informed that the survey was being done to aid in the completion of the current study's objectives. Rather than being concerned about the number of non-responses, the real issue here was the risk of bias.

The questionnaire inquired about respondents' risk perceptions and their willingness to deal with and engage in DRR within the institution. Numerous variables may jeopardise the questionnaire's results, including faults; sampling and non-response errors, bias, reluctance, misunderstanding, ignorance, respondent unreliability, statistical analysis, and

incorrectly interpreted results (Oppenheim, 1992). To address this issue, the author piloted the interview questions and questionnaire surveys with several colleagues (5 people) and undergraduate students (25 people in one class) to ascertain the initial thoughts and remarks. Given that the author is a university alumnus and a former staff member at the selected institution, the author should be conscious of how the author was seen as a researcher for conducting an interview and questionnaire surveys since this perception may have influenced the research. The author makes every effort to prevent ambiguity, resulting in incorrect details.

3.4.5 Study Settings and Scene

Flooding can have direct and indirect consequences for a community (Few et al., 2004; Yushmah et al., 2020). Flood management and the associated concerns have received increased attention in recent years (Greenough et al., 2001). Therefore, planning and preparation for anticipated and unforeseen risks are essential (Alexander, 2015). While disasters cannot be prevented, they can be mitigated via implementing a practical management approach (Omidvari et al., 2015). Disaster mitigation and management of risk have become a greater priority in educational institutions (Madu, 2017). Malaysian institutions are highly vulnerable to flooding, and flood-related efforts should be implemented in reaction to the issues (Mohit and Sellu, 2013). Additionally, the institution should be capable of recognising and managing flood events and developing a performance indicator or index (Balica et al., 2012). Universities now have a role in society beyond offering advanced education (Hirunsalee et al., 2013). The disaster situation should be thoroughly investigated by examining the institution's conditions, factors, and relationships with the communities in facing natural crisis (Guzzetti et al., 1999). Forecasting flood damage and understanding potential scenarios are crucial. In addition, the university must create tailored adaptation actions to adopt the flooding hazard inside the campus community. When a disaster strikes, universities must be prepared to adapt while educating and doing research. If this occurs, it displays the institution's maturity and resilience (Chai and Zeng, 2018). As a result, institutions must analyse their capacity for overcoming adversity (Shah, 2020; Plein, 2019). Institutions must act quickly in the face of disaster threats to overcome obstacles and disrupt the governing institution (Chang-Richards et al., 2013). Universities and colleges must analyse flood dangers and socioeconomic data to determine regulatory restrictions and potential environmental harm. Institutions should also be receptive to any flood protection method (Dawson et al., 2011). The necessary processes should be implemented to guarantee that operations resume as soon as possible, and that the campus can reopen to the public (Kahn, 2012). University students, staffs and the public become

stakeholders during a flooding catastrophe. When it comes to natural disaster risk reduction (NDRR), university administration should engage the community to understand university residents' capacity better to mitigate catastrophe-related consequences (Scolobig et al., 2015; Norris et al., 2008).

Due to the high risk of flooding in Malaysia, higher education institutions have been compelled to involve broader stakeholders in building disaster risk prevention and management (Holloway, 2015). Universities may collaborate with the public and private sectors while providing students and the university community with high-quality DRR knowledge transfer (Klein et al., 2011). As a result, the institutions must share their experiences and learn from the best practices in flood control design and implementation used by other higher education institutions (Demissie et al., 2021; Pahl-Wostl, 2006). Since universities are responsible for producing the nation's future generations (Howard, 1962), it is vital for short and long-term approaches to instil in students' knowledge of DRR. These forms of flooding events should increase awareness, which results in openness for the students and the university community to participate in NDRR (Amri et al., 2017).

This paragraph exemplifies several approaches previously adopted by various scholars in brief. In other word, this thesis is more likely to have the same approach as previous researchers. Josephson et al. (2017) developed processes for assessing small enterprises' preparedness for hurricane disasters, including a literature review, a questionnaire survey, and in-person interviews. Additionally, in this thesis, interview sessions were conducted to examine the university disaster events. Fillmore et al. (2011) explore it in detail as part of their research on university catastrophe experiences after the 2008 Iowa flood. They interviewed respondents from the University of Iowa using semi-structured interviews. Alekseev (2010) examined knowledge management processes in a project-based organisation, establishing success criteria and best practices. Intriguingly, questionnaire surveys and in-person interviews are gaining traction in project-based organisations. Tatebe and Mutch (2015), in contrast to the others, limited their investigation to a single method: a literature review. Abedin and Shaw (2015) use a similar method in their study on the part of university systems in DRR, which focuses on Bangladesh's coastal areas. It conducts desk-based research to identify the university's approaches in disaster efforts. Pathak and Ahmad (2016) also examined small and medium-sized firms' potential to recover from floods. They conducted the study at 7 different locations throughout Thailand, using various approaches. It consists of a questionnaire survey, in-depth interviews with key informers, focus group dialogs, data gathered from diverse sources, and

a review of flood recovery literature. Wang (2016) conducted a study on school-based disaster management using a literature review, a questionnaire survey, a site investigation, and focus group discussion. Wang (2016) developed a disaster management paradigm for Taiwanese schools. Wang focused the research on respondents' perspectives on disaster management at higher education institution. Inspired by Wang (2016), the author conducted a survey and an interview to determine how disaster risk reduction (DRR), risk perception, risk communication, and other characteristics to mitigate the effect of disaster. The questionnaire survey and interview were used to elicit thoughts from students and faculty members on how the university administration should involve, associate, and show responsibilities for students' safety in the case of a flood. It would also identify any improvements that could be applied to a higher education institution's NDRR.

As the author of this thesis noticed, Shah et al. (2020) took a similar approach to this thesis. Shah et al. (2020) focus on schools in Pakistan, interviewing school students and teachers to learn about their experiences with floods. The author of this thesis chose to gather more ideas based on the 6-stage all-inclusive flood model for school DRR particularly in defining the themes and aims of coding to serve as a guide (Shah et al., 2020). It could be used to develop the thesis's overall directions further. Alerts or capacity enhancements are the first stage; emergency planning is the second stage; preparedness behaviour is the third stage; safe facilities and guidelines are the fourth stages; educational continuity plans are the fifth stage; and response capacity development is the sixth stage. Shah et al. (2020) research included a case study at 20 randomly chosen schools and 100 surveys. Shah et al. (2020) concurred that most school-aged children spend more than half of their day in school, like university students. As a result, there is an additional reason to safeguard them against potential threats. It is interesting to learn that schools have a responsibility to protect children in a crisis and prepare students through education and preparation, likewise, with academic institutions. If schools do not respond appropriately to calamities, the students will suffer the consequences. As a result, the author of this thesis utilises Shah et al. (2020) notion that universities must constantly reflect on the realities of university preparation. The author of this thesis employs a component of the Shah et al. (2020) approach to elicit administrators' lessons and views.

This study demonstrates how Malaysian higher education administration (universities), students, and faculty act as first responders to flood disasters. When dealing with natural disaster risk reduction (NDRR), the author of this thesis should consult with the local populace to better understand the community's capacity to reduce disaster

repercussions. UiTM Malaysia has designed a disaster management program that involves 3 phases of disaster management, including preparations before, during, and following a disaster. Malaysian NDRR, on the other hand, is dependent on the country's procedures for mitigating flood hazards. Government and non-governmental organisations, universities, and other educational institutions should consider working together in lessening the impact of a flood catastrophe. All the campuses are public institutions that rely on the national system for flood recovery, and the campuses are intended to share all the government's and institution's resources. Due to the establishment of branch campuses, all the systems' structures should be synchronised. Each of the campuses selected was impacted by flooding. The remainder of this study will refer to these selected universities as selected "campuses". Identifying the flood recovery approach's strengths and limitations should be the process's centrepiece, as it will aid the institution in comprehending the relationship between the responders, resulting in more informed decision-making and action. University institutions may collect data, compare it to the underlying theoretical framework, and analyse it. This research employs primary and secondary sources. Secondary data sources comprise of unpublished and published literature, articles, and papers provided by the university administrator to the author. The author of this study sought the best available guidance regarding university protocols in the occurrence of a flood. Thus, the author referred to the preceding literature review when arguing the conclusions. Conclusions and suggestions were formed by integrating the author's observations with the findings.

3.5 Theoretical Phase

3.5.1 Philosophical Underpinnings

Typically, theories arise early in mixed methods research, serving as a unifying lens that shapes the types of questions addressed, the study's participants, the data gathering methodology, and the investigation's results (Creswell and Creswell, 2017). A study by Birkholz et al. (2014) plays an important role as the basis of this study's theoretical aspects. This section will provide a table derived from a work by Birkholz et al. (2014), summarised by the author. As mentioned in this thesis, the author will not recreate what other authors are doing. Therefore, getting the insights and the main theme of each theory would help the author in developing the findings of this study with the assistance of other theories as well.

Applying theories related to risk perception and NDRR is vital in shaping the research design for this study. The theory is used in the study conclusion by giving a theory-

after viewpoint by which different theories are contrasted with the theory developed (Creswell, 1994). The author will use the conclusion to develop at the final stage of the study and link it back to the pre-existing theories. The author needs to avoid the pre-existing theories in predetermining the outcome. The aim is not to re-create what other researchers have done but to explore more access to new knowledge within new research setting and be subjected to contribute fresh knowledge to benefit the community. From the author point of view, the current theory starts at providing structure and direction to the original inquiries by the researcher. The researcher then responds to the information obtained while questioning, utilising the existing principle and theories to involve, filter, and organise the data received.

The author of this thesis refers to McEntire (2004)'s long list of disaster management theories. The author can choose any of the theories as a reference when the author is explaining specific circumstances. This theory provides the author with the basic simple idea of how disaster management theories are included in each aspects of life.

Table 3.1: Disaster Management Theories
(Revised by the Author, Adapted from McEntire (2004).

Disaster Management Theories	Detail
Social constructionist views	Vulnerability directly related to the social construction viewpoint which is so prevalent in today's scholarship.
Marxist interpretations of disasters	Economic conditions and political powerlessness are related to disaster vulnerability.
Weberian perspectives of emergency management	Culture is major reason for rising disaster vulnerability.
Organisational behaviour	Organisations typically look after their own interests and do not understand how their actions or inactions affect other agencies.
Emergent behaviour	When a disaster occurs, people and resources will flow to the scene and new organisations will appear almost instantaneously.
Risk perception and communication	Most people are typically apathetic about disasters.
Development	Many scholars are aware of the links between development, vulnerability, and disasters.

Sustainability	Environmental degradation may create additional vulnerability in the future.
Technology	Modern communications equipment as well as advanced hardware and software applications may build our capabilities to prevent, prepare for and respond to disasters.
Decision theory	Disasters are almost always characterised by a lack of information.
Systems theory	Research now illustrates that the natural, built, technological, social, political, economic, cultural, organisational, and psychological environments have a direct impact on our level of vulnerability.
Chaos theory	it is impossible to detect simple linear cause and effect relationships.
Management theory	Disasters are political and organisational problems.
Paper plan syndrome	Some communities assume that the presence of an emergency operations plan is all that is needed to deal with disasters.
Networking and collaboration	Disasters require multi-organisational responses.
Compliance model of evacuation	There are several variables that influence whether a person evacuates during an impending disaster (age, gender, race, education, activities of neighbours,)
Policy making	Political processes not only allocate values in society, they also knowingly or unknowingly distribute vulnerability among the population.
Preparedness and improvisation	It is possible to see ties between vulnerability and the twin foundations of emergency management also.
Integration	Because there are so many participants involved in emergency management, it is crucial that these organisations espouse and implement consistent and achievable policies.

Both substantive and formal theories are self-contained and entirely supported by the data. (Andrade, 2009). The grounded theory employs concurrent data gathering and processing (Maher et al., 2018). This technique requires comparing data with data and codes,

and the researchers play a vital role in this procedure. In contrast to positivist forms of scientific study, the interpretative model maintains a degree of separation between the author and the object being investigated. Data were acquired from various sources as a constructivist approach (Maher et al., 2018). The theory of this study involved Convergent Parallel Design. The author gathers both qualitative and quantitative data. After that, both data are being analysed separately. They are both compared to analyse the results by identifying whether both datasets are the same or different. The direct comparison leads to the convergence of data sources (Creswell, 2011, as cited in Subedi, 2016).

A thesis is a formal statement of knowledge, or a developed notion presented in a paper (Bazerman, 1981). A thesis is a concise assertion of scientific truth. Examples of axioms and theorems can be found in a thesis. A preliminary thesis connected with a systematic principle deemed legal without rational justification to prove another thesis based on the same theory. A theorem is established by reasonable evidence to be true. Auxiliary theorems prove the correctness of statements or lemmas (Novikov and Novikov, 2013). The methodology is based on a scientific understanding of an organisational theory. Numerous subjects are encompassed by the term science, including epistemology, scientific reasoning, science sociology, and the psychology of scientific advancement (Hogan, 2000). Methods are techniques used to collect and investigate data on a study topic or hypothesis (Crotty, 1998). Activity and actions are investigated in philosophy because a human being can be considered an active being. The philosophy of a methodology facilitates understanding of the author's engagement with information (Ravitch and Carl, 2019). Additionally, it is a pre-publication strategy and design derived from specific systems or solutions—the methodology is linked with ontology and epistemology and the study philosophy of methodologies (Doyle et al., 2016). The author of this thesis approach should be systematic, with a clear and attentive understanding of science, familiarity with the laws and regulations regulating research and development, and familiarity with the framework of scientific awareness (Ross, 1996). Thus, the author of this thesis described the importance of scientific knowledge in the thesis as the ability to develop a new understanding from the research findings and other types of scientific knowledge for articulating the study findings. The author presents the scientific work in the next section systematically. According to Crotty (2020), philosophical theory entails 4 components: a paradigmatic perspective (epistemology, ontology, axiology, methodology), a theoretical lens (social science theory), a methodological approach (ethnography, experiment, mixed methods), and data gathering methods. In the conclusion section of this thesis, the author will discuss the philosophical standpoint. Numerous essential concepts assist as the foundation for mixed methods

research. They include pragmatism, transformational worldviews, critical realism, dialectic pluralism, a diversity of worldviews and paradigms, worldviews aligned with design, worldviews formed from research, and community philosophy (Crotty, 2020).

Referring to Novikov and Novikov (2013), epistemology is the study of the rules and capacities that govern cognition, the analyses, procedures, forms, and stages of the cognition procedure. On the other hand, scientific study is a highly subjective process by which the author acquires new knowledge, including the scientific technique. The epistemology of this study is founded on social constructivism, as evidenced through data collection and analysis. This was guided by a field study. This strategy was optimal since it enabled the author of this thesis to undertake an in-depth study within well-defined and commonly accepted parameters (Creswell, 2007). This demonstrates the importance of respondents on subjective experiences. Social constructivism refers to the belief that knowledge is mainly constructed through social interpretations rather than direct perceptions of truth (Gergen, 1995). Under the social constructivism paradigm, individuals are rewarded for communicating their ideas rather than those they discover. The author obtained a better understanding of the reality they faced by interviewing more informed people. This was accomplished by employing an inductive approach to establish important patterns throughout the data collection process. The literature contains some outstanding critiques of pragmatism as a philosophical theory (Parvaiz et al., 2016). The primary objective is to establish what works and what enables problem-solving (Patton, 1990; Creswell, 2003; as cited in Parvaiz et al., 2016). Pragmatists believe that one should forego inquiries into the laws of nature and reality “ontology” and into the theory of knowledge “epistemology” in favour of concentrating entirely on what works (Parvaiz et al., 2016).

Crossan (2003) justifies why studying philosophy may be beneficial for a research methodology. The author of this thesis will improve and stipulate the research methodologies employed in research, thereby aiding in the explanation of the overall research plan. This would include the type of evidence acquired and its source, how the evidence is analysed, and how the evidence helps in the resolution of the research questions addressed. The research was conducted to reinforce previous findings, solve new or existing problems (issues), bolster pre-existing hypotheses, or produce new ones. Research's essential functions are establishing, interpreting, uncovering, and expanding knowledge (Crossan, 2003). The purpose of a research is to study preliminary data, to analyse current challenges, to offer solutions to existing problems, to investigate and evaluate common subjects, to develop new methodologies, to explain novel phenomena, and to generate new

knowledge (Crossan, 2003). By gaining a firm grasp of research philosophy, the author of this thesis will evaluate various procedures and avoid inefficient use of time and resources by identifying the approaches' limitations early on. It may assist the author in developing their imagination and creativity while selecting or adopting new approach.

Quantitative approaches (or positivist ideologies) and qualitative methods (or post-positivist philosophies) are generally opposed perspectives. Contemporary research frequently employs a triangulation of methodologies (Polit et al. 2001, as cited in Crossan, 2003). As a result, it is necessary to fully understand both systems and their underlying philosophy to assess their relative strengths and weaknesses. Ontology derives from the Greek word for "to study". Throughout the study process, the author uses "ontology" to understand how to answer questions such as "What is reality?". This is crucial because the author's presumption directly affects how the study is conducted. Ontology establishes a set of philosophical issues that must be addressed in investigating the dynamics of truth or nature. The established scientific method originated in positivist philosophy. The literature illustrates that the character of positivism can be described in various ways (Crossan, 2003). The senses collect objective, quantitative, and recognisable information; all extraneous data should be ignored (Crossan, 2003).

Epistemology is a Greek phrase that translates as "How do I know the truth?" (Schwandt, 2007). A methodology is a strategy or design that directs the selection and implementation of specific processes and creates a link between the methods chosen, application, and the anticipated research outputs. When these three parts are joined with epistemology and ontology, they form what is known as research philosophy. Using the study's epistemology, the author should address the issue, "How could I possibly apprehend reality?" The author of this thesis combined pragmatic and philosophical approaches. It is a logical reasoning technique that incorporates either abduction, deduction, or induction (Johnson and Onwuegbuzie, 2004). The author employed a mixed-methods approach, which entails simultaneously or sequentially collecting and analysing qualitative and quantitative data in the same research. Numerous characteristics of positivism traced in this research via detailed qualitative methodologies. Regrettably, Weitzman and Miles (1995), as cited in Ritchie et al. (2013), demonstrate that individuals with divergent epistemological perspectives regard the system's most fundamental operations as intrinsically flawed.

This research has an epistemological viewpoint that is social constructivist. This paradigm demonstrates the significance attributed by participants to subjective experiences.

According to social constructivism, knowledge comprises social interpretations rather than objective real-world awareness (Gergen, 1995). This study, based on Novikov and Novikov (2013), employs both theoretical and empirical techniques. Theoretical and practical phases both contain operational methods. Academic input includes analysis, synthesis, comparison, generalisation, induction, and deduction. This valuable information includes analysing activity data, conducting oral and written queries, and making personal observations. Thus, by eliciting the most profound understandings from the respondents, the author of this thesis able to benefit to a better understanding of the respondents' perceptions of reality. This occurred due to the data collection process inductively developing patterns of meaning. The author of this thesis must have a clear and explicit vision of science, organisation, and advancement in the governing system (Novikov and Novikov, 2013).

3.5.2 Knowledge Application

According to the UNISDR (2009), NDRR research is a procedure by people, societies, and communities may increase their understanding of the critical nature of dealing effectively with flood catastrophes. It entails empowering knowledge and enhancing an institution's capabilities and competence. UNISDR (2009) emphasises the crucial nature of comprehending a community's or individual's condition. Everyone's involvement is critical, regardless of status or background (Kron et al., 2012). Individual knowledge, views and opinions would be detrimental to the NDRR's endeavours and processes. Understanding the community facing the risk of flooding is also as equal of learning towards NDRR. Flood-related NDRR research is a vast science. As a result, it cannot stand alone without the researcher becoming acquainted with existing information and ideas (Merz et al., 2010). The knowledge-driven, problem-solving, and social interaction principles will describe multivariate and complicated circumstances (Tellis, 1997). Knowledge-driven principles dictate that fundamental investigations will generate discoveries and ideas (Yin and Moore, 1987).

Appropriate application of knowledge and theories is critical (Von Hayek, 1989; Smithers, 1996). However, learning via experience and understanding the issues is required to rediscover the underlying generalisation (Stake, 2005). It is critical to comprehend the situation during subject selection, learn the problems, and connect the gaps with current issues (Baden and Major, 2004). The use of risk perception and NDRR theories is critical in determining the research design for this study (Schneiderbauer et al., 2021). The discoveries from this research are unique due to the field study's approach and selection criteria. However, the fundamental theory should be established in the same way as other theories.

As a result, the author of this thesis considers an interpretive scenario when conducting this investigation. The author of this thesis created and established each topic to produce and comprehend the data. The author of this thesis will provide opinions and judgments about the current situation regarding the evaluation situation and concerns, accompanied by supporting details (Sadler, 2004). The objective is not to duplicate the work of previous researchers but to increase access to new knowledge in a novel research context and provide new knowledge to benefit the community (Basturkmen and Von Randow, 2014). According to the author of this thesis, the current theory begins by giving structure and direction to the thesis's initial investigations. Therefore, the author of this thesis provides a lot of literature review basics on flooding issues for the reader to understand the basic underlying information to tackle the overall issues being questioned. The author of this thesis then analyses into the material gathered throughout the data analysis process, utilising established principles and theories, sifting, and organising the collected data (Liang et al., 2006).

According to the author of this thesis, knowledge, theories, and awareness are often stated in NDRR research due to the critical nature of comprehending existing knowledge and applying it to contemporary circumstances. It is believed that the ideas involved, namely those established before, serve as a guide for ongoing NDRR study. Additionally, it is critical to ascertain the level of knowledge of selected participants or relevant issues so that their suggestions and criticisms can help improve the subsequent strategy and action (Bell and Waters, 2018). Without new and fresh input, the issues involved cannot be tackled appropriately. To understand the disaster that occurs in a community in more depth, several approaches can be implemented, one of which is with learning from the communities (Mercer et al., 2008). The author also argues that in this way, people perspective can be identified (Mercer et al., 2008). Additionally, the author of this thesis claims that the Mercer (2008) method may ascertain people's viewpoints. The surrounding selected university campus community, which is frequently involved in disasters, may recognise the disputes and difficulties associated with them and possess the necessary abilities to deal with risk (Zainal, 2007). There are some instances where a community's understanding of disasters could aid in the development of a more effective disaster management plan (Price and Vojinovic, 2008). The author of this thesis contends that Malaysian institutions must acknowledge the impact of flooding on university communities and foster a new understanding of the flooding context or conflict. Local knowledge evaluation is crucial to understanding how the institutional system operates and what the community can learn from their capacity to work toward NDRR (Rose and Jayawickrama, 2016). Multiple administrators, university management and government may be responsible for disaster

management in higher educational institutions. Due to societal pressures, universities and other educational institutions must perform additional roles and take on specific responsibilities due to societal pressures (Hirunsalee et al., 2013).

3.6 Data Collection Methods

3.6.1 Instrument

The author used pen and paper rather than electronically when conducting the face-to-face interview. Lecturers are contacted face to face in advance before distributing the questionnaire survey. Additionally, there is no plan to do comparative research among Malaysian universities, and the usage is confined to internal purposes within the specified institution (Wright and Wordsworth, 2013). However, this study will present the quantitative data. At times, the author employs bracketing ("...") to suspend judgement regarding the qualitative data, which enables the author to embrace personal views (Bevan, 2014). The author's perceptions were separated from the occurrence and revisited. Numerous perspectives contribute to a comprehensive understanding of these strategies (Stemler, 2004). The author does not attempt to influence or control public behaviour in completing the study, which means that the subject is observed in "real-world" and natural settings or occurrences. Comparing the two methodologies, surveys and interviews, shows a complex problem. This may help explain why one study attempted to measure any parallels between these methodologies used in academic research (Villanova, 1984).

While the interview usually takes only a few minutes to finish, it is typically extended for around one hour, providing additional time to illustrate the respondents' beliefs' variabilities and inconsistencies (Marton and Pong, 2005). The resulting variability makes it challenging to categorise participants' views or understandings in preparation for an evaluation. Although it is consistent with several previously assessed studies, qualitative information is required to substantiate the quantitative outcomes with unfavourable results.

According to the author, the most vulnerable moments occurred when the respondents were all helpful but simultaneously wanted to maintain a low profile and provide answers in safe ways rather than provide honest responses or predictable responses. Regardless of the shortcomings of questionnaires and face-to-face interviews, there is a critical method for eliciting immediate responses from respondents regarding their comprehension or viewpoint. These methods should not be overlooked. Individuals can hold opposing beliefs and conceptions concurrently (Pajares, 1992), causing them to react in

inconsistent or contradictory ways. The evaluation must be conducted with the aid of legitimate and dependable instruments (Strachota, 2006). Since the overall number of flooding events changes, the author needed to triangulate the study using additional methodologies to confirm its validity. However, it is the approach by which researchers can ascertain the underlying causes of the problems (Zainal, 2007). The author needed to argue for each data point to avoid biases and misinterpretation, especially when a small sample or field studies were chosen. This research examines and emphasises Malaysia's university position on flood risk among building users and the most affected individuals during a flood at universities, namely students. The five campuses locations are shown on the map below.

Figure 10: UiTM Case Study Location (Self-Authoring).

3.6.2 Description of Sample

The study is being undertaken in a natural setting to better understand the dynamics of a little-studied location. It would assist any author in gaining a comprehensive understanding of the subject they were researching (Creswell, 1998). Nonetheless, the author of this thesis supported the conduct of this research and the field study chosen. The institutions and their communities were classified using the classification system used by a Malaysian university. The institution's criteria for selecting respondents for the questionnaire were that the number of individuals (regular students) present in the community outnumbered other visitors or personnel. Purposive sampling was used to sample the selected institutions (Etikan et al., 2016).

The research carried out by the author of this thesis employs a transdisciplinary method in which the author discusses the evidence and the literature surrounding the issues (Gaziulusoy and Boyle, 2013). Additionally, this thesis will make various recommendations for future solutions to the university NDRR issues. For instance, in Wales and England, the public's response to flood warnings is negligible. As a result, public reaction may be a limiting factor in undermining any national flood risk management policy directed at the public and its portfolio strategy. It is also critical to understand how human behaviour evolves regarding flood risk management (Green et al., 2007). The community's response should be analysed and compared to the existing flood alerts in the systems (Green et al., 2007). Flood alerts and warnings are evaluated to minimise adverse health effects and further damage to people's livelihoods (Parker et al., 2009). That is why the purchase of flood warning equipment is more critical than financial concerns (Soane et al., 2010). Numerous risk communication issues could be addressed by increasing public reaction to flooding warning systems. As a result, flood warning systems are becoming increasingly vital (Green et al., 2007).

The primary determinants of sampling in this circumstance were the number of respondents and the institution's campus location. The purposeful sample process involves selecting interviews respondents (staff of the institutions). Interviews were conducted with key stakeholders involved within the institutional DRR issues. Administrators with various positions and responsibilities are included in this study because they face a variety of unique challenges and scenarios when managing the teams (Zdziarski, 2001). The data was gathered through structured questionnaires administered to students at the specified university

campus, and field observations were used to verify the information gathered (Patton, 1999). The interview method was based on purposeful sampling. Purposeful sampling enables the author of this study to identify people and research settings that will response the research questions (Coyne, 1997). The author of this research has the authority to determine the details required for research purposes. Research with a small sample size lends itself to purposeful sampling to understand the phenomenon being examined (Patton, 2015).

The sampling process in this study involved selecting the target population under investigation. The population comprises Malaysian universities and the community (students and staff). The sampling frame includes the accessibility of the selected population or the field study. The author had access to the UiTM Malaysia because the author is an alumnus of the university. Next is choosing a sampling technique. Probability random sampling is preferable for quantitative data in this study. This is because the author of this thesis could generate the available data to generalise the population being selected. This study's probability random sampling type is systematic sampling (Etikan and Bala, 2017). The validity issues to a mixed methods approach may include types of research strategies in the thesis, the selection of samples, bias or inadequate procedures, or the use of conflicting research questions (Creswell and Clark, 2011).

Numerous students are present in the institution more frequently than other categories such as staff or visitors at the day and night. Since most students lack in having their own transportation, they cannot travel quickly from one location to another, much less alone to rescue themselves. The author of this thesis contends that such categories capture only a portion of how individuals interpret and appraise environmental threats—several proposed theoretical models in the cognitive and psychological sciences (Slovic et al., 2002). Individuals respond to the likelihood of disaster impacts arising in cognitively or emotionally. Affective evaluations immediately affect behaviour, whereas cognitive evaluations affect people's behaviour through replies (Loewenstein et al., 2001). Emotions may aid people in determining the likelihood of something. Individuals' judgement and reactions are occurred based on their prior experiences, current feelings, and emotions (Slovic et al., 2004). Thus, it is rational to accept that the insufficient connection among risk perception and disaster preparedness could be because risk perception criteria are inadequate to encompass psychological and human emotions (Kellens et al., 2013). Along with these elements, research indicates that disaster preparedness differs according to individual and psychological qualities, such as previous disaster experiences (Miceli et al., 2008).

3.6.3 Public Participation

Working knowledge of public engagement is critical, as it plays a role in flood DRR. Due to the frequency with which floods occur in Malaysia, the community is more familiar with flood dangers than other natural disasters. As a result, an institution should prepare the community to contribute in the public participation (Bernardo et al., 1993). According to the author, correct behaviour during a flood could be a means of minimising damage. Whether the strategy is structural or non-structural, it is beneficial to decide and arrange methods to achieve consensus or public approval. As a result, public feedback must be channelled so that it could help in the growth of more efficient flood management. It is necessary to involve the public in practise to obtain their perspective, even if it becomes disputed. Following EU Directives 85/337/EEC and 97/ 11/ EC,97/11/EC provides a provision authorising public involvement as a necessary condition (Langlet and Mahmoudi, 2016). The author concurs that public participation in community acts and organisations is significantly lower in Malaysia than in the United Kingdom. The public's willingness to participate in flood management and opinions of previous institutional attempts should be successful. Electronic information platforms should be implemented to store biophysical, socioeconomic, and technological data.

The interview method is based on purposeful sampling. Purposeful sampling enables the author to choose individuals and study settings that will elicit information regarding the research issues. The author can determine the specifics required for research objectives and select interviewees based on their skills, experience, and previous participations in flood works. It was conducted to ascertain their perspectives, experiences, and understanding of flooding challenges and threats on their campus.

3.6.4 Mixed Methods Design (Qualitative Method and Quantitative Method)

Qualitative or quantitative data may be gathered first when data collection occurs in stages, depending on the circumstances. It is contingent upon the author's initial objectives. Collecting data over an extended period is impractical. Collecting quantitative and qualitative data concurrently with the author in the area is more manageable in this case than returning to the field multiple times to collect data (Creswell and Creswell, 2017). In practice, the weighting occurs in a mixed-methods study via strategies such as prioritising quantitative or qualitative data. The amount to which the project addresses one form of data more thoroughly than another, or whether the project is inductive (topic generation in

qualitative) or deductive (theme generation in quantitative), As demonstrated in various research inquiries, the researcher may purposefully employ one type of data to support a broader search (Rogers et al., 2003, as cited in Creswell and Creswell, 2017).

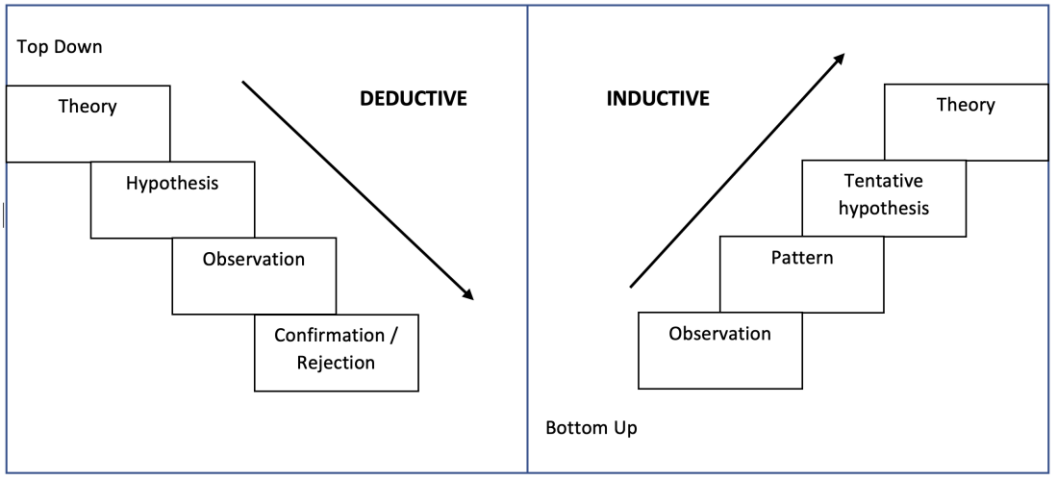

Figure 11: Distinction between Deductive and Inductive Approach (Adapted from Burney, 2008).

The qualitative issue is significantly more straightforward to resolve than the quantitative one, unless the two are inextricably linked. The term "connected" refers to integrating quantitative and qualitative research between the first phase's data analysis phase and the second phase's data-gathering phase (Creswell and Creswell, 2017).

Mixed research methods are used within this study because they can response to an extensive research question. The most crucial part is when the author can minimise and overcome the weaknesses of each method (Etikan and Bala, 2017). The mixed-method approach in this thesis also adopted steps derived from Migiro and Magangi (2011). First are explicit theoretical lenses, for example, philosophical basis or paradigm basis, that is further directed to the methodology being used (Crotty, 1998, as cited in Migiro and Magangi, 2011). This study then uses the paradigm views, which are post-positivism or constructivism. Next is identifying how the data collection is implemented. Data for this study were collected concurrently rather than later (Creswell et al., 2003, as cited in Migiro and Magangi, 2011), given on the priorities and time available. The third is the usage of the data being collected and how it is being integrated. This study carried out the data analysis process in Chapter 4. These data are analysed separately, but they are eventually linked (Onwuegbuzzie and Teddlie, 2003, cited in Migiro and Magangi, 2011).

A mixed-method approach helps integrate each of the methods and reduces the limitations of each approach taken (Bernard, 2017). The study will also include a descriptive situation and analysis to explain it based on the trend found during the analysis (McDonough and McDonough, 1997). According to Spence and Lachlan (2010), the investigation of disaster and crisis events, including data collection methodologies, is exceedingly unstructured. Therefore, the process of this study used a multi-stage and mixed-method research approach. The first stage of data gathering was to conduct a qualitative method. It includes a literature review to strengthen the root of the critical fundamental in getting the best flooding DRR exposure to be implemented in university settings. Disaster management is a vast area. Therefore, the author has applied a systematic review process to a well-focused disaster risk management (DRM) scope, providing an explicit and transparent approach, accountability, and fewer biases. The starting point of the literature reviews would go towards a more extensive explanation and be narrowed down (Hart, 2018).

Next was to use semi-structured interview sessions. It is to get another qualitative input from the university administration and the person in charge. They were able to share what they were taught in managing the university to face flooding events. The third was the quantitative method, through a questionnaire survey of the selected UiTM campuses. Most of the respondents were randomly chosen students from different faculties and classes. It was done to get their views, experiences, and understanding of flooding issues and risks that arise at their campus. An appropriate statistical tool, namely SPSS Statistics for Windows, was used in this research process and in its publication in proper scholarly journals. All three stages (literature review, semi-structured interview sessions, and questionnaire survey) were analysed further. The purpose is to get the best input that could be implemented for university practises in facing future flood threats. Accordingly, the analysis was referred to the previous literature review while deliberating the findings (Nitsch et al., 2013). The author's observations were then combined with the outcomes to provide conclusions and recommendations. Explanatory statistics were also used to investigate the data gathered and summarise them. Where possible, those data could be further described in variable form, table, chart, graph, figure, percentage, and frequency (Gissane, 1998). It is helpful to identify the patterns of answers from the respondent's judgments and perceptions about the field of study, as well as find the wide-ranging annotations about the data collected (Stedman and Adams, 2012). The processes for achieving the 3 objectives in this study follow the methodology process for each of the objectives on the next page (designed by the author).

Different data collection methods can help increase the quality of the raw information (Hale, 2011). The mixed method helps integrate each method and reduces the limitations of each approach taken (Bernard, 2017). The mixed method's design is the most important, and it had to be grounded on the research questions and issues arising. When the results are combined with other quantitative and qualitative data, a better outcome could be delivered through further analysis and observation (Tellis, 1997). This study involves an exploratory situation. The author of this thesis had to check some trends within the information gathered from various data sources. The author also compiled as much information as possible and suggested a hypothesis at the end. This method was necessary as the study addressed exploratory questions and descriptive information (Schensul et al., 1999). Strategies involve merging both techniques, associating solutions and analysis while triangulating each analysis into a research design (Turner et al., 2017).

Other theories contend that qualitative and quantitative approaches cannot be merged due to their different paradigms; for example, deductive and inductive approaches are mutually exclusive (Sale et al., 2002). Knowledge and reality are things that should not be combined because both had different quantitative and qualitative research strategies (Vázquez et al., 1996). The author of this thesis decided to use both methods because it was best to utilise both methods and apply them to social issues. Both methods would complement each other in terms of stages of analysis, data collection, and the design of a task (D'Zurilla and Nezu, 2010). The author of this thesis believes that each has pros and cons when combining both methods. Every method in this study had a practical use within a particular circumstance or stages of each analysis. Compared to traditional research methods, both methods have value (Cook and Leviton, 1980). Broader results were achieved when knowledge about behaviour, attitude, and individual perspective were considered (Salancik and Pfeffer, 1978). When the results are put together with other details such as qualitative and quantitative data, a better outcome can be delivered through additional analysis and observation (Tellis, 1997).

The author of this thesis hopes to link all the results and strengthen the rationality of the findings. This mixed-methods design provided more profound responses that would not have been achievable using a single method, thereby increasing the study's validity (Venkatesh et al., 2013). It permits the author uses different methods to give multiple perspectives and viewpoints in a more complex situation. There are few rationales for using the mixed method (Doyle, 2016). The first is triangulation (convergence), so that findings from qualitative and quantitative methods are mutually corroborated. The author of this

thesis agreed that expansion is needed in this study because each phase of the findings requires further explanation. Mixed methods research also provides more comprehensive details, which give completeness and offset the weakness of the selected method. It also comprehends the different research questions and makes sense of detailed illustrations of how to put things together at the end of the study.

The questionnaire surveys used to gather social data from community (undergraduate students) present at the university campuses that had previously been ravaged by flooding or were at risk of suffering the flood in the future. A questionnaire survey may collect demographic information such as the population's gender and employment status, as well as income and mental suffering, physical injury sustained by communities, the amount of time students spent on campus during their current years of study (for example), and the impact of spoiled infrastructure on daily events. A face-to-face interview with university staff members responsible for NDRR management on the university campus was conducted.

3.6.5 Qualitative Method

When a natural disaster happens, an affected institution should focus on the qualitative intrinsic, focusing on a single situation, learning, and designing the scenario to be better (Durcikova and Gray, 2009). The questions will determine the investigation approach (Yin, 1994). Since qualitative studies have comparatively little sample sizes, the outcome could be hard to reproduce or simplify (Bryman, 2008). The qualitative method involves collecting non-numerical data, such as words and images, rather than quantitative data (Johnson and Christensen, 2008). Qualitative data collection in this study includes literature review and face to face interview sessions. The data is being analysed by using the text and images from the data for coding and theme development. The qualitative data analysis goal was to convert the raw information from interviews (and literature review output as discovered this study) into helpful information (Caudle, 2004). It was done by categorising and grouping that information into patterns or ideas. The author translated all the data gathered and generated the coding system. The main aim was usually to identify critical themes or designs. There would probably be no best qualitative investigation method as it is not an exact science as it is mainly an interpretive act (Stake, 2010). Patterns were identified by collecting redundant, regular, or constant data, which showed up repetitively (Saldana, 2016). The author looked for repeated patterns of answers, consistencies, or inconsistencies regarding engagement with the respondents (Huang et al., 2012).

This thesis evaluates the factors causing a flood, identifying the aspects most people look forward to and pay attention to (Menoni et al., 2012). The author also investigated how the government in Malaysia tries to carry out the NDRR, especially in flooding, and how the people and institutions linked with the Malaysian government on these issues. The author grouped the data collected using 3 classifications: theoretical, substantive, and organisational (Maxwell, 2013). The theoretical classification is used to alter information into groups that are generally dependent upon the author's data interpretations. Substantive classification is usually created after data collection. It is used to utilise the information, phrases, or quotes during an interview to create its categories based on the interviewee's explanations (perceptions, opinions, understandings, or experiences). Finally, organisational classification differentiates details collected into broad, descriptive groups or topics (Maxwell, 2013). In the following section, the author of this thesis will explain more on the literature review (qualitative method) that covers huge part in the study.

3.6.6 Literature Review

A review of the literature can assist the evaluation process in developing a more comprehensive grasp of the study concerns. The potential sources of the literature review are determined and presented as a list at the last part of the thesis document. The chapter on the literature study identifies any underlying theories concerning flood management and difficulties that develop inside educational institutions, with a specific emphasis on the higher education sector (university). A literature review approach is used to collect, synthesise, and summarise the current state of the research (Snyder, 2019). The evaluated literature was compiled from various sources, including books, scholarly journals from earlier research, newspapers, articles, websites from the Internet, Google Scholar, national reports, pertinent statistics, and library databases (Lee et al., 2012). The principal source for journals and articles is the University of Manchester library search engine, which indexes all library holdings and databases. Diverse evaluations of published journals were employed to create diverse perspectives (Munafò et al., 2017).

The initial stage of data collection was to employ a qualitative approach. It included a literature study to develop the essential fundamentals for successfully implementing the best flood recovery exposure in academic settings (Lush, 2014). The purpose of the literature review is to establish what research has been completed in NDRR and what additional research should be conducted (Timmins and McCabe, 2005). The article references were used to perform a literature search for further pertinent publications (Godin et al., 2015). Additionally, the author conducted a cross-referencing exercise and repeated the process

until no new papers were discovered that were pertinent (Pollard and Collins, 2005). Due to a shortage of literature that matched the specific scope of the investigation, the author of this thesis was forced to locate the most appropriate research to connect the dots. As a result, the most recent sources were chosen, but the study's early years were included. Since massive flooding occurred in Malaysia throughout the last few decades, from 1886 to 2021, there was still relevant information to be utilised. However, only pertinent, and up-to-date statistics from the most recent years were used.

Additionally, the literature discusses the coping measures used by Malaysian institutions and how they respond to mitigate other impacts in the event of recurring floods. There was a dispute about knowledge theory and evidence-based judgments (Johnson, 1990). Additionally, this thesis comprises a descriptive situation and an analysis to explain the observed pattern and a storey (McDonough and McDonough, 1997). By thoroughly examining the literature, analysing respondents' risk perception and flood-related problems, and gathering information from university administration (staff) about what was happening throughout the overall institutional approach, the author of this thesis was able to discover possible ways to work collectively and collaboratively to lessen the risk of flooding. Additionally, the author examined how the Malaysian government attempts to implement the NDRR, and how the Malaysian people and institutions collaborate with the Malaysian government on these study concerns.

Since the research questions had been established previously, the literature review provided critical responses to those questions (Haynes, 2006). For example, "Disaster Risk Reduction", "Flood Management", "Flooding in Malaysia", "Post-Disaster in Construction Management", "Construction Remediation", including "Flooding Recovery and Remediation". To focus the search on the objectives, only the title, keywords, terms, abstract, and methodologies were sorted according to the case. This desk study found several essential factors not addressed in most flood recovery studies (Khan et al., 2013). The investigation began with an overview of the built environment, sustainable development, and construction, as well as natural disaster (Bosher, 2008). The research then discussed natural disaster risk reduction (NDRR), Malaysian rules for disaster management, Malaysian flooding, and context. The literature addressed the flooding of Malaysian universities, its components, problems, and knowledge management. The literature search began with 1430 references. After removing irrelevant papers, journals, books, and duplicates, only 780 references remained. The references were used throughout the thesis to establish the study's basis and foundation.

The literature review spans the entire period of the framework's development (risk assessment, dialogue, and action). It was supported via face-to-face interviews and questionnaire survey methods, which clarified the issue using community knowledge, as local knowledge. This study emphasis on the on-campus respondents (students and staff). In addition to that, information on other community members such as previous researchers, government, and non-governmental organisations was gathered through the literature review process. Enlisting the assistance of bottom-up and top-down initiatives was a component of developing an NDRR action plan for the institution. Thus, respondents' opinions and ideas in the form of interviewees and questionnaire respondents were incorporated into the literature review or desk work. These are gathered and analysed to establish the most effective way to address flooding concerns on university campuses. The first consideration was the respondents who considered high risk towards flooding impacts and how their viewpoints and existing understanding would contribute to building a well-designed approach that satisfies societal demands. Gathering the truth and scientific data helps to an improved understanding of the risk assessment process. The author's objective was to develop a paradigm that many could use to address flooding concerns within an academic institution. The author simplified the investigation to focus on the framework *(see Figure 7)* to fit the study's time constraints. The data collection process focuses on knowledge, emphasising the importance of the context in which learning occurs, along with the study's social constructivist paradigm.

3.6.7 Document Review

Flood administration for university campuses includes a broad kind of information and involves different administration offices. Therefore, it depends on what information the author was looking for. According to the senior staffs who manage the crisis issues within the university, there was no previous study conducted within the same themes the author was looking into. Thus, the staff members had given me permissions on reviewing the related documents that fitted into the study. The documents were confidential and only could be reviewed together with the staffs. The author got chanced to review the documents in a very limited time and the author decided to go for anything related to what was related to any findings. The questions emerged from a few studies and interpreted from the author’s perspective in giving input to the research questions. Any questions that were selected were initially interpreted by the author towards the purpose to fit in the usage of the study.

3.6.8 Quantitative Method

Quantitative data is numerical; therefore, it is more of a set of information that involves statistical tasks to produce results and interpret results (Oppenheim, 1992). In contemporary designs, the strands or parts of research happen synchronously or parallelly. The qualitative and quantitative inputs include questions, data collection, and data analysis. Each method's information was viewed as essential, and inferences were made depending on the synthesised results of each strand (Teddlie and Tashakkori, 2006). This thesis additionally followed a contemporary multistrand mixed design. The descriptive survey evaluation method allows qualitative analysis to disclose the presence or lack of understanding of flood catastrophe within the issues involved.

3.6.9 Field Study Selection

Field study undertaken as part of this thesis provides further background for the real-world scenario (Queirós et al., 2017). A field research study must include few critical components, such as research questions, preceding work, research strategy, and contributing to the literature (Edmondson and McManus, 2007). As part of this research, the field study examined a limited method with the explicit objective of identifying connected knowledge components (Van de Ven and Johnson, 2006). The field study was designed to elucidate the university's approach to flood management, students' current awareness of flood disaster risks, and their perceptions of institutional approach in controlling the risks. To be prepared for a flood disaster, the community should have a firm grasp on the hazards they face so that they may lend support by clarifying their requirements for disaster protection. Malaysian higher education institutions needed to increase the involvement in disaster risk prevention and management due to its high flood risk. Universities were chosen as a field of study or research site because they can connect with the government and non-governmental sectors while also delivering excellent disaster management knowledge transfer to students and the university community. As a result, universities bear responsibility for developing the nation's future generations; as a result, instilling a sense of DRR in students is critical for both short- and long-term success.

Higher education institutions have a variety of characteristics that make developing an emergency plan difficult. For instance, there are no specific business hours or operations, no open campuses of UITM in Malaysia, and no short-term student jobs. The community determines flood disasters, including emergency preparedness, by comprehending the resources available to them and acting fast but strategically. The questionnaire survey and

in-person interview were designed to enable students to express their concerns and perceptions concerning emergency response attempts on their campuses. This research employs a field study to evaluate a bounded technique with the explicit purpose of identifying connected knowledge components. Collaboration between higher education institutions and student populations is critical for understanding how people perceive the safety of natural catastrophes and emergency planning (Kapucu and Khosa, 2013). The author incorporated individuals and operations into the field study's environment, events, and procedures (Maxwell, 2005). Due to their involvement in effecting a better and safer environment in the event of a flood, students and staff were the key sources of data for gathering their thoughts. The sample was deliberately chosen.

Malaysia has a diverse range of universities located throughout the country's states. However, MARA University of Technology (UiTM Malaysia) is a well-known university in Malaysia, with branches located around the country. This institution has 189,008 students, 17,969 faculty and staff, 498 programmes, and 35 sites or branches in Malaysia (Centre for Strategic Planning and Information, 2021). Since UiTM Malaysia fully funded this study, the author believes that gathering data and collecting private information looks like it will be feasible. Each campus is affiliated with a public university and relies on the national flood recovery system. The campuses are intended to share all the government's and institutions' resources. All the systems' architecture should be synchronised when establishing branch campuses. This university should serve as a model for NDRR management and treatment. Since UiTM Shah Alam is the central campus, all control relating to flood response originates on this campus. This main campus serves as a model for the other UiTM branches in Malaysia. The UiTM Shah Alam campus also serves as the location for establishing all NDRR policies and regulations, as all upper-level administrations are based on this campus. The branch campuses should then adhere to any decisions, manuals, guidelines, or other adjustments to ensure uniformity. This is how UiTM's administration operates. The author of this thesis had less idea whether the campuses picked would implement the veracious flood adaption or recovery measures required, although all the selected campuses were prone to flood before. As a result, various methodologies were used, including in-person interviews and questionnaire surveys. Another benefit of the focus group technique is that it allows for identifying strengths and shortcomings to provide a more practical approach to flood control for Malaysian universities. Additionally, this strategy enables university management and decision-makers to better understand NDRR concerns, particularly in the context of recovery efforts and emergency plans.

Flood catastrophes are geographically distinct. As a result, the author had to analyse the survey's institutional setting. The five campuses were chosen for their geographic dissimilarity. For example, the Shah Alam campus is in the city's centre and is often threatened by flash flooding in certain regions. The Segamat campus is in the flood-prone town of Johor. While the Dungun campus is situated along the coast, the Machang campus is located on a hilly terrain prone to natural disasters such as landslides. Finally, but certainly not least, the Kota Bharu campus is in one of the locations hardest damaged by the December 2014 disaster (Utusan, 2014). Due to the campus's location on the peninsular, Malaysia's south and east coasts face greater flooding danger. According to the National Security Council Malaysia (2011), Johor, Terengganu, and Kelantan are all at risk of flooding, particularly during the monsoon season. Terengganu and Kelantan experienced flooding due to a mixture of physical influences such as raise and closeness to the sea, as well as severe rainfall. The distinct advantage of adopting case studies was that each of the campuses mentioned above had its own flooding experience and faced more significant flooding dangers than others. Field visits and individual observations were conducted at each of the five campuses. This thesis was created using the observations obtained during the data gathering phase of the interview sample (Light, Singer, and Willett., 1990).

The author chose 5 UiTM campuses that were important to Malaysia's flood challenges. The Shah Alam campus in Selangor was selected as the headquarters or main campus, with the Segamat campus in Johor (Johor state campus), the Dungun campus in Terengganu (Terengganu state campus), and two Kelantan campuses in Machang (Kelantan state campus) and Kota Bharu (Kelantan state campus). The overall undergraduate and postgraduate students in each campus were approximately 1000 to 2000 at each campus, depending on the year students enrolled and how big the campuses are. However, during the field study being conducted; considering the academic building occupancy, lectures being conducted, and selecting only undergraduate students, the author had been told that it is estimated that less than 300 students are present within the timeframe. Even so, after the population was filtered by selected courses and level of education (diploma or degree) by the survey's requirements, the number was reduced further. Since the questionnaire survey was conducted by the author of this thesis alone, approximately 200 students could be gathered to answer the questionnaire survey manually at a time for each campus. Five campuses were chosen for interview sessions (UiTM Shah Alam, Segamat, Dungun, Machang, and Kota Bharu), 3 campuses were selected for questionnaire surveys (UiTM Segamat, Dungun, and Machang), and one campus, UiTM Kota Bharu, was not chosen for questionnaire surveys due to the time slot being inconvenient. As a result, the author makes

only personal observations and brief site visits and has access to restricted information from the supervised staff. The locations of the five (5) campuses are depicted on the map below. All the campuses selected have previously been hit by water.

3.6.10 Advantages and Disadvantages of Field Study

Field studies are critical for comprehending educational difficulties (Gulsecen and Kubat, 2006). The outcomes of the case studies were frequently determined by the theories rather than by the population's choice (Yin,1994). It could be duplicated by obtaining the same data from a previous study or previous findings or hypotheses (Campbell, 1975). This strategy significantly contributes to the robustness of the procedures used. Before any conclusion is drawn, replicated methods of conducting the approach will be linked to the theory.

There are numerous advantages to using the field study method. A circumstance can be thoroughly analysed, including the technique followed by the chosen subject to comprehend genuine textual content. Following that, variations in the vocabulary of intrinsic, collective, and instrumental techniques are applied to a situation in which research permits qualitative and quantitative data analysis. For example, a few longitudinal scientific studies on a particular topic matter rely on qualitative details from log writings that provide descriptive behaviour profiles.

On the contrary, one can discover a variety of instances when scientific research attempts to elicit proof from each categorical and numerical response to a specific topic matter (for example, Block, 1986; Hosenfeld, 1984). Researchers should avoid using case studies and qualitative situations to situations, and research should be entirely based on quantitative evidence or ideas (Yin, 1984). Third, the extensive qualitative profiles frequently created in conjunction with scientific studies assist in exploring or explaining the data to connect it to a real-world context and help clarify the complexities of real-world living scenarios that may not be captured via experimental or survey analysis. The qualitative technique was frequently used with a case study approach to aid in exploring and explaining data. Additionally, it aids in clarifying intricacies that may be impossible to acquire through experimental or survey analysis.

3.6.11 Pilot Tests

The author conducted a pilot test, because the pilot tests include an initial work to help in preparing a framework of the study, and it is essential to figure out the process which would be utilised within the process. As for a collective scenario, various of information comes from people and institution. Instead of intrinsic scenario when scientific research is done to solve the specific problems associated with a scenario, instrumental and collective scenario during the investigation could permit for generalisation of outcomes to a bigger population. Inside a collective situation, information coming from several different energy sources, like individuals or campuses are coordinated by the author. A theory may be lacking research concentrating on describing the problems and study cases (Stake,1995).

Possible misunderstandings, confusing questions and language challenge often occur no matter how well a researcher designs a questionnaire survey. The author tried to adopt prior surveys which have dealt with the issues. The author also did a few pilot tests of the questionnaire surveys with several people resembling the preferred sample to reflect the actual questionnaire survey demographic. Pilot tests could help to certify that the questions are adequate, following the order, contents are thorough, instructions are clear and fair, and identify patterns that can be skipped. Among other things, data compatibility and transfer difficulties are handled. Piloting can be done traditionally. The author may conduct cognitive interviews with pilot project participants (Regmi et al., 2016). The author of this study solicits cooperation from supervisors and colleagues at the University of Technology Malaysia (UiTM) to ensure that the questionnaire contains pertinent information. Fortunately, all parties were willing to contribute considerably to the process of improving the questionnaire before its completion. If any changes have been made, the survey needs to be pilot tested a few times to eliminate the opportunity for misunderstandings (Asch et al., 1997). After receiving feedback from the pilot test, the author revised the survey accordingly. A pilot test can minimise the possibility of bias.

The author also did a few pilot tests of the questionnaire surveys with several people resembling the preferred sample. A pilot survey was given to twenty-five (25) undergraduate students (approximately a total of thirty students in one classroom) at the study site to get idea of unclear or complex phrasing, limiting responses. The pilot test was carried out to a class of undergrad students at the UiTM Shah Alam main campus. The interview questions were piloted with the author's other friends, also postgraduate students.

It was done to ensure relevant and content-focused issues were asked of the participants. These people aided in a pilot test to certify the survey questions efficiently addressed the critical aspects of flooding issues within higher education institutions. Comments on the questionnaire survey and interview template were first obtained from the author's thesis supervisors at the University of Manchester. The author then refined the template according to the feedback given.

3.6.12 Interview Questions Design

In drafting the interview questions, the author uses the emergent themes gathered through coding activities from the thesis literature review. Not only that, but the author also uses additional theoretical constructs to design the interview sessions *(See next page).*

Table 3.2: Main Theme for Interview Questions Design (Self -Authoring).

Main theme	Author(s) (Example)
University acquire DRR knowledge	(Wahab, 2013)
Educating public in DRR	(Sellnow and Sellnow, 2010)
Recovery terms availability	(Hamin et al., 2013)
Recovery related amenities	(Hamin et al., 2013)
Protection of critical infrastructure	(Zevenbergen et al., 2018)
Assist people to get accurate info	(Zevenbergen et al., 2018)
Early warning system	UNDRR, 2019a
Weak infrastructure	(Liew, 2009)
Weak response capabilities	
Land management	UNDRR, 2019a
Recovery operations plan - Recovery team - Temporary accommodation - Damage assessment, repair etc - Pre-plan to protect flood victim - Protect historical sites - Develop policies	(Lindell, 2013b)

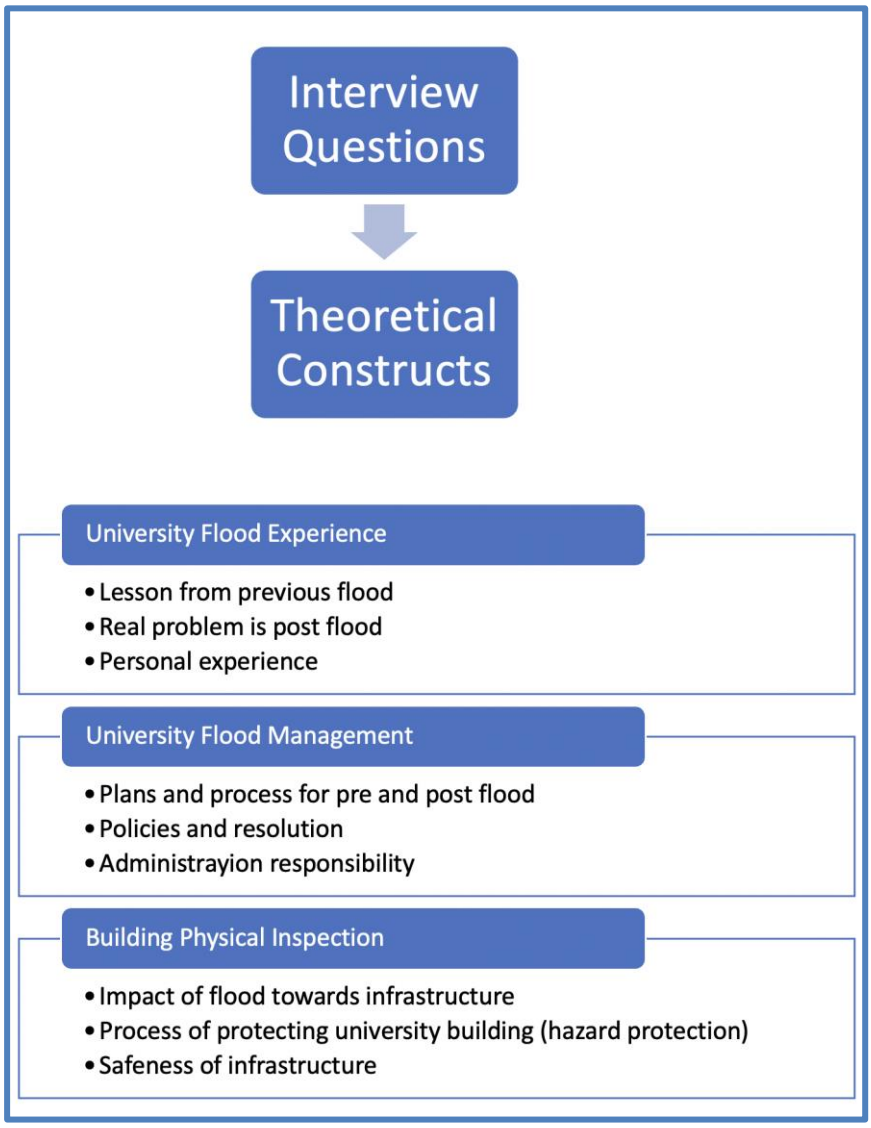

Figure 12: Theoretical Constructs for Interview Questions Design (Self -Authoring).

3.6.13 Interviewee Selection

Another method of gathering information was through conducting interviews with the right individuals. An interview is a technique for getting information that is frequently more adaptive than a questionnaire result regarding attitudes toward the problem and is less expensive than searching (Parker and Fischhoff, 2005). Conducting interviews enables the author to elicit data on interviewees' perceptions, reflections, and experiences following the study's requirements (Maxwell, 2013). The purpose of the interview was to delve deeper into the data acquired. Numerous researchers have conducted detailed, semi-structured, face-to-face interviews (Yin, 2009). Organised interviews were performed to gather information from a specific community (staff) on chosen university campuses—the author concentrated on staff members officially assigned to DRR within the institution. The interview session

employed a non-random sampling approach, aided by the respondents (Daniel, 2013). The most appropriate sampling approach is known by the type of questions that the interviewee was required to answer. Non-random sampling is acceptable for this study because it requires individuals to respond to interview questions. There is a need for a quick decision, and the target population is small (Kelley et al., 2003). The author establishes a small size sample of respondents. The author obtained the contact number from the university's official website to identify the requested department to participate in the research. This was accomplished by considering the institution's population size, characteristics, and suitability for this study. Additionally, interviewees were picked based on the extent and responsibility of their jobs (Andersen, 2012) inside the university's organisational structure. The author visited a few university administration departments during each visit, including Facilities and Asset Management Administration, Occupational Safety and Health Administration, Energy and Telecommunications Administration, and Project and Design Administration.

This study interviewed senior administrative personnel and chose a high-profile university since those are the best interview characteristics (Kezar, 2008). Individuals were chosen based on their roles in specific internal procedures; planning, preparation, and ingenuity were required to obtain authorisation to interview individuals (Frohmann, 1997). This study conducted respondent-assisted sampling using a snowball sampling method or chain-referral sampling method (Goodman, 1961). Following that, casual discussion with the primary vital individuals determined the inclusion of various participants in the research. The sampling methodology is based on the snowball effect, in which individuals invite new participants to participate in the analysis (Fraenkel et al., 2012). As individuals were interviewed, others were suggested as those who may have contributed to the analysis. The final point was made when essential individuals questioned previously were recommended (Sotirios, 2013). Members of staff selected as participants will have a variety of roles (Macpherson, 2004), implying that they will be performing other duties during the timing allocated for the interview. As a result, the author needed to select an ideal time to conduct the interview session (Polkinghorne, 2005). These interview sessions involved a total of 10 individuals. In the initial step, the responsible person's responsibilities were identified. Several sample inquiries were posed to the university administrator by phone and email. In this manner, the author can contact the appropriate individual for the study opportunity. While an interview is often conducted with a single respondent, a team interview was also an option (Frey and Fontana,1991). However, in this study, the author conducted sessions with only one interviewee at a time. The interview dates and locations have been determined to coincide with the people's schedules at the designated university campus region.

This study, like Oppenheim's, uses a face-to-face interview (2000). The interview was guided in response to the author's stated objectives (Schensul and LeCompte, 2010). The semi-structured interview substantiated the existence of agreement or consistency across plans and approaches. Thus, concise questions may aid in obtaining information within the allotted interview time, which was about one hour for each interviewee. The questions were previously developed and constructed by the study objectives based on the necessary information, and they were not in any way deceptive or leading (Kallio et al., 2016). By conducting a semi-structured interview, sets of questions were posed in response to the responses received throughout the interview sessions, and any further information, ideas, or opinions were most welcome (Adams, 2015). Individuals may react according to what they trust instead of what they think is right (Carver et al., 1989). The interviewee may respond differently, and questionnaires allow for a range of responses that may reflect a much more cognitively dispassionate trait (Oei and Zwart, 1986). Regardless of the shortcomings of questionnaires and face-to-face interviews, there is a critical method for eliciting immediate responses from respondents regarding their comprehension or viewpoint. These methods should not be overlooked. To encourage interviewees' engagement in the crisis management process, the author provided some room during interviews to share their experiences and knowledge and drive the conversation while also prompting discourse about topics relevant to the analysis.

3.6.14 Face-to-Face Interview Implementation

The author of this thesis obtains the contact number of the interviewee from the university's official website by locating the department involved in the research. As previously mentioned, each interview took place following a pre-arranged online appointment. An email was sent to the designated respondents, informing them of the study and soliciting their participation. The author personally phoned them to reconnect with those who had not responded, as not everyone reads their emails—a few efforts at scheduling time for the mutually agreed time and day. Before the interview, follow-up emails were addressed to them. There was no second phase of the interview because most of the earlier interviewees said that they could not offer further information. The team was kept small to allow for individual participation variations. A confidential follow-up communication was established to contact a list of interviewees. The interview location was chosen to minimise distractions for the interviewee. Most interviews take place at the interviewee's place of employment. The interview begins with an introduction to the author, a summary of the study background, and the study's objectives.

Flood management on university campuses entails a wealth of information and multiple administrative entities. As a result, it depends on the information sought by the author to deliver the interview questions. The interviewees responded to the questions by describing their documents, their official website, and internal administrative materials. The interview sessions were conducted by UiTM's existing executive for risk management (Risk Management Guidelines, 2017). According to staff being interviewed who are responsible for the university's crisis management, no previous study had been undertaken on the subjects the author was investigating. Thus, staff members granted the author of this study permission to review pertinent records. The records were classified as confidential and could only be studied with the staff, and the author was able to review the documents quickly. As a result, the author resolved to pursue anything linked to any findings. The research questions were derived from a few studies and were interpreted from the author's standpoint to address them. Initially, the author interpreted any questions to match the study's usage.

After obtaining clearance from the interviewee whose identity could not be disclosed, the interviewee allowed the author to further assess internal information on DRR within the organisation. By contacting the so-called leader in the organisational risk team, any documents about the DRR's establishment or operation were discussed during the interview sessions. The author quickly went through various documents, including organisational charts, records of associated flooding problems and response plans, institutional recovery plans, and publicly accessible reports on the campus's response to and handling the flooding situation. None of those documents can be reproduced or recorded at this point as it is classified as confidential. The author somehow uses the knowledge derived from the session to have a rough idea of what the situation looks like within the university process. Even it is just added information, this procedure aided in establishing a baseline of information about the university before conducting more research (Creswell, 2003). While university documents are typically made freely available, employees, lecturers, student handbooks, and website content can be viewed but not reposted without causing an issue. The author was previously informed that all available materials would not be updated for an extended period. As a result, it was no longer valid, yet the interviewee claimed that the information was still in use. However, some of the materials available were identical to those supplied electronically to the author before the interview visit. It is only for internal circulation. It is critical to have access to documentation that corroborates the profiles produced by institutional stakeholders (Yin, 2009). There are documents that were not made public. These were established by several significant departments and individuals involved

in the campus issue. Numerous written materials were accessible via public files on the university's website. The author must search the university's official website for the documents and contact information.

On the other hand, the interview was designed to last between 30 and 60 minutes, but the author of this thesis placed no time limit. Certain interviews may last longer than anticipated. Even if the face-to-face interview was conducted using pre-made questions, it might result in some open issues, which may be supplemented by additional opportunities for the interviewee to comment on their thoughts or words. Within the interview, the interviewee may express their ideas. The interviewer (author) was also informed that the additional evaluations could result in extended interview procedures. They were used to provide rational explanations for respondents' responses, assisting in covering the areas covered by the questionnaire or literature review by boosting their intelligibility. The selection interviews focused on risk perception and community approaches. The interview was conducted in response to the author's stated objectives (Schensul and LeCompte, 2010). The interview questions were piloted with my fellow postgraduate students. The interview procedure was standardised but flexible in this study. The questions included both pre-set and probing questions about the study's topics. In addition, the author asks several clarifying questions to obtain data concerning their understandings and perceptions of specific issues. The interviewees' comments may be documented using handwritten or computer-generated notes and verbal records using audio or videotape (Gall et al., 1996). Rather than digitally recording the interview, the author conducted a backup process manually during the interview sessions. The interview was not taped to allow the interviewee to express their thoughts freely, understanding that all those public workers would exercise extreme caution while making comments to safeguard their identity and job at the same time. The author observes that interviewees are constantly cautious in their statements and share information that may be confidential to only one individual with access to the institution. The author took notes on significant sentences and keywords using a pen and notebook. The interview was conducted in Malay, and the author converted it to English shortly afterward to ensure that it accurately reflected the experience of the entire interview. The interview transcript has been translated using a technique known as a circular type of inquiry approach (Flick, 2002). Inductive thematic analysis was used to transcribe all the conducted interviews.

Following the interview, Microsoft Word was used to convert handwritten notes from the transcripts and interviews into a soft copy version. After that, the author saved it to a flash drive on their personal computer, and the flash drive was kept secure in the author's

home office. All personal information had been removed from the records, and each participant was given the option of using a pseudonym. The interviewee was more than willing to lead the author throughout the talk with his own experiences. They constantly asked the author whether their response was enough to answer the questions posed. The interviewee expressed gratitude for their time. As a sign of gratitude, the author presented a modest souvenir from the United Kingdom. The interviewee concluded when they stated that they had no additional information to share with the author following the interview session. As a result, the author was required to peruse the interview notes. Coding cycles are involved. The first was facilitating an organisational group by creating categories. The process was enhanced by conducting additional analysis on the interview notes and developing themes, concepts, and patterns, which resulted in smaller categories. Secondly, a theoretical strand was used to analyse the final grouping, categories, and subcategories. This examination of the categories in conjunction with established knowledge specialists resulted in the author developing major categories, themes, and sub-themes.

3.6.15 Questionnaire Design

The study questions were reviewed to ascertain the meaning of the participants' experiences and to elicit their descriptions of their flood knowledge. The location and timing of the investigation significantly impact the findings. The research location must be chosen by the study's objectives so that it accurately reflects the informants' actual circumstances. Undergraduate students do not perceive disaster recovery and emergency response as popular studies. Students were unaware of the need for emergency management until asked what they would do in an emergency. The author of this thesis attempted to stimulate intellectual thought by eliciting students' insights of their institution's capacity to deal with flooding, engaging them, and encouraging them to help the institution for overall DRR's benefit. To better understand the effect on students' idea and influence, students were asked how the university administration may serve as a better model of appropriate responsive behaviour. A questionnaire survey was used to ascertain respondents' risk perceptions and current knowledge of flood issues and DRR implementation on Malaysian university campuses. It was previously recognised that colleges and universities lacked motivation and concepts for disseminating disaster preparedness to students (Bishop, 2013). As a result, this study examines existing university procedures. It assists the author in gathering improved suggestions for dealing with flood hazards through multi-dimensional perspectives and actions using a focus group.

The questionnaire was designed to elicit economic and sociological data from the selected institutions' communities. The survey questionnaires gathered data on demographics (for example, gender, employment, and income), psychological distress, actual physical deterioration experienced by towns, the duration of the disaster (time, days or weeks, many days, and years), and the effect of damaged infrastructure on day-to-day activity (Deshmukh, 2011). Questionnaires can be used to create verifiable patterns over large populations, providing detailed insights into people's actions, ideas, and attitudes (Kendall, 2008). Numerous surveys follow the same phases or iterations of phases (Oppenheim, 1992). As a result, the questionnaire was designed according to the study's stated aims and objectives. The premise was that when respondents' impressions of floods are favourable, they will seek additional information on the subject. The author structured it in this manner for it to be transformed into operational objectives. When designing the questionnaires, the author must create questions, indicators, and scales. The questionnaire is designed to emphasise resource efficiency, logic, and correctness. This minimises or eliminates incorrect responses and generates critical information with greater precision (Oppenheim, 1992). The questions were created using the "funnelling" technique. It is a concurrent, extensive issue that has been narrowed to focus on specific regions (Oppenheim, 2001). The respondents' flood knowledge and attitudes may contribute to developing additional flood management methods. This study evaluated a flood's perceived hazards by examining the primary component associated with the following issue. Flood hazards are widespread in Malaysia, and the decision is based on the level of threat the institutional administration believes the public would face due to the flood. A review of the institutions' community responsible for flood preparedness, recovery, and response was conducted. The author aims for a larger perspective when it comes to understanding behaviour, attitude, and the individual perspective (Tellis, 1997).

While drafting the questionnaire, a few critical points were kept in mind. While the questionnaire may appear straightforward, it should be considered an opportunity to increase the likelihood of gathering information that the public or community would not usually disclose under other circumstances, particularly those involving detrimental opinions about a subject (Borg and Gall, 1989). The author used straightforward questions and vocabulary to inspire students to submit their finest work. The findings could recommend ways to improve the NDRR inside the institutions. The author purposefully divided the document into distinct sections to accomplish various tasks. Three sections comprised the questionnaire. The first contains biographical information; the second is an attitude scale; and the third is an open-ended question. The sample procedures used in this research depend

on the likelihood or probability of a particular group being comprised in the investigation. The sampling method chosen is "Random Systematic". The integrated information collection was based on the public (students in this case) who exposed to the flood's impact. Due to its practicality, the non-probability sampling method was utilised in this study, even though probability sampling methods are more commonly used (Cooper et al. 2001). A convenience sample is often referred to as a non-probability sample. It imposed no restrictions on who could be included in the sample while still adhering to the framework. The following criteria were applied to the respondents in this in-depth analysis: The institution's community should be the respondents (focusing on students). They were normal university students, and they should not necessarily have had experience with flooding before.

The study does not make use of a standardised questionnaire and instead it means to follow the "Theory of Reasoned Action" (Fishbein and Ajzen, 1975). Individual behaviour is consistent with individual choices and intentions and is unaffected by external institutional forces. As a result, the questionnaire was developed using instruments associated with the individual principle rather than institutional effects. The study did not develop a standardised evaluation or measures of students as responses to any government or higher education institution regulations. The ideal method was to present and answer questions on knowledge, beliefs, behaviour, and attitudes using data obtained from the individuals who completed the surveys (Boynton, 2004). While questionnaires are frequently regarded as objective research tools, they can produce generalisable results due to huge sample numbers.

Most of the questions were of the "what" variety, designed to elicit data from a sizable sample. The questionnaire survey consisted of 18 questions divided into 2 sections: Section A and Section B (see Appendix A). Section A elicited demographic information from respondents. Section B discusses flooding at a university in Malaysia. Section B is divided into 3 distinct sections. Each question from 1 to 17 requires respondents to check a box to indicate their response. It is intended to be a brief response that gauges respondents' interest. In response to question 18, respondents were invited to react to six additional assertions. All the respondents were asked to rate their level of agreement on a 5-point Likert scale, ranging from "Strongly Disagree" to "Disagree", "Neutral", "Agree", and "Strongly Agree." Individuals must respond to a questionnaire by selecting their responses (Likert scales or multiple-choice questions). The outcome factors were evaluated using a 5-point Likert scale. The "Likert Scale" was developed in 1932 to assess people's attitudes and preferences, and the measure was frequently employed in political and social surveys

(Taylor et al., 1996). A Likert scale, one of the most common surveys, was also included between the two explanations of the continuum. Respondents might express their agreement or disagreement using the "Likert Scale."

As a result, the projected outcome was necessary for defining the associated components or various adaption phases (Christensen et al., 2015). The final section of the questionnaire includes one open-ended question. The first section aimed to ascertain respondents' familiarity with flooding threats, preventive measures, university rules, and flood procedures. The questionnaire responses would assist in determining whether the flood mitigation measures, such as infrastructure available during catastrophes, emergency signage, and strategies to survive, are effective. The second section elicited responses regarding the university's current assets, building safety, recovery or remediation initiatives, high-risk buildings, administration, control, coordination, existing safety, and flood response. In the third section, respondents were invited to provide comments and opinions on how to improve the survey further. They shared their prior or current experiences, concerns, and expectations about the existing university practice, damage repair, and remediation in the area offered.

Additionally, the questionnaire responses were incorporated into the explanation of the literature review. Seven qualitative concepts have been identified, and they are related to four evaluation concepts: improvement, academic institution accountability, student accountability, and irrelevance. These are the structural elements of the questionnaire. The questionnaire sought to ascertain respondents' knowledge, emotions, and intentions regarding flood risk perception. Collecting data via questionnaires and analysing it statistically enables the description of respondents' general knowledge of flood issues, the identification of their social backgrounds and how they influence their attitudes, and the correlating of their responses to other qualitative and quantitative data.

The questionnaire survey is a non-experimental category that deals with possible bias. The lower rate of return leads to a biased outcome. The author should respond to the issue of whether the lower rate of return will alter the conclusions. The rate of return of 85% or more is reasonable because even though some of the respondents did not return their questionnaire sheets, the result will remain, thus increasing its validity (Asch et al., 1997).

3.6.16 Socio-Demographic Variables (Risk Perception)

Table below suggests variables from previous researchers from different socio-demographic characteristics.

Table 3.3: Socio-Demographic Variables (Risk Perception)
(Revised from Burningham et al., 2008; Miceli, Sotgiu, and Settanni, 2008; Kellens et al. 2011).

Socio-Demographic Variables (Risk Perception)	Author(s) (Example)
Age	(Schiff, 1977) (Lindell and Whitney, 2000) (Heller et al., 2005) Grothmann and Reusswig, (2006) (Lindell and Hwang, 2008) Burningham et al, 2008)
Gender	(Jonkman and Vrijling, 2008).
Marital status	(Dooley et al.,1992) (Russell, Goltz, and Bourque, 1995).
Women, disabled people, ethnics minorities, older and younger people	(Bolin, 1986) (Oliver-Smith, 1991) (Cutter, 1995) (Peacock et al., 1997) (Fordham, 1998) (Enarson and Morrow, 1998) (Bolin and Stanford, 1998)
Income	(Edwards, 1993) (Russell, Goltz, and Bourque, 1995)
Education level	(Edwards, 1993) (Russell, Goltz, and Bourque, 1995) (Lindell and Hwang, 2008) (Burningham et al., 2008) (Lapka et al., 2011) (Vávra et al., 2014)
Length of residency	(Dooley et al., 1992) (Russell, Goltz, and Bourque, 1995).
Previous disaster experience	(Jackson, 1981) (Johnston et al.,1999) (Heller et al., 2005) (Norris, Smith, and Kaniasty, 1999) (Zaleskiewicz, Piskorz, and Borkowska, 2002)
Personal characteristics	(Heller et al., 2005)
Self-efficacy	(Mulilis and Lippa, 1990)
Risk knowledge	(Terpstra et al., 2006)
Risk communication	(Bier, 2001)
Understanding warning systems	(Chu et al., 2007)
Hazard sources	(Lindell and Hwang, 2008) (Burningham et al., 2008) (Colten and Sumpter,2009)

Location	(Kreibich et al, 2005) (Grothmann and Reusswig, 2006) (Barnett and Breakwell, 2001) (Lindell and Hwang, 2008) (Terpstra, Lindell, and Gutteling, 2009) (Jonkman, Vrijling, and Vrouwenvelder, 2008)
Causal attributions	(Baumann and Sims, 1978) (Turner et al., 1986) (McClure, Walkey, and Allen, 1999).
Perceived responsibility	(Mulilis and Duval, 1997) (Lindell and Whitney, 2000) (Mulilis et al., 2000)
Concern for disaster	(Dooley et al., 1992) (Weinstein et al., 2000)

During the first phase of drafting the survey questions, the author uses the coded themes from the literature review process. The author wants to make sure that the questions being asked can easily be validated through the findings from the literature and to make sure no emergent themes are left out (apart from the socio-demographic variables).

Table 3.4: Main theme for Questionnaire Survey Design (Self-Authoring).

Main theme	Author(s)
Knowledge from previous disaster	(Tatham and Spens, 2011)
Dense area	(Sherly et al., 2015)
DRR in lives and health	(UNISDR, 2015).
Long lasting effect of flood	(Bhattacharyya, 2012)
Reactive approach	(Gardner et al., 2007)
Losses and suffering	(Hamin et al., 2013)
Building constructed to withstand flood	(Batica and Gourbesville, 2016).
University environment deterioration	(Cadag et al., 2017)
Operational disruption	(Gardner et al., 2007) (Carlisle, 2008)
Recurrence of problem	(Cosgrave, 2014)
Vulnerability	(Hamin et al., 2013) (Few, 2003)
Community concern	(Sheffield et al., 2016)
University as a model in DRR	(Comfort, 2001)
No proper flood planning.	(Gardner, 2007)
Leadership role Carlisle, 2008.	(Carlisle, 2008)
Safe university	(Hamin, 2013)
Resilient city Rani, 2017.	(Rani, 2017)
Identifying weakness and vulnerability	(Sheffield, Gregg, and Lee, 2016)
Coping skills	(Few, 2003)
Students contribute to policy development	(Mort et al., 2018)
Awareness	Global Platform, 2007

	SAMOA, 2014
Early warning system	Third UN Conference, 2017 UNDRR, 2019b SAMOA, 2014.
Share experience	Global Platform, 2007
Identifying people needs.	Johannesburg Plan, 2002
Disaster effects (Exposure, Vulnerability, Capacity to reduce, Adapt, Recover)	(Adger et al, 2003)

During the second phase of drafting the survey questions, the author uses the code triangulated together from Table 3.3 and Table 3.4 and the author produce a connection between survey questions and the socio-demographic variables for both Section A and Section B of the questionnaire.

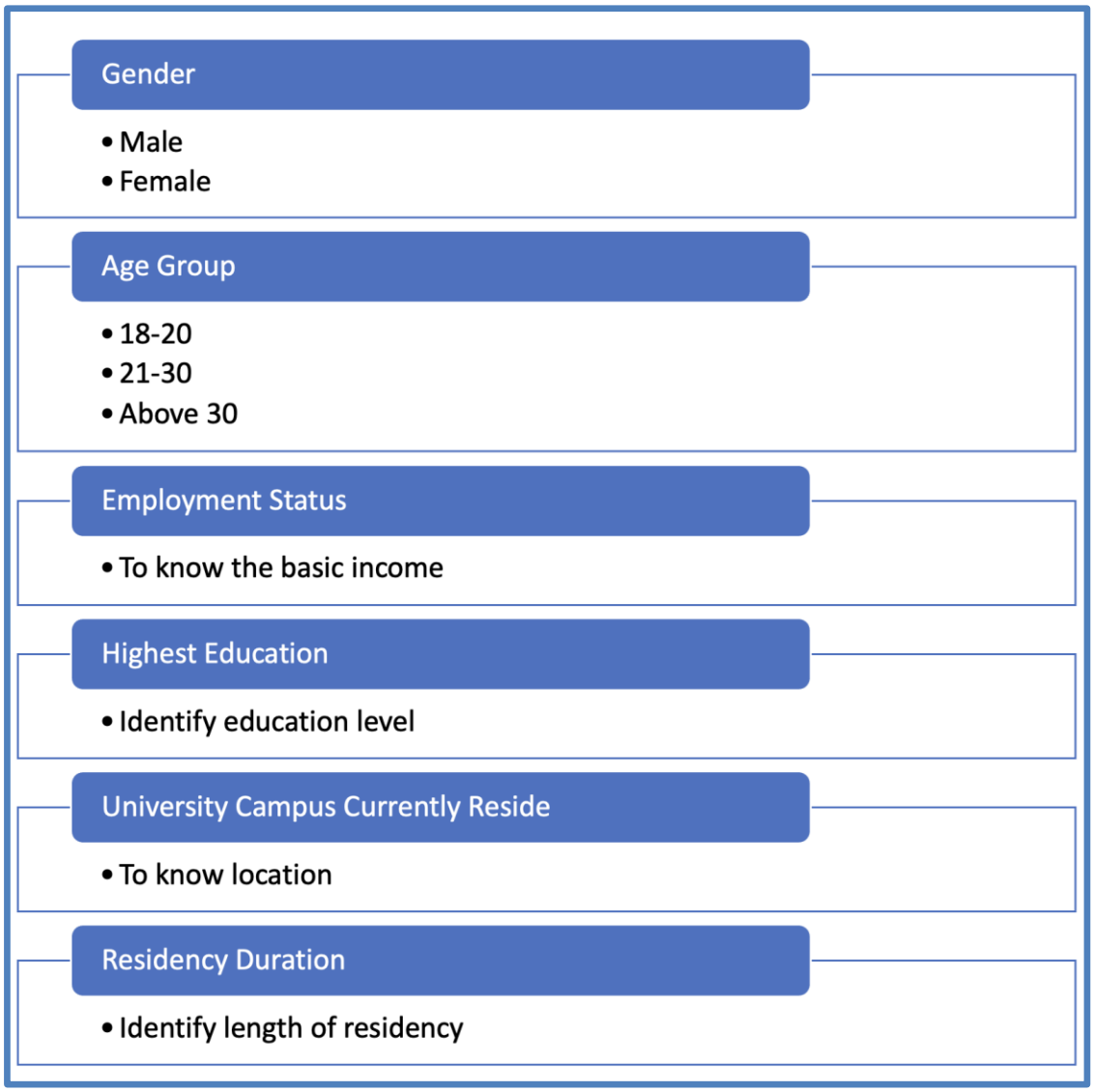

Figure 13 : Questionnaire Survey Design (Section A) (Self -Authoring).

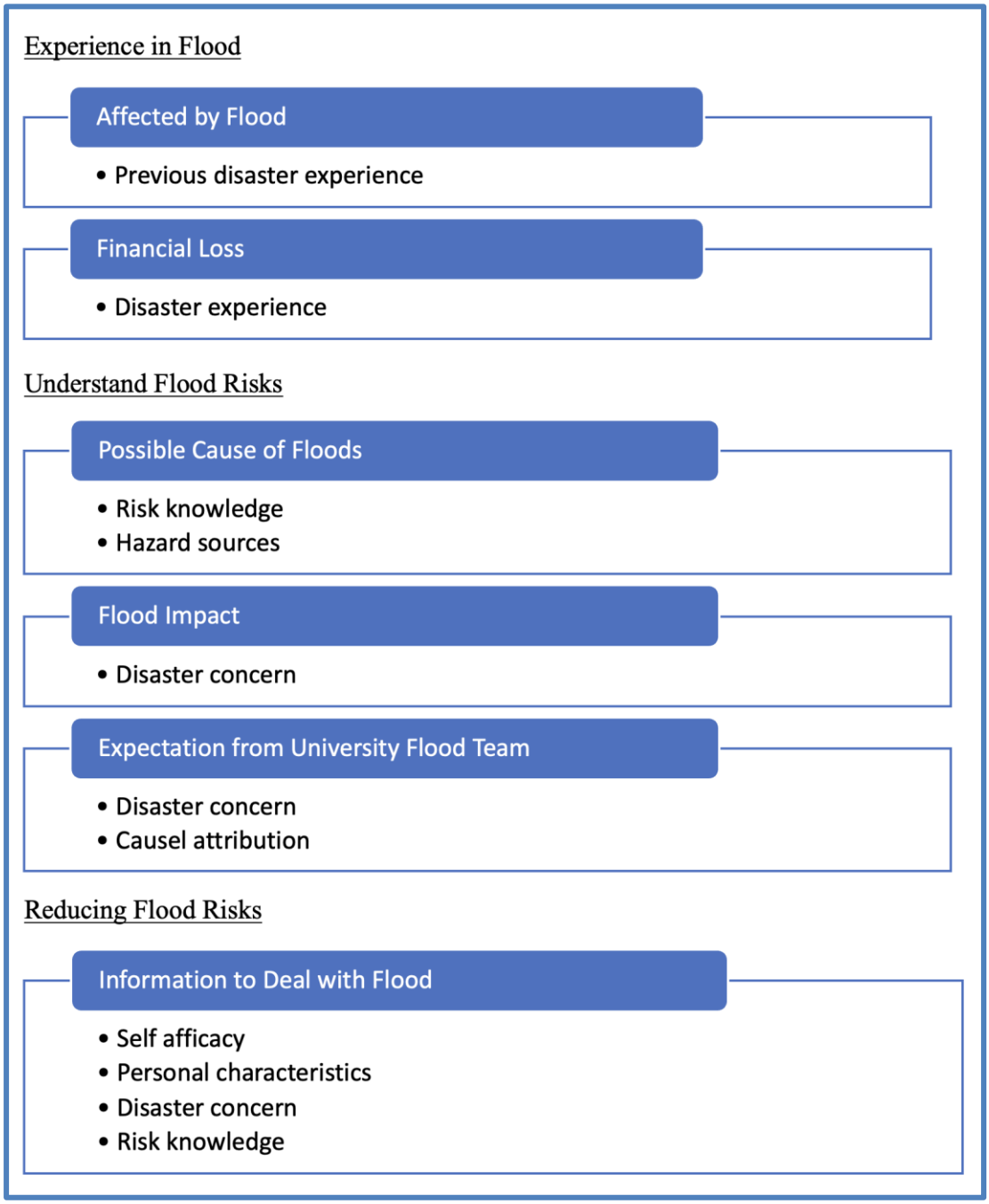

Figure 14 : Questionnaire Survey Design (Section B).

3.6.17 Questionnaire Survey

The questionnaire survey was conducted between January and March 2017 to determine how flooding could adversely affect the university, particularly to its building occupants. Respondents for the questionnaire survey were recruited from university building occupants (students) to express their opinions and comprehension before the unforeseen flood attacks. Participating in surveys could provide individuals with knowledge about a natural disaster (Gaume and Borga, 2008). These subject interests the author since the questionnaire issued could assist students in becoming more aware of the flood and its risks and their view of a situation regardless of whether they have personally experienced it. The

questionnaire addressed the selected university campuses' recovery and recovery efforts. The quantitative research entails self-administered questionnaires at a few selected UiTM campuses throughout Malaysia. This survey gathered 700 respondents from 3 different university campuses (UiTM Segamat, Dungun, and Machang). The author chose certain university campuses because previous flooding incident at a university indicated high-risk campuses are prone to flooding. Additionally, the field study locations were chosen in cooperation with the institution's risk management committee.

Please keep in mind that the faculties, courses, and levels of education on the field study campuses were picked at random. The author randomly picked respondents from different faculties on each university campus (the author only had 3 months to finish the field study, including pilot tests). The author approached lecturers and the heads of each faculty or department to obtain the students' schedules. Students were chosen via planned random selection after having the opportunity to contact academics from the selected department. Throughout the day, the author approached any available students. Things became simpler when each lecturer provided the author with a detailed schedule of each student's availability (including their courses, student timetable, and availability).

Most of the questions were of the "what" variety, designed to elicit data from a sizable sample. The survey received a 91 per cent response rate, with 637 out of 700 valid questionnaires returned. The respondents' background information includes their gender, age, working background, the highest schooling or degree, and present university campuses. The author randomly selected respondents from diverse faculties on each university campus to keep the study's budget and time commitment to a minimum. Computer science and mathematics, electrical and chemical engineering, administrative sciences and policy studies, accounting, hotel management and tourism, and business management are available at UiTM Dungun. UiTM Segamat provides a variety of courses, including accounting, computer and mathematical sciences, business administration, and information management. Accounting, business management, computer science, and mathematics are the 3 primary subjects offered at UiTM Machang.

These 3 campuses share characteristics in that they all provide courses in computer science and mathematics, accounting, and business management. The surveys were administered after a classroom lesson, and the author remained there until all the surveys were returned and finished. The other reason for hand-distributing the questionnaire survey was to eliminate the possibility of the online questionnaire failing. This could have occurred

because UiTM students did not have official university email accounts, as most international students do. It is the only reason on why online questionnaire cannot be conducted. The questionnaire survey was developed in response to the NDRR issues examined. The supervisor at the University of Manchester provided initial feedback on the questionnaire survey template, and the author then improved the template based on the input received. Additionally, those university students may be grouped into a single classroom regardless of their study courses to attend a same subject. As a result, being picky about the courses they take seems needless. The author might choose several campuses, with permission from the faculty, that provided the best accessibility for distributing the questionnaire in a manner that suited the author's time and the availability of the students in class.

The author must ensure that those students did not have their examinations or exams throughout that period. Otherwise, they were likely to ignore the survey. A viable response meets the following criteria: (a) completing all survey questions; and (b) are between 18 and 24. These criteria were used to maintain consistency across data analyses while providing the author with the highest possible quality data. The author had to conduct extensive checks to ensure that students completed all surveys completely before considering them a complete response. This strategy aided the institution in achieving an information evaluation procedure for each situation and then evaluating the themes.

Before reaching prospective responders, the questionnaire sheets were printed in hardcopy. All the questions were designed to address the complexities of the flood scenario on campus, and their preparedness level is likely to strengthen the university's overall NDRR approach. Students who completed the paper-based questionnaire survey were told that they were joining in a study toward earning a Master Degree for the author's dissertation. All respondents were sent a similar set of questionnaires. The respondents were given enough opportunity to participate in the questionnaire responses to clarify and detail; the data was analysed qualitatively. Respondents may complete the questionnaire sheets within the allotted time limit of five to ten minutes. To confirm the honesty of the questionnaire survey, the author recommended that surveys be finished in per session (for each of the classrooms attended). They were, however, acting rapidly because they were aware that the author would be collecting their questionnaire shortly. Students may respond or leave it blank. The lecturer did not attempt to excuse or absence from the classroom. Students have been notified that their responses will be anonymous, and they are also permitted to withdraw from the survey if they desire. The author appreciated the participants' time and effort in responding to the questionnaire.

3.7 Data Analysis and Process

The quantitative component of the study entailed collecting data from students at the designated universities. Parallel to the quantitative strand, the qualitative strand of the study includes qualitative interviews with university staff from the selected campuses. The data analysis technique for this project was to prepare and analyse interview transcripts, questionnaire responses, hard copy materials, field notes, and any extra supporting information discovered during the literature review. It is critical to assist in evaluating and organising data (Bogdan, 1972).

Most of the data has been organised thematically. The process of developing themes or templates and coding information evolved entirely because of data compilation. Additionally, the author will conduct the interview and search for available documents to elicit the most essential and helpful information. The author used "coding" to categorise all the responses. The findings of the in-person interviews and questionnaire surveys were transcribed, categorised, and organised into to determine their frequency. The transcripts of these face-to-face interviews were checked and read numerous times to confirm data accuracy and help the author better grasp the context. Clustering was used to create specific codes, and the author made a point of listing each master code before beginning the clustering procedure.

The author entered data manually from the questionnaire provided both manually and electronically. The author had to properly examine and ensure that all questions on the questionnaire were entirely answered before accepting them as a complete response. This strategy aided in the information evaluation process for each case and the subsequent examination of the themes. The main objective of the data analysis is to address the study's research questions.

In this thesis, three statistical approaches are used to analyse the data: Naturally, a researcher would require only one statistical procedure to complete a particular assignment. When econometrics is necessary, a researcher must experiment with incorporating statistical packages such as SAS, Statistics, R, Stata, SPSS, and StatXact/LogXact (Hilbe, 2010). However, there may be instances when the researcher requires various application information management, visual aid, descriptive, or statistical capabilities. Descriptive statistics aim to provide details on the relationship between variables in a sample. The mean, median, and mode are used to summarise the points in descriptive statistics.

SPSS was used to analyse the data, and transcripts of spoken responses were examined. The topic of flood danger within an institution is prioritised in this research. It begins by highlighting problems that were discussed, such as how floods affect institutions and individuals and how the national and institutional levels respond to these concerns.
A questionnaire was designed to elicit economic and sociological data from the selected institutions' communities. The survey questionnaires gathered demographic data (for example, gender, employment, and income), psychological distress, actual physical deterioration experienced by towns, the duration of the disaster (for example, time, days or weeks, many days, and years), and the effect of damaged infrastructure on daily activities (Deshmukh, 2011). Participating in surveys could provide individuals with knowledge about a natural disaster (Gaume and Borga, 2008). The author is particularly interested in this subject since the questions posed in the questionnaire distributed can assist students to become more aware of the flood and associated risks and their view of a situation, regardless of whether they have personally experienced it.

Most of the data has been organised thematically. The process of developing themes or templates and coding information evolved entirely because of data compilation. Additionally, the author will use the interview and search for available documents to elicit the most essential and helpful information. This strategy aids in the information evaluation process for each case and the subsequent examination of the themes. The data analysis technique for this project was to prepare and analyse interview transcripts, questionnaire responses, hard copy materials, field notes, and any extra supporting information discovered during the literature review. It is critical to assist with data assessments and organisation. The author entered data manually from the questionnaire provided both manually and electronically. Before accepting a questionnaire as a complete response, the author must rigorously examine the data to ensure that all questions were answered thoroughly.

On the other hand, inferential statistics use random data samples from a selected population to generate inferences. It is advantageous because the author cannot study all populations. A suitable statistical programme, SPSS Statistics for Windows, was used throughout the research process and published in approved scholarly journals, and SPSS software was used to examine the data. Transcripts of spoken responses have been analysed. The distribution of power between the author and a participant was much discussed. As someone seen as an "expert", the author knew that their answer might be restricted. Therefore, the author used a "laddering" method to control the force of the interviews, (for

example, "What did you do? What happened? "), on knowledge ("Why was it done that way?"), and concerning philosophy or feelings ("How did it feel? What do you think caused you to do that? ") (Price, 2002). During the interview, participants were evaluated for verbal and nonverbal signs specifying their comfort level.

Still, none of that happened during the interview sessions because all the interviewees were given their best answers to help make the interview successful. They all showed an interest in the research issues and had been quite receptive to the ladder questioning technique, which helped gather more information. They frequently express that they were assisting others by participating in the research, gaining valuable experience for the author. The interview duration was connected to the interviewees' capability to explain the current university situation and their familiarity with the said issues. The author often ends interviews with the question, "Is there anything more you would like to tell me?". The author avoids leaving abruptly at the completion of the interview so that the interviewee would not feel used (Corbin and Morse, 2003).

3.7.1 Data Analysis Procedures

Data analysis was carried out concurrently with data collection to assist the author in gathering and analysing material iteratively. The data analysis cycle began with the first phase of coding, followed by the second phase of coding, jottings, propositions, and assertions (Miles et al., 2014).

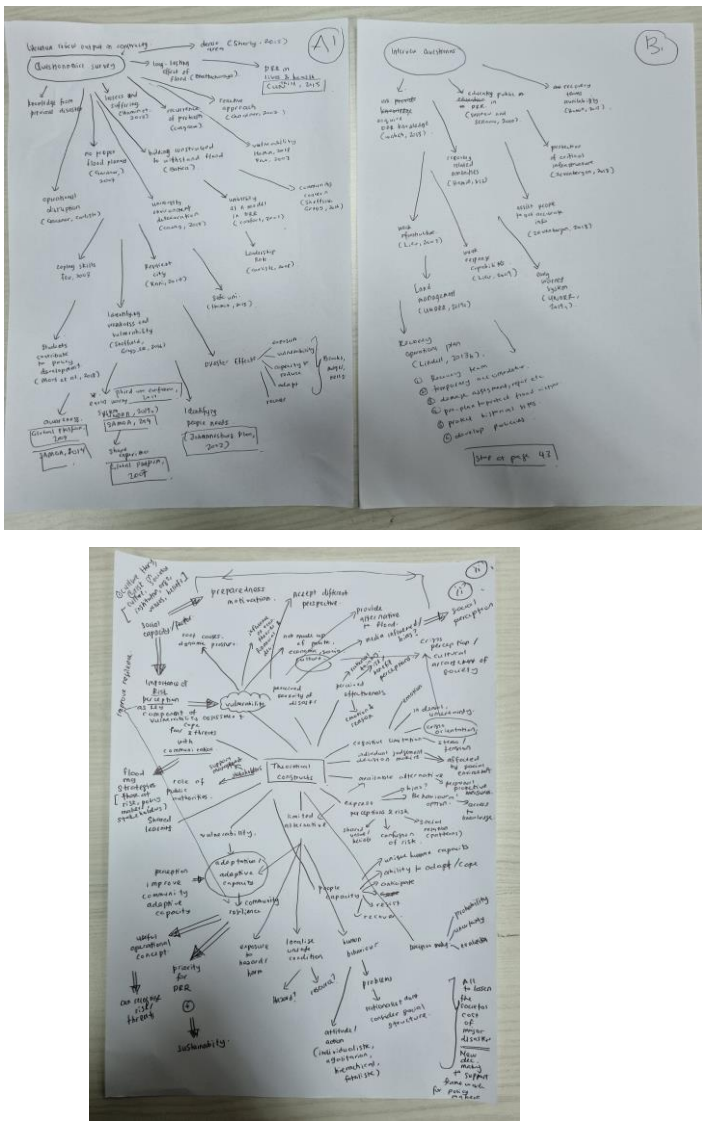

Figure 15: Example of First Phase Coding (Self-Authoring).

Additionally, the author of this thesis utilised jottings as a method of establishing credibility through its accuracy and regularity. The author uses personal jottings, also known as memo writing, to record observations and notes on personal thinking, and it assists in reflecting on any challenges or difficulties that arise during the data analysis process. The jottings activity will include remarks that will serve as the basis for a more in-depth analytical memo and annotations of pertinent material. In both phases of the coding process, jottings are employed as part of the information analysis stage, replacing pen and paper with Microsoft Word to tie ideas to a piece of data. It is beneficial to ensure that the information is not lost in its context (Chang-Richards et al., 2013). The author relies entirely on manual coding to analyse the data and observations collected during the investigation (Bergin, 2011).

This study adopted some NVivo key terms and their associated names. The examples are sources (associated names: data, material, survey documents, and transcripts), Node (code, theme, category, topic, or concept), case (unit of observation, units of analysis, and objects of study), Coding (quotations, analysis, and tagging), classification (types, sorts, classes), attributes (variables, characteristics, demographics, biographical information), annotations (comments, reminders, observations, footnotes) (Leech, 2011). The coding category also involved a comparison statement. The second phase of the coding cycle condenses the first cycle's codes into a manageable number (Miles, Huberman, and Saldana, 2014). From the initial stages, the author could identify emerging motifs. The second coding step went more quickly because the author was already familiar with how to organise readily available data. It was constructed as a deductive code using the codes discovered throughout the literature research process. The codes were derived from a variety of sources. Table Table 2.3 and 2.4 contains samples of codes derived from the conceptual framework's sources. While the author used codes throughout the coding process, several were altered and shifted to better fit the acquired data. The coding process here follows (Gaur and Kumar, 2018).

All the different mediums of data collection were coded together to represent the set of codes, to meet the relevant qualitative and quantitative feedback. There were no specific patterns or common answers found. The final transcripts were coded again to produce a final set of codes, merged with the codes from the literature review. If there were some quotations or the same things were being said from different research repeatedly, the author was representing them within certain codes. When this exercise was continuously done, the author could determine specific categories or patterns that would help to produce a research

summary. The findings in this study emerged from the discovery of it is then interpreted into a framework proposed by the author, known as a social constructivist conceptual framework. The framework is constructed from the reflection of the most heavily repeated statements collected from all the data collection methods. The author constructed the framework to reflect the findings of this study. Hopefully, the framework could become a model that represents the significant findings, ideas, and interpretations from the research.

Basit's (2010) methodology for data synthesis is used. Most qualitative researchers analyse their data independently. The author seeks a complete grasp of the subject throughout the analysis process and continually strives to improve the interpretations. Qualitative data analysis collects information about the categories, linkages, and assumptions that shape respondents' perceptions of the world in general and of the subject (McCracken, 1988, as cited in Basit, 2010).

The most crucial and challenging stage of qualitative research is data analysis. Coding is vital for organising and presenting textual information rationally while evaluating it. The process of data coding and classification is critical to the analytical process. Data is classified into codes or categories, tags or labels that serve as units of meaning for the data. Codes are usually associated with chunks of varying-sized words, phrases, sentences, or entire paragraphs that may or may not be related to a specific location (Lofland and Lofland, 1971).

The categorisation of data results in the development of an appropriate conceptual structure for the data. This technique assists the researcher in creating questions, analysing data from multiple sources, adding, or eliminating categories, and hierarchically organising them. The computer and text analysis software do not carry out the analysis for the researcher; they merely aid them in carrying out the research. The user remains in charge of categorising, segmenting, and coding the data and selecting what to extract and combine.

Before fieldwork, Miles, and Huberman (1996) prefer to compile a temporary starting set of codes. This list is generated from the conceptual framework, which includes research questions, problem areas, and critical variables identified by the researcher and from relevant literature. The process included transcribing interviews, translating interviews conducted in Malay languages into English, summarising the transcripts several times, creating codes and selecting categories, coding statements, connecting themes, and finally, developing a theory based on the data and writing it up logically.

This study explores students' impressions of a higher learning institution's efforts and capacity to convey its natural disaster preparedness strategy using a qualitative case study technique and transformational leadership theory. Understanding students' attitudes about natural disasters and emergency response activities at a postsecondary institution enables leadership to assess present procedures' efficacy while establishing ideas for future enhancements. The purpose of this study is to shed light on the following: the specific flood management methods, the contemporary institutional flood management strategy, and the participants' perspectives on the relationship between risk perceptions and institutional control over flood disasters.

According to Oltedal et al. (2004), there are four worldview categories: individualist, egalitarian, fatalistic, and hierarchical. Each of them has unique risk characteristics. Individualists have always admired nature, but there is no reason to honestly care about it because it can be restored independently. If the risk does not endanger life, it is viewed as an opportunity. Egalitarians are sceptics of authority or expert knowledge and concur that human nature is perishable. Fatalistic individuals dislike social gatherings (Francis, 2010). They view nature as unpredictable and always provide less feedback when attempting to detect problems. Trust must be placed in the government or an expert on a hierarchical basis. While nature is viewed as autonomous, human involvement should be limited. They have never refused to accept risk justification from a higher-level administration (MacKinnon and Derickson, 2013). The author has always believed that a person should look for various information sources. Numerous variables that may influence an individual's attitude toward risk. A perception study has defined the effect of personal experience with previous flood hazards and socio-demographic characteristics on perceived personal risk in the context of flood threats.

3.7.2 Alternatives to Each Technique

The author of this thesis employs content analysis to keep track of a large volume of documents. It is a less expensive or simpler option as an indexing tool (use of keywords). It will take the form of document coding to reduce the text to a smaller number of categories due to the analysis. A keyword analysis is also included in the context analysis process to determine the frequency of terms in various types. The author of this thesis summarises the literature review chronologically to contextualise the reading and aid in the study's sequencing.

This study will adopt a non-experimental approach since it is the most adaptable, cost-effective, and time-consuming (Medema, McIntosh, and Jeffrey, 2008). Additionally, it can respond to all forms of evaluation questions. There are other non-experimental designs, but the author of this thesis prefers to use a questionnaire because it directly assists with research questions and collates the responses. The author of this thesis selected the study design based on the time of data collection, funding constraints, data availability, ethical considerations, and logistical considerations.

This investigation necessitates the use of a non-random sampling technique. The sampling technique selected is "Respondent-Assisted Sampling" "Snowball" or "Chain-Referral Sampling" with key informant interviews (Barros-Bailey and Heitzman, 2013). Each interviewee is asked to submit names of further potential interviews in snowball sampling, and the chain continues indefinitely until no new names appear. The alternative method is "Purposive Sampling". Purposive sampling selects the sample so that the items sampled provide the most significant amount of information for the study.

Mixed techniques necessitate both random and non-random sampling approaches. Still, regardless of whether they employ large-n or small-n methods, the author of this thesis should describe the sample strategy and decisions made. Additionally, the author of this thesis explains any potential biases or constraints inherent in the selections (Mügge, 2016). In addition to the literature review methods, the author of this thesis employed a "Field Method" to collect data. Interviews and surveys are used in the field (Labov, 1981). Interviews were conducted semi-structured (qualitative interview methods, key informant interviews, in-depth). Alternatively, structured interviews, group interviews, official meetings with university faculty or administrators, and focus group discussion may be used by another researcher.

The author of this thesis will analyse qualitative data by assigning categories to specific pieces of evidence and then connecting those pieces of evidence (coding). Codes denote the types (cutting and pasting notes for an organised theme) (Joffe and Yardley, 2004). The data collected is quantitative and categorical. There are two types of data involved: nominal data (for example, gender, (female or male)) and ordinal data. Triangulation is the process of examining a situation or phenomenon through numerous methods. The goal is to minimise the shortcomings and biases inherent in any way. In other words, the advantages of one strategy may offset the disadvantages of another.

3.7.3 Coding

This study conducts a coding process following the method suggested by Maher et al., (2018). A coding process could be done using paper and pen, and the result could be recorded in a soft copy version, for example, using Microsoft Word table. This coding method aids in the visual, imaginative, and reflective processes. The author employed coding as an indexing activity to connect pieces of knowledge. The coding process began with a collection of words, paragraphs, or phrases (Fade and Swift, 2011, as cited in Saldana, 2012). Stake (1995) suggested that the data be analysed using categorical grouping and direct interpretation. Coding serves a few purposes. It investigates the functions of codes and coding in qualitative data collection and analysis procedures. It delivers specifics on the coding methods used in qualitative data analysis. Additionally, it gives sources, explanations, recommendations, and examples for categorising qualitative data for subsequent analysis (Miles, Huberman, and Saldana, 2014, as cited in Hashimov, 2014).

As an interpretive researcher, the author employed the coding process to establish causal correlations and investigate the connections between those codes, emphasising the integration of their core. Additionally, a researcher could establish conceptual connections between the codes, resulting in the generation of concepts, frameworks, models, or bodies of knowledge (Gregor, 2006). The coding methodologies were utilised to arrive at the research findings and summarise them. Common themes were coded and altered appropriately for each data collection method. The author transformed data by creating codes and themes, then used to aid the study.

The author coded the data using recorded face-to-face interviews, the literature research findings, emergent themes, and anticipated findings. Interviews were transcribed and then classified according to previously identified themes. Unspoken words were also determined by the interviewee, such as laughter, facial emotions, sarcasm, and physical actions such as nodding or the act of disagreeing with something. These were transcribed and assigned to a few carefully chosen coding schemes. Following that, the questionnaire survey findings were coded using the same codes. The coding of the topics was grounded on the qualitative data gathered throughout the literature review.

There were 32 coding methods available (Saldana, 2012), but the author chose to employ "Descriptive Coding" in this investigation (the simple subject of the qualitative data). After the author generates descriptive codes, descriptive coding employs descriptive

nouns. Additionally, it can be used for visual data. Examining the "Descriptive Codes" may assist the author in identifying "keywords" for further exploration of the emerging issues or topics. As an alternative coding strategy, another researcher may use other coding methods and incorporate them into the literature review wherever they believe it is appropriate. Coding entails elucidating analytical questions, segmenting data using a coding name, and utilising those codes to accumulate knowledge about the subject being analysed (Charmaz, 2006, as cited in Maher, 2018).

The questionnaire survey responses were coded using a mixture of inductive and deductive procedures. The transcribed face-to-face interview was coded inductively. According to Maxwell's three classes, the author modified and developed their coding (2013). There is no one-size-fits-all technique for coding, as each study's coding is unique (Saldana, 2016). As a result, the author had to combine the necessary coding skills and perform a few episodes of the coding process. The initial stages of coding included broad subcategories of items and approaches that were regarded as foundation strategies for categorising qualitative texts (descriptive). Due to the absence of NVivo in this study, the author was forced to manually code the qualitative descriptions, phrases, words, or terms. While in NVivo, coding is classified as verbal, inductive, or emic, depending on how the language is expressed (Saldana, 2016). The author employed successful strategies in the second coding process. This method codes using emotion and values. Emotion coding was used to represent the participants' ideas or feelings, whether their emotions or the author's account of participant information. Values coding examines the participant's values and views' cognitive processes (the process by which knowledge and understanding are acquired via experience) (Saldana, 2016). The coding methodology described earlier was applied to all the author's data collection methods.

The coding procedure was done by the author by using the transcribed face-to-face interviews, outputs from the literature research, emergent themes, and common discoveries. Interviews were transcribed and classified by previously identified themes. Additionally, any new emergent topics were considered during a continuous coding session. There have been few attempts at developing a comprehensive collection of categories. The author revisited the study objectives, aims, research questions, and conceptual framework multiple times to create explicit codes. Each code was confirmed and specified with statements that would be pertinent and highly considered if applied to each code. The author made a conscious effort to eliminate any overlapping themes that would result in repetitive assertions. The approach was to simplify the assertions and arrive at a more appropriate

category or group. There were apparent assertions such as negative and positive statements, neutral and "unsure" statements, and others that could easily be classified under certain sections. In a face-to-face interview, unspoken words were discovered by the interviewee's laughter, facial emotions, sarcasm, and physical actions such as nodding or the act of disagreeing with something. These were transcribed and described using a few carefully chosen coding schemes. The conclusions were arrived at by applying coding methods that summarised the research findings.

The author can contribute to the analysis more than would be possible otherwise by jotting. It enables the author to develop a greater sensitivity to the significance of the data (Birks et al., 2008; Chang-Richards et al., 2013). Writing enables clear thinking about a research issue, provides a means for articulating the author's ideas and perspectives on the study, and enables the author to remain true to the available material. The author enhanced the analysis process by using the jotting process. This activity incorporates an analytical component that enables the author to remain truthful to the data. While extracting data, the author uses jottings to map the research.

No coding approach will suffice, as each study's coding is unique (Saldana, 2016). As a result, the author needed to combine various essential coding methodologies and code in multiple episodes. The earliest stages of coding comprised many subcategories of characteristics and approaches that were deemed important ways of categorising qualitative texts (descriptive). Because NVivo was not used in this study, the author had to code each qualitative description, phrase, word, or term manually. NVivo's coding is verbal, inductive, and emic, accurately expressing the target language (Saldana, 2016).

The initial coding phase was carried out inductively by the data. The initial categories are predetermined following the literature review gathered in Chapter 2. It is to make sure that the author can keep track of the codes, considering they might change later. A single code is used for each key topic or subject to avoid confusion and overlap. The coding process in this study involved all the data collection methods, including literature review, document analysis, questionnaire survey, and a face-to-face interview. The author will ensure that the codes used are easy to resemble and fit into all the different data collection methods. The transcripts provided an enormous quantity of important information to the researcher. The coding technique was facilitated by highlighting sentences and counting the frequency of keywords and phrases. To guarantee the integrity of the original qualitative data, the author

transcribed all verbatim interviews and questionnaires. The transcripts were checked multiple times during the coding process to confirm their accuracy.

This second stage of the coding cycle condenses the data from the previous phase into a manageable number of codes (Miles, Huberman, and Saldana, 2014). The author could identify emergent patterns as early as the first step. The second coding step proceeded more swiftly due to the author's prior knowledge of organising readily available material. It was performed using deductive coding from codes pulled from the conceptual framework's sources found during the literature study phase. While the author used code to code, numerous lines were modified and altered to fit the gathered data better.

To verify that the codes corresponded to the pertinent qualitative and quantitative feedback, all three (3) data collection mediums were coded concurrently. There were no discernible trends or consistent replies. The full transcripts were coded again to generate a final set of codes combined with the literature review code. If the author repeated quotations or remarks from previous studies, they classified them using predefined codes. After going through the coding process several times, the author identified some categories or trends that could be used to create a study summary. It is then understood within the framework of the author's conceptualisation, which it refers to as a social constructivist conceptualisation. The framework was created by combining the most frequently repeated sentences across all data collection methods. The author developed a framework for the study's findings. Hopefully, the framework will evolve into a model describing the primary findings, concepts, and interpretations derived from the coding process.

The author used Microsoft Word documents to record the interview sessions and questionnaire surveys for the coding technique. Due to the volume of information in the transcripts, they were underlining and numbering the frequency of keywords or phrases, which aided in the classification process. To preserve the integrity of the initial qualitative details, the author verbatim from the respondents to sustain the quality of initial qualitative details. The author assigned every code a label to observe the frequency and occurrences throughout the evaluation process to get a more profound, contextual comprehension of the participants' perceptions. For instance, "disaster risk reduction" was tagged as "DRR".

The author adopted this to evaluate the qualitative and quantitative data results. Not only that, but the author also analysed the themes from the analysis design instrument in contrast to the qualitative data. The coding categories ended up forming a few main findings in the

study. For example, the codes emerged when the author realised common types of statements and replies from the interviewee. Throughout the coding process, the author would state the findings and statements on the recurring issues.

3.7.4 Coding Categorisation

Few attempts were made to come up with a substantial collection of categories. The author revisits the study objectives, aims, research questions, and conceptual framework multiple times to provide clear codes. Each of the codes was defined with pertinent and highly considered criteria for application. The author utilised Maxwell's three classes and developed their coding throughout the data analysis and review procedure (Maxwell, 2013). Comparative statements were also used in categorising and classifying. For instance, respondents' questionnaire responses were compared to the literature review findings in a face-to-face interview. The transcribed face-to-face interview, the questionnaire survey, and the qualitative data from the literature study were all coded using inductive methods. Inductive coding is a method of encoding that is "open or data-driven" (Fade and Swift, 2011, as cited in Saldana, 2012). Inductive coding offered the author to interprets raw textual details to generate themes, process models, or concepts (Thomas, 2006). An inductive approach is used when producing the open coding, and a deductive approach is used when collecting details to produce the basis of data coding according to categories. The inductive approach involves smaller observations to further generalisation, while the deductive approach starts from general ideas or statements to a focused, logical conclusion (Azungah, 2018).

Using the literature review as an example, coding techniques were applied when needed and as an inductive process based on the information available in the review. Coding for the literature review necessitated segmenting the data into key phrases or terms. Qualitative coding data into codes is an interpretive procedure that entails examining the original data. The author uses predetermined codes, also known as deductive coding, to provide codes for the most recent qualitative details in the literature study. Within the analysis section, the author supplied the generated codes. The codes used to describe the present data were developed arbitrarily called "theoretical" or "concept-driven" coding.

3.7.5 Alternative Application

NVivo is a programme for data analysis. It was initially released in Australia by QSR International a few decades ago. According to its official website (www.qsrinternational.com), the software enables users to obtain a deeper grasp of mixed methods and qualitative data. NVivo has gained appeal, particularly in qualitative disciplines, due to its capacity to manage massive and rich data sets (Jackson and Bazeley, 2019). NVivo offers many advantages, including increased efficiency in terms of time management and transparency (Hoover and Koerber, 2009). The software supports various data kinds, including Word documents, web pages, spreadsheets, videos, PDFs, and photos. NVivo supports data import from reference management applications such as EndNote, Zotero, and Refworks. NVIVO enables the visualisation of research data, sharing information with other team members, and creating relevant notes or memoranda (Durian, 2002). NVivo can manage the synthesis of research and data analysis (Major and Savin-Baden, 2010). Additionally, the software is required for each data analysis and review stage, including evaluation, critical appraisal, synthesis, and data extraction (Houghton et al., 2017). This technique establishes a structured framework for the analytical process, which improves transparency and rigour (Dalkin et al., 2020).

Numerous academic areas continue to employ NVivo as a data analysis tool. NVivo enables researchers to manage data-derived information, such as discovering and managing emergent themes. Additionally, NVivo enables speedy data management and can make identifying study themes easier and simpler. The software is used to automate marking, sorting, cutting, gathering, and rearranging data in a research project, which has historically been performed on paper (Weitzman and Miles, 1995). Given the thousands of data pages, researchers who utilise NVivo or a comparable piece of software routinely express surprise that this type of job could ever be accomplished manually (Ely et al., 1991). While NVivo is not easy to use, it is an invaluable tool for increasing the robustness of qualitative studies (Bergin, 2011).

The author chose not to utilise NVivo or any other software application other than SPSS for various reasons. According to Dollah, Abduh, and Rosmaladewi in 2017, NVivo has a few problems. The examples require considerable time to learn how to use the software, are prohibitively expensive for individual use, and are frequently impossible to interpret. Despite its quantitative data, NVivo is well-known among qualitative researchers. Due to the time commitment associated with NVivo, many researchers opt for manual data

review. If the study employs grounded theory or another method (Zamawe, 2015), NVivo has a negligible effect on the research design. The NVivo tools can manipulate a large amount of data, and the emphasis on this capability frequently overshadows the importance and richness of the analysis and depth study of a situation to ascertain its occurrence and processes (Brandão et al., 2015).

NVivo is useful for verifying complex coding algorithms used in large detail sets. However, this research used a relatively modest set of codes and contained a manageable amount of data. Software and programmes assist researchers in identifying links and simplify the study process compared to manual coding, especially with more enormous datasets, though this is not a guarantee. However, it should be emphasised that a software programme cannot recover textual information or alter the analytical capabilities of the research. Occasionally, the data extraction form used a table format, resulting in formatting issues when imported into NVivo. When using NVivo, formatting difficulties may occur. For instance, if a researcher uses an incompatible table, the pre-determined theme must be manually programmed anew (Houghton et al., 2017). The author agreed that novel insights could be generated even with inadequate methodological quality. Alternatively, some "fancy" methodological studies may provide superficial results (Gough, 2007).

NVivo requires a considerable length of time to master, depending on the assignment, the budget, and the researchers' skills. While using a software programme to code a large volume of data may appear impractical, it allows researchers to become comfortable with the package to code confidently. There were several assumptions made in connection with the evaluation of qualitative data. If the sample size is smaller and the dataset is not vast, the study does not require as much time to review as quantitative studies (Basit, 2010). Each time a researcher mentioned NVivo, some participants were unfamiliar with the software. However, this could not be considered the sole cause for its use (Yin, 1994).

Additionally, the author did not use NVivo software for various reasons, including opportunity, availability, and how the author regarded hurdles. The author would employ NVivo if the choice was established in advance, but only in the case of a specific study topic. The author's reasons for not using NVivo, even though the author had to master the learning curve and the concept of "costs" associated with the time required to master the application, in comparison to the benefits of a software programme and its usage (Rodik and Primorac, 2015). The author cannot assert that NVivo was a good fit for this study because it was

created without software from the start. If the author coerced the programme to suit the study's parameters, this could affect the study's outcomes. The difficult period occurs when a researcher must determine how to utilise the software, considering the time-consuming activities, such as the extensive tutorial and the researcher's basic understanding of software usage (Zamawe, 2015).

3.7.6 Traditional Alternative

The author opted for more traditional methods such as pen and paper and a word processor. Manual coding is significantly more beneficial to the author since "you are accustomed to adapting to the author's manner of working." Additionally, the author's handwriting and coding will be more ingrained in their memory. The author was content with manual coding and, in retrospect, would not change anything. The author employed thematic data analysis to identify critical material in documents essential phrases of appropriately grouping and subdividing the terms.

Researchers initially encountered alternatives, documents, or informants when analysing their data (Taylor and Bogdan, 1998). The author will classify the data based on the conceptual framework that best suits the data. Using the "Framework" technique, the author analysed the data and generated recorded numerical codes (Ritchie et al., 2003). The author accomplished this manually, utilising the computer's "search" function to identify numerically determined concepts, which then incorporated into the proper framework. The author began by creating a numerical coding system or index to denote the author's main ideas, for example (1.1.0). By subheading the notions contained within each significant heading, the author can then refer to them as (1.1.1), (1.1.2), and so on. The following concept should be coded as 1.2.0 and its sub-concepts (1.2.1), (1.2.2), and so on. It is critical to use manual coding techniques when analysing the literature review chapter. When the author went on to the interview and questionnaire survey sections, the author employed the same numerical coding but more significant margins and transcripts. This was when the author used the "framework" technique.

The research data was transcribed into a Microsoft Word document. The major themes, categories, and subcategories were established in advance. NVivo is advantageous for ensuring consistency across the coding process. Codes were employed to assess the study and organise the researcher's observations (Bergin, 2011). Categorising or coding data analysis entails classifying the data (Dey, 1993). The codes may be paired with a straightforward or a more sophisticated label (Miles and Huberman, 1994). The coding

position is necessary to recognise and collect phenomena and discover common concepts, variations, structures, and patterns (Kelle and Bird, 1995). It is beneficial to recognise many perspectives on information coding, which encompass both the significance within the research context and what might be significant to other individuals (Gough and Scott, 2000). "Sources," "Node," "Case," "Coding," "Classification," "Attributes," and "Annotations" are all NVivo important terminology.

As a result, the data analysis determines the names connected with the key terms. Documents, categories, subjects, themes, concepts, observations, quotations, labelling, variables, and attributes are only a few examples. For instance, "nodes" in NVivo were used to describe the literature review as codes for themes and subthemes (Houghton et al., 2017). Additionally, the author employs a mind-mapping research technique (Crowe and Sheppard, 2012). The study was categorised similarly. The researcher employed a variety of mind mapping approaches, including the use of coding structures such as tree nodes, free nodes, and child nodes.

Qualitative researchers do their analyses of data. Researchers use assessment to understand better the subject they are studying and improve their study evaluation constantly. The review of qualitative data is a highly effective, intuitive, and creative technique for inductive cognition, thinking, and theorising (Basit, 2010). To analyse qualitative data, a researcher must first establish the study's assumptions, linkages, and categories that shape respondents' overall perceptions and those of the subject (McCracken, 1988). NVivo is an excellent tool for framework synthesis and qualitative proof synthesis. If data did not convert to pre-existing themes or templates during the synthesis phase, more thematic synthesis was conducted for an interpretive, inductive approach (Carroll et al., 2011). According to Dalkin et al., in 2020, there were a few methods for increasing the transparency of the analytical process and systematic recording of the study's decision-making within Microsoft Word documents (Lhussier et al., 2015), separate Microsoft Word documents for each theory (Dalkin et al., 2018), and the use of Google documents (Turner et al., 2018).

3.7.7 Manual or Electronic Coding

Generally, a researcher must provide a reason for selecting a particular software application. Perhaps the software programme is more convenient due to the researcher's specialised expertise, familiarity with the application, a recommendation from someone, or the availability of institutional affiliation. Software may be advantageous because it facilitates, organises, and "fashions" information processing operations (Rodik and Primorac, 2015). The most challenging aspect of a research component will be data analysis. Coding is a phase in the analysis process that organises textual information. Codes are constructed from pieces of paragraphs, sentences, phrases, or varying-sized words that are related to or unrelated to a particular situation (Basit, 2010). The objective is to create an organised and readily available code reference book.

A study's data can be coded manually, electronically, or in a hybrid of the two. Miles and Huberman (1994) identify two distinct approaches to code creation. The first is for an inductive researcher who may not need to code until they understand how the code works, how it fits into the study setting, and how it should fit into the models. This is consistent with Glaser and Strauss (1967) grounded technique. The second is to create a provisional code or list before initiating anything. The conceptual framework, research questions, hypotheses, issue areas, and variables in the study all contribute to developing the recommendations (Basit, 2010). A computerised database is required to manage the elimination of duplicates and the maintenance of references (Brunton and Thomas, 2012). EndNote, for instance, is frequently used for this purpose (Houghton et al., 2017).

3.7.8 Data Management

The study follows the data management from Spencer et al. (2003) as below. It is a depiction of stages and processes involved in qualitative analysis.

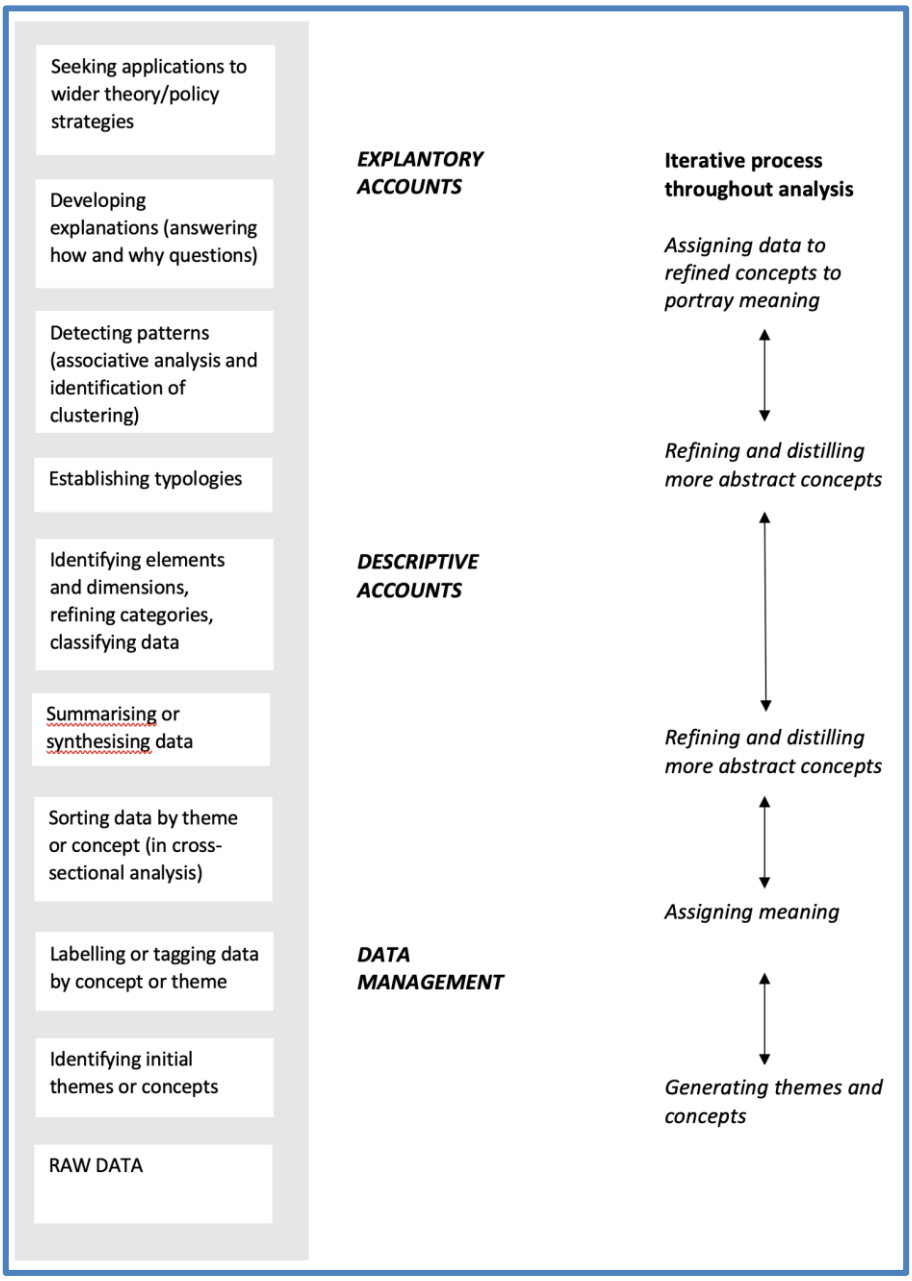

Figure 16: The Analytic Hierarchy (Adopted from Spencer et al., 2003).

The management of data in this thesis is consistent with Ritchie et al. (2013) and Spencer et al., (2003). Depending on the analytic tool being utilised, the data management processes may be carried out in a different order than specified. After each labelled chunk of text has been evaluated for its content, sorting and synthesis occur nearly concurrently in the framework. Synthesis may occur before sorting the data (Ritchie et al., 2013).

Specific analytical tools may be lacking in a systematic synthesis method, such as abbreviated tags, thoughts, or analytic notes, to accomplish the study goals. It is critical to add a step before continuing that allows for a more straightforward formulation and representation of the original data. Without this, excessive abstraction may occur early in the analysis, preventing the analysis from returning to conceptualised categories or the entire text until later stages (Ritchie et al., 2013). No exact software is known as an ideal programme. Computer-assisted analysis tools should not be allowed to take over the researcher's involvement in the analytical process. Qualitative research is harmed when researchers transmit data via software rather than perform intellectual analysis (Ritchie et al., 2013).

Analytic commentary is helpful for qualitative data, particularly for those new to qualitative analytical research. None of the computer applications will be capable of performing automated data analysis. Researchers must determine for themselves which analytic questions to pursue, which concepts to prioritise, and which modalities of representation are most appropriate for their work (Spencer, Ritchie, and O'Connor, 2003). When raw data in verbatim text, observation notes, documented proof, or anything else is reduced, a synthesis of the acquired information can be constructed. Information reduction is a necessary and integral part of the analytic process; without it, the author would not make sense of the overwhelming data. However, care must be taken to ensure that the study participants' original terminology, thoughts, and perspectives are not obliterated during the process. Additionally, documenting the synthesis is critical to ensure that it can always be compared to the source material and trace the process of conceptualisation or interpretation (Ritchie et al., 2013).

It makes ordering easier to manage and more visible. Similarly, the focus is placed on the sorting, or sifting, of accessible evidence. Almost definitely, the results will not be presented in tidy subject-related packets; if they are, this implies that the necessary penetrative and exploratory questioning tactics were not applied during data collection. To summarise, facts must be organised and sorted to be presented in blocks of the related topic matter (Ritchie et al., 2013). It enables case-by-case and case-by-case searches. Exploration of the data collection to determine characteristics, clusters, links, and other comparable entities is a component of the analytic process. This necessitates a rapid search of the entire dataset to identify the most relevant patterns, including theme clustering and trends across a range of contexts (Ritchie et al., 2013). After collecting data in the field, it was processed using the Statistical Package for the Social Sciences (SPSS) and Microsoft Excel tools. This

study used descriptive and inferential statistics, with percentages, standard deviation, mean, and mode acting as descriptive statistics (Kaliyadan and Kulkarni, 2019). This term refers to the analysis of respondents' perceptions of flood risks and perceptions of the causes, processes, and impacts of flood disasters. Meanwhile, inferential statistical analysis was performed using mean comparison analysis. Adnan (2021) carries out research by having 350 respondents from 5 Malaysian schools, also follow the sample size according to the population by Krejcie and Morgan (1970).

3.7.9 Data Triangulation, Reliability and Validity Measures

Data analysis strategies in this thesis involve integrating qualitative and quantitative data. In this thesis, the strategies follow Caracelli and Green (1993), which call for the transformation and conversion of qualitative or quantitative data so that both types of data can be analysed together. Qualitative data (literature review) in this study are coded numerically following a statistical analysis presented with the existence of the quantitative data. In addition, the quantitative data (questionnaire survey and face-to-face interview) are included in the pattern or thematic analysis that analyses the transformed narrative. In conclusion, this study integrates qualitative and quantitative data. It provides an enriched understanding of the sample being studied.

In mixed-method data analysis, research strategy is recognised for the methods used within the study design. In this thesis, approaches to mixed methods data analysis are as follows. The first is by using data transformation. The author produces codes, themes, subthemes and counts the number of its occurrence in the textual analysis. This is a process of quantification of qualitative details so that the author can evaluate qualitative data with quantitative outcomes. As an alternative method, the author could analyse themes in the design instrument chosen, which would then be contrasted with the qualitative data source (Caracelli and Greene, 1993; Tashakkori and Teddlie, 1998; Creswell and Plano Clark, 2007; as cited in Crossan, 2003).

The reliability of the study was increased by using data triangulation and pattern matching. For qualitative investigation, reliability entails producing results that can be established, trusted, significant, and thrilling (Trauth, 1997) rather than demonstrating consistency through repeated studies. During the triangulation process, all the codes derived are analysed together to produce sets of themes and subthemes to create a meaning for each piece of data gathered. Chapter 5 will give a summary of the underlying themes. The author will examine the coding process using the inductive method, which acts as a reduction

process. This is because the author wants to make sure each code delivers the same meaning and can express the real sense of the data. Not only that, but coding is also compared to identify the findings. Reliability aids in the organisation of data collected during the evaluation process. Nonetheless, from an interpretive standpoint, the objective is not to ensure that a second researcher will reach the same findings as to the first author. Other researchers can take the same data and interpret it differently based on their opinions or emotional context. The second researcher may approach the topic posed by the first researcher from an entirely different angle. The chain of data boosts the evaluation's credibility. The author of mixed methods research employs validity techniques throughout the study's quantitative and qualitative phases (Tashakkori and Teddlie, 1998). Issues with mixed methods validation may include sample selection, sample size, inconsistent results, data collection bias, flawed methodologies, and competing research topics, among others (Creswell and Plano Clark, 2007). When summarising or minimising content, it is critical to work carefully through the data to ensure that all relevant information has been assessed and addressed. Similarly, it is possible to collect and analyse all an individual's data in order to analyse and synthesise it across multiple contexts. Alternatively, the researcher could go through a transcript systematically, addressing each issue one by one. However, the data should be coherent in terms of the material displayed once synthesised. Without reviewing the source material, the essence of the data can be comprehended (Ritchie et al., 2013).

The dependability of the investigation was increased by data triangulation and pattern matching (Hale, 2011). Triangulation of data is a method for boosting the analysis and quality of data. The author of this thesis used data triangulation to explain patterns that overlapped or were distinct (Johnson and Christensen, 2008). The process of linking observed data with identified conclusions is called pattern matching (Hale, 2011). The author used this strategy to make numerous predictions about the study and to identify any trends that may have been uncovered throughout the process. The author contrasted the perspectives of students and interviewees to those obtained from an earlier study's literature review. This strategy would have strengthened the validity by providing supporting evidence (Johnson and Christensen, 2008).

The author identified the unique characteristics necessary for properly disseminating obtained data. The outcomes of the research included information regarding pattern checking, and some patterns were similar. The author tracked the study's progress and refined the code selections using coded groups or subjects. Additionally, memos were retained when new ideas for expanding the accumulating data appeared (Johnson and

Christensen, 2008). After reading the themes or strategies produced during the information analysis phase, the author did this exercise. Numerous scripts, themes, and templates emerged because of the gathered data. It was critical for the author to evaluate the material on a frequent basis using memos, patterns, and coded themes. The practise of pattern matching is the comparison of perceived results to predefined conclusions. Each pattern that is matched increases the study's reliability (Hale, 2011). This technique allows the researcher to make many predictions about the topic of the study. If the predictions come true, this strategy bolsters their validity by providing evidence in their favour (Johnson and Christensen, 2008). The findings of this investigation, including pattern checking, are emphasised.

Triangulation is another term for corroboration, which is the process of bolstering a case with more evidence (Hayward and Sparkes, 1975). Data triangulation is a technique for enhancing data analysis and quality (Hale, 2011). The author employed data triangulation to account for overlapping or disparate phenomena. The author contrasted the information gathered by the questionnaire survey, in-person interviews, and literature review. Data triangulation was used throughout the information analysis procedures for the questionnaire survey and the interview to ensure credibility and validity across all evaluation methodologies. This study design advocate using many triangulation sources to overcome any potential issues (Yin, 2003). The author contributed to the outcome by examining the same incident or phenomenon (Johnson and Christensen, 2008). By employing a mixed-methods approach, the author can apply a triangulation methodology to qualitative and quantitative data to achieve convergence and recognise the results. The preceding discussion of the study design were used to compare qualitative findings to quantitative statistical data to comprehend the research challenge better. Different data collection methods can assist in improving the quality of raw data.

As alternative, systematic, or unstructured observation might be used in the study. The author of this thesis utilised many techniques for data triangulation. Triangulation of data objectives: Obtaining, compiling, and aggregating the required data; conducting an analysis of the data and generating conclusions (Jack and Raturi, 2006). The alternative method is triangulation of theories or hypotheses refers to examining a situation or event using numerous theories or hypotheses. The goal is to explore a problem or phenomenon from various angles, via multiple lenses, and with various questions in mind. Other theories or hypotheses do not have to be compatible or similar; in fact, the more divergent they are, the more likely they will identify distinct challenges and concerns (Denzin, 2010). The

author of this thesis demonstrates how to conclude a specific finding, and it should reach saturation with the data for each approach. The author of this thesis tried multiple methodologies find the same themes and difficulties, this is referred to as triangulation. Triangulation will address bias in interviews and data inconsistency (Fusch, Fusch, and Ness, 2018).

The author of this thesis will detect large-n (quantitative data) or small-n (qualitative information) and perform implicit triangulation using mixed methods. It is accomplished through mutual assistance in achieving a precise conclusion and finding, and decisions may be drawn from different results. The critical premise is that evidence must be triangulated to ensure its quality. The author of this thesis then analyses the evidence to address normative and evaluative issues (for example, by using evaluative reasoning) (Collier, 1995).

Pattern matching increases the analysis's dependability; it is the process of correlating outcomes to selected conclusions (Hale, 2011). The author employs pattern matching to ensure internal validity in this study's analysis. The author used this method to generate many hypotheses about the research and identify any possible patterns that fit. As an approach for evaluating the study, the author compared all observed patterns to the expected ones. Meanwhile, explanations were generated using a specific pattern-matching approach (Yin, 2003). Supporting evidence was provided if the author employed this method and boosted the study's validity (Johnson and Christensen, 2008). Additionally, the author discovered the specific characteristics used to disseminate information acquired successfully. Further, a collection of codes for themes or templates was formed due to the information gathered. The author combines findings from various methodologies when examining the same occurrence or phenomena. Pattern matching, which involves comparing an observed pattern to a predicted one, is an effective technique for case study analysis. Simultaneously, explanation construction is regarded as a distinct type of pattern matching (Yin, 2003). However, as previously stated, interpretive researchers may minimise the importance of theory development to attain internal validity within the confines of the case study approach. Once again, theory-building research can result in inconclusive theories and is not limited to hypothesis generation.

The author kept track of their research progress and commented on their information choices using coded groupings of topics. Miles, Huberman, and Saldana (2014) noted throughout the data analysis process. The author employs jotting to make personal comments and notes on their ideas. It makes it easier to think about any concerns or difficulties during

the data analysis process. The jotting activity will include personal statements for a more in-depth analytical note and information annotations. Jotting was employed during the information analysis step, but instead of pen and paper, Microsoft Word was used to associate concepts with a piece of data during the coding phase. It is beneficial to ensure that the context of the material has not been obliterated (Chang-Richards et al., 2013). The author could participate more actively in the analysis than would be possible with jotting. It enabled the author to develop a greater sensitivity to the significance of the data. Jotting allows for the clarification of a research subject and provides a means for conveying the author's assumptions and viewpoints on the study while being truthful to the available material. The author enhanced the analysis process by using the jotting process. While extracting data, the author employed jotting to aid in the mapping of the research.

Memo writing was another method of establishing credibility that the author used to ensure correctness and consistency. The author penned the memoranda as the author travelled between each section or analysis of the study. Additionally, memos were kept as new ideas for developing the growing data surfaced (Johnson and Christensen, 2008). It was vital for the author to regularly examine the information using memoranda, patterns, or coded themes. For instance, the author gathered personal reflections and thoughts before and throughout the interview sessions and transcribed them into separate notes.

External validity states that the conclusions of a particular study that may be simplified. Nonetheless, the phrases are not limited to a statistical description based on generalisations to the general population based on the sampled population. The author should have analysed the study's geographical and temporal aspects to generate theoretical generalisations (Walsham, 1995). These dimensions can provide significant explanations for historical data in specific circumstances that may apply to other settings in the future. However, a proper positivistic method diverts interpretive scholars attempting to create theories away from their core objective.

The study should have provided critical explanations for prior details in specific contexts, which could have been applied to various scenarios. As an "interpretive researcher", the author may advise methodically examining the emerging theory from one case to the next and performing a hypothesis testing exercise (Yin, 2003). Interpretive researchers must maintain an open mind when looking for any cause-and-effect link that might explain the trend or occurrence under consideration. Additionally, it would help the evaluation and findings' credibility (Guba and Lincoln, 1994). These specific tasks were

completed while the author or guides generated during the information analysis process assessed the themes.

CHAPTER 4

4 Data Analysis and Evaluation

4.1 Quantitative Data

4.1.1 Questionnaire Survey

The questionnaire survey consists of two sections. The first section (Section A) was to examine the respondents' profiles. The second section (Section B) presented sets of questions related to flooding at the three selected UiTM campuses. It was to find out three main aspects, namely: clarifying respondents' experience with flooding (if any), understanding of flooding risks at the selected Malaysian university campuses where they are located, and assessing their flood risk perception in reducing flooding risks. A description of each of the questions was provided under each table. From that, the author's evaluation, including personal review and observation based on the resulting output of each question, was presented. The copy of the questionnaire survey is attached as ***Appendix A.*** The development of the questionnaire survey questions came from the establishment of theoretical constructs and socio-demographic variables.

4.1.1.1 Section A: Respondents' Profile

Table 4.1 (a): Number of respondents based on gender

Gender	Frequency	Percentage
Male	176	27.6
Female	461	72.4
Total	**637**	**100**

The earlier target was to obtain 90% responses from a total of 700 people from three different UiTM campuses. According to the survey results in table 4.1(a), the response rate was 91%, with 637 of the 700 people in the sample population returning a valid questionnaire. There was a reason why this survey managed to gather many respondents, 637 people. It was because the author decided to randomly select respondents from different

classes and courses at each campus to ensure more extensive engagement and participation. It was done to make sure the questionnaires reached as many people as possible, focusing on the students. The survey was conducted at the end of classroom lessons, and the author promptly collected the questionnaire survey sheet after all respondents finished answering. Thirty-five classes were approached on doing this survey. The number of students in each class varies. It was because there were overlapping classes. Some of the students were combined from different courses and classes when the survey was conducted. Therefore, the respondents were asked not to fill in the questionnaire if they had filled it out beforehand. The questionnaire survey was distributed only to respondents who would like to participate. It is an achievement to know that a significant number of respondents were happy to participate in this study, both male and female. It was good to see both genders' participation in this survey so that the result was more varied, and the study got broader views.

Table 4.1 (b): Cross correlation between respondents' gender and the UiTM campuses at which respondents currently studying

		University				**Total**
		UiTM Dungun	UiTM Segamat	UiTM Machang	Others	
Gender	Male	36	36	101	3	**176**
	Female	165	91	196	9	**461**
Total		**201**	**127**	**297**	**12**	**637**

UiTM is the largest producer of graduates among the public universities in Malaysia, with 35,681 graduates recorded in 2015. Of this total, it was indicated that male graduates were more than female graduates for community colleges and polytechnics, each of which was 56.6% and 51.4%, respectively. Whereas for Malaysian public universities and other higher institutions, the number of female graduates was usually higher than male, including the number of graduates at UiTM. This scenario was considered normal in Malaysia. At the campuses where the surveys were carried out (based on Table 4.1 (b)), which were UiTM Dungun (Terengganu), UiTM Segamat (Johor) and UiTM Machang (Kelantan), the results showed the female domination of the overall survey. UiTM Machang contributed the most significant number of returned questionnaires, followed by UiTM Dungun and UiTM

Segamat. It is due to the number of students in each class. Some of the courses had a higher number of hours than the other courses on different campuses.

The author also had a chance to distribute many the questionnaires at a time at the UiTM Machang campus. Mainly because most of the classes were in one big building, they were easy to reach, and classes started mostly at the same time. Besides, in this question, the total numbers of respondents were referred to by looking at the participation distribution between campuses. The author was satisfied with the number of responses. One should not be too far from another (in terms of the quantity). The author also aimed for at least 100 to 200 participants from each campus.

In the case of this study involving floods, ideas, perceptions, opinions, and experiences were a few essential things to look at. Therefore, every question that was reviewed did not include gender bias. The author embraced the diversity of respondents' participation because of the diverse backgrounds and the possibility that different gender participation could make the results of the survey more varied and unbiased to any campus or respondents. Gender, in total, does provide a different assessment depending on the perspective of the study.

Still, the difference between male and female, as shown in table 4.1 (b), did not affect the overall results because this questionnaire did not examine the effects of physical abilities between genders (for example). The gender bias on female respondents was reflected in the imbalanced number of male and female respondents. However, from the author's perspective, it did not make any significant difference. The author could further analyse gender bias points, but every question should have other sets of cross correlation on gender. On the other hand, the number of male and female respondents was only asked for a record to ensure that each gender had the opportunity to participate in this survey, and their responses were reviewed equally. Furthermore, the "age" and "gender" questions are used in the socio-demographic variables as the basis of the thesis.

Table 4.2 (a): Number of respondents based on their age group

Age Group	Frequency	Percentage
18-20	183	28.7
21-30	452	71.0
Above 30	2	0.3
Total	**637**	**100**

Most respondents were between 21 and 30 years old (Table 4.2 (a)), and this indicates that they are representing a "younger" generation. All the chosen UiTM campuses had their area of speciality studies mainly in Diploma and Bachelor's Degrees, resulting in a large number of younger respondents. The next highest group was those 18 to 20 years old. It indicated that the respondents were all from younger groups of people. The involvement of the younger generation could contribute to the study's "voice". Being a student allowed them a secure place to learn and least worry about disaster risks imposed on them, even though disasters did happen.

Even though this survey targeted students as respondents, their participation was still voluntarily. They were not selected according to their level of study or age. Since the chosen campuses were mostly offered at diploma and bachelor's degree levels, the respondents' age group did not have much difference in their responses. Respondents in the 18- to 20-year-old age group were usually pursuing studies after high school. Respondents in the age group of 21 to 30 years old were most likely to be matriculated or have graduated with a diploma. Hence, it was necessary to identify each group's education level to prove the consistency of the age. Another cross correlation was presented in table 4.2 (b), concerning their current highest education level.

Table 4.2 (b): Cross correlation between respondents' current highest education level and their age group

		Age Group			Total
		18-20	21-30	Above 30	
Highest education	No schooling completed	0	1	0	1
	Completed schooling	11	5	0	16
	College or vocational training	0	0	1	1
	Foundation study	1	5	0	6
	Diploma	139	206	0	345
	Bachelor's Degree	25	231	0	256
	Master's Degree	6	2	1	9
	Doctorate Degree	0	2	0	2
	Prefer not to say	1	0	0	1
Total		**183**	**452**	**2**	**637**

All the questions developed in this questionnaire survey were based on the theoretical constructs and the socio-demographic variables. Therefore, education level is necessary to know more the information in flood risk perception. It could be a determinant factor of how the level of education affects students' perceived risks. The highest number of respondents were from the age group of 21 to 30 years, with the current highest education level is Bachelor's Degree and Diploma. It meant that most of these young people were students who are currently studying at their respective campuses. There was a small number of respondents who were over 30 years old, and this is typical for Malaysian higher education. One of the respondents had the highest current education, a Master's Degree, while the other had the highest current education in college and vocational training. There was one person, from the age group of 21 to 30, who had claimed that he had not gotten any

school education. Checking the respondents' background, he has already been at the UiTM campus for one year or less. His response was not considered valid as there was an inconsistency between the answers.

The results show that the age groups were consistent with their current and highest education level, either a Bachelor's Degree or a Diploma. Respondents needed to have a higher qualification level. It was because this survey required a batch of students who were studying at university and not lower than that. Thus, they should have had exposure and experience on their campus to give their views and thoughts through the survey.

It became problematic when some respondents might select the options for education level that they had completed, instead of choosing their "current highest education level". However, the result was still good with the significant domination of Diploma and Bachelor's Degree students represented about 601 people from 637 respondents (94.4%). The current level of respondents' education was essential to ensure their presence and attendance at the campus where the surveys were carried out.

The author intentionally puts a variety of options ranging from "no schooling completed" to "prefer not to say". It was because the author could not initially be 100 per cent sure what was the respondents' level of education. Even though the author only targeted the students; initial approach might change during the spontaneous survey conducted. It was possible that public people answering it, including building occupants, people attending short courses, staffs, and others. It is just a backup to fit every background of people. When the actual survey was in progress, the author got full cooperation from the university campus administration and support from many lecturers from various faculties to distribute the questionnaire to the students.

Table 4.3: Number of respondents based on employment status

Employment	Frequency	Percentage
Government sector	2	0.3
Private sector	3	0.5
Self-employed	4	0.6
Unemployed	57	8.9
Student	570	89.5
Retired	1	0.2
Total	**637**	**100**

Based on table 4.3, many of the respondents who were students ticked "unemployed" and "private sector" instead of choosing "student" as an option. Students should not have to tick "unemployed". Besides, students who worked part-time or full-time in the "private sector" might as well choose the "student" options. Undoubtedly, lecturers comprising the "government sector" also participated, or maybe those lecturers were "private sector" university staff that were invited to give lectures at the university for some of the courses. This question helps in identifying the basic idea of whether they have an income or not. It could also develop the personal characteristics mentioned in the socio-demographic variables (in risk perception), including some aspects of self-efficacy. The question existed to know the background of the participants and acted as a backup plan. Even though the author favoured student participation before the survey, the author had to come up with a plan in case something came up at the very last minute. Therefore, the author had prepared a question to identify the background of the respondents, such as university staff, administration team, or the building end-user.

Table 4.4: Number of respondents based on the UiTM campuses at which they were currently studying

University	Frequency	Percentage
UiTM Segamat	201	31.6
UiTM Dungun	127	19.9
UiTM Machang	297	46.6
Other campuses	12	1.8
Total	**637**	**100**

There were three main university campuses at which these questionnaire surveys were circulated (Table 4.4). The three UiTM campuses were chosen among other UiTM campuses because of their vulnerability to flooding, according to the university administration (and from NADMA details on each states vulnerability towards flood). Further details may be referred to in Chapter 3, where the description of the selection of the field study was made.

There were also a small number of respondents from other UiTM campuses, including six respondents from the UiTM Shah Alam campus, and another six respondents were from different other campuses. Those twelve people who were from "other campuses" were present at the three UiTM campuses where the surveys were carried out, and they were not permanent students there. The students were the random sample who did the same survey. Since the number was relatively small, this survey treated and analysed them like the whole sample and treated them as if they were. The real difference was that their combined experience at the campus was shorter.

For some questions raised, the responses from respondents from "other campuses" were still considered. The author deliberately provided the option of "other campuses" as the answer option. It was for taking precautionary measures in case the field study (campus location) needed to be changed. Respondents from "other campuses'" presence might be due to several reasons, such as having a short study trip, attending short courses, exchanging students from different campuses, and various other possibilities. The willingness to consider flexibility in the answer form was vital for such a survey so that respondents could choose the answers that were most applicable to their current situation.

Table 4.5: Number of respondents based on the duration of their presence at the UiTM campus

Duration	Frequency	Percentage
Less than 1 year	167	26.2
1-3 years	322	50.5
3-5 years	130	20.4
More than 5 years	18	2.8
Total	**637**	**100**

For this question, the author chose to provide different duration options for the respondents' presence at each of the UiTM campuses (Table 4.5). The total percentage of "more than one year" is 73.7%. It could be concluded that most of them had sufficient time to appreciate their surroundings and gave their beneficial opinions on this study.

The duration could also be used as an indicator of their exposure to flooding risks. The author assumed that respondents' flooding risk understanding was improving along with the length of their presence on campus. Meaning that, if they stayed longer on campus, it could help them grasp the flood situation and experience better. Nonetheless, the minority of the students, which was comprised of 26.2%, was still valid to answer the questions. It was because their "understanding" and exposure to their university surroundings based on time or duration was subjective.

Respondents spent their time at their respective campuses for a different duration, usually depending on how long their study courses were. In Malaysia, the Diploma programmes offered by public universities are usually of three-year duration, while Bachelor's Degree programmes have a duration of between three and four years. A Master's Degree will take about one or two years of study. A PhD needs at least two or three years of study in general but could require as many as seven years for specific specialisations.

Some students indicated that they had been at the campus for more than five years. There were possible reasons for this, for example, the repetition of years of a course due to failure and direct progressions from one course level to the next. For a reasonable period of time, the students had studied on their campus and become a part of its community. It allowed them to express their opinions and views based on their previous experiences of flooding issues at the campus.

4.1.1.2 Section B: Flooding at Malaysian University

4.1.1.2.1 Experience in Flooding (if any)

Table 4.6 (a): Number of respondents previously affected by flooding (if any) in their university campus area

Affected	Frequency	Percentage
Yes	195	30.6
No	442	69.4
Total	**637**	**100**

Nearly two-thirds of the respondents stated they had never been affected by flooding at their campus (Table 4.6 (a)). However, many respondents indicated that they had been affected by flooding in their university area. It was a matter of some concern, both for the students and the university campuses.

Based on the results, the proportion of respondents who had been affected by floods was relatively high. It gave the impression that the three selected campuses had already been and were still at risk of floods, whether on a small or large scale. Since this was a random act of survey distribution, the result of 195 was quite high for the author's expectations. The author expected fewer than 50 people to answer "yes" because of the big flood that hit Malaysia in 2014 that had already happened for the past three years since the survey was conducted. Consequently, the previous respondents might not be present on the campus anymore because their study duration has ended, and people do come and go from the university.

Table 4.6 (b): Cross correlation between respondents based on their experience affected by flooding and the university campus at which they were studying

		University				Total
		UiTM Dungun	**UiTM Segamat**	**UiTM Machang**	**Others**	
Affected	Yes	72 (35.8%)	9 (7.1%)	113 (38.0%)	1 (8.3%)	195 (30.6)
	No	129 (64.2%)	118 (92.9%)	184 (62.0%)	11 (91.7%)	442 (69.4)
Total		**201**	**127**	**297**	**12**	**637**

The author chose those three campuses to get a more variable response, especially from individuals who had been exposed to flood situations. With any luck, the experience could help them give better answers. The answers received (Table 4.6 (b)) were quite interesting because, on every campus where the survey was carried out, some people had been affected by flooding, especially at UiTM Machang in Kelantan. UiTM Segamat recorded a low number of affected people as the previous floods only covered a small part of the campus area. It contrasted with UiTM Dungun and UiTM Machang. Both are located on the east coast of the Malaysian peninsular, exposed to floods due to the north-eastern monsoon change.

The number of respondents affected and not affected by floods was different. It depended on the length or duration of respondents' studies at their respective campuses ***(refer to Table 4.5)***. For this question, responses from twelve respondents from "other campuses" were excluded. As for respondents who chose the answer that they "had been affected by flooding," they were required to answer the next two following questions. One was about the extent they had been affected by flooding (result presented in Table 4.7), and the other one was regarding the total of respondents' financial loss during the flood at their campus (result shown in Table 4.8).

UiTM Machang in Kelantan recorded the highest number of respondents affected by flooding compared to other campuses. The flood that happened at this university campus was due to the abundance of river water nearby. The Kelantan River flows downstream to Machang and some other areas before going out to the South China Sea. The source of this

river comes from several water catchments located in the rugged highlands around Machang. As such, all the areas along the river were vulnerable to flood events. Besides, the amount of rainfall received was another factor that caused flooding in UiTM Machang, which may happen every year.

Flooding at UiTM Dungun in Terengganu happened because of several elements, including heavy rain and rainwater coming down from the nearby hills. Additionally, the UiTM Dungun area was also close to the coastal areas that were prone to flooding. UiTM Segamat experienced flooding because of the continuous rain that caused the Segamat River's water to overflow its banks, which happened on several occasions. It also created a rise in water of about 1 to 2 metres, especially in the lowlands of the Segamat area.

Table 4.7: Number of respondents based on the extent of how they have been affected by flooding at their university campus area

Extent	**Frequency**	**Percentage**
(a) Flooding has caused minor disruption (*e.g., class postponed, delay to work, roads not accessible, minimal damage to properties*)	63	32.3
(b) Flooding has caused moderate disruption *(e.g., loss of communication or relocation to flood evacuation centre)*	132	67.7
(c) Flooding has caused major disruptions *(e.g., serious injury, loss of life of a person you know)*	0	0.0
(d) All of the above	0	0.0
Total	**195**	**100**

In Malaysia, minor disruption is associated with little disturbance to the public but is still under control. Things will get better within a few hours or a few days. Moderate disruption involved the higher authorities taking further action to ensure the safety of the people. It is to reduce the likelihood of any worst-case scenario. The public had to obey the instructions given to them during flood events. Major disruption is considered a critical way of handling disaster events, requiring major help from the army, police forces, and any other agencies. Sometimes the highest state of emergency, called "*darurat*" in Malay, is announced. No respondents had experienced injuries to and/or loss of life to the people they

knew. 100 per cent of the respondents affected by the flooding had faced either minor or major disruption during their flooding experience.

Based on the highest percentage of the answers for a question of "flooding has caused moderate disruption" (Table 4.7), it was specified that most of the respondents had experienced moderate disruption during flooding. The remaining respondents who had been affected by flooding experienced minor disruption. The options provided in the questions were the usual impacts of flooding in Malaysia through the author's readings and observations. While respondents were dealing with minor and moderate disruption, the numbers of respondents affected were still high. Students were relocated to the temporary evacuation centre managed by the university. Students cannot go back to their homes because during a flood, most of the roads are closed and it is dangerous for the public to use.

Table 4.8: Number of respondents based on Table 4.7 estimating the value of their financial loss during the whole flooding events they had experienced at their university campus

Total Loss	**Frequency**	**Percentage**
No loss	156	80
Less than RM 1,000 (~GBP 200)	26	13.3
RM 1,001-RM 5,000 (~GBP 200-GBP 1,000)	11	5.6
RM 5,001- RM 10,000 (~GBP 1,000-GBP 2,000)	0	0
More than RM 10000 (~GBP 2,000)	2	1.1
Total	**195**	**30.6**

This question attempted to provide insights into how severe the respondents' losses were concerning monetary aspects (Table 4.8). Although most of the respondents declared no loss, there were still individuals who lost property or belongings amounting to RM1000 (GBP 200) to RM10,000 (GBP 2000). Even though the majority agreed that they experienced moderate disruptions in the previous question, about 20% of them experienced financial loss during flooding, while the remaining 80% had no loss at all. It could be

concluded that the disruption they experienced was due to factors other than the risks to their finances or properties.

Only 37 respondents stated that they had lost less than RM 1,000 (GBP 200) and not more than RM 5,000 (GBP 1,000). Financial loss from the flooding event was another negative impact, apart from the physical and emotional instability of the flood victims. Their belongings were something that should have been protected at the highest effort, regardless of their amount or value.

It is quite challenging to determine whether the exact amount of money should be considered a minor, moderate, or major loss. It was because only the respective insurance company or professional appointed person by the university could identify the accuracy of the total financial loss. Perhaps their property, such as money, laptops, gadgets, cars, or other valuables, was damaged, or in the worst case, uninsured. Direct losses like this would usually occur.

Hence, it was becoming the individual and institutional responsibility to assess the loss. Knowing the amount of loss was the first step towards further action, laying out responsibility and evaluating the additional risk of the disaster (UNISDR, 2014). Those who have been facing financial loss should report the damage to their belongings or properties and seek help from the university. The total loss that had been recorded by the university administration should be one of the university's indicators of the severity of the flooding events.

4.1.1.2.2 Causes of Flooding

This section was to test the respondents' knowledge and perceptions of floods that happened at their university campus (Table 4.9). It could help to look further into their understanding to increase their resiliency towards floods and broaden their views on understanding flooding effects. Through understanding those factors, the responsible stakeholders could take appropriate measures in preparation to prevent or reduce the unwanted risks from happening.

Table 4.9: Respondents' observation on the possible causes of flooding that happened at their university campus area

Cause(s) of Flooding	Yes	No
(a) Heavy rainfall	315 (71.3%)	127 (28.7%)
(b) Monsoon	120 (27.1%)	322 (72.9%)
(c) Coastal and tidal	58 (13.1%)	384 (86.9%)
(d) Flood defences failure	51 (11.5%)	391 (88.5%)
(e) Reservoir or dam failure	38 (8.6%)	404 (91.4%)
(f) Drainage failure	110 (24.9%)	332 (75.1%)
(g) River flooding	96 (21.7%)	346 (78.3%)
(h) Sewer flooding	34 (7.7%)	405 (92.3%)
(i) Not Sure	33 (7.5%)	409 (92.5%)

Respondents were able to choose more than one answer. There were a variety of answer options provided in the questions. Those were based on the usual causes of flooding in Malaysia. Of course, there were many more complex causes, but the author simplified them from the Malaysian Department of Irrigation and Drainage (DID).

It does provide that there are few causes of flooding in Malaysia, such as increased runoff due to urbanisation, loss of flood water catchment areas, inadequate drainage systems, construction at bridges and culverts, land clearing operations, heavy rainfall, tidal backwater, and insufficient river capacity. However, the DID taking those causes happens in urban areas like Kuala Lumpur, Penang, and Kuching (Department of Irrigation and Drainage, 2017a). The author had to make a few adjustments from the literature review in Chapter 2 to gather all the possible causes that would impact the chosen campuses according to their locality.

When respondents were asked for their opinion on what the possible causes of the flood events at their respective university campuses were, a majority agreed that heavy rainfall was a significant cause. For this question, the majority response rate was 69.4%, meaning 442 respondents gave their answers, while 30.6%, or 195 respondents, did not respond. Since this question did not provide any options to leave it blank, responses from every respondent were highly expected. However, receiving 30.6% of respondents not answering these questions gave some uncertainty to the author. This is because the meaning of each flooding "cause" had been provided in the question.

It was not an overstatement to say that respondents were leaving the answers blank because they did not know how to respond to the subject that they knew nothing about. In addition to that, there were no respondents who answered "other possible causes" of flooding as their answer. 33 respondents chose "not sure" as an answer. It denoted their lack of awareness and understanding of the situation, as they would be unable to recall any of the flooding causes in their surroundings, or simply because they were unsure how to respond.

UiTM Dungun is located on the coast. Only 12 respondents, out of 130 respondents in UiTM Dungun, believed that the monsoon was one of the flooding factors for their campus. In the real situation, the Dungun area or Terengganu area was the area affected by flooding because of the monsoon season, as mentioned in the literature review. The same response was received when coastal and tidal should be one of the reasons for UiTM Dungun's flooding. However, the majority did not agree with this. It might be because they did not seem aware that their location is prone to the monsoon, or that they did not see the monsoon and coastal threats as risks to them. This result could be something to ponder on respondents' lack of knowledge. Flood defence failure, reservoir dam failure, drainage failure, river flooding, and sewer flooding altogether were the leading causes of flooding in Dungun (Yusoff and Aziz, 2018; Utusan, 2018; Sinar Harian, 2018; Kosmo, 2018; Buletin Online, 2018).

However, only small numbers of respondents agreed to all those causes. On the other hand, the same goes for respondents' survey results at UiTM Segamat and UiTM Machang. The majority only agreed on heavy rainfall as the cause of flooding at their campus. Conversely, the reason flooding happened at Segamat was the monsoon, flood defence failure, drainage failure, and river flooding (Utusan, 2017; Komoo, 2018). Since UiTM Machang is in a hilly area, heavy rainfall could only be the primary factor, apart from monsoon seasons.

It was a positive response given by the respondents that heavy rainfall caused flooding. It was quite surprising to see that all the other factors got such a meagre percentage (all under 27%) for each factor given. It was probably because each of the campuses experienced different causes of flooding. The result of the respondents' understanding was in line with the frequent floods occurring throughout Malaysia. If heavy rainfall lasts for some time, or a few days, water will rise immediately in the high-risk area. Monsoon events also contribute to flooding severity. Both two causes of flooding were caused by nature and could not be determined by humans because of their natural factors. Next on the list was drainage failure.

In the university area where the survey was conducted, all drainage universities were in a satisfactory state (based on author personal observation and details given by the staff). However, rainfall capacity and the quantity of floodwater were too large to be accommodated by the existing drainage. The university campuses have also taken an initial step by providing a more massive flood catchment reservoir to cater to more severe flood events. Besides, the upgrading of drainage and its systems must be in line with current university development. The next part under this section provides a cross correlation between the UiTM campuses where the survey was carried out and the different possible causes of flooding (a to i).

Table 4.9 (a-i): Cross correlation between the UiTM campuses where the survey carried out and the possible cause of flooding based on respondents' observation at their university campus area

University		**UiTM Dungun**	**UiTM Segamat**	**UiTM Machang**	**Others**	**Total**
Cause(s)	(Y/N)					
(a) Heavy rainfall	Yes	105	80	123	7	315
	No	25	38	60	4	127
	Total	**130**	**118**	**183**	**11**	
(b) Monsoon	Yes	12	50	54	4	120
	No	118	68	129	7	322
	Total	**130**	**118**	**183**	**11**	
(c) Coastal and tidal	Yes	6	38	13	1	58
	No	124	80	170	10	384
	Total	**130**	**118**	**183**	**11**	
(d) Flood defences failure	Yes	12	13	25	1	51
	No	118	105	158	10	391
	Total	**130**	**118**	**183**	**11**	
(e) Reservoir or dam failure	Yes	4	16	18	0	38
	No	126	102	165	11	404
	Total	**130**	**118**	**183**	**11**	
(f) Drainage failure	Yes	43	16	49	2	110
	No	87	102	134	9	332
	Total	**130**	**118**	**183**	**11**	
(g) River flooding	Yes	47	19	29	1	96
	No	83	99	154	10	346
	Total	**130**	**118**	**183**	**11**	

(h) Sewer flooding	Yes	4	15	15	0	34
	No	125	102	168	10	405
	Total	**129**	**117**	**183**	**10**	
(i) Not sure	Yes	7	8	16	2	33
	No	123	110	167	9	409
	Total	**130**	**118**	**183**	**11**	

Based on all the cross correlations from Table 4.9 (a) to Table 4.9 (i), most of the respondents from the three UiTM campuses believed that flooding did not happen at their campus for any other reason than heavy rainfall. It means that they agreed that heavy rains are the most likely possible cause of flooding. According to the previous explanation (refer to Table 4.6 (b), the cause of the flooding at the university was caused by a variety of factors other than heavy rain. It is then discussed in the discussion section of Chapter 5. Flood risk assessment by an individual was inevitable. Respondents' assessments were essential to know how well they understood the flooding situation, avoided the risks, and dealt with flooding. Further analysis and recommendations could be made, including the future management of the flood risks posed by possible causes of floods.

Table 4.10: Respondents perceptions on flooding impacts that they were afraid of at the university campus area

Factor	Yes	No
Personal health and safety	460 (72.2%)	177 (27.8%)
Relocation of people	264 (41.4%)	373 (58.6%)
Damage or loss to personal belongings	376 (59%)	261 (41%)
Interruption of studies or work	315 (49.5%)	322 (50.5%)
Making buildings you live and work unsafe	258 (40.5%)	379 (59.5%)
Communication disruption	259 (40.7%)	378 (59.3%)
The difficulty and cost of getting back to a normal state	256 (40.2%)	381 (59.8%)
Not Sure	15 (2.4%)	622 (97.6%)

Respondents always had their worries about the impact of flooding. They were asked about the impacts they were afraid of and worried about. A majority agreed that their health and safety were of the utmost importance and had to be well taken care of. However, the author found out that 27.8% had no perception of danger (personal health and safety) in floods. This is a bit disturbing. It is the wrong perception because everyone should prioritise their own wellbeing when facing flooding or any other disaster. The difference between the "yes" and "no" answers between the remaining factors was within a small gap, which means that the respondents were all concerned about all factors concerning the flood impacts.

Table 4.11: Respondents opinions on types of help they needed during flooding

Types of help needed	Yes	No
Receive accurate instruction	378 (59.3	259 (40.7%)
Fast relocation	398 (62.5%)	239 (37.5%)
Appropriate placement for affected people	377 (59.2%)	260 (40.8%)
Enough basic needs	403 (63.3%)	234 (36.7%)
Sufficient workforce or rescue teams	385 (60.4%)	252 (39.6%)
All the above	26 (4.1%)	611 (95.9%)

Each of the respondents gave more "yes" responses to each type of help presented in the questions (Table 4.11). Since most of them have individual preferences, only a small percentage of them chose "all of the above" as an answer. Since respondents could tick more than one answer to this question, they selected multiple options that, in their opinions, they felt were required in the event of a flooding emergency. From the responses, it showed that people did have ideas and knew their needs in case of future flooding. Most respondents agreed that they needed enough basic needs during flooding. If they were trapped at their home or at one of the flooding evacuation centres, it should be sufficient for survival.

The 2005 Hyogo Declaration states that (UNISDR, 2005);

"*States have the primary responsibility to protect the people and property on their territory from hazards, and thus, it is vital to give high priority to disaster risk reduction in national policy, consistent with their capacities and the resources available to them*"

and

"***Strengthening community level capacities to reduce disaster risk at the local level is especially needed, considering that appropriate disaster reduction measures at that level enable the communities and individuals to reduce their vulnerability significantly to hazards***"

However, because floods cannot be predicted, not all flood management teams were able to deliver these items on time. Attempts to meet people's basic needs may endanger those involved in the process of meeting those needs, as it places risks on the person in charge.

As supported by the previous survey question, a high response was recorded. Respondents were happy to be relocated to a safer place as soon as they realised, they would probably be in danger. Flooding is a time-sensitive matter. Plus, temporary shelters for affected people need to be made available. Respondents were expecting good helping hands from the recovery team. The temporary shelter and necessities were needed for people to survive for several days or until they could go back to their place.

Receiving accurate instructions is another significant help. During a flooding emergency, people would probably hear too much information, or they might listen to very little information during their hard times. If they received the wrong information, it could lead people to greater danger. The authorities or trusted parties should only instruct by using appropriate communication channels. A small number of people might not be sure of what they could expect from the recovery management team. These people might follow their instincts in a particular situation. It is entirely not wrong but having some expectations would be better together with training and practice.

4.1.1.2.3 Reducing Flood Risks

Table 4.12: Respondents' sources of information regarding ways to deal with flood risks

Information	Yes	No
(a) General reading (book, magazine, journal, scientific paper, newspaper)	235 (36.9%)	402 (63.1%)
(c) Friends or relatives	198 (31.1%)	439 (68.9%)
(e) Information leaflet by the university	108 (17%)	529 (83%)
(f) Health and safety talk by the university (not include training)	78 (12.2%)	559 (87.8%)
(d) Government and local authorities	98 (15.4%)	539 (84.6%)
(b) Internet and social media (TV, radio, Facebook, Twitter)	398 (62.5%)	239 (37.5%)

There was a lot of information available for the respondents to gain knowledge on how to deal with flood risks. For this question, there were six different possible options that they could choose from, but only one got the highest preference (Table 4.12). Most respondents got information on how to deal with flood risks mostly through the Internet and social media. The respondents did not prefer the other five remaining options, resulting in the higher response for the "no" answer.

A minority of respondents still preferred to get information about flooding risks through other sources. One of them was through their general reading. Reading may be present in a variety of sources, for example, books, magazines, newspapers, journals, or scientific papers. Other sources were from friends or relatives. Flood information could be delivered through stories from those who have experienced or have lived in areas where floods are not new. There were several "sources" that got inadequate responses. Among them were an information leaflet by the university and a health and safety talk by the university.

It showed that these respondents were lacking or did not receive such information continuously.

The same situation applies to getting information from the government and local authorities. For this question, 27 respondents (4.2%) left the answer blank. The Internet and social media could spread information on dealing with floods quickly and easily and reach more substantial communities. This question provides options for respondents' preferences in choosing their medium of information. One could choose reading, browsing through the Internet and social media, or asking their family circles, including friends and relatives (for example, options a, b, and c).

There were also different mediums of information based on the availability provided by the organisational administration (for example, options d, e, and f). Responsible government or local government and a university would always provide necessary information and guidelines to the public, not only during flooding events. It was to offer essential precautions to vulnerable people. Sometimes, not all sources of information are reliable. For example, books are an excellent source of information, but they could be out of date in terms of their publication. Some websites on the Internet are not all credible, as the authorities before distributing the information to the public should have verified the information.

Therefore, choosing the correct information was the responsibility of the Internet user to avoid false information that would result in threatening themselves. Whatever the sources are, the respondents or the individuals should have the ability to identify credible and non-credible information sources for their benefit.

Table 4.13: Respondents opinion on the helpfulness of direction signage at their university campus for an emergency evacuation if flood emergency happens

Signage	Frequency	Percentage
Yes, it is helpful	428	67.2
No, it is not helpful	26	4.1
I don't know if there is any	112	17.6
Not sure	71	11.1

Most of the respondents agreed that directory signage at their university was helpful for an emergency evacuation if a flood emergency happens (Table 4.13). On the other hand, quite a significant response from the respondents was mentioning that they did not know if they knew the existence of this signage. A small percentage agreed that this kind of signage did not help at all. The probable reason respondents who answered, "I don't know if there is any" was maybe because the signage was lost or not in the proper place.

For example, the standard route or walk passage, they did exist, but in inadequate quantities, and the staff did not do a check-up and put concerns about these signage issues and many other factors. A small number of respondents were "not sure" about the signage. Each university in Malaysia should have an emergency evacuation space, usually in the event of a fire, but somehow it could be used for other emergencies such as flooding. Proper directory signage could help to guide people through a stressful and time-sensitive event. The need to provide emergency management at work is mandatory under the legislation relating to occupational safety and health. Although not mentioned directly under the Occupational Safety and Health Act 1994 (Act 514), Section 15 explains the arrangement to be established so that the workplace and its people are safe at work or work.

"...People in control of the workplace (that was building owners who were not the employer) must ensure that the workplace, including entrances and exits safe and without risks to safety and health. Section 18(1) of the Act, requires that an occupier of a non-domestic premises which has been made available to persons, not being his employees, as a place of work, or as a place where they may use plant or substance provided for their use there, shall take such measures as are practicable to ensure that the premises, all means of access thereto and egress therefrom available for use by persons using the premises, and any plant or substance in the premises or provided for use there, is or are safe and without risks…" (Occupational Safety and Health Act, 1994).

Table 4.14 (a): Respondent's opinion based on the safeness of occupying the university campus building

Building Safety	Frequency	Percentage
Yes, I feel safe occupying all the university buildings	497	78
No, I only feel safe occupying some of the university buildings	140	22

Table 4.14 (b): Cross correlation between respondents' opinion based on the safeness of occupying the university campus building and the university campus at which they were studying

University		**UiTM Dungun**	**UiTM Segamat**	**UiTM Machang**	**Others**	**Total**
Safe	Yes	156	90	242	9	497
	No	45	37	55	3	140
Total		**201**	**127**	**297**	**6**	**637**

Respondents' opinions on each campus vary (Table 4.14 (a) and (b)). There was a total of 488 respondents (excluding the respondents from other campuses) who had a firm belief that the university buildings they occupied were safe. It was a good indicator for the university administration. Nonetheless, 137 respondents (excluding the respondents from other campuses) did not feel safe at their university building. The university should try to reduce the unsafe feelings among the building's occupants, especially the students, as this matter could affect their wellbeing.

University buildings that were involved in flooding disasters need to go through an assessment to identify any damage, either damage to structures or damage to the building envelope, including its contents. Building contents could be damaged when water penetrates the building, destroying the furniture, fixtures, and fittings of the university building, including classrooms, laboratories, offices, and others. Physical damage or destruction of buildings and property could cause contamination from chemical, radiological, or biological leakage from laboratories and stores.

Table 4.15: Respondents interests to participate in any activities involving flooding risk projects, partly or wholly.

Joining activities involving flooding risk projects (Volunteering, raising awareness to the community)	Frequency	Percentage
Yes	421	66.1
No	77	12.1
Not Sure	139	21.8

Table 4.15 shows that most of the respondents were willing to participate in the activities, and only a small number of respondents did not seem interested in participating in the respective activities. Many of the respondents were happy to join in any related flood risk projects, including volunteering and raising awareness within the university community. It is shown that many respondents had the awareness to help society and contribute back to the people. For respondents who answer "no" and "not sure" about this question, they may not be sure of the method they could engage.

The university should provide a platform that they could use to help the community and engage in NDRR issues, particularly flooding. Exposure like this is significant in improving people's resiliency to the consequences of flooding. For Malaysian universities, there are several units of uniformed teams that could be joined by students, such as SISPA, PALAPES, KOR-SUKSIS, and others. Those are the bodies that will provide early aid if floods occur. The University of Malaysia Volunteers Council (MASKUM) was established on August 13th, 2007, under the Public Institutions of Higher Learning Malaysia to organise the activities for the public universities in Malaysia appropriate to the event. The vision is to be the leading body for Malaysian public university students through the involvement of volunteer work and charitable activities while providing emergency relief. The mission is to improve awareness among Malaysian public university students towards disaster management in Malaysia and how significant their involvement and contributions are.

A medium like this could provide the university community opportunities to get involved with NDRR efforts. It is for everybody to have more access to flood-risk projects within the university that could change their perspective. All the activities or projects included must be an attractive programme.

Table 4.16: Types of the medium via which respondents would like to receive information on safeguarding them from flooding risks at all time

The Medium of Information	Yes	No
Public broadcasting (government mass media, Internet, TV, and radio)	505 (79.3%)	132 (20.7%)
University official website	227 (35.6%)	410 (64.4%)
Email from the university	105 (16.5%)	532 (83.5%)
University newsletters	67 (10.5%)	570 (89.5%)
SMS/text alert from the university	215 (33.8%)	422 (66.2%)
Not interested	11 (1.7%)	626 (98.3%)
Not sure	23 (3.6%)	614 (96.4%)

Most of the respondents preferred to receive information on safeguarding themselves from flooding risks from public broadcasting, for example, government mass media, the Internet, television, and radio (Table 4.16). This medium of communication would provide resources on what was happening on a larger scale, as well as more detailed information and an approach. People could quickly get the same information at a much faster rate.

The respondents were happy to receive information through their university's official website and via text alerts. There will be information available on emergency access and contact numbers, what to do during emergencies, and other related issues with recovering during and after flooding. An SMS alert is an excellent medium when people do not have access to the Internet during a flood. The respondents were less keen on getting information via email. Maybe they would have a bulk of emails and did not know which emails should be treated as of high importance. Some of the respondents are "Not interested" in receiving information and answered "Not sure" about this.

Table 4.17: Statements concerning the university flooding

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
(a) The university area that previously not subjected to flooding is now at high risk	16 (2.5%)	98 (15.4%)	342 (53.7%)	167 (26.2%)	14 (2.2%)
(b) I am aware of the potential flood risks that I may face	4 (0.6%)	14 (2.2%)	128 (20.1%)	442 (69.4%)	49 (7.7%)
(c) I know which are the high-risk building or location during flooding at the university area	5 (0.8%)	36 (5.7%)	279 (43.8%)	282 (44.3%)	35 (5.5%)
(d) I know which administrator to contact if I had concerns about flooding at the university area	4 (0.6%)	41 (6.4%)	260 (40.8%)	305 (47.9%)	27 (4.2%)
(e) I am well informed about the precautionary steps at the university if flooding happens	6 (0.9%)	37 (5.8%)	220 (34.5%)	341 (53.5%)	33 (5.2%)
(f) I believe "Sustainable Flood Management" (put concerns to the economic, environmental, and social effects) should be implemented in the	3 (0.5%)	8 (1.3%)	135 (21.2%)	337 (52.9%)	154 (24.2%)

university flooding emergency and recovery planning	

Table 4.17 represents the frequencies and percentages of respondents based on the aspects concerned in the university areas. Based on the statements given, most of respondents answered "Agree" for every question, except for the first questions where the majority answered "Neutral", which means they might agree or disagree. Most of the respondents are aware of the potential risks of flooding that they may face in the future.

However, contrary to their answer, most of them answered that they are not sure if their university area is at risk for future flooding. The university community should know that every university campus in Malaysia is at risk of flooding because flooding is considered the number one natural disaster problem in Malaysia. They also knew which areas or parts of their university were prone to flooding. It shows their alertness to high risks or low risks of flooding areas at their campus. They are also positive that they already knew the steps to survive during flooding and knew whom to contact if they had concerns about flooding. The respondents also agreed that sustainable flooding management should be implemented at their university.

4.2 Qualitative Data

4.2.1 Interview Results

This section presented the discussion sessions and outcomes with ten university staff interviewed at the UiTM campuses *(see methodology chapter for justification).* The questions asked of the interviewees were based on three main issues: i) University flooding experience at each UiTM campus; ii) University building recovery; and iii) Post-flooding reconstruction and management. There were three interviewees, both from UiTM Shah Alam and Segamat, two interviewees from UiTM Dungun, one interviewee from UiTM Machang, and one from UiTM Kota Bharu.

The number of interviewees involved was based on the person in charge being available and ready to give their cooperation for prearranged interview sessions. They came from various departments in charge in the event of a flood, including Facilities and Asset Management and Administration, Project and Design, Occupational Safety and Health

Management, and Energy and Telecommunication. The interview questions list was included as ***Appendix B.***

The author could not have accurately represented the interview outcome. This is because the interviewees' sharing is minimal and falls short of the author's expectations. On the other hand, the author attempts to make the little details as valuable as possible. The author was forced to agree that UITM Malaysia's limited teams could not provide additional assistance. Only one or two employees are aware of the university's risk management policy at each campus. At UITM Malaysia, the risk management and crisis management teams are in their infancy. It is a significant challenge for the author to obtain a complete response in identifying the flooding issue at large, as most respondents skip the interview questions and are prepared to just talk about flooding in general.

4.2.1.1 Interviewee 1 (UiTM Shah Alam)

Each of the UiTM campuses played a role in ensuring the safety of the campus and the community. The vision, mission, customer service, and quality objectives guided them. Most of the teams involved in the immediate action when risks involved were, the infrastructure division, occupational safety, and health, and electrical and telecommunications. Floods that occurred in UiTM Shah Alam came from the result of heavy rainfall. In the event of heavy rain, the rainfall was monitored, and the campus team practised the concept of wait and see. When floods hit, the campus needed help from the university police to provide a way for alternative roads. It was to prevent the public from having to go through the flooded areas. This alternative was a quick action from the “university police”. UiTM Shah Alam also had a rescue and volunteer team that would assist in the process of flooding recovery. Although flood events were not happening recurrently, the process flow needs to be understood. When a flood risk was detected, the flood crisis room was established, and the public could contact the flood operations team. So far, UiTM Shah Alam campus flooding had not destroyed property.

There were proposals to reduce flooding risks at the main campus, such as creating more water reservoirs, water door closures, and flood insulation. Design and project team had to evaluate any new coming project. There were some improvements made by the UiTM Shah Alam through integrated operations, such as adding water pumps, widening drains, increasing flood resistance, and increasing road height. Soil contouring had also been carried

out. The main campus entrance area was more rugged than the surrounding area; therefore, more precautionary measures were needed.

For projects involving pumps to prevent flooding, filter cleaning was done once every six months to help the water run smoothly. Every other project such as building, road, infrastructure, and two years warranty was obtained from the contractor. When a project completed, the landscape team would take over. Whereas when it comes to building maintenance, there were contractors who carried out monitoring activity. The university supervisor would notify the appointed contractor if there were any issues involving damage to university buildings or surrounding area. The facility team released the estimated cost of recovery to obtain approval and allocation from the university treasurer. All quotations, tender-related matters, and retail prices were identified and analysed at the pre-tender meeting. The selected contractor must meet all the requirements.

4.2.1.2 Interviewee 2 (UiTM Shah Alam)

Public universities in Malaysia manage disasters according to the SOP for disaster management issued by the Ministry of Education Malaysia. Flood operations were usually carried out according to state law but should be based on the decisions of the campus committee. UiTM Segamat, Dungun, and Machang risk coordinators were under the quality unit, and the chief was the rector of each campus. Some of the steps taken to reduce flood risk on the campus were to create a retention pond, run a flood mitigation project, elevate low-ground areas, and increase drainage where floods usually occur.

To reduce the flood risks, campus topography was identified to reduce the impact on the areas at risk. The university innovation centre would provide information to those involved in flooding and send their staff before the contractor took over the responsibility. If this was not possible, an application was made to take further action.

Each operating zone within the campus had a technical team to handle any arising problems, whether they involved building issues or infrastructure. If it still failed, the project team would take over the matter. The contractor in charge was accountable for the repair work while they were still under contract. The public may make an emergency call at 4444, direct to the crisis team to create reports, or may deliver their complaints. The team would respond to the report by issuing a referral. The project teams were responsible for the site visit, report on the study, identifying issues regarding the project and contractor appointment. In resolving the matter, a private university IR engineer would play a role.

Otherwise, external expertise was used, including the selection of an external consultant, especially in design and building matters. An experienced faculty lecturer could also assist in disaster recovery for the existing building.

The selected consultants then issue reports on work cases, including identifying problems. If the university and its area did not cause the root problem, the other authorities involved should be notified. In the event of a more significant issue, a paperwork procedure was provided, followed by tender advertising and site visits by the contractor. Completed documentation was analysed, and it would take up to six months, as it would include external agencies and authorities' approval. Each project includes activities such as conducting meetings and feedback from the end-user, identifying the complainant, defining the process for application, identifying requirements, timeline, design, urgency, and availability of the current contractor. The university always preferred refurbishment work because the cost involved was lower. Currently, the need for setting up green building or resilience-building means higher prices, and this was not the best decision and preference within the time frame.

To prevent any breach of trust or misappropriation, the quantity surveyor was to provide paperwork to calculate the exact cost. In the event of an emergency, issues were taken over by the treasures to make sure recovery work ran fast. As soon as information about an emergency was presented, the budgetary committee for the emergency project issued a quote. Current contractors with direct tenders were prioritised because the process would be more straightforward, and they were more aware of responsibility and design.

.

4.2.1.3 Interviewee 3 (UiTM Shah Alam)

The disaster management committee and volunteers carried out flood management and recovery issues. Among the things that were done through strategic planning and innovation, The university identified the risks associated with flooding and strategic risk management and identified the steps involved in office security. The decision-making process involves several divisions, including the flood committee, the university main campus committee, the executive meeting, the university board of directors, and several units on the board of directors.

4.2.1.4 Interviewee 4 (UiTM Segamat)

Every move made by the UiTM campus was based on the risk management guidelines issued by the UiTM main campus, which is UiTM Shah Alam. Given that each campus had its own unique risks, university risk management was always prepared to face any form of threat.

The flood at UiTM Segamat occurred because the rainforest had turned into a residential area. Consequently, floodwater flows into the campus area. In 2010, floods from nearby rivers caused flooding. However, the situation became less severe because, at the time of the flood, students were on their academic break. From 2013 to 2014, flooding on campus occurred again. It resulted in the loss of access for vehicles, such as cars, to enter and exit the campus. Security officials advised the public not to enter the university. There was a particular risk reduction input for students by ensuring that cafes on campus could provide enough food for the people who had been trapped inside the campus during flooding. The supply should last at least 3 to 4 days.

In the event of a flood, the campus required cooperation from the police to assist in the operation. It also includes advisors from the student groups, staff, and administrative secretariat. Not only that, but partnerships with several parties were also carried out, such as with the Johor state flood relief and Segamat district office. The campus also had a plan to provide volunteers and to ask for help from the district committee to provide food supplies. Information about floods was displayed on the campus website. There was also a 24-hour operation of the crisis room. A notification was sent to student representatives and staff, through emails or "WhatsApp" where possible.

4.2.1.5 Interviewee 5 (UiTM Segamat)

If flooding happens on the campus, the guard would be among the first people to notify the management team. Facility management and building operations teams carried out activities related to university building improvements. If it involved a large project, the university aided and cooperation from the public for repairs and cleaning purposes. If any recovery work was included, the proposal came first and led to further costing and budgeting. The university management team's work was mainly based on public complaints, including those from students, staff, or contractors.

The response time was about one hour. Somehow, it would depend on the seriousness of the issues. It would take around 3 to 7 days for the team to provide solutions. If it took more time for the contractor to resolve the problem and exceed the agreed upon contract, a new contractor had to be appointed. The process of selecting a contractor was done by having the voting work done by the university treasurer. The work involved the process of drawing votes, listing numbers and turns, preparing proposals, preparing a bill of quantities, dealing with consultants, and budgeting.

The main problem at UiTM Segamat was the slope around the campus. An action plan should include ways to act in the event of a food shortage on campus during floods, increase road levels, and make road improvements to reduce flood risk. In the event of an emergency, the recovery costs of the disaster impact shall not exceed the fixed ceiling price. Any waste would be minimised.

Furthermore, the disadvantage of the UiTM campus was that it did not have an IR engineer; therefore, consulting help was much needed. Unlike at the main campus, there was an IR engineer who could make decisions on behalf of the university. When it came to students' college, there was an appointed person who would take care of those student accommodation buildings and monitor any crisis that might occur. Imagine the moment when a flood happens, and students are directed out of their building through an emergency staircase to a safer place. Auxiliary police called the firefighters, hospital, and ambulance to assist as soon as possible.

4.2.1.6 Interviewee 6 (UiTM Segamat)

Complaints from both the public and the community were received through the Facility Management System. The system provides an "e-complaint" for end-users to report any problems related to assets and facilities under university supervision. The system operates daily, seven days a week, including holidays. A meeting was held in response to each complaint received. There were some problems when the maintenance was required. For example, complainants were difficult to contact, it was hard to set up appointments, there were difficulties assessing some rooms, and an increased number of complaints were received.

The university requires two-way communication and cooperation from the public. For anyone facing a disaster, the individual was advised to report it to the university for real-time emergency assistance. If it involved engineering and maintenance work, the in-charge

technical officer interpreted the damage and made a follow-up report on the problem. If necessary, they were advised by the rector, including the facility team, where required.

However, the university team always adheres to the university's vision and mission of addressing the disaster. Conducting workshops, seminars, and studies, the work and revised issues arise over time. It was imperative because the team wanted to make sure that all the approaches implemented were precise and up to date. Every plan requires an endorsement by the administration. Staff were always welcome to receive training through specialised workshops, and these workshops were standardised among the other campuses.

4.2.1.7 Interviewee 7 (UiTM Dungun)

Building care and facilities were focused on end-users. End-users such as building occupiers, students, staff, and visitors could provide their complaints or reports through "e-complaint", a reporting initiative online. In the event of urgent repairs, for example, flood damage, instructions were issued to the contractor to repair for seven days. To ensure the smooth running of these compelling pieces, quotes were sent to the finance department for approval. If the repair costs involved a total cost of less than RM5,000 (GBP 1,000), recovery and maintenance work could take less than seven days. The facilities management team was responsible for overseeing the damage to buildings involved in the flood, obtaining approval and allocation from the administrators, and beginning the process.

Among the printed documentation that was available for reference were a meeting memo from the team and an inspection by the person in charge. For example, building inspections and facilities checks were conducted in each classroom at the end of each semester. The activities involved were space audits, identifying damaged facilities and providing quotes for repairing damaged university property. Some of the most common problems were the waterproofing system on the roof and rusted iron structure on some parts of the building. Old structures, when exposed to water, could cause decay, loose iron, and chipped cement. Any work required opening the tender contract, and the cost incurred used the existing management money allocation. The selected contractor was contractually bound and given two months to complete the work assigned, or on a case-by-case basis.

The voluntary team from the university monitored the progress, and the contractor worked within those two months. If the contractor had experienced a delay, the team conducted a meeting, and a warning letter was issued to the contractor. A second warning letter was issued if it was still delayed, and after the third warning letter, the university had

to take action to terminate the contractor. University engineers should find the best method for the purpose of building recovery and repairs.

One of their roles was to choose a durable construction material and do direct negotiations with the contractor, who also happens to be a specialist. They had to put the importance of quality on top of everything. It might require time and transparency. However, in the search for quality items, the cost of construction would automatically increase. It was a fact that the university had to deal with. In the event of an emergency, such as a landslide after a flood, the university directly contacts the Ministry of Finance Malaysia for approval on the emergency allocation. UiTM cares about meeting resilience, green building, and sustainability issues. All decisions, policy development, and management policies, however, were made at the main campus.

4.2.1.8 Interviewee 8 (UiTM Dungun)

The monsoon season, which occurs every year, caused flooding on campus. this campus, there was no such thing as "real floods". The campus location was very close to the beach. However, there were floods in several parts of the campus. The university has taken some steps to upgrade several buildings. For example, upgrading the ground floor area of the building has affected. The other course of action was to clean up buildings and areas as well as repair damaged buildings, including pedestrian areas.

4.2.1.9 Interviewee 9 (UiTM Machang)

The facility management team should advise the university administration about flood mitigation measures. The management would provide budget allocation. As such, it would also depend on the costing of the recovery works. If a flood recovery work was categorised as an emergency, the vice-chancellor must approve the emergency work within three days. The flood crisis centre would be activated immediately when a major flood occurs. For students living in residential college and university facilities, they had to refer to the person in charge at each college. Among others who played an essential role were, the officers for students' accommodation, maintenance administration including the vehicles unit used for emergency. The university's flood operations had received support from the government and NGOs.

4.2.1.10 Interviewee 10 (UiTM Kota Bharu)

Disaster stages in UiTM are based on the case study SOP, which consists of three levels. The first level of disaster staging is the cautious state of the incident. Small incidents could occur at any time, and they are not life-threatening. The incidents could impact the property, safety, health, and environment. This incident is not capable of spreading to a broader area. Among these small incidents are flash floods in small spaces, power cuts, and small fires. The second stage is an emergency. This phase requires involvement from the university's disaster operational centre.

Where necessary, assistance from external agencies is needed. It means that this emergency can spread to a more significant area. This stage could result in the loss of life, health, and property and is likely to be involved on a large scale. Examples of emergencies are floods, earthquakes, and fires that are still under control. The third stage is a disaster and is considered a very critical situation. When this happens, the university will not be able to manage it alone.

Therefore, assistance from external agencies, including NGOs, is needed immediately. The disaster attempts to spread to more extensive areas, causing destruction and threatening the security of the university community. Critical disasters are, for instance, massive floods or earthquakes that could cause buildings to collapse or large fires. The university's higher administration will provide an emergency statement when they have reviewed the situation. Among the emergency announcements are the suspension of university sessions and the closure of campus operations.

Every flood relief action delivered to victims varies according to the needs and conditions. There are some risks to be faced. For example, if the floods occurred on a large scale, it would be difficult for the distribution of necessities, poor coordination of work, and difficulty getting into a remote area. It might even involve a scarcity of workers, a lack of transport, bad accessibility, and bad weather. Considering all the challenges that might be involved, this case requires preparation and enough supplies. Competent and robust rescue staff would increase the chances of assisting more people who need help or increase the volume of distributing the necessities.

Table 4.18: Coding for Social Demographic Variables and Results from Respondents (Based on the questionnaire).

Social Demographic Variables (Main coding) (Adapted from socio demographic variables ; *See Table 3.3, Page 177*)	**Result from Respondents (students) (Sub coding)**
Gender	Female (majority)
Age • Personal characteristics	Younger people (21-30 years old) (majority)
Education level	Bachelor's Degree and Diploma (majority)
Employment Income	Students (majority) No income (majority)
Location	Flood prone are campuses (all three campuses)
Length of residency • Hazard sources	More than 1 year (majority)
Previous disaster experience • Causal attributes • Self-efficacy • Disaster concern Hazard resources	Yes (30.6%) No (69.4%)
Hazard Sources	Each campus is affected by flood Feel safe occupying all the university buildings (majority)
Disaster Concern	Moderate disruption (loss of communication or relocation to flood evacuation centre) (majority) Health and safety as main concern (majority) Enough basic needs including all types of help are welcome (majority)
Income	Financial loss (moderate)
Risk knowledge	Rainfall as cause of flood (majority)

	Lack of awareness and understanding about cause(s) of flooding (majority) Not sure if their university area is at risk for future flooding (majority)
Risk communication	Internet and social media (TV, radio, Facebook, Twitter) are preferable (majority)
Understanding warning system	Directory signage is helpful for evacuation (majority)
Perceived responsibility	Interests to participate in any activities involving flooding risk projects, partly or wholly. volunteering, raising awareness to the community) (majority)

Table 4.19: Themes and Subthemes Development from Interview Sessions (Based on the interview sessions).

Themes (Adapted from theoretical constructs; See Table 2.5)	Subthemes
Safety	University mission, quality objective
Rapid response	Safety related; infrastructure related
Flood cause	Heavy rainfall
Current practice	Reactive action, wait and see
Shared responsibility	University police, volunteer
Process flow	Manage by university administration
Crisis and emergency activation	Public reach for help
Flood impact	No property destroyed, food shortage, relocate
Structural improvement	Water pump, drainage, flood resilience, retention pond, soil contouring
Damage building	Slow approval to fix
Disaster management	SOP by university
Internal assessment	Internal quality unit
Refurbishment	Low cost
Green technology or sustainability	No intention; high cost
Decision making	Many layers of management
Information dissemination	Website
Work done	Based on public complains; report via online
Disaster management improvement	Workshop, seminar, revised previous work
Urgent repair	Low cost, at least 3 days approval
Incidents	Not life threatening

4.2.2 Interview Data from UiTM SOP in DRR

Past floods in the university area have usually been the result of heavy rain. When floods occur, the university needs help from the university security service (also known as university police in Malaysia) to make way for alternative routes. Alternative routes are a quick act of assistance plan. The university security service or "university police" is responsible for safeguarding the university's main entrance; including visitors, vehicles, and goods brought to the university area. Where necessary, roadblock and traffic control should be created, including the pedestrian area. If there are visitors such as journalists or outsiders in the event of a flood or other disaster, university police should accompany them.

Based on the interview session, there have been some improvements made by the Shah Alam main campus through integrated infra-operative operations, such as adding water pumps, enlarging drains, increasing flood barriers, and raising the height of the main roads. These are all university development projects. There are also recommendations to reduce the risk of flooding in the university, such as making more water reservoirs and flood insulation.

Design and project team would need to evaluate any new projects. Land contouring has also been conducted, which shows the university entrance area is much lower than the surrounding area. Therefore, more precautionary measures are required, as it is the main access point for the campus. In the event of heavy rainfall, the flow of rain will be monitored, and the team involved will adopt the concept of waiting and observing. The projects involved are, for example, pumps to prevent flooding and filtration every six months to assist in the smooth running of the water.

In every other project such as buildings, roads, and infrastructure, a two-year warranty is obtained from the contractor. When a project is completed, the university landscape team will take over. Complaints from the public and university community are accepted through the online "Facility Management System". This system allows e-complaints for end-users to make reports or complaints about any problems under the university assets and facilities. The system operates daily, 24-hours per day, including holidays. To attend to every complaint received, a meeting will be conducted. There are some problems, which arise when maintenance work is carried out. For example, the complainant could not be contacted, an appointment with complainant did not become

successful, difficulty accessing a particular room, incorrect information received, and so forth.

The student affairs division is tasked with ensuring that all staff involved in emergency assistance is adequately informed. Their job is to provide necessary facilities to flood victims, including temporary placement. Contributions or donations from the public should be distributed to all victims, so that all activities are conducted transparently and professionally. Another rarely focused task is to provide a complete report by the investigation committee to convey the actual flooding situation. The team should concern with the safety of students and the public. From an academic perspective, the responsible party should prepare contingency plans involving learning activities, such as students lecture schedules, exam schedules or class relocations.

CHAPTER 5

5 Discussion

The author believes that the lessons learnt and examined throughout this study will aid in dealing with Malaysia's rapidly increasing and dangerous flood issue. It is necessary for this thesis since it allows for an in-depth discussion of scientific or technological themes. Several variables related to risk perception were considered, including location, hazard experiences, sociodemographic characteristics, and residence characteristics. The author of this thesis drew upon Layder's (1998) theories of adaptive and social domains. The macro part of this thesis is about the university as an organisation, while the micro part is about the individuals who are students, staff, and members of the public at the university. A realist approach may aid in comprehending what lies beyond language and social discovery. This is governed by the notion that prior theoretical conceptions, ideas, models, or propositions aid in sampling and creating theories. The author describes the situational reliance on the individual's interpretation and comprehension of reality and societal knowledge (Bergin, 2011).

5.1 Emergent Themes from Literature Review

First step is to relate every finding to the first research question, which is to provide strategies through literature review to assist Malaysian universities in conducting further exploration and development in flood DRR. All the emergent themes (as the subheadings) are derived from the thematic. The repetitive themes are considered important and provide a wonderful strategy for tackling the issues. Please note that this section is all based on the literature being presented in Chapter 2 and how can those be applied (as the readily Malaysian university strategy in NDRR).

5.1.1 Sustainability

Papargyropoulou et al. (2012) helped to establish a study on sustainability, as explained in this paragraph. Some examples of legislation with regards to sustainability include the Building Regulations (2010) in England and Wales and (Amendment) Regulations 2015 (The National Archives, 2019), The Waste (England and Wales) Regulations 2011, and The Building Regulations (2006) in Australia. Laws and legislation should encourage sustainability experts to become stakeholders so that they can deliver and contribute to sustainable development (Papargyropoulou et al., 2012).

There are some crucial issues highlighted. Among them is what sustainability means. Sustainable flood management could be interpreted in different ways. It has no specific meaning, especially in real practise (Scottish Environment, 2007). Sustainability refers to the "ability of society to maintain and enhance today's resources for future generations" (Connerly, Laurian, and Throgmorton, 2017). In Malaysia, sustainable efforts in post-flooding reconstruction are carried out voluntarily, just like standard construction. It is due to the fewer green building index certifications given in the country. Through revising the issue in the Uniform Building By-Laws (Uniform Building By-Laws, 2006), there is already an action by the government towards making sustainable assessment tools an obligation. The people and government can collaborate on a flood catastrophe emergency response plan. Emergency response plans are a vital part of the procedure. Disaster risk reduction and mobilisation might benefit when resources become an essential component. To minimise hazards and risks, particularly in terms of readiness, future measures to address the flood disaster's underlying causes will require the cooperation of local communities, particularly those at risk of flooding. To lessen the effect of a tragedy, a community must acknowledge its vulnerability and potential to overcome resistance and maintain resilience in the face of risk.

5.1.2 Malaysian Construction Sector

Today, built assets are seeking construction management leadership that has its own unique and practical solutions (Legrand, 2016). Do the issues arise from what is going to happen when uninvited natural disasters attack towards assets or construction projects? Therefore, professional construction management should have some plan to manage the construction activities accordingly under the worst-case scenario, including the handling of natural disasters. Every disaster management must adhere to a set of Standard Operating Procedure (SOP). In preparation for disasters in Malaysia, the Ministry of Education only provides a SOP for Malaysian educational institutions. Each school and the higher educational institution receive the SOP and manual for teachers and university staff reference. It is unknown where universities kept their standard operating procedures, and the author could only access them via the Internet after a few unsuccessful attempts with various search terms.

Additionally, it is questionable whether the information is shared among university communities or is retained solely by an individual or a small group of people. Diverse approaches and tools for data analysis would be investigated further to be published in a variety of journals with broader objectives. Disaster reconstruction would not only need

information about damage and losses but also must fulfil any needs for the strategic reconstruction response (Roosli and Collins, 2016). Malaysia's construction management must face various challenges nowadays; therefore, the appropriate administrative strategies should be developed (Low et al., 2006). Malaysian economic growth somehow threatens to ruin the environment and physical development that is already over the limit. In Malaysia, the state government is urged to compile an immediate emergency response plan and consider the contingency factors at risk of triggering floods before approving development projects (Rohman, Hamid, and Fuad, 2017). The government plays a role in synchronising and incorporating countrywide policies to reduce flood risks (Ahmad et al., 2014). They should provide necessary planning management policies, including resilient property construction (Wedawatta and Ingirige, 2012). In a crisis, stakeholders urgently need to decide on reconstruction efforts. As a result, it is likely that the constructions being undertaken will face difficulties. These reconstruction activities include rebuilding the affected assets and infrastructure and aiding in terms of communications, loans, credit or technical help. For things related to post-flooding reconstruction for university buildings, there is no current study on it. The only nearby study is dealing with the post-flooding housing reconstruction in Malaysia.

Research states that in Malaysia, there is no clear practise on how to monitor the construction work being done (Roosli and Collins, 2016). Post-disaster reconstruction should focus on the significant areas, which are access to land and facilities, employment, and reconstruction means. All these could be noted if post-disaster strategies are implemented in the long term. The strategic reconstruction strategy includes a robust framework, follows the existing policies and procedures, adapts to the reconstruction needs, and follows the flow of the process (Roosli and Collins, 2016). It is the opinion that dealing with post-disaster problems ranges from the community, local government, and agency as opposed to the reliability of an external organisation. Affected communities and groups, which had previously been changed, should get involved in the post-disaster reconstruction program, thus improving the building capacity (Roosli and Collins, 2016).

5.1.3 Sustainable Construction

There are guidelines to apply for sustainability in construction. Malaysian university should apply the principle of “built back safer”. When a university building is damaged or destroyed due to flooding, reconstruction should combine with these principles to ensure resilience inputs. It provides opportunities for buildings and structures to more energy-efficient, low carbon emitting, and reduces climate impact. The university building should

be constructed using the materials and waterproofing towards flooding, which can withstand a certain level and specific effects of flooding. In this process of reconstruction, the critical thing to be given priority in the selection of materials for building, usage of technologies, choose the cost-effective approach, ensure information needed are always available also including the building that being reconstructed has the energy-efficiency input. This information can be applied to a university building and much other building as well.

No resilience input during the reconstruction process will cause the same or worse effect in the future. It indicates that the recovery and reconstruction process is not learning from the previous flood hazard that occurred (Lindell, 2013b). Authorities should monitor that future reconstruction and development should avoid floodplains to reduce levels of flooding hazards exposure on the building (Nguyen, Imamura, and Iuchi, 2017). The resilience approach involves large decision-makers from various university levels and departments, and the early planning process of the recovery and construction are essential. Facilities and infrastructures may result in improved service levels and upgraded capabilities. University stakeholders should take proactive steps to adapt to future threats. Should new developments be undertaken, planning and decision-making should avoid any probable high risks areas of flooding or away from flooding resources.

5.1.4 University as a Business and Important Infrastructure

Any damage caused by flooding to the buildings, equipment, failure to continue the business, or disruption of business could make the business insurance premiums go higher. Universities should know and be aware of the real cost when flooding happens (Wedawatta and Ingirige, 2012). A business could be affected by flooding in terms of the affected areas: markets, logistics, premises, people, processes, and finances (Metcalfe, Jenkinson, and Johnstone, 2010). The institution's policy and decision-makers would be able to use the flooding knowledge to provide more guidance for the business (Wedawatta et al., 2014). Early preparation for flooding could ensure business sustainability in the future (Josephson et al., 2017). Institutions need to emphasise urgency matters in dealing with disasters because the faster they are solved; the quicker business can resume. The same flood will have different effects on each business. Some businesses might be severely affected and could not continue their business at all. Meanwhile, for another business, flood events do not much disturb their business's ability to continue operating (Wedawatta and Ingirige, 2012).

Previous research by Wiseman and Parry (2011) agreed that flooding impacts would have different effects depending on the industry sector. Therefore, the need for property-

level protection measures will also vary. Each business could mix the available strategies to manage flood risks as it could help with the long-term survival of a business. Business institutions must rank their priorities and put resources into flood planning (Frost, 1994).

Critical infrastructures, including the systems of an organisation, could influence society. Examples of critical infrastructure are energy supplies, transportation, water supplies, information, and communication services. If they were disturbed, more serious consequences would occur. The resulting impact could be more severe than the initial event (Zevenbergen et al., 2018). If the critical infrastructure is impaired and damaged, this will have negative implications for the public, the operation and business of the organisation, the nearby areas, state, or government (Van Ree et al., 2011). Flood-related critical infrastructure could have a wide range of secondary effects (Bach et al., 2013). Critical infrastructure could create a more complex situation where this could lead to economic losses (Escarameia et al., 2012) and unpredictable damage because of the limitations of data (McBain, Wilkes, and Retter, 2010).

Protection against critical infrastructure could aid in the advancement of emergency relief and recovery efforts (van Herk et al., 2013). There is a scarcity of information to help make decisions when there is a lack of concern for critical infrastructure and assets (Zevenbergen et al., 2018). Building resilience strategies should play a role in ensuring a higher protection level for critical infrastructure (Whittle et al., 2010). As for critical infrastructure and assets, best practises for floodproofing are limited due to a lack of practise with this method (Zevenbergen et al., 2018).

5.1.5 University Business Continuity Management (BCM)

An institution should have a business strategy by carrying out Business Continuity Management (BCM) to face the risk of flooding. There are a few approaches under BCM, such as setting up the flood warning system, providing flood plans. Therefore, an institution would prefer to come up with plans to sustain its business, apart from improving their flooding protection measures for their assets.

Putting BCM as one of the inputs for flood management would help to solve unexpected flooding issues since BCM tackles complex procedures (Malachová and Oulehlová, 2016). Malachová and Oulehlová (2016) conducted research that provides critical insights into BCM and its necessary application to flooding management issues. BCM would be the primary strategy for any institution as it supports planning for disaster. How this BCM helps deal with flooding is by getting prepared for an institutional operational

disruption through an organised process. It is to ensure fast flooding recovery while reducing the impact of BCM on an organisation (Sharp, 2008).

A good BCM will have a few important aspects (Kotulová, 2010). First, is to understand the institution. The second is to define the BCM strategy. The third is having a BCM response. The fourth is by implementing, upholding, and revising the BCM. BCM needs to be consistent with the purpose and objective of an organisation. This BCM includes strategies to reduce the risk of anxiety. The crisis management should consist of some step-by-step measures needed to mitigate the material and human resources of the institution involved. BCM is a big area. The Business Continuity Plan (BCP) is the output of the BCM. To determine the strategy and steps that need to be considered not only under BCM but also involve broader management aspects such as risk management, disaster management, human resource management, finance, and others, This BCM includes all the steps and procedures to ensure that business operations can run adequately (Malachová and Oulehlová, 2016).

For a flood-prone university, it is critical to ensure that BCP can provide a clear guide to the university so that it can resume regular business as soon as possible (Malachová and Oulehlová, 2016). Business continuity for universities can be carried out in various ways, for example, moving to another location to resume business, if it meets the needs of the institution (Malachová and Oulehlová, 2016). Universities need to have the ability to face any disruption caused by flooding, including business continuity. It is to protect the university's reputation, which can benefit the students, stakeholders, and partners. Proper business continuity management could help the university get back to normal with better rebuilding and recovery efforts.

BCM needs to be taken seriously for the university because, on flooding occasions, many disruptions will occur (Asgary, 2016). The appointment of experts to handle all the output regarding the university's BCM is essential. Not all people could come up with great strategies, but the author thinks gathering ideas would be a great effort to address things that may be missed. It is mentioned that many educational institutions do not have the holistic approach of BCM. Based on Asgary (2016), all businesses should emphasise this.

Disaster risk and BCM aim to integrate risk into corporate, strategic, tactical, and operational management systems. Disaster risk management, declared by Asgary (2016), is one way to incorporate uncertainty into the order of the parties involved. Business continuity can be said to be one of the branches under DRM itself. All the efforts or approaches used

to repair and recover after the disaster can be planned in tandem and meet the standards set by the authorities or the university itself. To ensure this is a success, the professionals need to come out with the relevant knowledge and skills in both areas. More importantly, the course and curriculum must be aligned with knowledge that can be effectively applied. Institutions require leaders who are experts in managing matters relating to decision-making. The specialist includes skills and has a full understanding of the concept of DRM and business continuity issues (Asgary, 2016).

5.1.6 Ineffective Flood Risk Reduction

The institutions should be aware of the real costs involved when flooding happens. Short-term impacts have caused more serious implications (Wedawatta et al., 2014). When those challenges are handled successfully, the problems could become an opportunity for an institution, as they are now ready to face disaster events. Thus, the substantial negative impacts on the educational sector could be eliminated (Cadag et al., 2017). The author believes that all of these are matters of administration. If the party is seriously responsible for the task of reducing the risk of floods, appropriate action could be taken while taking into consideration the challenges. The government should consider attending to public complaints about the flood recovery service and improving the aid operation in the future (Khalid and Shafiai, 2016). When a disaster happens, the current actions will change according to the situation. For example, there may be changes in rules, floods, or investment programs. Therefore, the involved parties should always do a follow-up that is in line with the changes that have taken place (McEntire, 2007).

5.1.7 Framework Development

Framework in handling a disastrous event like flooding always focuses on reducing risk to the vulnerable communities (International Federation of Red Cross and Red Crescent Societies, 2008). It requires endless reviews and feedbacks, setting up consultative units, and taking all the relevant suggestions and recommendations from the community to incorporate them into the framework. Framework in reducing disaster risks often associated with three objectives, which are integration into policies, planning and long-term engagement in DRR, focus on disaster management cycle, emphasis into humanitarian response and disaster recovery (International Federation of Red Cross and Red Crescent Societies, 2008).

Malaysia will be still having problems in flood risk management if there is no single legal framework to follow (Hamin et al., 2013). Issues continue to occur because every

decision-making and actions are taken based on the need of the locals, and not improving it. Hamin et al. (2013) also believes that a prosperous country should have a robust legislative framework and making a continuous effort towards it. There is a need for single legislation or framework that is up to date to the current flood risk management policies but needed tweak with the country policy (Ahmad et al., 2014).

The framework for good DRR is a combination of multiple inputs to achieve university goals but still ensure resiliency and built back better efforts. There are few critical fundamentals towards DRR framework (see Sheffield et al., 2016). In the case of a university is a risk-informed humanitarian response (Ahmad et al., 2014), the needs of the flooding victims become the highest priority. The management should make sure their safety, guide them to continue their lives as before and meets their expectation and satisfaction. Ability to undertake those steps allows the more exceptional approach for the long-term post-flooding recovery process. Safety and resilience of the people are increased, at the same decreasing people vulnerability in the future disaster (Sheffield et al., 2016). The framework should follow and align with the country disaster guidelines, within the context of national, social, environmental, and political areas. A country may have its own sector-based post-flooding recovery program. The sector could be healthcare, water and sanitation, and housing. Further to that, the areas must be categorised, for example, school, higher institution, college, and universities.

In Malaysia, there is no direct flood framework and legislative. The current legislation is outdated and based on sector or industry. Chan (1995) believes that some regulations like Waters Enactment 1920, the Mining Enactment 1929, the Drainage Work Ordinance 1954, and the Land Conversion Act 1960 is not clear and not convincing enough as measures for flood works regulation. Consultation from expertise or specialist is required to channel expertise in their respective fields to address all relevant issues (McEntire, 2007). The author of this thesis, the author already proposed a conceptual framework for Malaysian University NDRR strategy. Even though the framework is still in its initial stage and still have room for improvement, the author will let it be validated by the experts (see Figure 7).

5.1.8 University Sustainability and Resiliency

For over three decades, Malaysia has experienced significant economic development. It is now the best time for Malaysia to implement tighter and stricter sustainability policies for the new development in the country (Economic Planning Unit

Malaysia, 2010). It is worrying that the present legislation is viewed as being weak. Malaysian authorities or agencies should work towards achieving the "Sustainable Flood Management" where adjustments are made to the environment, including concerns for the economic, environmental, and social effects, and prepare flood plans. It also shows that the author agrees with the findings of a study in the same area, in which it is stated that sustainable flood management requires commitment, modelling tools, and monitoring tools to achieve affordable, sustainable, and long-term management (Odoni, 2014).

5.1.8.1 Sustainable Building

Though this result has not previously been described, stakeholders would look forward towards sustainability if only they could gain something from it. It has always associated with business or money in return. Sustainable buildings can only be found within government and private buildings and are still scarce. For example, buildings have been constructed in Malaysia in floodplain areas. Many builders do not foresee putting up buildings on flood plains as a massive problem until floods happen. Additionally, flooding problems in the proposed project area would hardly affect their decision to continue the construction project. To move forward towards the achievement of sustainability, developers should expand their skills in some areas. Examples include sustainable design, energy efficiency, waste management, resource efficiency, and sustainability assessments (Kibert, 2016). In general, therefore, it seems that a sustainable community provide greater success to achieve a better development with the added factors of wellbeing and flexibility.

5.1.8.2 Socio-behavioural Process

This study emphasises the need to connect with community perspectives on danger and include the public in practical awareness-raising approaches (Burningham et al., 2008). As cited by Cheong and Cheong (2011), collective behaviour becomes apparent during a crisis (Dynes and Quarantelli, 1968). It involves socio-behavioural processes such as enhanced information seeking and information dissemination (Starbird et al., 2010). Rapid transmission of information is crucial during an emergency because it can save lives. Individuals exchange information regarding possible threats, evacuation routes, and where to seek assistance during a flood (Heide, 2004). They seek to learn about the disaster and assist people impacted by lending a hand and raising funds through contributions. However, this is challenging because information generated during crises is usually incomplete and of varying quality (Cheong and Cheong, 2011).

5.1.8.3 Technology and Innovation

The present study raises the possibility that Malaysian universities should be improving along with technological advancement. The technology may be a true representation that could help the community to stand stronger to fight disaster and become more resistance towards the impacts. It is a long-term benefit and would improve the recovery context within the institution. It confirms the association between technologies and institutions that could help beyond human ability and assist many existing measures to provide more positive results and outcomes. This study has been unable to demonstrate Malaysian university interests in technology. The most striking and concerning finding is that Malaysian university commitment to implement more advanced technology to reduce flooding impacts are low. This result may be explained by the fact that there is no co-operation from the top management, with a lack of capital investment, because they consider it unnecessary.

According to prior research, the flood delivery system is an official strategy centred on technology, emphasising the use of modern technologies in flood management, forecasting, warning, and evacuation systems (Khalid and Shafiai, 2016). The university should make full use of technology because at this time the emphasis on this issue is not satisfactory. Therefore, further innovation, such as fast and efficient technology, would bring the university to another level for better recovery options. These are encouraging findings, where Malaysian university must check their ability to meet the needs of the current technologies and resources to make sure they are functional towards the current changing environment. An implication of this is the possibility that, if a Malaysian university could not afford more significant reconstruction and investing in advanced building technology, re-adjustment towards the flooding impact seems to be a better choice. Re-adjustment could require the university community to work together to prepare themselves and act when they become the next unlucky flood victims.

5.1.8.4 University Resilience Agenda

By promoting the university's NDRR, it can elevate the community's safety and resilience agendas (International Federation of Red Cross and Red Crescent Societies, 2008). Universities should provide a learning environment while simultaneously protecting the public in the case of a crisis. Education institutions already confront various internal issues, such as academic failures, deteriorating infrastructure, financial malfeasance, or fraud

(Kennedy, 2007). Institutions that have not yet been impacted by a flood catastrophe but are vulnerable to the possibility of flooding must be always vigilant (Wedawatta and Ingirige, 2012). All education institutions in Malaysia, including universities, colleges, and schools, they should have a comprehensive flood risk assessment that could be used as a reference. A detail recovery plan should cover possible flooding issues. The examples are like, how flooding affects the victims' post health, their psychological effects, and plans towards the damage university infrastructure (Fillmore et al., 2011).

As mentioned by McEntire (2007), an institution must have its evaluation and monitoring process related to disaster management. It is very much related to the importance of a Malaysian university to know how vulnerable their institution is. This evaluation and monitoring process should be conducted periodically and report on the current situation should be recorded. Improvements could be made via brainstorming as well as an assessment with the administrator. An evaluation also needs to involve past issues for review. When all questions, assessments, and studies have been made, knowledge application and learning should be applied to the organisations involved. It is also supported by McEntire (2007), where the accountable person in dealing with disaster management for the university should also learn about risks. An institution also must assess the existing framework.

Sometimes the university officers could not be able to describe the real flooding situation. The university administration could go for training through specialised workshops. Even if the flood situation were not as difficult as predicted, it would also pose a threat to university campuses (Fillmore et al., 2011). Based on Beaton et al. (2007), some problems could be identified by understanding the university disaster plans. For example, issues in placing the victims, interruptions during operation, identifying victims' location, and issues in health and communication services. Special attention is given to students, staff, and anybody who suffered injuries or damage, including the facilities and buildings (Fillmore et al., 2011).

Among other strategies that could be implemented at the university are relief centres, also known as set up of the base camp (Cordero-Reyes et al., 2017). It is also could be used as food storage centres. Besides, the centre could be used as a community or sports space during non-emergency times (Islam et al., 2016). The emergency landing craft is also something that could be considered for emergency use if flooding event discontinues contact with university exits (Islam et al., 2016). The post-flooding condition requires detail data and information gathering while making decisions from the data gathered. Those data

collections are useful to implement a long-term recovery plan (International Recovery Platform Secretariat, 2012). Emergency management planning requires Vital Records Protection (VRP). As for educational institution, data and record keeping is the top priority, and this record-keeping is not something that could be compromised (Carlisle, 2008). Records could be students record, curricular record or maintenance record. Each data needs to be analysed and categorised for identifying the required level of protection. The university must assess whether each information is worth protecting or not as it might have caused higher expenses and time-consuming. Interview with personnel who has been dealing with records is necessary to understand the record-keeping process (Carlisle, 2008).

Further to that, all data and information gathered are the key to all reconstruction strategy and could be used in the new project proposed (Roosli and Collins, 2016). Cadag et al. (2017) also recommend a systematic data collection on the disaster impacts on education. Flood risk management should focus on dissimilarities in flooding. Understanding the flood definition and how it happens will help in the success of the recovery works of a flood, including the precaution measures. Other things lead to further damage of flood events. For instance, not enough early warning system being used, construction material not being resistance to flooding, properties being built in the flood risk areas, and lack of time of implementing all the recovery efforts because of flooding that keeps occurring each year.

One interesting finding is that the principal objective of natural disaster governance is resilience (Tweed and Walker, 2011). A possible statement for this might be that “safe and resilient communities know the future disaster they are likely to be facing, know how to monitor it, and could at least lessening the impacts towards them”. The community would be able to continue their life as usual and functions like normal, despite the effects of a flood. This is useful for the recovery stage, as it involves applying knowledge to make the community and built environment to be more resilient to the flood than before.

Being safe and resilient would further lead to enormous development. Hamid, Roslan, and Dul (2015) have agreed that few factors play essential roles to achieve resiliency, such as robustness, resourcefulness, redundancy, and rapidity. The author believes that Malaysian universities strive to improve their infrastructure and buildings, including public safety in the event of a disaster. However, Malaysian universities are still far to reach a sustainable and resilient campus, and this is rather a hurtful finding. Repeated flood events indicate that the universities are not resilient, although there have been improvements in the structure and flood plans over time. The university administration is

not willing to pursue efforts to upgrade their university buildings and environment to make it more sustainable and resilient to flood. This discrepancy could be attributed to the management, which not being able to foresee that the recovery works might work within a short period. The study shows that if a university is not prepared in flood sustainability and resiliency, they will face more problems in the future.

5.1.9 Stakeholder Responsibility

The appointment of stakeholders is categorised based on the role they play in ensuring that their institution is well protected. A group of university stakeholders do have personal or individual interests, but they should work together, helping to make decisions for institutional benefits. Their determination to address flooding issues would help the institution to move further. The university stakeholders must care about their institution, and it means protection. These stakeholders should take proactive steps to adapt to future threats. All the stakeholders who are involved in the university administration should have both a short- and long-term focus for better adaptation to a changing situation, such as climate change resulting in floods. It has been hypothesised that, for ad hoc or pre-planned programmes, the stakeholders will put human needs as the number one priority.

Indirectly, stakeholders, including the administration, local government, and others are more open about the importance of better managing the land and the surroundings. It is essential, therefore, that stakeholders be always professional and focus on giving their best efforts. Stakeholders who are directly involved with a real flooding situation should share further information in terms of their experience and recovery preferences. It may be the case; therefore, that other elements in recovery stage may also include aspects like; implementing all planned actions and using relevant information among the stakeholders to develop a robust solution. What is surprising is that there are lacking parts, especially during and post-flooding disaster (Hamin, Othman, and Elias, 2013). The findings suggest that Malaysia should rely more on the building specialist, surveyors, insurers, and government agencies to help the institution that has no expertise for flood recovery purpose. This also accords with the earlier observations from the literature review by Cosgrave (2014). It showed that authorities have their long-term plans and agendas because they may face pressure from the government and the community. It is the responsibility of the government to provide help to the flood victims.

Likewise, the Malaysian public administration could also help in the flooding situation, including the police, fire and rescue, civil defence, and government hospitals. The local government provides little or no guidance regarding land use for it to be protected against flood (Josephson et al., 2017). It is difficult to explain, but the central government should provide recovery help when the local government fails to do so. Another important finding is that it is a government effort to put all the related agencies in DRM in Malaysia under one place. Besides creating public awareness, ensuring proper management between governmental and non-governmental agencies and active stakeholder participation are components of NDRR planning. These findings provide further support for the hypothesis that post-flooding recovery needs cooperative support systems, starting from the government, NGOs, communities, and residents, including society groups. The findings reflect those of Labadie (2008), who also found that the successfulness in the recovery approach is based on the cooperation from government and its agencies, NGOs, and may involve volunteering groups.

Labadie (2008) agreed that the government should make further improvements and learn from the previous flooding, to develop short- and long-term measures. There are similarities between the attitudes expressed by Khalid and Shafiai (2015) and those described by Roosli (2010), whose opinion is that the current policies implemented by the Malaysian government should be re-evaluated. Unfortunately, these findings are difficult to interpret, mainly because much of the relevant research has been descriptive, and it is not possible to draw upon any relevant structured research. It is somewhat disappointing findings because the Malaysian government and other relevant organisations have come out with different efforts towards NDRR and doing their part concerning flooding. The Malaysian government and agencies' structural and non-structural undertakings that have been carried out are rather disappointing they have not been giving assurance or substantial impact now. There is a possible explanation of the findings that they happen due to lack of cooperation and coordination between responsible parties in Malaysia.

It is therefore concluded that the government's responsibility is to assist the Malaysian university flood recovery, and that its involvement would be a major positive factor. This may be because of the post-flooding recovery method is primarily based on the government issuance of SOP, distributed to the Malaysian higher institutions. The Malaysian government should be representative of an emerging trend in ensuring resiliency practice. Examples include rebuilding the communities through partnerships with the local universities, infrastructure and environmental restoration, better social services, faster

recovery, and better preparedness for floods. Awareness campaigns should further be continued by the Malaysian authorities to create public awareness. It is a worrying finding that the government claims to have this campaign every year, but it has not received an overwhelming response from various parties. The likely cause for this is probably due to the lack of promotions and activities to attract the public. Promotions could be done through social media and attracting the public by conducting interesting programs. In general, therefore, it seems that disaster awareness could be initiated in each Malaysian university as a first move.

5.1.10 Implementation of Policies

Perhaps the most unexpected finding is the Malaysian policies implemented during flooding and post-flooding are weakly applied. This was found to be significantly associated with the Malaysian flood relief policies that are not designed to prepare for the future. Comparison of the finding with another study by Chan (2012) confirms that the Malaysian government still carries out reactive recovery efforts, and they only respond when real flooding happens. However, his theory is unable to provide a comprehensive explanation of why the government is not ready for the next flooding. Without legislation for Malaysian flooding, things might get worse, as people would believe that their decision is well enough to be carried out. Besides, all procedures need to be addressed and implemented per existing laws. When flooding occurs, there are no clear and direct laws that the university could refer to. The problem with this situation is that only one who understands all relevant laws, regulations, codes of practice and their interactions or interdependencies could develop a solution.

Surprisingly, there were no differences found in the research by Rautela (2016), as proper decision-making carried out by the government, or the authorities could only happen if there are guidelines to follow. It may help to explain why the author suggested that the Malaysian government must propose a new name and input for the Malaysia DRR. It should be shown as an exclusive DRR effort, apart from "The Capacity for Disaster Reduction Initiative (CADRI)" or the "National Security Council (NSC)". The new DRR initiative should consist of a Malaysian identity within the name, for example, "Malaysian Disaster Risk Reduction Strategy". It dictates that the action comes from Malaysian people, and this could be represented at the UNISDR meetings or other important DRR global conference or summit. The new "Malaysian made" strategy should be published online at the government official websites, and there should be a section open for recommendations and comments from the public. This may reflect differences in the strategy, and each sector should come

with their proposals. The segments could be categorised as SME (small-to-medium enterprise), hospitals, schools, higher educational institutions, agriculture, business, and other critical assets or facilities. Compiling all the DRR initiative from different areas of concerns seems a tedious work, but with help from each sector, the work could be reduced. If there are conflicting results or a lack of input, this could be an association with the nature of the governments' responsibilities to integrate and update them all. It may also be that DRR issue integration has benefitted from the national disaster management team.

5.1.11 Application of National Risk Assessment

The study also suggests that Malaysia should carry out a National Risk Assessment (NRA) and promote it to the country. The suggestion is due to the community need for the NRA to develop personal protection and institutional needs. The Malaysian government must take all the positive inputs derived from the NRA and applies it to society. Hence, the identification of the university community vulnerability towards flooding risks is an obligation. Plus, the efforts made could fulfil the communities' needs. Carrying out an NRA would not only help the Malaysian government to carry out better action to reduce disaster risks, but also guide Malaysian universities in providing the best support to the university community. It would be rather remarkable if Malaysian universities could come out with a disaster management plan that could match the NSC, but with further personalisation towards the institution. Some rules and regulations could help the universities to act well during emergencies. Based on the latest political issues in Malaysia, NSC was a wrong law and requires amendment, as claimed by the current Prime Minister of Malaysia (Jay, 2019). Since there are no other guidelines other than the NSC now, Malaysian universities have to rule out the DRR based on their capacities and objectives, but merely based on the national standards. Best if the management could come out with a single documented flood risk, so that all post-flooding recovery works should be based on law and regulations. It also could form scope for concerted action between institutions.

5.1.12 University NDRR

University NDRR should serve a common interest between higher educational institutions in Malaysia. The NDRR plan or strategy developed by each of Malaysian university should prepare the institution during pre- and post-flooding events. The planning stages need to have individual representatives to ensure the synchronisation between university levels to work accordingly. It can thus be suggested that university NDRR campaigns need to be done as an annual event. This event needs to be attended by local

authorities, university administration (Hashim, 2018), and the public. The absence of an NDRR implementation for higher educational institutions may underestimate the abilities of the community. The author agrees that NDRR teaching should be introduced to the students and staff, but it should not be made for class subjects. Malaysian universities should develop a more exciting approach, like doing tutorials or videos through the university website. Simple acts could make significant differences. It is therefore likely that such connections and the example of undertakings mentioned before could improve the university community safety and resilience agendas to another level. Governments, catastrophe managers, and humanitarian authorities' significant responsibilities are to manage post-disaster crises and long-term recovery stages. However, there is no universally accepted method for developing risk-reduction measures. They vary per risk zone and consider the unique social, economic, cultural, and political variables that exist in each.

Very little has been found in the literature as a case study focusing on flooding recovery. During the interview sessions, about three over ten interviewees mentioned that; they do not even know about the flooding that happened before they had been placed on the current campus. Thus, they do not know what to comment. The author sees this as unpractical because it should be someone's job of handing over valuable information to the others. The team handling all the emergency and SOP documents is relatively small for such prominent university. Apart from taking a long time, meetings with stakeholders are also held every few months. Some must travel to another campus to attend the meeting. Meaning that, each action requires approval from some upperclassmen, while it takes a long time to express any further opinion or action. The unexpected finding was the extent to which, matters of flooding could increase the workload and responsibilities of the university staff, as mentioned by Thayaparan et al. (2015). As for Malaysian universities, the workload should be distributed equally among various staff and levels if needed. According to Roosli and Collins (2016), learning from the past provides a way to identify the needs of each institution. First, the responsible personnel handling flood issues at the university should have the ability to collect, organise, and analyse the problems arising.

Plus, the appointed management team should have a different relevant background and expertise to tackle the flooding issues. Different disciplines could help to present ways of solutions. What is interesting in this study is when it describes how experts could observe data in a different area of concerns, like disaster, environment, and gender. The occurrence of floods is a time-sensitive matter. Therefore, any unnecessary obstacles should be eliminated. University stakeholders comprise of different people with different job scopes.

Therefore, it is essential to make sure they understand each other's roles and do not go beyond their responsibilities. The public relies on the stakeholders to come out with a great solution to plan for disaster, with less internal disputes. All views and recommendations are highly appreciated and must be implemented where possible. The recovery process would not work with limited resources. Somehow there is a situation where the resource is not used efficiently. With the limited funding available within Malaysian universities, the existing resources need to be maximised. The best step is to list all the existing resources, its ability, and who are the handlers of each. Consequently, the university could evaluate whether to seek external help during an emergency. These challenges could come from various sources, such as stakeholders, many administration levels, budgeting, and resources. Malaysian universities have faced multiple challenges in making sure NDRR within the institution is a success. Each challenge allows the university management team to provide solutions. The solutions offer an enhanced version of university flooding recovery plan. Universities are also expected to explore more likely challenges in future.

5.1.13 Problems Identification

Malaysian universities, particularly the administration, must list down the likely problems involved in the flooding management process. Potential solutions need to be listed for each issue identified. These efforts should reduce response and recovery delivery times. This study corroborates the earlier findings that a university needs to provide a backup plan to ensure that the damage caused by a flood is minimal (Marris, 2017). The approach to handling flooding may differ from the original method, or human resources requirements may be higher than expected. Next, the impact that has occurred and its implications may be far worse than ever before. As for the university community, they should not carry out any actions that could harm the university property. For instance, throwing rubbish inside the campus drainage could lead to stagnant of rainwater, and cause a flood. More complicated actions are like building university property near hill and slopes, causing landslides. Under the documented version of UiTM SOP in general disaster management, there is no classification of floods and its type. It is a good starting point for the university to classify or categorised floods. After that is to find out which category of disaster has the potential to occur. This finding was unexpected and suggested that a problem faced by Malaysian university is the lack of learning-based approaches and mechanisms for understanding the lessons learned from previous disasters.

The university members should be geared for learning and use knowledge in real practice, as there is a lack of routine and appreciation for the environment. It is a disturbing

finding that the author's review found that the general UiTM SOP and the manual documents were not filed and gathered properly for reference purposes. The documentation system and management are a bit weak. It was found that only one or two individuals within the university hold essential documents that should be shared and studied. Documentation and paperwork are also scattered, with different people and different teams holding them.

Most of the respondents agreed that heavy rainfall is the leading cause of flooding. However, some respondents could not deliver their understanding on the flooding issue, meaning that they were unable to think any other of the reason for flooding to happen. The real situation is, flooding in the university results from some other sources and not just heavy rain. The university community conveyed their worries towards the impact on flooding. Their most significant concern is their health and safety. They also considered other factors such as damage or loss to personal belongings, interruption of studies or work, and the relocation of people. Most respondents agreed that they required enough basic needs during flooding. The responses showed that people did have ideas and knew their needs in case of future flooding. They agreed that other factors they needed help with are, for example, fast relocation, sufficient human resources, and accurate instruction.

5.1.14 Recover from Disaster

Pre- and post-flood preparedness through encouraging the respondents to have protective behaviour. By collecting systematic data and information, an interdisciplinary approach to environmental concerns would benefit residents of high-risk flood areas. This would aid in determining whether and to what extent the communities of these zones have evolved risk-averse behaviours (Miceli et al., 2008). Universities that experience floods in Malaysia go through different recovery process rate. Some recover faster than the others, and some are not. Therefore, it is vital to take note on which impacts or university segments that will have the most difficulty in recovering and more attention should be given on that (Lindell, 2013b). In the 90s, as cited by Medd et al. (2015) and Perrow (2011) pointed to some of how institutions should be able to respond to any uncertainties pre- and post-disaster, consistent with their findings in disaster management research. The university should always have a contingency plan (Cordero-Reyes et al., 2017). Most emergency planning is created to ensure the safety of life, which requires the use of tools to ensure that its functions are well implemented (Carlisle, 2008). Special attention is given to students, staff, and anybody who suffered injuries or damage, including the facilities and buildings (Fillmore et al., 2011).

Planning must be made carefully to ensure that the university and people at the surrounding could survive for a few days after flooding (Marris, 2017). Not only that, but universities must also acknowledge the potentials of such endangerments (Sheffield et al., 2016). In handling emergency events, university administration should take several actions such as paying attention to hazard control, public safety, land-use, building construction activities, and building contents protection (Lindell, 2013b). A high volume of affected people requires enough crowd management by the university's authorities. A university must respond well to the situation through the appropriate contingency planning, mitigate the negative impacts, and to achieve the regularity as soonest possible (Sheffield et al., 2016). Moreover, a university needs to have a backup plan, including having enough foodservice operations and other in-house facilities department, including clinics (Kennedy, 2007). Every planning is to make sure that the university can sustain any losses from the flooding that happens realistically (Carlisle, 2008).

When floods occur, the operation of the university will be disturbed. How long the service of the university or how long the university should be closed is to how bad the flood is. When flood events occur at a large scale, resulting in an enormous impact in the short term, the university management needs to make full use of the recovery planning to prevent or reduce the long-term impacts from happening (Garbett, 2014). A larger organisation like university needs a proper response (Fillmore et al., 2011) and recovery plans because dealing with future disasters are not secure. A disaster that happens always put questions on university issues such as politics and the university capacities and performance (CPWF, 2013). Planning for post-flooding recovery involves a broad area, and there are a lot of different areas on how to approach the issues depending on the area concerns. Too many planning approaches available by just searching into Google or through the journals.

When a disaster happens, the current situation will change according to the case. For example, there may be changes in rules, flood, or investment programs. Therefore, the involved parties should always make a follow-up that is in line with the changes (McEntire, 2007). The university should be prepared with all the changes taking place after the flood. The approach in handling flooding may differ from the original plan; human resources requirements may be higher than expected the impact that has occurred, and the implications may be far worse than ever before.

To ensure that disaster events are reported to the university community, the reality of what happens at the university should be made clear and acknowledged (Sheffield et al.,

2016). Probability of this disaster recovery management could also be explained along with controllable and uncontrollable risks that may be involved. The explanation could include weather conditions, institutional locations, dangers that can occur. Participants should have enough information to prepare themselves. Indirectly, the university can formulate a strategy and a good recovery planning process. Action plans could be adjusted according to the needs of branches in each state. For example, each campus has a similar type of residential layout for the students (Sheffield et al., 2016).

Information about flood danger is likely to be evaluated by the public based on personal preferences or experience with flooding and their level of trust in those who provide the information. The fundamental concept is that humans lack the ability to get accurate knowledge and to get beneficial information, which supposedly will help them overcome the flood issues. Incorporating this kind of study is critical to understanding how individuals living in flood risk situations create perceptions and respond to risk. There are frequently inconsistencies in the importance assigned to distinct risk sources, the severity of the risks, their potential consequences, and the proper reactions to these risks (Burningham et al., 2008). Cheong and Cheong (2011) demonstrate that social media enables the rapid and effective dissemination of information, whether accurate or erroneous, good or bad, at the same rate (Cheong and Cheong, 2011). Instagram, Twitter, and Facebook are excellent examples of social media platforms that may be used in times of crisis due to their ability to transmit crucial information in real time. As a result, authoritative and trustworthy sources of information are regarded as valuable and are actively sought after and disseminated (Cheong and Cheong, 2011).

Internationally, many guidelines and rules are available in post-disaster reconstruction, but none of those exists in Malaysia. Reconstruction measures require an expert survey, and project risk management must be based on best practices (Arain and Low, 2006). Reconstruction after flooding is not as straightforward as the standard building reconstruction as it a complicated process. Flooding recovery and response is a complex system, which requires careful long-term planning over two to three decades (Asian Disaster Reduction Centre, 2005). Reconstruction activities within the university should have a comprehensive assessment, including development activities that are not within the high-risk area. There are few ideas in recovery efforts, which universities could further explore. They are, for example, reconstruction and environmental regulation, contractual arrangements, potential cost savings, quality, and time.

To ensure reconstruction or structural improvements for Malaysian university, some issues should be addressed. Examples include project or reconstruction cost, time duration, the product used, environmental impact, responsible contractor and supplier, construction methods, and how well everyone could meet the requirement or regulation. Post-disaster reconstruction involves a few different decision-making processes, depending on who are the stakeholders involved. For instance, some may require resilience improvements, or some might be concerned about the costs and benefits. Post-flooding recovery requires a university to take proper action in the reconstruction project management. Every project is carried out within the timeframe given to make sure the university could operate as soonest possible and reduce the cost. It is because of the longer construction time, the higher the cost it would be. The university project manager is responsible for administering all aspects involved. Malaysian universities must create a close connection between project management department and the recovery management team. It is to make sure the team could work together and respond accordingly before, during and after a disaster. The administration must change from the traditional approach towards DRM to a more modern approach that could deal with increasing risks.

5.2 Knowledge and Risk Perception

The second part is to relate respondent's risk perceptions and knowledge associated within understanding the university pre and post flood DRR.

5.2.1 Students and University Community

Risk perception may help individuals to prepare for catastrophes. Individuals will take catastrophe risks more readily if they are ready, facilitating mitigation measures. Meanwhile, risk perception and mitigation are positively correlated. People perceive themselves to be in danger, they will exert significant mitigation measures. Risk perception might pertain to individual mitigation measures (Ho et al, 2018). The media is believed to be critical in this attention and information selection process since they carry information about hazards and the effect of trust on authority. Although humans may receive a great deal of information, they typically absorb just a portion of it. This is done to expedite the processing of data. Individuals will frequently make snap judgments in response to prominent information or messages about risk perception and risk management conducted by authorities. Thus, individuals will tend to assess risk heuristically rather than systematically due to this process (Fischhoff, 2013).

Heuristic thinking tends to cause individuals to perceive risk based solely on available information and common sense. Individuals with a high level of knowledge can alter their perceptions of the severity of the risk to seek mitigation. The presence of this anticipated knowledge demonstrates that the information processing process is no longer intuitive heuristic but instead incorporates caution and a depth of thought indicative of systematic thinking. However, a lack of mitigation does not always imply that the public is unaware of the dangers. Risk perception sometimes interacts with social factors such as trust. Risk perception and acceptance are highly reliant on socio-political situations impact people's perspectives. The information obtained by the public throughout this procedure will be determined by risk communication. However, by placing confidence in risk management's capacity to resolve risk issues, anxieties of a large-scale tragedy may be avoided (Frewer, Scholderer, and Bredahl, 2003).

There are three fundamental incentives drive humans' heuristic or systematic thinking: accuracy motivation, defence motivation, and impression motivation. Individuals are frequently motivated to make choices based on their desire to affiliate with or gain acceptance from their surrounding environment. Individuals inspired by the defence will accept his viewpoint and reject opposing views, which involve ego and personal commitment; in other words, the assessment will be adjusted to reflect personal values and attributions. Meanwhile, accuracy motivation is a kind of assessment motivation focused on objective and open accuracy, in which people' weak drive and mental processes lead them to think heuristically rather than methodically (Metzger and Flanagin, 2013). The loss of trust resulting from the societal change will affect how acceptably risk management approaches are in the future. risk perception often interacts with societal factors, such as mistrust of the players engaged in catastrophes. Distrust in agencies develops for various reasons, including a lack of integrity, a negative image, situations perceived to be fraught with intrigue, or a lack of institutional competence demonstrated by failure to perform their duties properly. Additionally, distrust of institutions results from a mismatch in social values between individuals and institutions. This involves how institutions are adjudged to have violated regulations, manipulated rules, or breached contracts. Both institutions are seen to have damaged their honour by failing to do their obligations, violating promises, and lying. Finally, the institution is deemed untrustworthy for abusing its power

Various factors might erode confidence in a catastrophe or risk scenario. There have been complaints of safety or hazard issues, hazard management that was not completed on

time or promptly, comparable disasters in other places that were not addressed, and reports of health in disaster areas beginning to deteriorate in comparison to the surrounding areas. negative experiences coping with catastrophes may also erode trust. Still, the experience of authorities mishandling a crisis ranks highest in terms of eroding faith in disaster management. the community has a low level of trust in the central and regional government regarding disaster management, owing to negative experiences with previous disaster management (Metzger and Flanagin, 2013). Similarly, a low-risk perception suggests that the public is under-informed, leading people to use succinct heuristics and do not re-filter existing knowledge, resulting in the community being insufficiently prepared to mitigate.

A high level of knowledge can motivate individuals to seek mitigation. Even educational programmes are suggested to reduce risk. This, of course, provides an opportunity for future researchers to examine the link between knowledge and mitigation, or even how risk perception mediates this relationship, given that knowledge serves as a source of information for people when evaluating risk. When it comes to risk perception, the knowledge theory concept states that something will be considered dangerous if known to be hazardous. Although this theory has been criticised for its ambiguous treatment of knowledge and risk perception, the absence of mitigation may be attributed to the individual's lack of understanding in risk assessment (Jonas, Schulz-Hardt, and Frey, 2005). According to social psychology, the information processing that people engage in while evaluating risk reveals how they assess risk perceptions and their link to risk perceptions. Information processing may be classified into two types: heuristic and systematic. Heuristic information processing is characterised by a quick cognitive process that relies on existing data without additional effort to conduct further evaluations. Meanwhile, the systematic thinking process necessitates a thorough review and analysis

Individuals can think heuristically because of this. Individuals with heuristic thinking will make fewer mitigation efforts, as their information and knowledge will be based solely on common sense Individuals' ability is subjective under heuristic settings, and hence they assess exclusively based on what they think to be accurate, a phenomenon referred to as defence motive. Low and high subjective knowledge conditions affect how people perceive risk before implementing mitigation measures. Individuals with less information tend to evaluate common danger and think heuristically, necessitating modest mitigation actions. On the other hand, increased knowledge enables increased mitigation efforts due to high-risk perceptions (Kunreuther and Useem, 2009).

The more information an individual must assess risk, the more likely they will seek mitigation. Individuals who think heuristically tend to make the same judgments as to their peers. Persons with little knowledge or who have not yet considered mitigation would seek it by mimicking the comfort practices of others around them. This is true regardless of whether the mitigating measures implemented are effective. The cultural theory offers an alternative perspective on risk perception to hierarchical, individualist, and egalitarian views (Metzger, Flanagin, and Medders, 2010). At first glance risks are seen to have the capacity to be "evil and tolerant" in hierarchies. Individuals have no control over resources, so it is essential to listen to other perspectives. Individuals must collaborate with experts and government officials to communicate risks to seek later mitigation actions. Individualists view risk as less frightening because they believe they have control over it and can devise new solutions. When humans perceive danger, they see the outcomes of high risk as more frightening than those of medium or low risk. This perspective essentially diminishes mitigation efforts since present circumstances already warrant them. Individuals who see themselves as endangered by future calamities seek mitigation (Metzger, Flanagin, and Medders, 2010).

Meanwhile, the perspective Egalitarians believe that risk is uncontrollable and unavoidable. This is a manifestation of the individual's weakness in the face of danger, and powerless individuals are less able to seek optimal mitigation. This condition is more prevalent in urban areas, as evidenced by the unpreparedness of individuals confronted with risks and their reliance on emergency services (Bennett and Raab, 2017). Vulnerability includes a sense of powerlessness. There are two types of powerlessness: powerlessness and helplessness. The sense of powerlessness exists when a person sees a significant risk or danger but believes he can do nothing about it. Meanwhile, helplessness is associated with something external to the person; specifically, the individual's helplessness needs assistance from an authority external to cope with hazards. Several of these conditions will undoubtedly serve as input for future research examining mitigation efforts more broadly, not just in terms of perception but also in individual vulnerability to risk or the source of the perception, namely knowledge. According to the findings above, risk perception is associated with NDRR in Malaysian universities.

This is possible because the public's risk assessment process is heuristic. Additionally, this is owing to the notion that catastrophe risk is not severe enough or a state in which people blame or depend on external authorities to identify the danger, resulting in little mitigation activities. Risk perception is also described in this research using the

framework of knowledge theory, which considers risk perception as potentially harmful if evaluated. As anything potentially harmful. According to cultural theory, risk perception is classified as individual, hierarchical, or egalitarian. Individuals' perceptions of risk are not dangerous, but they may be manipulated to make mitigation easier. Meanwhile, resources are difficult to manage when measuring risk, necessitating professional aid in minimising them. Risk is seen irreversibly from an egalitarian viewpoint, creating an impediment for people to pursue mitigation owing to catastrophes' impotence. This study describes several aspects of mitigation and the university community's unpreparedness to seek relief, which can serve as a starting point for future research. This research indicates that students who have a strong understanding of disaster preparation, a high-risk perception, and the capacity to plan for disasters are more prepared for disasters than students who have a weak performance, a low-risk perception, and poor self-efficacy. The theoretical constructs in risk perception become the main reference to develop a strategy for Malaysian university.

When the universities are responsible for their ethics, legal requirement, business practices, as well as protecting the environment, the universities will earn public respects. Malaysian universities work hard to improve all infrastructure, buildings, and public safety in the face of any disaster. The university must lessen the percentage from “moderate disruption” to “minor disruption” for the upcoming threats. However, it signified that the floods in the university campuses were still manageable as there were no major threats imposed on the respondents. However, the administration should have the capability and capacity to provide workforce and volunteers, activation of a crisis room, and other resources needed during an emergency. It was also to make sure that the whole situations were manageable, and the detrimental effects of flooding could still be handled.

The survey results presented suggest that every individual's health and safety should be treated as a priority during the flood. It follows the importance of saving their personal belongings, especially valuable items. The university should emphasise these two essential points and try to minimise the damaging impact on those people involved. Besides, respondents still think that they were afraid of how the flood could force them to move to another place. People did not feel happy when they were asked to move further from their home or residence. However, if it was about safety, it was no longer considered as an option. Concerning relocation, the involved parties, including the university recovery team, need to provide detailed information on the evacuation centres, and why flood victims need to relocate immediately.

On the other hand, respondents still have a high fear of floods could interrupt their studies or work, including communication interruptions. It is normal if people feel that way. Plus, perceptions versus reality play a role. For example, a high percentage of respondents were afraid of damage or loss to their personal belongings. The real situation showed that, when flooding happens, only a minority of them had experienced the loss. A good action plan is needed to ensure flood victims could resume their study or work as soon as the flood volume reduced. The university could provide alternatives. It is either providing temporary infrastructure or give an alternative plan if students had to continue their learning until floods were receding entirely. People could not just move to the affected building or properties after flooding. Detail checking should be done to avoid further problems towards the people. That would be another reason why respondents frightened about the unsafe condition of university building after flooding.

Apart from the more significant elements such as floodproofing building, alarm systems, and flood rescue team approaches; the author found that the "little things" like directory signage at university (for emergency evacuation) during flood emergency is helpful. Through seeing the signage, including clear evacuation space near the university building, respondents would develop their alertness. It means that a university is lacking in flood initiative. It includes the issues of exit evacuation measures when floods occur, lack of staff training in handling building safety requirement, vandalism, or lack of maintenance on signage. A proper emergency plan needs to be established. It is one of the facilities that help residents to plan their escape route during flooding and quickly. Individuals who need early help could do so when they finally escape to a safer place. The university and team should make periodic checks as well as scheduled maintenance on the signage. Moreover, emergency evacuation routes, especially in classrooms, hallways, and staircases, should be always clear.

5.2.2 Vulnerability

Local community functions, personal and social ties and networks, mutual assistance and support, the actions and examples of neighbours and friends, the potential degradation of relationships as a result of perceived unequal income remuneration availability, speculation and feelings of selfishness or criticism, as well as trust in the proper operation of risk management, all affect people's readiness for flood events in some way. Affect heuristics appear to affect individuals' anticipating and response to risks considerably. Certain elements, such as indigenous ideology and legends, perceived injustice and

exclusion of particular players or locations, and social bonds, may influence adaptive behaviour following flood catastrophes (Warschauer, 2003).

Capabilities for adaptive action are context-dependent. Advances in technology have altered the sources of danger information that must be considered in risk perception studies. Risk awareness should be assessed not just based on familiarity with flood danger maps but also, and probably most crucially, based on media coverage. According to empirical studies, the media affects how people perceive the threat of floods. More attention should be paid to social media's function in changing public perceptions of floods in flood risk management. The media is more likely to cover spectacular and catastrophic incidents than common hazards. These findings imply that common dangers are less terrifying, less alarming, and simpler to deal with, meaning that the risks associated with more typical incidents are underestimated (Wachinger et al., 2010).

The availability heuristic deserves further examination as a theoretical foundation for risk perception. Consider how dangers are conveyed socially. The media may significantly impact how risk perception is socially moulded. The media study of a catastrophe investigates how it is depicted and reported in the news and the audience's emotional reaction to these presentations. Electronic media may be more effective in conveying a threat in the era of digital civilisation. It demonstrates the critical role of extrinsic cues informing risk attitudes. Due to the possibility of profiling individuals based on their social networking behaviour, it is also feasible to identify certain common traits among groups that are more resistant to or prone to flooding. Numerous relationships can be discovered within the constructivist factor category (Wachinger et al., 2010). Local information has a more substantial influence on risk perceptions than the institution's organisational influence. The government and economy have a tremendous impact on the media's social standing. Increased authority control leads to a narrower pool of danger-related knowledge. Different historical contexts impact the strength of social relationships and the type of social capital that influences how indirect experiences influence perceptions of flood danger. Conduct a study to determine which approach gives the most valuable data for reducing flood risk. The medium through which colleges communicate information should be re-evaluated.

5.2.3 Risk Perception

The author followed Bergin's (2011) recommendation to avoid going word-by-word when transcribing interviews. Rather than that, the author of this study summarises the interview sessions and does a data-driven literature analysis. Its objective is to guarantee that

the native tongue of the individual is recognised (Bergin, 2011). Previous experiences can shape an individual's impression of a common flood incident, providing a comprehensive understanding of flood victims' perspectives, attitudes, and experiences (Bempah and Øyhus, 2017). Future impediments to establishing long-term flood risk management include floods that are happening similarly and with similar features. However, the characteristics of floods caused by various causes remain unknown. Additionally, the influence of climate change on floods should be researched further, taking local and regional climatic variables into account, as well as worldwide climate change (Melillo et al., 2014).

The answers and criticisms of flood victims should serve as a roadmap for future improvements. Prior disaster experiences may influence all planning. Distributing the flooding questionnaire might help the university community become more aware of flooding hazards on their campuses. Additionally, the author noticed that prior floods at UiTM Malaysia had had little effect on their general understanding of the flood recovery procedure. Further, the research recognises expectations and includes them in constructing the rehabilitation plan. The university community may better understand the flood scenario if their stay on campus is prolonged since they will have a better experience of their surroundings and threats. According to the findings, the risk of flooding remains significant, affecting a sizable number of individuals across many UiTM campuses. It includes scenarios of both small-scale and large-scale floods. UiTM Machang in Kelantan was the most severely hit of the other campuses. This is because the region is prone to flooding due to the nearby river. Not only that, but increased precipitation also played a role in floods. Floods have caused some inconvenience for flood victims. However, the majority of them incur no financial loss. Due to various circumstances, including shifting land-use patterns and unrestricted growth in flood-prone regions, flood risk assessment methodologies have trouble simulating future scenarios for the vulnerable elements or the repercussions of flooding.

Additionally, worldwide disparities in asset values and structural developments may result in risk assessment and project outcomes (Bergin, 2011). The descriptive analysis found that respondents were prepared to deal with a flood disaster and had adopted a restricted number of behaviours to reduce their campus's flood susceptibility. Earlier research addressing the same topic used various structures or institutions, geographical locations, and catastrophe types. The campuses chosen are quite a distance from the city and have fewer resources available to aid the populace in times of disaster. The author of this study purposely selected numerous areas to evaluate how various components of campus

life may lead to distinct NDRR viewpoints or behaviours that may be successful as a tool for NDRR learning.

It is fantastic to hear first responders' real concerns about impending flooding. However, both sets of judgements appear to be related to the cognitive and rationalist components of the risk perception theoretical construct, as well as the emotional and affective components. Correlational investigations confirmed the idea that perceptions of flood hazards are substantially associated with catastrophe planning. Preventive behaviours within the community should be strengthened to better prepare for the possibility of a future flood catastrophe. The study's research validated this finding, demonstrating a strong correlation between protective behaviours and various sociodemographic and experiential characteristics, including participants' age, proximity to bodies of water, and participation in civil defence activities. This study demonstrates that by conceptualising risk perception as a combination of probabilistic and emotional assessments about a succession of flood effects, one may obtain a valid and accurate psychological indicator of individuals' responses to disasters and environmental emergencies.

Concern was found to have a positive and statistically significant relationship with adopting protective behaviours. From a purely theoretical standpoint, a positive correlation between anxiety and protective behaviours confirms the widely held idea that emotions, including fear, have an adaptive function for the individual. This draws attention to the inherent dangers and opportunities in the physical environment, encouraging individuals to adopt behaviour strategies that ensure their survival and aid them in locating and utilising personal and social resources to cope with the consequences of potentially threatening events. This case study of a single Malaysian institution cannot be generalised to other under-researched issues. A future study might concentrate on the NDRR impact plan established to better understand the plan's influence on a broader community, notably students and staff, and the link between the different NDRR advantages. The responses and opinions of respondents about disaster-related concerns give crucial information for risk perception. This work is relevant on several levels, including theoretical-empirical, empirical, and practical. However, it is a subjective matter when it comes to people's risk perception and behaviour in reaction to flooding. Collecting data on how individuals react toward certain activities and items under research enables institutional administrators, experts, and policymakers to get significant insights. This study may be used to aid in developing a complete NDRR strategy with the cooperation of the public. This study may contribute to improving communication deliverables to the community. The author revealed significant disparities in respondents' risk perceptions. This conclusion, however, should be

interpreted carefully, as the study examined only a handful of impacted universities in Malaysia.

Age was positively associated with risk perceptions. Respondents over the age of 65 scored higher on various perceptual qualities than respondents under the age of 25. (Grothmann and Reusswig, 2006). Women's risk-averse behaviour commonly shapes perceptions of coastal flood threats. This is consistent with research on public perceptions of natural catastrophes in general and flood threats in particular (Lindell and Hwang, 2008). The connections between demographic parameters are modest and become statistically significant only when large samples are employed (Lindell and Perry, 2000). Government risk awareness campaigns should be content-specific and demographically targeted. Thus, understanding the psychological factors behind risk perception in diverse target populations is crucial. According to the study's findings, kids had a more favourable opinion of flood hazards than adults. The present and future outcomes of this study are expected to improve communication between the institution and external stakeholders. Individual decision-makers are shown weighing numerous viable alternatives in the aftermath of natural disasters. However, their selections are constrained by their perceptions of accessible options. (As quoted in Birkholz et al., 2014; Kates, 1971; White, 1972). Decision-makers are supposed to express their risk perceptions in dangerous situations through threat descriptions, verbal evaluations of the consequences, and actual behaviour (White, 1972, as cited in Birkholz et al., 2014).

A constructivist study on flood risk perception yields more valuable data for developing risk attitudes and, ultimately, improving flood risk management. The purpose of flood risk perception research should be to elucidate the influence of contextual elements on risk perception. Rather than relying exclusively on the facts supplied, it is vital to explore how the public perceives flood dangers on a social and cultural level. Risk perception research is a scientific field of study since it requires observing and analysing social processes and occurrences and data on the population's requirements, attitudes, and social behaviour. It examines the facets of culture that contribute to its formation, including its worldview, historical background, social structures, norms, and power relations. People's perceptions of happenings and events are influenced by regional values.

Flood risk studies should emphasise the identification of risk factors and their interactions. A disregard for the rationalist method is inconceivable in studies of flood risk perception. It should not be substituted by paradigmatic constructivist research but should be constantly enhanced. Constructivist and rationalist methods are insufficiently reliable and

credible. They are incapable of giving appropriate direction on their own, and "well-managed discourse" should be used to bring value systems, rational decision-making, and scientific understanding into alignment. Flood risk perception research should be reintroduced with a more holistic approach, especially a constructivist methodology, to provide a more comprehensive experience of the factors affecting flood risk perception. As a result, the constructivist paradigm calls for a more in-depth analysis of the sociocultural environment's influence on a more comprehensive understanding of risk.

5.2.4 Behaviour

Constructivist research has gained appeal in recent years, notably in indirect experience and politics. Data access and the development of scientific instruments Geographic information systems increased the breadth, detail, and accessibility of data by enabling the differentiation of flood zones, the identification of flood features, the determination of an individual's physical location, and the assessment of housing quality (Fellows and Liu, 2021). Contemporary empirical research on flood risk perception is motivated by a rationalistic technique that uses psychometric measures to stimulate cognitive forms of behaviour amid flood danger. The rationalist approach to research results in a vast area of study, which includes fundamental theoretical questions, methods, and, most crucially, findings. Attitudes regarding flooding are complex and cannot be described solely by physical, cognitive, behavioural, or demographic-economic variables. Specific rationalistic investigations have a weakness in that they multiply variables or cannot assess them due to external factors.

Risk attitudes are inextricably linked to a multitude of factors. It is unknown how the numerous components interact, the nature of their causal connections, or the type of effects they create. The environment in which rationalistic variables affect one's perception of flood hazards is frequently constructivist (Eiser et al., 2012). Constructivist research indicates that context might mitigate flood perceptions of threat. Constructivist variables either cancel out or amplify the effect of rationalistic elements on the degree of flood risk perception and risk attitude in general. Negative emotions associated with prior tragedies erode trust in authorities and established flood prevention techniques. Positive emotions promote the establishment of faith, and trust-based public protection measures strengthen the influence of personal flood experiences on risk perception and vice versa.

Media communication systems and human contact both operate as moderators of the influence of information on risk perception. Social capital, indirect knowledge, and social

connections take several forms due to historical events and the populace's confidence in authorities and public protection measures. A constructivist perspective on flood risk perception may assist us in making sense of the disparate and frequently contradictory findings of rationalistic research. A new study reveals that the influence of rationalistic elements on views regarding flood hazards is context-dependent. Individual responsibilities and user support are frequently deciding factors in study findings variance. It notes an inconsistency in the data about the impact of sociodemographic factors on flood risk behaviour across localities. Sociodemographic variables should be viewed as facilitators or enhancers of the significant connections between experiences, perceptions, and preparation rather than as direct predictions or determinants. Due to the constructivist context, rationalistic variables frequently affect one's degree of flood risk perception. Understanding distinct local political, cultural, historical, religious, and social circumstances enables more effective moderating of residents' attitudes toward flood threats.

Certain constructivist elements, such as the media's influence on flood risk perception or the results of neighbours, friends, and family, appear to be more controllable than rationalistic decision-makers. Indeed, rationalistic decision-makers frequently have a more significant influence on constructivist variables than rationalist variables. The initial (intangible, soft) aspects appear to be more controlled than those (complex) elements. Thus, constructive research generates more data that may be used to improve flood risk management. Recent literature reviews show that equivalent conclusions have been reached. The strength and advantages of interpersonal networks significantly impact a community's capacity to handle flood hazards, including social status, cultural structure, the impoverished, social injustice, and environmental injustice.

Individuals' risk perception may aid them in preparing for disasters (Burns, 2007). Therefore, individuals who need to be compensated will take catastrophe risks more readily, facilitating mitigation measures. Risk perception and mitigation, on the other hand, are positively correlated. When individuals believe they are in danger, they will take significant mitigation measures. Perceptions of risk may be related to individual mitigation measures (Paton et al., 2008). The media, it is believed, play a critical role in this process of attention and information selection because they convey information about dangers and the effect of trust on authority. While humans receive a large amount of data, they typically retain only a portion of it, and this is done to speed up data processing. Individuals frequently make snap judgments in response to prominent information or messages from authorities regarding risk perception and risk management. As a result of this process, individuals will tend to assess risk heuristically rather than systematically (Sandman, 1993).

Individuals with heuristic thinking tend to perceive risk solely based on available information and common sense. Individuals with a high level of knowledge can alter their perceptions of the risk's severity to mitigate it. The presence of this anticipated knowledge indicates that the information processing process has shifted away from intuitive heuristics and toward caution and a depth of thought characteristic of systematic thinking. However, the absence of mitigation does not always indicate that the public is unaware of the dangers (Croskerry, Singhal, and Mamede, 2013).

Occasionally, risk perception interacts with social factors such as trust. Risk perception and acceptance are highly dependent on the socio-political context in which people live. During this procedure, the public's access to information will be determined by risk communication. However, by placing confidence in risk management's ability to resolve risk issues, one can avoid the anxiety associated with a large-scale tragedy. (Leiserowitz, 2006). Humans' heuristic or systematic thinking is motivated by three fundamental incentives: accuracy motivation, defence motivation, and impression motivation. Individuals frequently choose to affiliate with or gain acceptance from their immediate environment (Renner et al., 2003).

Individuals moved by the defence will accept his point of view and reject opposing points of view that involve ego and personal commitment; in other words, the assessment will be adjusted to reflect personal values and attributions. Meanwhile, accuracy motivation is a type of assessment focused on objective and open accuracy. It occurs when people's short-term drives and mental processes cause them to think heuristically rather than methodically (Stueckemann, 2019).

The erosion of trust brought about by societal change will affect how risk management approaches are perceived in the future. Risk perception frequently interacts with societal factors, such as distrust of those responsible for disasters (Harvatt, Petts, and Chilvers, 2011). Numerous factors can erode confidence in the aftermath of a disaster or risk scenario. Negative experiences coping with disasters may erode trust as well. Nonetheless, the experience of authorities mishandling a crisis is the most damaging to public confidence in disaster management. Due to negative experiences with previous disaster management, the community has a low level of trust in the central and regional governments when it comes to disaster management.

Similarly, a low-risk perception implies that the public is under-informed, leading people to employ succinct heuristics and fail to re-filter existing knowledge, leaving the community unprepared to mitigate (Noland, 2014). Individuals with a high level of knowledge may be motivated to seek mitigation, and even educational programmes are recommended to help mitigate risk. This, of course, opens the door for future researchers to investigate the relationship between knowledge and mitigation, or even the role of risk perception in mediating this relationship, given that knowledge serves as a source of information for people when evaluating risk. The knowledge theory concept states that something will be deemed dangerous if it is known to be hazardous in terms of risk perception. While this theory has been criticised for its ambiguous treatment of knowledge and risk perception, the absence of mitigation may be attributed to an individual's lack of understanding regarding risk assessment (Oltedal et al., 2004). Before engaging in risk mitigation activities, individuals assess risk using their subjective knowledge.

There are two types of information processing: heuristic and systematic. Heuristic information processing is defined by a rapid cognitive process that uses available data without requiring additional effort to conduct further evaluations. Meanwhile, the process of systematic thinking necessitates an in-depth review and analysis. As a result, individuals can think heuristically. Individuals who think heuristically will make fewer mitigation efforts as their information and knowledge will be intuitive. Subjective knowledge conditions such as low and high affect how people perceive risk before implementing mitigation measures. Individuals with limited information overestimate common danger and think heuristically, necessitating modest mitigation measures. On the other hand, increased knowledge enables increased mitigation efforts in response to high-risk perceptions.

Individuals who have more information to assess risk are more likely to seek mitigation. Individuals who think heuristically make judgments in the same way as their peers do. This is true regardless of the effectiveness of the mitigating measures implemented. Cultural theory provides a counter-narrative to hierarchical, individualist, and egalitarian perspectives on risk perception. When humans perceive danger, they perceive high-risk outcomes as more frightening than medium-or low-risk outcomes. This perspective essentially diminishes mitigation efforts by assuming that current circumstances already warrant them. Individuals who believe future disasters will harm them seek mitigation. In the meantime, the perspective. According to egalitarians, the risk is uncontrollable and unavoidable. This demonstrates the individual's vulnerability in the face of danger, and powerless individuals are less capable of seeking optimal mitigation.

This condition is more prevalent in urban areas, as evidenced by individuals' lack of preparedness and reliance on emergency services when confronted with risks. Vulnerability is associated with a sense of helplessness. There are two distinct types of helplessness: helplessness and powerlessness. When a person perceives a significant risk or danger but believes they have no control over it, they experience a sense of powerlessness. Meanwhile, helplessness is associated with something external to the individual; more precisely, the individual's helplessness necessitates assistance from an external authority to deal with dangers. Many of these conditions will undoubtedly serve as input for future research examining mitigation efforts in greater depth, not only in terms of perception but also in individual vulnerability to risk or the source of perception, namely knowledge. According to the findings above, risk perception is associated with NDRR in Malaysian universities.

This is possible due to the heuristic nature of the public's risk assessment process. Additionally, this is due to the perception that catastrophe risk is not severe enough, or a state in which people blame or rely on external authorities to identify dangers, resulting in insufficient mitigation activities. Additionally, risk perception is described in this research through the lens of knowledge theory, which views risk perception as potentially harmful when evaluated. Individuals' risk perceptions are not dangerous but can be manipulated to facilitate mitigation. Meanwhile, managing resources is difficult when assessing risk, necessitating professional assistance to minimise it. Risk is viewed irreversibly from an egalitarian perspective, which impedes people from pursuing mitigation efforts due to the impotence of catastrophes. This study discusses various aspects of mitigation and the university community's inability to seek relief, which can serve as a springboard for future research. This research indicates that students who have a strong understanding of disaster preparedness, a high-risk perception, and the capacity to plan for disasters are better prepared for disasters than students who perform poorly, have a low-risk perception, and have low self-efficacy. Theoretical constructs in risk perception serve as the primary framework for developing a university strategy in Malaysia.

5.2.5 Communication

The results of this study indicate that the excellent delivery of information and exchange is necessary to avoid any miscommunication during a hazardous event. Consistent with that, the research found that the university community must receive information about flooding risks to respond well to the situation. This means risk communication is a tool,

which leads the public to prepare themselves when flood attacks. One unanticipated result was that it is unclear how the flood risks perception and communication carried out by Malaysian universities. It can thus be suggested that two-way communication between the university and the community should be used to get detail information for flood recovery; hence, the interaction between management and the community could be improved. When floods occur, the university should deliver information safely and efficiently without causing panic, while at the same time providing adequate and useful details. Information for small scale flooding could be easy to disseminate, but the community would be hard to reach when a massive scale of flooding happens. The university administrator is responsible for identifying the best medium to distribute information in a faster way.

Most of the respondents got information on how to deal with flood risks through the Internet and social media. They got very little or minimal information from other sources such as general reading, through friends or relatives, information leaflet by the university, health, and safety talk by the university (not include training) or government bodies. Respondents were happy with the university directory signage, as it was helpful for emergency usage. Nonetheless, quite several of them believe that signage did not exist or was beyond their sight. Some also thought that that emergency signage did not help at all. A vast number of respondents felt that the university buildings they occupied were safe. However, some indicated there a few numbers of university buildings, which they feel worried because of the condition, and they perceived not safe to occupy. Most respondents would be excited to join the flood risks projects for the university if they get the chance to do so. It showed that their awareness and willingness to learn are high. Most of the respondents would like to receive information on safeguarding them from flooding risks through public broadcasting, for example, government mass media, the Internet, television, and radio. The other mediums such as the university official website, email from the university, the university newsletters or SMS or text alert from the university did not attract as much popularity as public broadcasting.

5.2.6 Knowledge Management

The clearest finding to emerge from the literature review analysis is that flood management in Malaysia has failed to maximise the use of knowledge, resulting in inefficiencies and lack of coordination between stakeholders. Knowledge management could not be expanded due to the failure to manage knowledge distribution and coordination effectively. This agrees with the findings of Ahmad et al. (2014), who stated that in

managing flooding management in Malaysia, problems always involve issues concerning the sharing of information and coordination between stakeholders. The finding adds to a growing body of evidence that suggests there are several ways to ensure that knowledge management benefits could be conveyed, such as activities like problem-solving, decision-making, rules, and routines (Rodzi et al., 2016). Knowledge management could develop an understanding of problem-solving, and lead to more informed decisions, while rules and routines are linked to the overall organisational activities and control the whole working process. In addition, based on the United Nations International Strategy for Disaster Reduction, education and knowledge create a preparedness culture, and disaster awareness leads to better safety and resilience environment (UNISDR, 2007). DRR education somehow being criticised because DRR that is supposed to be government responsibility has been shifted to the community (Benadusi, 2014). However, this would not reduce its usefulness or effectiveness.

Benadusi (2014) also cast some doubt on the quality and effectiveness of Malaysian university knowledge management systems. Also, very little evidence has been found to suggest that Malaysian universities are making efforts to upgrade their level of knowledge. The following few suggestions for improvement are made; setting standards of practice in dealing with flooding, identifying key lessons and best practice of NDRR, and providing an optimisation platform for the community to reach for more knowledge. The university could organise activities to assist the students, staff, and others in gaining more knowledge of flooding risks reduction. It could be concluded that somebody who has been equipped with sufficient knowledge tends to be more resilient than the others who do not. Without knowledge, the flood risk situation might get even worse and becomes more complicated to solve. Appointment of the right personnel with appropriate levels of skill and experience is required. It is understood that university personnel change their position from one campus to another when needed. Therefore, the exchange of knowledge and detail reports of the university campus is relevant to enhance understanding of the issues at the university. Malaysian universities could have good access to knowledge sources; have a strong involvement with various researchers in different areas of NDRR and flooding and be able to work with agencies and stakeholders to better manage floods. The university approach in flooding should be an example to others. Organisational learning within a university requires a more structured system, with all the documentation easy to access and archived properly. Each of the proposed mechanism should also be described in a detailed report. The management could upload them in an appropriate system. In this way, the exchange of information could be done quickly.

CHAPTER 6

6 Conclusion and Recommendations

The Sendai Framework for Disaster Risk Reduction (2015–2030) emphasises the importance of disaster studies. The author of this thesis follows the Sendai Framework targets and guiding principles in steering this research. Even though this study is focusing on providing strategies for Malaysian universities in the DRR approach, the basic and main reference for the development of headings and subheadings of this study are mostly derived from the Sendai framework. Malaysia was already confronted with flooding a long time ago, so preparing a flood-resistant environment for buildings and people is critical. The situation should improve because little could be done while the flooding continued. Even when flooding occurs on a small scale in a university area, problems arise. For instance, the community panics, emergency assistance is delayed, and university management provides scant information to determine the source of the problem. To mitigate or avoid the adverse effects of flooding, universities must concentrate their efforts on potential occurrences within the surrounding communities. As a result, they should develop their strategic plans as there are no guarantees that flooding threats will not recur. Malaysia's government has recently invested millions of dollars in Malaysians' access to higher education (The Ministry of Higher Education, 2017).

This section also summarises the study's significant findings or conclusions regarding the economic, social, and technical implications of NDRR at the university. According to the research findings, there is a beneficial relationship between risk perception and community resilience when confronted with flood-related consequences. The university community should have a high level of resilience and risk perception, which should be maintained by remaining optimistic, confident, and not giving up quickly, particularly during flooding. This chapter also discuss all the element in the data collection medium and the emergent themes are created and all data are used and triangulate together, to come out with a comprehensive strategy in university flood risk reduction. The author put the connection from all the issues and data gathered, linking them to the usage of the university settings where possible. That is how the author promote the ideas.

As a summary, all the data was gathered during the literature review (to address the research questions), manually coded (pen and paper), and the author is looking for themes.

Researchers from all over the world have identified themes related to the issue of risk. These themes, along with their associated codes, are presented in this thesis through a variety of tables and figures. The gathered themes were further explored by incorporating them into each field method. The author then created a framework based on the specific findings of each. Following that, the critical criteria are incorporated into the questionnaire survey and interview questions for further examination. The only difference between the two is that the questionnaire was designed using triangulation of emergent themes and risk perception sociodemographic variables in order to fit them well in the risk study. On the other hand, the interview was conducted to shed light on the emergence issues and elicit information about the current university approach to the issues at hand.

6.1 Research Synthesis

This study illuminates the university's strengths and weaknesses and identifies areas for improvement. As a result, the university must prepare to meet and overcome current challenges. This is when the Malaysian university should devote more resources to analysing the erroneous activities and repairing the harm. The executive team's careless behaviour should be eliminated. Finally, the university's business, property, and people would be most harmed. The author places a premium on sustainability, resilience, and rebuilding better. Enhancements to recovery may include the development of post-disaster goals, objectives, and tactics. Additionally, it is anticipated that this research will contribute to the educational system by defining the essential requirements for catastrophe risk recovery activities. Nonetheless, the author believes that this exploratory study lends itself to expanding the scope of future NDRR research.

This research examined flood disaster risk, pre-and post-disaster programmes and participants, emergency response and recovery, flood mitigation and management, relief and preparation mechanisms, flood forecasting and warning systems, as well as policy, planning, and strategic solutions. Every detail of recovery planning is necessary because it may aid in making the best choices. A review of the university's existing catastrophe plan identified severe inadequacies. Currently, UiTM's flood preparedness is adequate, but there is still room for improvement. The issues addressed are resilience and sustainability, budgeting, transparency, employee responsibility, time management, job quality, emergency response, and a framework for future growth. Because the research places a premium on optimisation, it will provide operational suggestions.

This research makes no judgments about the relative relevance of various factors. However, it illustrates the need for community preparation, response, management, and recovery after catastrophes. Identifying and adapting a remedy to a university flooding scenario is challenging. As a result, ongoing research is required. The best advice is to brace yourself for the worst-case scenario. The question arises to the author's thinking, why does the same building face a flood problem like a previous flood event? It turns out that Malaysian universities (as the field study in this research) have not been able to cope with the complexity of flood disasters in terms of their diversity, frequency, magnitude, and other uncertainties (Adger, 1996).

One of the strengths of this study is recognising that UiTM Malaysia's disaster management plan applies to all its campuses in Malaysia. However, there is no significant expansion in terms of pre- and post-planning of flooding situation within the institution. Since the Malaysian community already has long experience with the flood, the community vulnerability towards the hazardous event should decrease over time. However, the opposite happens, where a lot of people are affected, showing that they are still vulnerable and need proper assistance. University resources also have no full protection and no individual plan for protecting their community property or belongings. With increased attention to disasters, Malaysian universities should adopt disaster recovery and response plans or policies, many of which are general and lack specificity. The sustainability agenda in Malaysian universities is also not promising. Effective risk perception and communication is not practised within the Malaysian university, particularly between UiTM campuses. Telephone communication runs out of the reach of the community and only alerts certain officials. There are also no official emails runs by UiTM for the students. Plus, there are no flood warnings except for a few loudspeakers, no CCTVs, and no alarms for significant university buildings.

6.2 Limitation of the Current Study

There are some limitations to the current research. The case study is confined to a few campuses of UiTM Malaysia. As a result, the study is highly imprecise in capturing all the challenges throughout all Malaysian institutions. Additionally, the colleges chosen for case studies may not have any unique design for dealing with floods at all. This is an under-explored subject in flood-related concerns since the recovery period encompasses a large region. This research refers to the university community, which comprises inhabitants of UiTM, the neighbouring community, and students.

However, the approach used in this study limited the questionnaire survey to students. The examples mentioned do not necessarily represent the Malaysian university

sector's official policies or viewpoints. Some responses would have been active in the university's post-flood recovery efforts, while others would not have. Many of the assumptions that would generally be true may no longer be accurate in the aftermath of a tragedy. The author's observations are restricted and do not transcend campus political divisions.

6.3 Contribution of Knowledge

Firstly, this study's produce range of output, suggestions, or findings all relate back to the Sendai Framework for Disaster Risk Reduction (2015–2030), and this study fulfils all the guiding principles and targets of the "worldwide" framework that could be another lesson learned for an institution to apply. According to the author's observations, Malaysian society are continue having negative experiences with flooding, despite limited resources and little effort to act. Each higher education institution should be held accountable for protecting the community, including students, faculty, and visitors, and should maintain a strong interest in and concern about flooding issues. This action should be taken during times of flooding and in advance. Flood response procedures are well-established and involve the federal government, local governments, non-governmental organisations, and the community. However, even though floods have occurred repeatedly, UiTM as a university is less capable than its specified means of addressing flood risks and difficulties. Without referencing the UiTM's pre-planned practise or design, conducting flood evaluations and focusing on action improvements is challenging without referencing the institution's general flood practice. This results in dubious accountability and an inability to deal effectively with emergencies. Even if the UiTM lacks expertise in flood planning and management, opportunities for employees, students, and administration to increase their knowledge and reduce their risk of flooding should be provided.

Since there were no recent research had been conducted on what worked or did not work for a higher educational institution, the author of this study believed that identifying meaningful input for change would be difficult. As a result, a framework, specific actions, and a broader perspective are necessary. Additionally, the Malaysian university has not shared information about how they facilitate their approach to floods or extra flood practice. The university's current flood-hazard resources are not based on extensive research. Most of the available general information is either out of date or is derived from publicly available data provided by the Ministry of Education. Resolving Malaysia's flooding concerns presents numerous difficulties and complications.

Nonetheless, there is an insufficiently comprehensive and credible strategy to avoid a recurrence or worsening of the crisis. Additionally, based on the author's observations of the country's response to disasters, the author believes that the input of those involved in developing improvements is given less weight and should be resolved. Currently, the author indicates no comprehensive guide for the university sector's response to floods and no prior advice on how Malaysian students should respond to a flood scenario. Furthermore, institutional, or public requirements, needs, and expectations after a flood disaster were not met. Additionally, the Malaysian university referred to floods as general hazards or "any disaster," which included floods. This means that the current plan contains no detailed actions to address flooding concerns.

There are numerous ways for the author of this study to contribute to or assist Malaysia's higher educational institutions (in this case, Malaysian universities) in mitigating flood risks to the community and institutions. This study uses a variety of methodological techniques to fill in any remaining gaps (including the challenge and responses from different parties). The author of this study was tasked with eliciting input from students to ascertain their understanding of flood risk and risk perceptions about floods and gain insight into how they desired the situation to improve. The issue is whether university administrators and management believe that the university's current DRR policy and practices are worthwhile. A collective knowledge assessment should be conducted via a literature review to remedy this. This ensures that "undiscovered" knowledge gleaned from literature reviews can be applied in the future. By tailoring the literature review's outputs and incorporating input from UiTM students as university campus users, there is a strong likelihood of increasing learning and improving the institution's current approach to flood management and resolving related concerns.

The primary goal is to avert deaths and alleviate suffering in the university community in another flood. The author desired to contribute to improving the performance of higher educational institutions. Learning and knowledge are critical components of this research, and it is essential to gain knowledge from the literature review sessions and the opinions of others. Small-scale evaluations can still produce high-quality results if they are contextually appropriate (considering factors like no sponsor for data collection and no funds available, location, complexity, timeframe, and available resources). The purpose of this study was to foster a shared understanding between the university community and administrators to facilitate the study's outcome, which will hopefully be implemented throughout the UiTM institution or serve as a model for other higher educational institutions in Malaysia or elsewhere the world. The community (including the public) must observe and

comprehend the university's strategy for managing floods, their approach, and their efforts to foster a shared understanding among numerous stakeholders to avoid or mitigate the exact impact of flooding. The questionnaire survey and interview responses were altered to generate viable approaches to the study's objectives and goals. Additional information is required for flood planning and management. Simultaneously, the author will make appropriate recommendations and address the community's identified needs. The framework, guidelines, suggestions, and submissions may assist universities in improving their emergency response performance by providing the best available evidence or proof of what works well for the institution and relevant considerations. As a result of the identified data, decision-makers, policymakers, and administrators can make necessary corrections.

This section is on emergencies and crises focuses on attempts to improve disaster management and preparedness in educational settings. Early exposure and practise will better prepare students and the community for a flood event. There is a need for a disaster management and discussion approach that can be implemented within these institutions (Shah et al., 2018). University administration and policymakers should be directly involved in the crisis management of educational institutions. They should be perpetually interested in education and participate actively in teaching and learning activities (Grindler, 2018). The government should strengthen its disaster response and security measures to educate students and the public about flood hazards. Students representing Malaysia's younger generation are viewed as vital to the country's ability to respond effectively to floods. This research adds to the identification of numerous critical factors that may influence an outcome. Flooding challenges will always require additional research. Nevertheless, topics involving higher education and action are routinely overlooked and excluded from flood management activities. It is difficult for a community to have a consistent negative experience with floods, especially when resources are taxed, or response effort is reduced due to previous flooding experiences (Whitmarsh, 2008). There are several ways to make a difference or aid Malaysia's higher educational institutions (universities and campuses) in mitigating the flood effects on the community and institutions.

There is an insufficient comprehensive and trustworthy approach to prevent the flood risk issue from reoccurring. Furthermore, if the institution lacks the necessary procedures to respond to flood issues, conducting flood assessments and concentrating on flood recovery activities is difficult. The institutional capacity and accountability should also be questioned. Even if the university administration lacks experience in planning and controlling floods, opportunities should be provided for staff, students, and administration to increase their

understanding and reduce their flooding risks (Fillmore et al., 2011). Existing academic resources on flood threats do not necessitate much research. Much of the basic information is either outdated or essentially a generic statement from the education ministry. The institution has not shared details on communicating its flood response strategy or other flood practises with the public.

It should be noted that universities should be accountable for the community's safety (students and employees). It should consistently demonstrate a significant interest or care for flood problems (not just when flooding occurs, but also before) (not only when flooding happens, but even earlier). There is no advisory information for universities concerning floods, and the university's warnings are excessively ambiguous. There was no comprehensive guidance for the university sector on flood management, and there was no prior knowledge of how the university community's students responded to the flood scenario. The question is whether the administration's or management's current programmes, policies, or behaviour are desired. A long-term goal is to protect people first, to avert fatalities and alleviate the suffering of the university community in the event of another flood. This research aims to provide a clear framework, action, and larger perspective for coping with the flood scenario by acknowledging and considering community needs, wishes, and expectations (Twigg, 2004).

Due to the lack of information on what worked and what did not work, the author of this thesis applies various methodological approaches to identify all the remaining gaps. The result is to assist decision-makers, policymakers, and administrators in making critical changes based on what has been discovered. The author of this thesis seeks to discover a solution that will improve the planning or design of future flood management and recovery procedures by utilising the technique of learning from the experiences of the community (students) and administration (staff).

To do this, collective knowledge should be gathered through various methods, one of which should be a literature study. This ensures that the unknown information may be accessed in the future. The author of this thesis intends to establish a common language and deliver an easy-to-understand approach to facilitate relationships within the NDRR efforts to benefit the Malaysian university. The community needs to see and understand the university's approach to flood planning, their methodology, and how they intend to foster a shared understanding among varied stakeholders to avoid repeating the flooding effect. The responses to a questionnaire survey and an interview were designed to create viable

approaches to the research aims and objectives. Additional guidance is required to prepare for and respond to flooding situations. Simultaneously, the author of this thesis will provide pertinent counsel and meet the specified requirements of the individuals concerned. The framework, guidelines, concepts, and recommendations may assist universities in improving their emergency management performance by offering the best available evidence or proof of what is working effectively for the institution and the associated problems.

The author of this thesis wished to contribute to improving higher educational institutions' performance (the sector as a whole). One strategy is to analyse how the community has performed thus far and improve their learning to adapt to a problematic situation more effectively. Learning from the literature review sessions and other people's perspectives is vital, as this study's education and knowledge are critical components. By adjusting the outputs from the literature study and the reactions of staff and students as university campus users, there is a great chance for extra learning and strengthening the institution's current strategy. Small-scale evaluations can produce promising findings if they are conducted appropriately (considering criteria such as unsponsored data collection, money available, location, complexity, timing, and accessible resources).

By giving the findings and recommendations, the study may help others make informed choices, promote learning, and identify areas for improvement while also pointing to more future research or evaluation difficulties. Malaysian ways of solving flooding with different measures exist. However, this involves prompt decisions, and works according to the situation, not based on any advanced planning. Community responses to flooding recovery are different, as they would experience each case differently. Any potential upgrading must be presented to the administration to come out with a new university plans, policies, or regulations. Things get complicated after a flood; therefore, new, and improved versions of flooding recovery actions are worth trying. The author has gathered proposed measures and methods to adopt in flooding NDRR, which are applicable to universities and other relevant institutions.

Table 6.1: Proposed Management Action in Natural Disaster Risk Reduction (NDRR) in flooding for Malaysian universities (Self-Authoring):

Partnerships and collaborations	Investment in technology
Community engagement	Appointment of leaders
24 hours of technical support	Skills and training opportunities
Sufficient human resources	Knowledge management
Raising of awareness	Set up a volunteering team
Social media usage	Detail task report and assessment
Risks identification	Impact study
Collects suggestions and opinions	Establish crisis management
Vulnerability assessment	Establish a bank of data
Establish a search and rescue team	Emergency response plan
Recovery modules	Coordinate research
Information gathering	Crowd control
Appropriate contractual arrangements	Stricter rules and regulations
Funding and cost structure	Quality as a priority
Improvement in building technology	Improvement in communication
Improvement in early warning system	Provide health care and social services
Prevent waste and fraud	Stricter contractor appointment
Learn to react and response	Building and assets appreciation
Protection of historical sites	Land use management
Active monitoring and maintenance	Proper building design
Well-run sewerage system	Resource management
Effective decision-making	Business continuity plan
Identify people disability or incapacity	Identification of success and failure
Disaster management organisational structure	Relief centre locations
Understanding building history	Disaster assessment
Victims' needs assessments	Preliminary damage assessment
Lessons learned	Site assessment
Priority for repair and refurbish	Public spaces protection
Recycling methods	Waste and debris management
Security workforces	Online system for public complaints
Training and conferences	Model development
Risk Vulnerability Assessment (RVA)	National Risk Assessment (NRA) elements application
Flood Resistance (FRe)	Flood Risk Management Plans (FRMP)
Integrated Flood Management (IFM)	Business Continuity Management (BCM)
Social relations	Mix technique
Identify critical areas	Policy management
Long-term planning framework	Contingency planning

6.4 Recommendations for Further Research Work

This work may serve as a foundation for future research. This study's outcomes need additional investigation to ascertain any possibly missing essential inputs. Additionally, there is a need for further research that may occur due to the study's shortcomings. Additional studies should be conducted to elucidate the knowledge management strategies prevalent in Malaysian institutions. Additionally, the effort might discriminate between flooded and non-flooded university campuses, including a broader geographic area and higher-level officials. Developments in the research area should also consider the resilience and sustainability of Malaysian educational institutions.

Another area to study is the catastrophe category level, which includes severely, moderately, or mildly affected university services in Malaysia. Diverse building structures and university assets and the facility's history, site condition, and accessibility need more investigation to get more exact answers. Additional study is required to investigate collaboration with other authorities and organisations since many sectors throughout the country are increasingly lending a hand in mitigating flood hazards. Another fascinating issue is how choices are made during times of crisis, particularly inside a higher educational institution that is limited by the government's standard operating procedures. Indeed, future research must examine all dimensions of institutional and administrative identities to comprehend how choices were made and influenced by individual job or personality qualities. Additional research is required to fully grasp the ramifications of improved abilities to perceive reductions in flood threats, and this is because suggested improvements may introduce other dangers.

The investigation of post-flood recovery should delve deeper into how race, gender, state, culture, or other characteristics may affect the overall scope of the study. The paper makes no mention of NDRR training at Malaysian universities, and further study is needed to determine the content and most effective methods for offering this training. Future studies should identify vulnerable populations within the university community and devise strategies to address their needs. A more in-depth examination of the Malaysian university practises associated with NDRR projects' success is necessary. Additional study on the factors influencing student resilience is advocated, including social support, intellect, self-esteem, social competence, and community features.

The author of this thesis proposes that further researchers plan and undertake a study on the factors impacting student preparation behaviour in the event of a flood that is

exclusively determined by personal experience, education level, and peer influence. This is significant, but there are additional factors to consider. It is meant to act as a springboard for educational progress in terms of readiness and behaviour for institutions. Additional study is required to ascertain the relative contributions of structural and non-structural solutions to overall flood risk reduction, resulting in a better understanding of flood risk and management alternatives. Improved views of flood risk and risk communication systems must benefit current and future generations. Resolving the issues outlined above may develop more sustainable flood risk control strategies (Shah et al., 2018).

Floods are a series of destructive events that repeatedly occur around the planet, and their impacts may be catastrophic. A flood can be distressing, resulting in physical damage, trauma, disruption of lives, and worry. Flooding is a result of bad design and human activity. Additionally, the prevailing norms and framework governing floods control should be clarified. Meanwhile, a comprehensive and coordinated effort is required to address the dangers of catastrophes. Policymakers responsible for NDRR capacity development may make use of this helpful information. Appropriate communication is critical for communities because it enables residents to make informed decisions about flood prevention and mitigation.

The region's vulnerability was judged essential since it may aid in applying relevant building rules and laws governing construction management operations. The 'prevention culture' between NGOs and the private sector should be promoted to mitigate the impact of environmental hazards, in this case, flooding. When it comes to natural disaster management, the government and local governments are on the front lines, exercising administrative control over unfavourable flooding situations. When these scenarios are considered, expert methods are constantly in demand. Numerous actions may be taken, including establishing a base camp, working with indigenous people, fostering teamwork, broadening knowledge, giving skills, and training opportunities, selecting leaders, and mobilising volunteer teams. The response team would be capable of swiftly meeting current or emergency requirements, identifying the most severely impacted regions, and caring for the victim's emotional and physical health. The difficulties include a lack of understanding of DRM from a different perspective, inconsistency in roles and responsibilities, and a scarcity of money, human resources, and knowledge. This paper discussed several factors relevant to dealing with NDRR, including incentives for collaboration, stakeholder benefits, the importance of developing agreements, independent facilitation, developing an understanding of the information received and making informed decisions, and opportunities for new resolutions.

It is proposed that additional research be conducted on the elements affecting student resilience, including social support, intelligence, self-esteem, social competency, and community characteristics. It is suggested by the author of this thesis that further researchers will design and conduct a study on elements influencing student preparedness behaviour in dealing with flood that are solely driven by personal experience, education level, and the influence of others. This is considered significant, but there are additional considerations. For institutions, it is intended to serve as a step for educational development in terms of preparedness and behaviour.

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 regarding the flood prevention and mitigation. Not only that, but the vulnerability of the area also 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.

The Malaysian government's general disaster management guidebook applies to all forms of disasters in Malaysia, although it is inconvenient. This is due to a lack of specialism in issue resolution. Malaysia's flood management practices, along with the country's substantial financial expenditure, are insufficient to mitigate flood damage. Due to a lack of information, post-flooding projects and hazards are difficult to handle. The healing process was complicated due to a lack of assistance. Executing flood catastrophe preparations across a big university campus is a perplexing undertaking. The tasks range from simple to complex.

Several obstacles confront the institution, including financial cuts, economic hardship, and policy changes from time to time. Making decisions about university matters is also complicated, particularly during times of recovery and redevelopment. Within the university, decision-making takes a long time and involves multiple levels of flood committees of stakeholders, which makes it difficult to obtain quick results and decisions. In the author's mind, the issue arises as to why the same structure faces a flood problem comparable to the prior flood. Malaysian colleges have shown an inability to deal with the complexity of flood catastrophes, including their variety, frequency, size, and other uncertainties. Additionally, the recovery stage has been undervalued compared to the different phases of a disaster, such as preparedness, response, and mitigation.

One of the study's merits is that it acknowledges that UiTM Malaysia's disaster management strategy applies to all Malaysian campuses. However, there has been no considerable increase in pre-and post-flood preparation inside the institution. Since the Malaysian community has extensive experience with flooding, the population's sensitivity to hazardous events should diminish with time. However, the contrary occurs, with many persons impacted, indicating that they remain vulnerable and need support. Additionally, university resources are not fully protected, and there is no strategy to safeguard common property or personal items. With increased awareness of disasters, Malaysian universities should adopt disaster recovery and response plans or policies, many of which are broad in scope and lacking in specificity. Malaysian universities' sustainability agendas are also unattractive. Effective communication is not practised within Malaysian universities, especially between UiTM campuses. Telephone communication is out of reach of the public and notifies only certain authorities. Additionally, UiTM does not send official emails to its students. Additionally, save for a few loudspeakers; there are no flood alerts, no CCTVs, and alarms for key university buildings.

6.4.1 Disaster Management Process; Malaysian University

Below is the disaster management process for Malaysian university application (revised by the author).

i) Preparedness - The university administration must develop a preparation strategy to enhance its reaction to flooding. Preparedness problems include how to conduct risk assessments, identify potential threats that the institution may encounter, develop an emergency plan for university usage, contact authorities, and obtain collaboration with authorities as a preliminary action plan. Additionally, it is critical to provide the university community with the most up-to-date information about floods and raise their understanding of NDRR (Hamid et al., 2015). Additionally, the readiness stage necessitates the establishment of early warning systems by a university. Additionally, university management should be capable of early detection of floods. Success in preparation planning also requires a high level of engagement from a broader viewpoint of university stakeholders. A strong relationship between the university and government and non-government organisations appears necessary (Leman et al., 2016). Forecasting and warning systems are highly effective in informing the public about flooding catastrophes. However, with the advancement of technology, social media platforms such as Facebook, Twitter, university email, and other telecommunications systems such as WhatsApp may assist in disseminating information about the flood. Another viable option is to visit the Malaysian flood information website (Leman et al., 2016). Flood preparedness is critical for the following reasons (Hamid et al., 2015): it is a central tenet of disaster or emergency management; it is a continuous process in which managers and victims learn; it is an educational activity designed to increase awareness and understanding, based on knowledge; and it requires appropriate actions from both disaster managers and victims.

ii) Response - The reaction phase examines how the university administration and community response to the flood warning and how the previously developed emergency plan is implemented during the actual disaster occurrence. The university must put all that was planned during the preparation phase into action in a real-world context. It will aid the institution in responding quickly to a flood. During an emergency, it is assumed that all of the preparation agreed upon previously would help mitigate the total disaster's impact (Leman et al., 2016). Additionally, at this phase, each party is aware of their tasks and can adhere to the responsibility or job scope that has been established from the start. Proper reaction planning will enable you to swiftly address all issues that arise and always have a

backup plan for the worst-case situation. Additionally, the strategy should include procedures and processes appropriate for an emergency and have a significant impact on flood victims. This strategy must consist of concerns such as search and rescue activities and, if necessary, evacuation. It is thought vital to have excellent coordination and assistance across parties in assisting victims (Hamid et al., 2015).

iii) Recovery - Recovery is defined as "...the action of restoring the community and built environment to pre-disaster circumstances or better..." (McEntire, 2007). Recovery methods frequently include damage assessment, debris clearance, disaster aid, and rebuilding efforts. The recovery phase is the process of returning to normal conditions as quickly as feasible (Hamid et al., 2015). This phase may help mitigate the danger of future flooding by relocating susceptible acts away from high-risk regions and constructing flood-proof structures during restoration (Leman et al., 2016). Recovery following a flood is related to early preparation and spontaneous actions made after a flood (Lindell, 2013b). The primary goals of the recovery and rebuilding process are to restore harmed university properties or assets to their original state and to re-establish them in the best possible condition (Lindell, 2013b). The recovery phase entails establishing a flood emergency centre complete with facilities, equipping the person in charge with all necessary information to conduct operations, utilising university assets and emergency funds according to priority lists, providing food aid and other physical facilities, and enlisting the cooperation of university stakeholders, including prompt decision-making. It should be emphasised that the populations affected should get water, food, shelter, and power (Hamid et al., 2015). Decisions made quickly and precisely may strongly influence the recovery period. Additionally, it entails inspecting the building's safety and university property, ascertaining the victims' condition, and resolving the problem more organised. Additional features of the recovery phase may include implementing all action plans, using important information among stakeholders, and developing a dependable solution. Therefore, the recovery team should be constituted before a disaster for them to have a vision and develop feasible solutions that may be implemented immediately following an assault (Lindell, 2013b). It is critical that resources are available to facilitate a swift recovery. Relevant university departments should be assigned specific responsibilities for ensuring the recovery efforts are successful, and they should get adequate training. To minimise conflicts of interest, each entity engaged in the catastrophe is allocated a distinct degree of the recovery effort. Specific individuals or industries are more resilient to calamities than others. As a result, they can enter the recovery phase more quickly, whilst others may take longer (Lindell, 2013b).

iv) Prevention and Mitigation - Mitigation is defined as "…a statement of intent or a plan of action to reduce such significant hazard risks while incorporating sustainable values; this includes seeking opportunities to relocate inappropriate land uses out of hazard areas and to rebuild infrastructure in more resilient ways instead of replicating brittle, unsustainable development practices…" (Labadie, 2008). The post-flood mitigation phase, also known as the preventative phase, includes university administration lowering the danger of flooding consequences through more in-depth flooding analysis, increased review of present mitigation methods, and more study into this reoccurring issue. Apart from that, the mitigation and preventative phases would seek to mitigate the social and economic consequences of floods on those impacted. The institution should prevent additional rebuilding in the flood-prone area, pay close attention to flooding concerns throughout reconstruction, and implement proper land use practises during the redevelopment process. There are several approaches to avoid or minimise flood damage: avoiding developing houses, properties, and industries in flood-prone regions now and in the future; adjusting future projects to account for the likelihood of flooding; and encouraging suitable land-use, agricultural, and forestry practises (European Commission, 2017). Sustainable development in Malaysia is increasingly considered ineffective in resolving global environmental challenges. Humans are more exposed than ever before to hazards, threats, and natural disasters, owing to development activities that disregard nature's sensitivity. Environmental and climatic change are inherently complicated and unpredictable, and the current climate change issues need a paradigm shift. Mitigation measures alone would not be enough, as the country's future will require an adaptive and strategic strategy. The country has significant challenges in coping with the pressures associated with catastrophe risk due to climate change and unpredictable weather (Birkmann et al., 2010).

6.5 Malaysia's Resiliency and Sustainability Efforts

Malaysia is currently facing a growing population and heading towards damaging threats of socio-economic activity and environmental system. Malaysia needs a change in its transformation towards a more fundamental economic structure. Therefore, Malaysia needs to be ready for any possible risks and challenges. It could be achieved by having more resilience and sustainable development to be implemented within the Malaysian strategic planning. The idea of resilience implies accepting that society will adjust positively to emerging developmental risks. A resilient society adjusts to the changing conditions in its region. The significance of risk perception in enhancing people's and communities' resilience

is generally recognised as a critical component of the broader field of risk study (Burns and Slovic, 2012). Resilience is a person's capacity to adapt to highly stressful situations by confronting and overcoming them. Individuals with a resilient mentality will be immune to conditions that may cause stress and will be able to quickly recover from traumatic experiences. Resilience is required to deal with the effects of flooding (Garcia-Dia et al., 2013). Resilient individuals will remain optimistic about their potential to overcome these challenging circumstances. Most people will adapt to their surroundings to survive in the face of unfavourable scenarios or conditions. Along with self-esteem, the capacity for positive adaptation plays a critical role in developing an individual's resilience. It's fascinating to learn how respondents (students) respond to flooding issues (Nartova-Bochaver, Donat, and Rüprich, 2019). The UiTM students were previously affected by floods. It is hard for them to reach their college. Difficulties in travelling within traffic jams and floods affect their means of transportation, such as buses and pedestrians.

The more positive students' self-adjustment towards flooding, the greater their resilience in dealing with the effects of floods, which is defined by the ability to control their emotions. The university community should always be optimistic about the future and adapt to difficulties or any challenging circumstances. An individual with positive traits or characteristics always remains optimistic in the face of danger. Situations and settings of flooding require an individual to demonstrate resilience, which is an attitude of perseverance in the face of adversity until they achieve their desired goal (Seligman and Csikszentmihalyi, 2014). The university community may experience feelings of anger or anxiety. This requires them to be resilient to overcome unpleasant experiences. Experience is a broad word that encompasses both knowledge and abilities. The aspect that can influence individual catastrophe resilience is prior direct or indirect disaster experience (Seligman and Csikszentmihalyi, 2014).

Early preparation will enable the community to be better prepared for a disaster. Disaster preparedness was inadequate in Malaysian university settings. Experience affects an individual's preparation to deal with disasters. Thus, disaster experience can be considered a factor affecting disaster preparedness as such experience can serve as an incentive for disaster preparedness and early warning (Ghezeljeh et al., 2019). Preparedness for floods enables the community to formulate and prepare the activities that must be performed in the event of a flood. The preparedness of the community and individuals is critical to dealing with and evacuating during flooding (Tagg, Davison, and Wetton, 2016). When a flood hits, all actions must be carried out in an emergency under chaotic conditions.

Therefore, thorough preparation, coordination, and training are required to ensure proper flood handling and evacuation.

The government should invest in sophisticated geospatial mapping to collect data for mapping disaster-prone regions and deliver geographic information (Tran et al., 2009). The preparation and distribution of maps of flood-risk zones will alert the community to the possibility of flooding. Flood predictions and evacuation procedures should be provided to at-risk populations as part of an awareness and preparation campaign (Rollason et al., 2018). The researchers emphasised the notion that an individual's prior experiences with a given stimulus influence how that stimulus is perceived in a particular context (McDougall, 2015, as quoted in Bempah and Øyhus, 2017). Individual experiences may heighten awareness of the danger, but the degree of attention is also contingent on understanding the threat (Neupane, 1999). Personal expertise and external awareness programmes contribute to danger perception identification (Neupane, 1999).

The flood disrupts almost every area of people's lives. However, it should be recognised that the quality of disruption is not uniform and is incredibly reliant on the magnitude of the disaster threat, which is also determined by the capacity and inability of the current community. This is consistent with the disaster risk reduction approach, according to which disaster risk is determined by concepts of threat, vulnerability, and incapacity (Wisner, Gaillard, and Kelman, 2012). Numerous government attempts, all of which are structural approaches, while non-structural policies involving community engagement in flood management have been developed, they have not been implemented effectively or even by community requirements, reducing their effectiveness. As a result, the policies specified become useless (Wisner, Gaillard, and Kelman, 2012). Thus, flood control, which is primarily concerned with structural approaches, must be combined with a non-structural approach. Flooding preparedness encompasses education and training for the university community for management. Thus, disaster preparedness assists in minimising losses by implementing prompt, suitable, and practical actions. Malaysian universities and Malaysian government should work together in delivering better infrastructure to the community. Based on the EU Floods Directive (Directive 2007/60/EC), the risk mitigation should now be based on structural and non-structural measures. Structural measures include levees or reservoirs, and non-structural measures include flooding plans and land use planning (Merz et al., 2010, as cited in Bodoque et al., 2019).

6.6 Difficulties in Managing Flood Risk

There are components that make it difficult for the management of the risk process (Wenzel et al., 2007). DRR requires full system administration. Typically, government-led organisations are made up of individuals who have the power to make decisions. If the person with this authority is weak, this means the institution will be ineffective due to bureaucracy. It can complicate the process of improvement for NDRR in every aspect of its development. Organisational structures involving risk management must be sensitive in terms of social advancement to get the right information and have good connections with other agencies or communities. Not only that, getting continuous knowledge will help a lot in NDRR. Failing to understand all these important matters would result in an incompetent governance structure in the NDRR. To ensure that NDRR efforts are working well, a suitable medium of communication needs to be found so that it can cover many parties. With this, NDRR planning could be implemented transparently. Government policies and programmes are viewed as unequal power relations that contribute to local vulnerability and insecurity. This is advantageous in this thesis since it focuses on the political-ecological issues ascribed as causes of socio-economic difficulties. This perspective implies that disasters are more likely to strike civilisations lacking resources, fundamental necessities, freedom, authoritarian ideologies, fast population expansion, and a shaky economy. The drawback is that it lacks a feedback mechanism and hence does not attempt to depict modifications made to minimise vulnerability and boost individuals' adaptive capability to learn and better their condition. NDRR is a complex issue that necessitates the participation of numerous parties. Working with others to come up with best practises in NDRR requires coordination from all levels and departments, public government, and agencies, including civil society reps.

The author of this thesis executes all the Sendai Framework's core action items, as the Malaysian DRR needs a multi-field strategy since natural disasters are national concerns that must be tackled effectively and holistically. For example, comprehensive knowledge of disaster risk involves an ongoing study that draws on various disciplines, including engineering, geology, geospatial science, social sciences, and economics. It guarantees that choices are made based on scientific facts and evidence rather than based on subjective assumptions and impressions. There is a need for strategic collaboration between research institutions, government agencies, professional associations, and non-governmental organisations and forums for diverse entities to exchange knowledge and engage actively.

The author proposes several measures, including a better knowledge of catastrophes, an assessment of places that disasters may impact, and establishing an effective early

warning system. The recent flood crisis in Malaysia in December 2021 might have been managed more effectively if the government had a robust and well-coordinated disaster information transmission system that relied only on short messages (SMS). Additionally, the author hopes that the government would strongly emphasise catastrophe risk management, including both structural and non-structural approaches. Efforts should be undertaken to educate the public about natural catastrophes so that they are prepared in the event of a disaster. Simultaneously, the government is strengthening its disaster risk management capabilities via resource deployment, communication networks, early warning systems, forecasting approaches, and capacity development. Additionally, it is critical to research and learns from best practices in other nations to implement them appropriately in Malaysian situations. Malaysia has always been completely committed to assisting Asian efforts to mitigate risks and respond collaboratively and swiftly to regional calamities. Malaysia's government and agencies should establish a national platform for disaster risk reduction to serve as a venue for strategic collaboration, coordination, and exchange of best practices. It contributes to Malaysia's contributions to disaster management being widely recognised on a global scale.

There does not appear to be enough assessment of the impact of various measures on the Malaysian capacity to deal with climate change. Additionally, the community must be prepared for situations where adaptation measures are impossible to adopt. A new beginning is necessary to examine everything the country does through the lens of climate change. Otherwise, the government would undertake an ill-advised investment that would be short-lived and result in a significant waste of public funds. Adaptation is a vital component of efforts by people, communities, and Malaysia to reduce the consequences of climate change. In Malaysia, there are numerous threats to adaptive activities and preparedness in the face of threats. Flood catastrophes are either self-inflicted by flood victims or communities or are caused by a combination of community and government initiatives. As a result, collaboration, and proactive communication between those in charge and the local community are critical to the issue of this flood disaster being addressed more effectively. In Malaysia, early flood warnings are still judged insufficient, owing to the small number of individuals who get flood information. An early warning system requires a well-defined structure, adaptive and responsive organisations, and socialisation at all levels of society. The goal is to develop a continually watchful community as a result of the risks associated with living in disaster-prone places. Collaboration, partnership, and networking with different sectors are required to achieve governance. Effective catastrophe management requires collaboration across public, private, and related sectors.

After considering the literature reviews included in this chapter, the author of this thesis concluded that Malaysia's national catastrophe management needed a comprehensive strategy. Malaysia's efforts should be coordinated with all research institutes and professional associations. Historically, the reliability of engineering solutions has been associated with high prices. As a result, the government must pursue long-term, non-engineering solutions that are less expensive and more effective. The initial stage is to improve one's understanding of DRR. This component requires ongoing study in various fields, including engineering, geology, architecture, construction management, and economics. This leads to large amounts of data accumulation, which enables decisions to be made based on scientific facts and evidence rather than subjective assumptions and opinions. Additionally, collaborative efforts between academic institutions, government agencies, professional groups, and non-governmental organisations (NGOs) constantly enhance information sharing and active engagement.

The second is a financial investment in catastrophe preparedness and risk reduction initiatives, including disaster risk management investments. Numerous efforts must be made, including raising public awareness about floods, assessing disaster-prone regions, and establishing an efficient early warning system. Thirdly, catastrophe risk reduction administration and governance must be strengthened. The Malaysian government, NADMA, related agencies, and the general public are included. Malaysia's government should offer data for analysis in advance of a disaster to ensure that Malaysia is prepared in the event of one. Floods are Malaysia's most frequent natural calamity. Malaysian authorities might have more efficiently dealt with the current flood calamity if they had had a comprehensive and well-coordinated system for distributing emergency information.

The Malaysian community's experience with floods every year gives knowledge about flood disasters and influences the community's ability to be prepared. Individuals' attitudes and concerns are influenced by their knowledge. In the event of a crisis, it is vital to be prepared and vigilant, especially for vulnerable people. Preparing for floods and emergency response is a critical component of the process. The author suggests that Malaysians broaden their awareness of flood avoidance strategies through reading and developing a flood response community. Additionally, higher education and the community should take the lead on flood risk reduction initiatives and social services, including making suggestions to the government to manage flood-prone regions. Malaysia's government should encourage pupils' problem-solving and analytical abilities by incorporating spatial

thinking into the national curriculum. It teaches pupils about natural disasters and how to visualise and analyse them. Malaysia's prior flooding experience may prove crucial in resolving various environmental challenges by promoting education on NDRR through current technology or resources.

Malaysian students must improve their critical thinking and problem-solving skills, communication, creativity and invention, use of information and communication technologies, and learning skills as part of their personal development. Individuals engage in existing disaster protection or preparedness efforts primarily due to their understanding of catastrophes, and they are endowed with foundational knowledge that incorporates their attitudes and values. Individuals should be aware of catastrophes, their causes and symptoms, and what to do in the case of a flood. There are a few approaches that could be taken by the Malaysian government, such as establishing infrastructure for a disaster early warning system, strengthening human resources during a disaster, and providing an emergency response strategy for the community. The community, on the other hand, should recognise and understand the risks of disaster imposed on them.

6.6.1 University Students and Community Engagement

Understanding the community facing the risk of flooding is also an equaliser of learning towards NDRR. The surrounding community that is often involved in disasters can already identify the conflicts involved, the challenges and the skills involved in dealing with danger. There are issues where knowledge of the community towards disaster could help in planning for a better disaster management plan (World Humanitarian Summit, 2015). From it, the author argues that Malaysian universities must see the results that impacted university communities as well as create brand new awareness that ought to be validated towards the flooding context or conflict (World Humanitarian Summit, 2015).

A university as a field study could provide a complete picture of the phenomena being investigated since it is conducted in a natural context and the university as a field study has received little attention previously (Andrade, 2009). Field studies are critical for comprehending educational challenges (Gulsecen and Kubat, 2006). Even if just one example is used to contribute to a better grasp of the phenomena under investigation, it could contribute to a greater understanding of the phenomenon under investigation (Andrade, 2009). From an interpretive stance (Miles and Huberman, 1994, as cited in Andrade, 2009),

the author of this thesis could obtain sufficient information from the selected university for a subsequent study.

6.7 Malaysian University Decision-Making

This section is about another contributor to flooding recovery management, which is decision-making. Decision-making could involve pre- and post-flooding recovery. The decision-making process for flooding is not an easy task because it means matters of effort, time, cost, and life. However, proper decision-making can be accomplished through systematic analysis, identifying the cause(s) and resolving them. Decision-making was studied considerably by Gardner et al. (2007), involving decision-making carried out by higher education institutions during a disastrous event. Although the disaster studied by Gardner et al. (2007) is related to the hurricane, the research could provide relevant inputs, including flooding. Gardner et al. (2007) describe the primary characteristics of a decision support system for flood management: helping decision-makers at the upper level, providing a flexible and quick response to questions, providing a "what if" scenario, and considering specific requirements of the decision-makers

In handling flooding situations, decision-making power is always given to the appointed people, also known as stakeholders. There are also a few guidelines on how to make a better decision. One of them is having a cooperative working environment with one another, including in different departments or levels at the university. It is undeniable that university management has appointed different roles in decision-making but dealing with disasters should be made a shared responsibility. Everybody should have his or her part, even though it is just a small approach (Gardner et al., 2007). Nonetheless, only certain people will take charge of it, as not everybody else knows the real university protocol. Commonly, higher education institutions have their own plans towards any crisis for years, but the author believes that disaster effects and impacts are not the same. It means that any preparation could not be perfect enough to fit in with the future or current disaster.

The pioneering work of Gardner et al. (2007) remains crucial to extending decision-making understandability for an adaptation in changing the leadership or higher administration style that has been involved. A problem arises when the decision-making process has been influenced by the organisational culture that lasts for years. Sticking to the previous version of decision-making plans would not be the best step to be carried out. It is because the situation and the administration should always be open to new improvements in

revising ideas or approaches on how a better decision could be made. The study of Gardner et al. would have been more interesting if it had included how decisions are made and what the institution's administration came up with.

However, the author personally thinks that decision-making discussion is such a broad idea that it may require another whole new topic to discuss the decision-making process itself. The university administration or stakeholders must come up with a few approaches and types of decision-making that they would agree to follow. It is also involved in getting ready for the different styles of leadership from time to time. The author agrees with understanding the different approaches, but what is more important is choosing one method of decision-making that suits best for the university. It could be made based on previous experience, by asking for opinions from the higher administration, or by leaving it to the expertise to suggest what the best approach is. Having several decision-making types could make things worse as people would get even more confused when the real disaster strikes, unless the proper justification is made clear in the first place (Gardner et al., 2007). Each member of the staff or university community should have the willingness to take part in dealing with any damage caused by flooding. The university should come up with an excellent design programme that enables people to take their part in NDRR, and they should explain how decisions are made among the administrators during an emergency. It would help to the extent that people would have an idea of what happens next during flooding while having some security and peace of mind (Gardner et al., 2007).

It may be challenging for the author of this thesis to include disaster risk reduction activities, information, and stakeholders. This is due to a lack of confidence among various stakeholders. Combining scientific and local knowledge or awareness has several advantages. Most of the time, the top-down strategy fails. As a result, supporting a bottom-up approach is judged appropriate for mitigating catastrophe risks, as agreed upon by a few academics. DRR should be handled holistically, much like a road plan. It functions as a roadmap for ensuring that stakeholders, activities, and knowledge are all integrated.

Global DRR has improved and even been revolutionised over the years. The main objectives are similar, which is to reduce disaster risks and take care of people and their environment. With so many DRR comes with a different name and countries conducting it, all the information mostly remains the same. Malaysia always supports any DRR agendas, including at the international level. However, it is particularly troubling finding that Malaysia has fewer contributions towards it (even though the government claimed otherwise). A possible explanation for this might be that Malaysia always agrees with

whatever recommendations and programs suggested by the international community. Malaysia would believe those could be applied within the country but may not take any further efforts. It could be better if Malaysia designs a national DRR initiative that suits the present-day disaster situation. It should be then presented globally, getting feedback through comments and re-design them. All of those are learning processes. Malaysia can do its research, having lots of experts. Therefore, the government needs to put more emphasis on government initiatives, training, and encouragement (for example, through research grants). It is not necessary to appoint high-cost agencies or overseas researchers to conduct the work. The author believes that if such initiatives are carried out, the importance of DRR will become the national priority, and the Malaysian community will contribute more than what could be expected.

6.8 Integration of Strategy

This part exists to integrate data received from the university community and data gathered from the earlier chapter of literature review. Those integration of data sources could help in managing future DRR practice.

6.8.1 Public Authorities

The university's infrastructure should be more sophisticated; its support personnel should be superior and better equipped to manage emergencies. Another lens to view the university approach to NDRR is via the lens of corporate social responsibility (CSR) (Hirunsalee, Denpaiboon, and Kanegae, 2013). CSR efforts might be directed at strengthening the university's resilience for the benefit of society (Hirunsalee et al., 2013). The university's reputation might be enhanced by having a great CSR in floods.

Gardner et al. (2007), who conducted a case study on the storm, concurred that the catastrophe added to the workload and obligations of management. Gardner's study found that private organisations tended to have less hierarchical organisational structures than public equivalents. However, private organisations' reliance on a small number of personnel to perform many functions resulted in higher onerous workloads (Gardner et al., 2007). The scenario of flood difficulties in Malaysian colleges presents a challenge in enlisting all stakeholders' efforts to achieve a more favourable recovery condition (Colorado Water Conservation Board, 2018). As a result, an incentive should be supplied for cooperation, stakeholder benefits, agreement-making, independent facilitation, information gathering, and informed decision-making (Faehnle and Tyrväinen, 2013).

Thayaparan et al. (2015) discussed actions to enhance universities' flooding strategy. Examples include visits by responsible authorities to identify areas for improvement, staff exchange programmes with other universities, talks and training sessions with key industry figures, and collaborations with responsible parties other than the university for events, teaching, curricular activities, publications, industrial functions, research, and consulting. Additionally, this is the strategy for a few recognised issues, such as communication difficulties, late findings, and disagreement between industry and academics. There should be safe networking between higher education institutions to influence the country's education policy (Thayaparan et al., 2015). As such, higher education institutions must play a crucial role in developing students' competence to manage post-disaster rebuilding difficulties as-built environment experts (Ofori, 2002).

The university management must act considering the flooding's enormity. Appropriate techniques should be offered for developing strategic plans (Sheffield et al., 2016). Appropriate authorisation and bids should have been secured at the institution. Any recovery efforts should be thoroughly addressed with the team and stakeholders to ascertain necessary enhancements for increased resilience. A recovery team should identify emergency requirements, ascertain the most severely impacted locations, and care for flood victims' emotional and physical health (Cordero-Reyes et al., 2017). For instance, the institution has designated police officers to secure university property (McElreath et al., 2013).

However, even with the strictest security measures at universities, emergencies related to natural catastrophes will not be eradicated (Sheffield et al., 2016). Flood training may be provided via courses, programmes, or integrated components of students' curriculums. Additionally, an emergency exercise might guarantee that university residents have a perspective on the operational factors during a crisis (Sheffield et al., 2016).

6.8.2 Strategic Goals

Recovery of people requires speed and help from all aspects. Each area of the university at risk needs to be identified, and the rescue team needs to understand the university safety mission. The recovery approach to save the university business requires detail coordination, mitigation efforts, and building work if necessary. This provides ways for the university building to operate within a short time, ensuring that access to the university is not compromised, and to ensure the university community is always safe.

Making prioritisation is a must, and the decision could be divided into sections, which are short-term recovery, long-term recovery, pre-planning of recovery management, and post-flooding recovery action. Through this way, the scope of recovery will become smaller and easier to accomplish. Malaysian university should come with a backup plan. If one recovery plan had failed, there are more plans left to try. Malaysian university now does have a plan, but the plan is not updated for many years. Only slight adjustments were made here and there, with no noteworthy difference.

The study also confirms that there is a strong working relationship between the Malaysian universities and the local and central governments. The Malaysian universities should in any case always work together with the NSC, government, agencies, and NGOs. Several factors could explain this observation. Firstly, they should always open to adopt new methods in dealing with a flood. Secondly, Malaysian universities must identify all the relevant agencies that the institution would likely work with during emergencies.

The university community must always maintain good relationships with those agencies. Thirdly, the institution should seek further advice and guidance from those agencies on how to manage disaster based on the expertise of each agency. All the information and details given by the responsible agencies must be considered and further applied. Each of them might provide different views and aspects to focus on. These findings suggest that combining all this information would provide a comprehensive action plan for the university, which is worth managing in the NDRR.

There is no exact approach, framework or legislation that could give full positive results in conducting the recovery process. It is therefore vital for the university to learn from other higher educational institutions (private university or overseas institutions) about their comprehensive approaches and develop enhanced initiatives. This is troubling finding that there are none other external institutions that could understand the university needs and requirement to successfully recovered from flooding other than the community itself. On the other hand, it is somewhat encouraging as it is an added advantage if UiTM could prepare itself with all the necessary planning and measures. This would make the institution more independent and stronger to face further threats, which all starts from proper planning and cautious management action. The cooperation between UiTM and other higher educational institutions or other external governmental agencies and NGOs would help and make a further difference in better ways to approach things, especially in the recovery process.

In this study, insufficient funds were found to cause problems to the Malaysian public universities, in terms of the cost of repairing and upgrading facilities to be more sustainable or flood-resilience. The result further supports the idea that the limitation arose when the costs involved is very high, and the government must consider their affordability before any decisions being made (The Star, 2014). Since flood prevention, mitigation and post-flooding remediation are very costly, finding the means to lessen the expense is necessary. Public universities in Malaysia usually receive funds from the Malaysian government. The reconstruction and recovery process needs good financing from the government because nothing can be started without sufficient funds. Perhaps the most unexpected finding is how Malaysian universities are feeling lenient on flooding. It is because their ability is limited, and the government would help for anything beyond the university's capability. The study confirms that Malaysian universities received help and money allocations from the government to make sure victims are all well, and that the university surroundings are free from damages.

6.8.3 Infrastructure Assessment

The findings from the case study suggest that any reconstruction and the new build will only be carried out if this is the only way to recover from flooding. For example, the activity of increasing road height within the UiTM Shah Alam campus is to avoid stagnant water. In the process of repair, many factors are considered, including the seriousness of the building defects and the safeness of the affected building for the community. All assessments related to flood damage and repairs need to be done by a building specialist or contractor appointed by the university. Besides the university facility management team, the crisis management team and building engineer at the university need to review the reports issued by the appointed contractors. This reveals something about the nature of the university multi-level disaster management, in which any suggestions for improvement should be in line with the inspection done by the university team.

Additionally, the university engineer will produce the report that needs to be submitted to the university treasurer and approved at the university management level for budget approval. Budget increases depend on the materials, equipment, and labour that need to be used instantaneously. Restrictions on construction costs would result in a reduction in reconstruction quality, resulting in repeated damages, thus increased current losses. Once budgeting is approved, the contractor is appointed by the university within the specified time to start the construction work. In the event of a delay or the contractor breach any of the

stipulated contracts; the appointment of new contractors is made. University monitoring is carried out during the reconstruction process, so that all repairs meet the university's standards and expectations.

Different properties would need different types of property-level protection. This depends on what adaptations and strategies are used to manage flood risks. All university assets and infrastructure related to emergency use should be structurally sound to be used at any time. For example, the university building design should have proper access and exits for evacuation during flooding. If the university building has a fire exit or emergency routes, all those should not have obstructions such as chairs, desks, and items blocking the path. All descriptions of the emergency tools or signage should be readable and easily understood. Simple recovery action for the university building is like, raising the floor levels. A building survey is required to identify building structural or material damage. It will include identifying the building elements and their condition, such as walls, floors, basements, cellars, floor cavities, and services. Engineering is one of the most essential and critical parts, as it provides technical assistance covering electrical, mechanical, and building structures.

A flood is an emergency matter. Any emergency requires professional people intervention, time-sensitive, should follow instructions, and sufficient resources for action. It could be seen that UiTM campuses are likely to adopt property-level adaptation and community-level adaptation. UiTM as a case study has made some adjustments, for example, clean drainage, floodwater reservoir, road level elevation, and some refurbishment of the university building. Some other issues may be overlooked, such as business backup, online data backup, identifying initial loss of university assets or flood victims, and long-term recovery actions.

6.8.4 Institutional Structure and Governance

Recovery matters should be spread among those accountable for the building’s care and management, reducing the risk of misunderstanding. Stakeholder contributions to the administration of flood risks are a superior method. Stakeholders likewise have their responsibilities. The diverse backgrounds of stakeholders enable better decision-making strategies in pre- and post-flooding recovery. Decision-making for post-flooding improvement is complex because it requires consistent efforts, time, and costs. Malaysian universities should strengthen volunteering teams within the campus. The existence of this volunteering team must be spread. Certain benefits may also be provided. All employees should cooperate and understand their duties while in an emergency. Every team appointed

at each management level would tackle different risks and concerns. The level involves organising resources, including the assets and staff required to meet the purpose. The following is to provide support in terms of finance and human resources.

Training for disasters, which involves all the university administration, is required. These include emergency operation training, rescue process, first aid, and evacuation of victims. Currently, UiTM Malaysia workshops, training and seminars are only for the staff and not for the public. The university will follow the prescribed procedure in the event of flooding. Perhaps, the current practice of "wait and see" should be further improved to be more proactive efforts. University can activate their preparedness activities while waiting for disaster to happen. The crisis management team should act accordingly when a flood happens. They must synchronise their efforts in everything.

Floods that happen in UiTM Malaysia do not bring mass destruction. Nonetheless, it seems that the UiTM administration has made several improvement efforts on the main campus (UiTM Shah Alam), but less on the other campuses. The reconstruction and project management process seems clear cut, and everybody seems to be familiar with the process. It is a good indicator that UiTM is doing great work in managing university recovery and reconstruction projects. Recovery works that are currently done by the UiTM are based on complaints. Less reactive approaches being done. The time taken to resolve the problems is also quite lengthy, because of all the procedures involved. There are also fewer staffs to attend to matters, and UiTM merely depends on the end-users to transmit risk information that appears in the university. Recovery projects' successfulness also only based on the ability of the appointed contractor, provided that the management could only guide and assist those contractors.

6.8.5 Early Warning system

Flood emergency management contributes to integrated flood management. It is somewhat surprising that in Malaysia, flood warning systems exist but have less impact in reducing the flood damage than might be expected (Billa et al., 2006), such as damage to buildings and causing injuries. This rather intriguing finding may be related to the fact that the Malaysian local authorities do not get direct information on continuous rainfall potential and resulting floods. A note of caution is due here since the government website will provide the rain and water levels, which always monitored and updated online, assuming the Internet is still working. At the same time, a short message system (SMS) is also used to provide fast information. There is no signage suggesting meeting sites or evacuation routes in a disaster.

Students indicate that floods frequently occur during periods of heavy rain and that, on occasion, when it rains excessively and interferes with studying, the water suddenly rises rapidly. Except for children who participate in extracurricular activities such as scouting, schools rarely teach disaster preparedness. Little can be done except for university students to flee to a sufficiently high floor class when the flood crisis comes. Based on the author of this thesis personal observations, there are no disaster warning indicators, such as disaster gathering sites or evacuation routes. According to student data, floods frequently occur during periods of heavy rain. Occasionally, rain inundates water and disturbs school learning during the learning process. Knowledge regarding disaster preparedness is rarely imparted in the university.

As a member of society, we must be prepared to deal with the threat of flood hazards through proactive planning and a thorough grasp and knowledge of disaster response. This is critical, even more so for those who live in flood-prone areas. Flooding is generally caused by excessive rainfall, which overwhelms the water drainage system, including natural rivers and tributaries, and the existing drainage system and manmade flood storage canals. The capacity or capacity of the water drainage system does not remain constant over time. Still, it varies due to sedimentation, river constriction caused by natural and manmade events, choked rubbish, and other impediments.

There is a flood system implemented the state of Kelantan, Terengganu, and Pahang. The national flood forecasting and warning system will notify the authorities a week in advance of chances of a flood, with 100 per cent accuracy (NST, 2017). Besides that, Malaysia has already implemented an early warning system, which produces loud alarms if flooding were imminent. It is also applicable to the additional tsunamis early warning system, and these two systems should work together. It could be argued that it was due to the situation where floods occur on a large scale, damaging the flood mitigation infrastructure, and flood warning system. In an observational review from the author, an emergency plan should spell out flood forecasts and warnings; identify the necessary implementation activities; responsible authorities; and organise issues under various emergency flood scenarios.

Nevertheless, it requires cooperation across sectors and administrative levels. Individual participation is essential as part of an integrative approach for emergency flood management. The university community should know about flood warning and evacuation procedures (if they are in the university area). This is in accordance with recent studies

indicating that community must know the step-by-step action and not panic (Garbett, 2014). This also corroborates the ideas of Leman et al., (2016), who suggested that the early detection of any signs of flood hazards potential could help.

Those findings might help Malaysian universities to find new ways in flooding NDRR by investing in the flood early warnings system, which suits the university needs. Contrary to the expectation, the current UiTM SOP is not considering an early warning system in managing general disasters. Some of the issues emerging from the findings are related specifically to a lack of flood information and updates from the university. The updated reports should be made available even though the flood does not happen every year. There are personnel who had been assigned to this task, but still require cooperation and of information from various aspects.

The government should deliver the most accurate information on the early detection sign of flood or hazards potential so that the other institutions like university could act accordingly. Nevertheless, the university administration is doing great in other aspects, such as establishing a flood operation centre, complete with facilities. In addition, the university has provided emergency funds based on the priority lists, including food assistance and other necessities. Government and institutions could help, but cooperation from individuals can ensure that the recovery process is implemented smoothly. The results may be taken to indicate that the university should carry out reactive action, rather than just waiting for external help.

6.9 Pre-Flood Strategy

6.9.1 Disaster Preparedness

Numerous disaster-related studies have been conducted using a variety of methodologies and approaches. Understanding the numerous definitions, classifications, and types of disasters may help someone understand the nature of flooding and how it can negatively influence a community. Floods are challenging to forecast, and they are likely to become more common and severe in the future. Thus, preparing for the worst-case situation in terms of floods must be a primary development objective.

A rapid flood might negatively affect towns that lack capacity, leaving them exposed. Natural disasters are inextricably linked to most nations, even industrialised ones. Occasionally, it wreaks havoc on an urbanised country unprepared for it. Each county should

have a plan to mitigate the effects of natural disasters. Each person will respond uniquely to a natural calamity. This is because natural disasters manifest themselves in various ways and have a range of implications for their victims. As a result, the community should be prepared for catastrophe recovery via agreements and activities. Innovative and proactive solutions can help address this.

6.9.2 Flood Risk Perception

A framework should be established throughout the study process to connect quantitative and qualitative data (Creswell, 2017). This technique is often used in the discussion section to combine, integrate, or compare the results of two sets of data. This form of integration is often employed in mixed-methods research, starting with quantitative statistical data, and ending with qualitative claims that support or contradict the quantitative results (Creswell, 2017). The study will be guided or informed by pre-defined assumptions, views, and conclusions from earlier research, including literature, preliminary results, and personal experience that contribute to a more comprehensive understanding of individual risk perception. The results or suggestions may aid the university administration in fine-tuning their current plan, which contains action-oriented components. Additionally, they may discuss the merits and cons of their present normative method. The author anticipated that the findings would establish a solid basis for action.

Malaysian scenarios and trends show that civil society is less interested in engaging in and resolving regional environmental concerns. While Malaysia has a democratic system, public scrutiny of government decision-making continues to be limited. Prioritising public feedback is critical. It is an essential metric for analysing the implementation of sustainable development, and this indicates that the perspective of the community and government should be considered. Their opinions should be considered while creating and conducting a project that makes an environmental threat. These defects remain visible and need special treatment. It is difficult to assess if Malaysian society contains an ecologically appropriate value system from an ecological and ethical stance. However, there is evidence that community knowledge of environmental concerns has increased in this nation, even though their support and engagement in such causes remain minimal. To examine flood adaptation methods via students' eyes, It is critical to support the university in establishing a more realistic approach to flood-related NDRR implementation. The conclusions of the study were revealed in phases. Following that, the results of real case studies will be provided in their respective subtopics, addressed in further detail below.

Numerous approaches for managing flood risk have emerged throughout the ages due to studies into flood features and threats. Despite this, estimating flood risk has been challenging to date due to the diversity of causes and hydrological uncertainty associated with climate and land-use change. Frequently, during the flood risk management planning phase, the possibility of extra challenges such as pollution, land usage for megaprojects, deforestation, or drainage obstruction is overlooked. As a result, more sustainable flood risk management is not always possible. For example, flood control should be considered throughout the life of a project, starting with the planning phase (Shah et al., 2018). Effective flood control measures, both structural and non-structural, highly depend on the local environment and permitting procedures. Numerous structural flood control projects have proved their usefulness in averting floods in the near term. Nonetheless, some of these structural barriers will fall short of the long-term goal of preventing floods caused by unregulated development, population increase, and land-use change (Shah et al., 2018).

While perceptions of flood risk have long been recognised as critical components of community resilience in the face of flooding disasters, there has been a research void supporting them. For instance, rationalist and constructivist theories each provide a distinct framework for analysing facts and generating concepts related to the broader issue of risk perception. It situates risk perception in general, risk perception theory in particular, and modern thinking about flood risk and management in contemporary terms (Birkholz et al., 2014). Birkholz et al. (2014) address current understandings of the relationship between risk perception and flood management, emphasising communication tactics and the extent to which people at risk of flooding think they are responsible for taking preventive measures.

Throughout this research, the reader has been taught that people's risk assessments of environmental dangers are socially created and affected by their environment. Local community experiences shaped this perspective significantly. Community beliefs, the research indicates, are a component of social perception. Consequently, community members may take little or no mitigating action to improve their resilience and susceptibility to catastrophes, jeopardising DRR initiatives in flood-affected regions. Community-based disaster management is an excellent approach for communities to take the lead in strengthening their coping strategies in the event of future flooding. Understanding the community's social beliefs is vital to altering behaviour, communicating risks, and implementing appropriate DRR solutions. It is impractical to disregard the variables that lead to more resilient communities, which benefits everyone.

The goal of this research was to assess respondents' risk perceptions about the institution's flooding status or threats and their willingness or capacity to accept the NDRR scenario or the influence of flooding risks on them in their existing state. The present problem was categorised according to the hypothesised categories and then classified further according to culture, framework, tradition, and applicable affiliation. This is critical for evaluating respondents' risk assessments since it brings the image to a conclusion. The author selects a representative sample of respondents when conducting the sampling. This was done by balancing the size of the population, the features of the institution, and the extent to which the institution fit the study's goals. As a result, it is vital for the author to examine the plotted data carefully. The author starts with the theme chart's subtopic and progresses through the case to its conclusion.

Specific difficulties occur when the issue is unconnected to the respondent's knowledge. The respondent may have been fearful of confronting the issue. Throughout the analytical process, the author makes an interpretive note. Along with illustrating implicit and explicit connections between separate subtopics or themes at the case level, such comments may also be used to generate analytical questions about the entire data set after charting is complete. The descriptive and expository writing phases are completed (Ritchie et al., 2013). The study gathers all the relevant information to provide useful pre-planning for post-flooding. It will also provide strategic considerations that should be carried out by the university to address issues during the flooding at the university campuses, hence optimising the post-flooding recovery efforts. Remedial measures and strategic means are considered by identifying issues and real problems of university flooding events. Furthermore, assessing and analysing the contributing risks factors and their solutions, and how could those be well managed. It could give some inspirations to meet the needs of the university community and to provide the best way to support the affected population, building reconstruction, and environment.

6.10 Post-Flood Strategy

6.10.1 Guide to Recovery

The current research explains how scientific and technical skills, emergency preparation, government responsibilities, and legislation contribute to the NDRR approach's continued improvement. However, conventional methods cannot be disregarded, such as using prior expertise for growth objectives. Additionally, it sheds new light on the critical topics of public awareness, stakeholder relations, international partnerships, good governance, and community awareness as contributors to developing a better

NDRR. Overall, the recovery stage might help the institution become better. The study of post-flood recovery has shown that functional methods to recovery result in cost savings, better policies, knowledge progress, and efficient institutional coordination. These findings imply that the recovery stage enables an institution to pursue whatever optimisation strategy it desires, depending on its institutional demands.

Campus preparation efforts include completing risk assessments, developing an emergency plan for university use, and collaborating with authorities. On the other hand, the recovery phase demonstrates how the action plan is carried out in the event of an occurrence. This may include utilising university assets and emergency funding by priority lists. They give nutritional aid and physical facilities, for example, and enlist the support of university stakeholders to make timely choices. The recovery phase entails assessing the safety of university buildings and property, determining the whereabouts of the victims, and re-establishing a more regular and orderly situation.

Each member of the institution is responsible for the campus's and community's security. Their actions may be motivated by their history, purpose, goal, and vision. The institution has created a solid team to address flood concerns that demand further effort, and their prior and ongoing efforts are regarded as outstanding. Additionally, the mitigation phase is referred to as the preventative phase. It entails the university's administration minimising the danger of flooding consequences by more in-depth flooding analysis, increased review of present flood mitigation methods, and more study into reoccurring concerns.

A review of the university's existing catastrophe plan identified severe inadequacies. Malaysian universities should adhere to the "rebuilt better" and "rebuilt safer" principles. When a university building is damaged or destroyed by floods, rehabilitation should consider these concepts to maintain sustainability and resilience. Before this research, it was difficult for the university administration to act due to a lack of funding and stakeholder attention. Unsustainable university settings will not produce immediate results, but their insignificant impact will likely manifest over several years.

Even if university buildings are not resilient, their reconstruction should be structurally sound and compliant with applicable building codes and standards. This is because any damage to building structures resulting from floods would create unending disruptions to the institution's primary mission. Implementing property-level adaptation measures and establishing institutional goals are critical components of long-term initiatives

to address flooding challenges. The university must develop and implement centralised disaster response plans for a complex environment that includes a large and varied student and staff population scattered throughout several buildings and often a large geographic region.

6.10.2 Success and Failure

According to the literature, natural disasters occur due to technical system failure. Thus, what happens if an institution is not technologically advanced in the first place? The consequences of a natural disaster could be far worse. All Malaysian university campuses must have a catastrophe warning system, which must be adequately always maintained. The system should include continuous systemic assessments of catastrophes, robust disaster information systems, and proactive communication mechanisms. Appropriate risk perception and communication may aid in the NDRR process's efficiency. Risk communication will almost surely aid in comprehending flooding's impacts and the development of progressive measures. The university is responsible for ensuring that all individuals within the university's boundaries act appropriately in response to university instructions or warnings. They should flee disaster-affected locations or high-risk situations.

Serious communication preparations are required since the institution is crowded with students, employees, and visitors, including the public. The institution must establish priorities for flood safety investments. Malaysian universities could invest in technologies such as building technology and communication technology. Communication technology enables the rapid, accurate, and helpful dissemination of information, including humanitarian assistance. Effective communication is possible even during a tragedy when each party needs information to assist the institution in recovering swiftly.

The university must analyse the accomplishments and failures of prior university recovery efforts, compile a full report, and make the required corrections. Pre-planning should include a mix of approaches and actions. To choose the most appropriate practise to apply, it is best to conduct trial and error operations. Please keep in mind that each flood recovery and mitigation method have downsides. For instance, certain areas will be kept dry if wet floodproofing is chosen. However, exposed parts will be harmed. Dry floodproofing will incur a high cost for excavation, investigation, and potential harm mitigation.

6.11 Significance of Learning

As developing nations are also afflicted by flooding, we may learn from them about their more sophisticated response methods than Malaysia currently possesses. The most appropriate strategy that fits Malaysia's circumstances should be used, and Malaysia should have ample opportunities to observe and learn from its neighbours. Taking Asian nations as an example, many of them remain exposed to flooding difficulties due to the possibility of flooding occurrences being too extreme. To ensure rapid regional progress, measures across nations should be coordinated, rather than keeping flood recovery efforts in each country secret. Outstanding organisational practises must be shared. The nations that propose them should get credit for setting the norm and serving as an example.

Management should be prepared for any changes that occur after the flood. Another set of anticipated challenges might develop during the post-flood recovery period. Institutions should be prepared to implement practical measures and coordinate plans and resources to deal with the complicated aftermath. The first planning is critical for maintaining control of the situation and ensuring the institution has the authority and capability to manage its assets or resources. Managing each university or campus demands a dynamic strategy tailored to the specific requirements of those institutions. Their priorities may vary. Certain institutions go further into contemporary growth since money may not be an issue. Certain institutions may be able to enhance the functioning of their premises and assets solely via preventative maintenance and redevelopment. Rethinking institutional policies, preparations, and actions might aid Malaysian institutions' recovery efforts after the floods.

6.12 Priority Areas

While coping with a flood scenario is not difficult, dealing with people's emotions and grief is. Functional flood recovery is necessary to avoid causing further distress to flood-affected populations who have already been traumatised by floods. Vulnerability among individuals manifests itself in various ways during the flood event cycle. If a previous strategy does not work, quick reform should be implemented, bearing in mind that a calamity might strike again at any moment. The rehabilitation strategy must establish a balance between corporate-driven growth and community development.

Given the university community's size, disaster management preparation should be prioritised. Engagement of the institution with the community should always be long-term.

Malaysian universities should establish appropriate priorities. This entails ranking flooding as the most severe threat. To begin, an institution must have a thorough understanding of its history. Examples include the business's nature, features, strengths and limitations, the effectiveness of its policies, and the organisational structure. The gap created by overlapping obligations must be ignored. Institutional policies and objectives must be consistent with their capabilities.

Although UiTM Malaysia's relationships with external agencies are reasonably positive, they need to strengthen their ties with other governmental agencies, non-governmental organisations, and international institutions. Additionally, earlier research has shown the critical nature of an organisation's management via business continuity solutions. The capacity to manage small-scale floods may instil more confidence in the university's ability to deal with large-scale floods. Every alternative that might aid in post-flood recovery operations in Malaysia should satisfy both stakeholders and construction management teams.

References

Abdullah, H., Zailan, M. N., and Riduan, A. A. (2018). Community Attitude, Knowledge and Awareness on Disaster Management: A Case of a Selected Village Community in Malaysia. IJASSH.

Abedin, M. A., and Shaw, R. (2015). The role of university networks in disaster risk reduction: perspective from coastal Bangladesh. International journal of disaster risk reduction, 13, 381-389.

Abidin, N. Z. (2010). Investigating the awareness and application of sustainable construction concept by Malaysian developers. Habitat international, 34(4), 421-426.

Abrahamsson, M., and Tehler, H. (2013). Evaluating risk and vulnerability assessments: a study of the regional level in Sweden. International Journal of Emergency Management, 9(1), 76-92.

Abramson, D. M., Grattan, L. M., Mayer, B., Colten, C. E., Arosemena, F. A., Bedimo-Rung, A., and Lichtveld, M. (2015). The resilience activation framework: A conceptual model of how access to social resources promotes adaptation and rapid recovery in post-disaster settings. The journal of behavioral health services and research, 42(1), 42-57.

Abulnour, A. H. (2014). Towards efficient disaster management in Egypt. HBRC Journal, 10 (2), 117 - 126.

Abulnour,.H. A., (2014). The post-disaster temporary dwelling: Fundamentals of provision, design and construction. Hbrc Journal, 10(1), 10-24.

Adams, W. C. (2015). Conducting semi-structured interviews. Handbook of practical program evaluation, 4, 492-505.

Adger, W. N. (1996). Approaches to vulnerability to climate change (pp. 1-63). Norwich, England: Centre for Social and Economic Research on the Global Environment.

Adger, W. N., Brown, K., Fairbrass, J., Jordan, A., Paavola, J., Rosendo, S., and Seyfang, G. (2003). Governance for sustainability: towards a 'thick'analysis of environmental decisionmaking. Environment and planning A, 35(6), 1095-1110.

Adnan, M. (2021). Mathematics' Conceptual Knowledge of for Form Four Daily School Students in District of PetalingUtama, Selangor. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(3), 675-680.

Agranoff, R., and McGuire, M. (2001). Big questions in public network management research. Journal of public administration research and theory, 11(3), 295-326.

Ahlan, A. R., Lubis, M., and Lubis, A. R. (2015). Information security awareness at the knowledge-based institution: its antecedents and measures. Procedia Computer Science, 72, 361-373.

Ahmad, M.N., Othman, M., Zakaria, N.H., Rodzi, M.Z.M. (2014). Managing Information and Knowledge in Malaysia's Flood Management: Towards a New Framework. New Trends in Software Methodologies, Tools and Techniques: Proceedings of the Thirteenth SoMeT_14, 265, 446.

Albano, R., Mancusi, L., and Abbate, A. (2017). Improving flood risk analysis for effectively supporting the implementation of flood risk management plans: The case study of "Serio" Valley. Environmental Science and Policy, 75, 158-172.

Alekseev, A. (2010). Knowledge management in project-based organisations: the success criteria and best practises. Retrieved from http://publications.lib.chalmers.se/records/fulltext/128307.pdf

Alexander, D. E. (2002). Principles of emergency planning and management. Oxford University Press on Demand.

Alexander, D. E. (2015). Disaster and emergency planning for preparedness, response, and recovery. Oxford University Press.

Allen, N., and Davey, M. (2018). The value of constructivist grounded theory for built environment researchers. Journal of Planning Education and Research, 38(2), 222-232.

Allmendinger, P., and Haughton, G. (2009). Soft spaces, fuzzy boundaries, and metagovernance: the new spatial planning in the Thames Gateway. Environment and Planning A, 41(3), 617-633.
ALNAP (2006), Evaluating Humanitarian Action by Using the OECD-DAC Criteria, Overseas Development Institute, London
Alshuwaikhat, H. M., and Abubakar, I. (2008). An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices. Journal of cleaner production, 16(16), 1777-1785.
Altbach, P. G., Reisberg, L., and Umakoshi, T. (2004). The past and future of Asian universities. Asian universities: Historical perspectives and contemporary challenges, 13-32.
Amaratunga, D., Malalgoda, C., Haigh, R., and de Silva, A. (2020). How do we organise for Disaster Risk Reduction and Resilience?.
Amri, A., Bird, D. K., Ronan, K., Haynes, K., and Towers, B. (2017). Disaster risk reduction education in Indonesia: challenges and recommendations for scaling up. Natural Hazards and Earth System Sciences, 17(4), 595-612.
Andersen, E. S. (2012). Illuminating the role of the project owner. International Journal of Managing Projects in Business.
Andrade, A. D. (2009). Interpretive research aiming at theory building: Adopting and adapting the case study design. The qualitative report, 14(1), 42.
Anton, D. K. (2012). The 2012 United Nations conference on sustainable development and the future of international environmental protection. Consilience, (7), 64-72.
Apronti, P., Osamu, S., Otsuki, K., and Kranjac-Berisavljevic, G. (2015). Education for disaster risk reduction (DRR): linking theory with practice in Ghana's basic schools. Sustainability, 7(7), 9160-9186.
Arain, F. M., and Low, S.P. (2006). A framework for developing a knowledge-based decision support system for management of variation orders for institutional buildings. Journal of Information Technology in Construction (ITcon), 11(21), 285-310.
Asch, D. A., Jedrziewski, M. K., and Christakis, N. A. (1997). Response rates to mail surveys published in medical journals. Journal of clinical epidemiology, 50(10), 1129-1136.
Asgary, A. (2016). Business Continuity and Disaster Risk Management in Business Education: Case of York University. AD-minister, (28), 49-72.
Asia Planet. (2016). Malaysia Information. Retrieved from https://www.asia-planet.net/malaysia/information.htm
Asian Disaster Reduction Center (ADRC). (2005). Total Disaster Risk Management - Good Practices. Retrieved from https://www.adrc.asia/publications/TDRM2005/TDRM_Good_Practices/PDF/PDF-2005e/Chapter3_3.3.6.pdf
Asian Disaster Reduction Center (ADRC). (2012). Natural disaster data book. Retrieved from http://www.adrc.asia/publications/databook/ORG/databook_2011/pdf/DataBook2011_e.pdf
Azungah, T. (2018). Qualitative research: Deductive and inductive approaches to data analysis. Qualitative Research Journal, 18(4), 383-400.
Bach, C., Bouchon, S., Fekete, A., Birkmann, J., and Serre, D. (2013). Adding value to critical infrastructure research and disaster risk management: the resilience concept. SAPIENS. Surveys and Perspectives Integrating Environment and Society, (6.1).
Baden, M. S., and Major, C. H. (2004). EBOOK: Foundations of Problem-based Learning. McGraw-hill education (UK).
Baker, J. L. (Ed.). (2012). Climate change, disaster risk, and the urban poor: cities building resilience for a changing world. World Bank Publications.
Balica, S. F., Wright, N. G., and Van der Meulen, F. (2012). A flood vulnerability index for coastal cities and its use in assessing climate change impacts. Natural hazards, 64(1), 73-105.

Bamberg, S., Masson, T., Brewitt, K., and Nemetschek, N. (2017). Threat, coping and flood prevention–A meta-analysis. Journal of Environmental Psychology, 54, 116-126.
Barakat, S. (2003). Housing reconstruction after conflict and disaster. Humanitarian Policy Group, Network Papers, 43, 1-40.
Barnett, J., and Breakwell, G. M. (2001). Risk perception and experience: Hazard personality profiles and individual differences. Risk Analysis, 21(1), 171-178.
Barros-Bailey, M., and Heitzman, A. M. (2013). Labor market survey. Foundations of forensic vocational rehabilitation, 167.
Barsky, L. E., Trainor, J. E., Torres, M. R., and Aguirre, B. E. (2007). Managing volunteers: FEMA's Urban Search and Rescue programme and interactions with unaffiliated responders in disaster response. Disasters, 31(4), 495-507.
Basher, R. (2006). Global early warning systems for natural hazards: systematic and people centred. Philosophical transactions of the royal society a: mathematical, physical and engineering sciences, 364(1845), 2167-2182.
Basit, T. (2010). Manual or electronic? The role of coding in qualitative data analysis. Educational Research (Windsor), 45(2), 143–154. https://doi.org/10.1080/0013188032000133548
Basturkmen, H., and Von Randow, J. (2014). Guiding the reader (or not) to re-create coherence: Observations on postgraduate student writing in an academic argumentative writing task. Journal of English for Academic Purposes, 16, 14-22.
Batica, J., and Gourbesville, P. (2016). Resilience in flood risk management–a new communication tool. Procedia Engineering, 154, 811-817.
Baumann, D. D. and Sims, J. H., (1978). Educational programs and human response to natural hazards. Environment and behavior, 15(2), 165-189.
Bazerman, C. (1981). What written knowledge does: Three examples of academic discourse. Philosophy of the social sciences, 11(3), 361-387.
Beaton, R., Stergachis, A., Thompson, J., Osaki, C., Johnson, C., Charvat, S. J., and Marsden-Haug, N. (2007). Pandemic policy and planning considerations for universities: Findings from a tabletop exercise. Biosecurity and Bioterrorism: Biodefense strategy, practice, and science, 5(4), 327-334.
Beierle, T. C. (2010). Democracy in practice: public participation in environmental decisions. Routledge.
Beigbeder, Y. (1991). The role and statuts of International Humanitarian Volunteers and Organizations: The right and duty to humanitarian assistance (Vol. 12). Martinus Nijhoff Publishers.
Bell, J., and Waters, S. (2018). EBOOK: DOING YOUR RESEARCH PROJECT: A GUIDE FOR FIRST-TIME RESEARCHERS. McGraw-Hill Education (UK).
Bempah, S. A., and Øyhus, A. O. (2017). The role of social perception in disaster risk reduction: Beliefs, perception, and attitudes regarding flood disasters in communities along the Volta River, Ghana. International journal of disaster risk reduction, 23, 104-108.
Benadusi, M. (2014). Pedagogies of the unknown: Unpacking 'culture' in disaster risk reduction education. Journal of Contingencies and Crisis Management, 22(3), 174-183.
Bendimerad, F. (2003, April). Disaster risk reduction and sustainable development. In World Bank Seminar on The Role of Local Governments in Reducing the Risk of Disasters, Held in Istanbul, Turkey (Vol. 28, pp. 57-75).
Bennett, C. J., & Raab, C. D. (2017). The governance of privacy: Policy instruments in global perspective. Routledge.
Benson, C., Twigg, J., and Rossetto, T. (2007). Tools for mainstreaming disaster risk reduction: guidance notes for development organisations. ProVention Consortium.
Bera, M. K., and Daněk, P. (2018). The perception of risk in the flood-prone area: a case study from the Czech municipality. Disaster Prevention and Management.
Bergin, M. (2011). NVivo 8 and consistency in data analysis: Reflecting on the use of a qualitative data analysis program. Nurse researcher, 18(3).

Bernard, H. R. (2017). Research methods in anthropology: Qualitative and quantitative approaches. Rowman and Littlefield.
Bernardo, F., Ramos, I., Saraiva, M.G. and Correia, F.N. (1993). Sistemas de Informação Geográfica no Ordenamento de Áreas de Risco de Cheias, Caso de Setúbal, II ESIG, Estoril.
Bertot, J. C., Jaeger, P. T., and Hansen, D. (2012). The impact of polices on government social media usage: Issues, challenges, and recommendations. Government information quarterly, 29(1), 30-40.
Bevan, M. T. (2014). A method of phenomenological interviewing. Qualitative health research, 24(1), 136-144.
Bhattacharya-Mis, N., and Lamond, J. (2014). Socio-economic complexities of flood memory in building resilience: An overview of research. Procedia Economics and Finance, 18, 111-119.
Bhattacharyya, K. (2012). Communities of Practice facilitating learning and innovation in the Indian Administrative Services-A qualitative investigative study (Doctoral dissertation, City University London).
Bier, V. M. (2001). On the state of the art: risk communication to the public. Reliability engineering and system safety, 71(2), 139-150.
Billa, L., Mansor, S., and Rodzi Mahmud, A. (2004). Spatial information technology in flood early warning systems: An overview of theory, application and latest developments in Malaysia. Disaster Prevention and Management: An International Journal, 13(5), 356-363.
Billa, L., Shattri, M., Rodzi Mahmud, A., and Halim Ghazali, A. (2006). Comprehensive planning and the role of SDSS in flood disaster management in Malaysia. Disaster Prevention and Management: An International Journal, 15(2), 233-240.
Bioexpedition. (2013). Introduction - What is a natural disaster? Retrieved from http://www.basicplanet.com/natural-disasters/
Birkholz, S., Muro, M., Jeffrey, P., and Smith, H. M. (2014). Rethinking the relationship between flood risk perception and flood management. Science of the Total Environment, 478, 12-20.
Birkmann, J., Garschagen, M., Kraas, F., and Quang, N. (2010). Adaptive urban governance: new challenges for the second generation of urban adaptation strategies to climate change. Sustainability Science, 5(2), 185-206.
Birks, M., Chapman, Y., and Francis, K. (2008). Memoing in qualitative research: Probing data and processes. Journal of research in nursing, 13(1), 68-75.
Bishop Jr, W. E. (2013). Perceptions of participating K-12 educational leaders' experiences and decisions regarding the crisis caused by the April 27, 2011 tornadoes in rural Alabama. The University of Alabama at Birmingham.
Blewitt, J. (2012). Understanding sustainable development. Routledge.
Block, E. (1986). The comprehension strategies of second language readers. Tesol quarterly, 20(3), 463-494.
Bodin, Ö. (2017). Collaborative environmental governance: achieving collective action in social-ecological systems. Science, 357(6352).
Bodoque, J. M., Díez-Herrero, A., Amérigo, M., García, J. A., and Olcina, J. (2019). Enhancing flash flood risk perception and awareness of mitigation actions through risk communication: A pre-post survey design. Journal of hydrology, 568, 769-779.
Bogdan. R. (1972) Participant Observation in Orgnizational Settings (Syracuse University Press).
Bolin, R. C. (1982). Long-term family recovery from disaster. US University of Colorado. Institute of Behavioral Science.
Bolin, R., (1986). Disaster impact and recovery: a comparison of black and white victims. International Journal of Mass Emergencies and Disasters 4 (1), 35}50.
Bolin, R., Stanford, L., (1998). The Northridge Earthquake: Vulnerability and Disaster. Routledge, New York.
Borg, W. R., & Gall, M. D. (1989). Educational research. An introduction (5th ed.). White Plains, NY: Longman.

Bosher, L. (2008). Introduction: the need for built-in resilience. In Hazards and the Built Environment (pp. 21-37). Routledge.
Boyle, J. (1998). Cultural influences on implementing environmental impact assessment: insights from Thailand, Indonesia, and Malaysia. Environmental Impact Assessment Review, 18(2), 95-116.
Boynton, P. M. (2004). Administering, analysing, and reporting your questionnaire. Bmj, 328(7452), 1372-1375.
Brandão, C., P. Bazeley and K. Jackson (2015). Qualitative data analysis with Nvivo (2013). London: Sage.
Brinke, W. B. M. T., Knoop, J., Muilwijk, H., and Ligtvoet, W. (2017). Social disruption by flooding, a European perspective. International journal of disaster risk reduction, 21, 312-322.
British Red Cross (2014). Preparing for disasters. Retrieved from http://www.redcross.org.uk/What-we-do/Preparing-for-disasters
British Standards. (2006). BS 6079-4. Project management - Part 4: Guide to project management in the construction industry. British Standards Institute.
Bronfman, N. C., Cisternas, P. C., López-Vázquez, E., and Cifuentes, L. A. (2016). Trust and risk perception of natural hazards: implications for risk preparedness in Chile. Natural Hazards, 81(1), 307-327.
Brooks, N., Adger, W. N., and Kelly, P. M. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. Global environmental change, 15(2), 151-163.
Brown, A. L., and Palincsar, A. S. (2018). Guided, cooperative learning and individual knowledge acquisition (pp. 393-451). Routledge.
Brunton, J., & Thomas, J. (2012). Information management in reviews. Sage Publications.
Bryant, B., and Mohai, P. (2019). Race and the incidence of environmental hazards: A time for discourse. Routledge.
Bryman, A. (2008). Why do researchers integrate/combine/mesh/blend/mix/merge/fuse quantitative and qualitative research. Advances in mixed methods research, 21(8), 87-100.
Bryman, A. (2016). Social research methods. Oxford university press.
Buletin Online. (2018). Pembalakan Punca Banjir Hulu Dungun. Retrieved from https://buletinonline.net/v7/index.php/pembalakan-punca-banjir-hulu-dungun/
Burney, S.M. (2008). Inductive and Deductive Research Approach. Department of Computer Science University of Karachi. [Online]. Available on http://www.drburney.net/INDUCTIVE%20and%20DEDUCTIVE%20RESEARCH%20APPR
Burningham, K., Fielding J., Catt R., and Thrush, D. (2007). Public Response to Flood Warning. Report to the Environment Agency. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291079/scho0407bmmi-e-e.pdf
Burningham, K., Fielding, J., and Thrush, D. (2008). 'It'll never happen to me': understanding public awareness of local flood risk. Disasters, 32(2), 216-238.
Burns, W. J., (2007). Risk Perception: A Review, Center for Risk and Economic Analysis of Terrorism Events □CREATE□ (University of Southern California, Los Angeles, CA).
Burns, W. J., and Slovic, P. (2012). Risk perception and behaviors: Anticipating and responding to crises. Risk Analysis.
Bush, K. and Duggen, C. (2015), Evaluation in the Extreme: Research, Impact and Politics in Violently Divided Societies, Sage, London
Butler, C., Walker-Springett, K., Adger, W. N., Evans, L., O'Neill, S., & Adger, N. (2016). Social and political dynamics of flood risk, recovery and response. A report of the findings of the Winter Floods Project.
Cabinet Office. (2011). The role of Local Resilience Forums: a reference document. Retrieved from https://www.gov.uk/government/publications/the-role-of-local-resilience-forums-a-reference-document

Cadag, J. R. D., Petal, M., Luna, E., Gaillard, J. C., Pambid, L., and Santos, G. V. (2017). Hidden disasters: Recurrent flooding impacts on educational continuity in the Philippines. International journal of disaster risk reduction, 25, 72-81.
Calgaro, E., and Lloyd, K. (2008). Sun, sea, sand and tsunami: examining disaster vulnerability in the tourism community of Khao Lak, Thailand. Singapore Journal of Tropical Geography, 29(3), 288-306.
Campbell, D., (1975). Degrees of freedom and the case study. Comparative Political Studies.
Cannon, T. (1994). Vulnerability analysis and the explanation of 'natural'disasters. Disasters, development and environment, 1, 13-30.
Caracelli, V. J., & Greene, J. C. (1993). Data analysis strategies formixed-method evaluation designs.Educational Evaluation and PolicyAnalysis, 15,195–207
Carlisle, V. (2008). For The Record. American School and University, 80(6), 48–52. Retrieved from http://search.proquest.com/docview/212709288/
Carroll, C., Booth, A., and Cooper, K. (2011). A worked example of" best fit" framework synthesis: a systematic review of views concerning the taking of some potential chemopreventive agents. BMC medical research methodology, 11(1), 1-9.
Carver, C. S., Scheier, M. F., and Weintraub, J. K. (1989). Assessing coping strategies: a theoretically based approach. Journal of personality and social psychology, 56(2), 267.
Castro, F. G., Kellison, J. G., Boyd, S. J., and Kopak, A. (2010). A Methodology for Conducting Integrative Mixed Methods Research and Data Analyses. Journal of mixed methods research, 4(4), 342–360. https://doi.org/10.1177/1558689810382916
Caudle, S. L. (2004). Qualitative data analysis. Handbook of practical program evaluation, 2(1), 417-438.
Cemex. (2016). Sustainable Construction | Sustainable Development. Retrieved from http://www.cemex.com/SustainableDevelopment/SustainableConstruction.aspx
Center for Excellence in Disaster Management and Humanitarian Assistance. (2016). Malaysia Disaster Management Reference Handbook | 2016. Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/disaster-mgmt-ref-hdbk-Malaysia.pdf.
Centre for Strategic Planning and Information. (2019). UiTM Current Statistics. Retrieved from https://www.uitm.edu.my/index.php/en/
Chai, Y., and Zeng, Y. (2018). Social capital, institutional change, and adaptive governance of the 50-year-old Wang hilltop pond irrigation system in Guangdong, China. International Journal of the Commons, 12(2).
Chan, N. W. (1995). Flood disaster management in Malaysia: an evaluation of the effectiveness of government resettlement schemes. Disaster Prevention and Management: An International Journal.
Chan, N. W. (2012). Impacts of disasters and disaster risk management in Malaysia: The case of floods. In Resilience and Recovery in Asian Disasters (pp. 239-265). Springer, Tokyo.
Chang-Richards, A., Vargo, J., and Seville, E. (2013). Organisational resilience to natural disasters: New Zealand's experience.
Chang, Y., Wilkinson, S., Seville, E., and Potangaroa, R. (2010). Resourcing for a resilient post-disaster reconstruction environment. International Journal of Disaster Resilience in the Built Environment, 1(1), 65-83.
Charmaz K. (2006). Constructing grounded theory: A practical guide through qualitative analysis. London, England: Sage.
Chase-Lansdale, P. L., Wakschlag, L. S., and Brooks-Gunn, J. (1995). A psychological perspective on the development of caring in children and youth: The role of the family. Journal of Adolescence, 18(5), 515-556.
Chatterjee, R., Shiwaku, K., Gupta, R. D., Nakano, G., and Shaw, R. (2015). Bangkok to Sendai and beyond: Implications for disaster risk reduction in Asia. International Journal of Disaster Risk Science, 6(2), 177-188.

Cheong, F., & Cheong, C. (2011). Social media data mining: A social network analysis of tweets during the 2010-2011 Australian floods.
Christensen, A. I., Ekholm, O., Kristensen, P. L., Larsen, F. B., Vinding, A. L., Glümer, C., & Juel, K. (2015). The effect of multiple reminders on response patterns in a Danish health survey. European Journal of Public Health, 25(1), 156–161. https://doi.org/10.1093/eurpub/cku057
Clarke. E. S. (2003). Public Intellectuals and Useful Knowledge. Children, Youth and Environments, 13(2), 145–148.
Clary, E. G., Snyder, M., and Ridge, R. (1992). Volunteers' motivations: A functional strategy for the recruitment, placement, and retention of volunteers. Nonprofit Management and leadership, 2(4), 333-350.
Collier, D. (1995). Translating quantitative methods for qualitative researchers: The case of selection bias. American Political Science Review, 89(2), 461-466.
Collins, M., Neville, K., Hynes, W., and Madden, M. (2016). Communication in a disaster-the development of a crisis communication tool within the S-HELP project. Journal of Decision Systems, 25(sup1), 160-170.
Colorado Water Conservation Board (CWCB). (2018). Hazard Mitigation and Disaster Recovery. Retrieved from http://cwcb.state.co.us/water-management/flood/Documents/6HazardMitigationDisasterRecovery.pdf
Colten, C. E., and Sumpter, A. R. (2009). Social memory and resilience in New Orleans. Natural Hazards, 48(3), 355-364.
Comfort, L. K. (2007). Crisis management in hindsight: Cognition, communication, coordination, and control. Public Administration Review, 67, 189-197.
Comfort, L. K., Sungu, Y., Johnson, D., & Dunn, M. (2001). Complex systems in crisis: Anticipation and resilience in dynamic environments. Journal of contingencies and crisis management, 9(3), 144-158.
Comfort, L. K., Sungu, Y., Johnson, D., and Dunn, M. (2001). Complex systems in crisis: Anticipation and resilience in dynamic environments. Journal of contingencies and crisis management, 9(3), 144-158.
Comfort, L., Wisner, B., Cutter, S., Pulwarty, R., Hewitt, K., Oliver-Smith, A., ... and Krimgold, F. (1999). Reframing disaster policy: the global evolution of vulnerable communities. Global Environmental Change Part B: Environmental Hazards, 1(1), 39-44.
Connerly, C., Laurian, L., and Throgmorton, J. (2017). Planning for floods at the University of Iowa: a challenge for resilience and sustainability. Journal of Planning History, 16(1), 50-73.
Consoer, M., and Milman, A. (2018). Opportunities, constraints, and choices for flood mitigation in rural areas: perspectives of municipalities in Massachusetts. Journal of Flood Risk Management, 11(2), 141-151.
Construction Industry Council. (2016). APPG for Excellence in the Built Environment. Retrieved from http://cic.org.uk/services/all-party-parliamentary-group.php
Cook, T. D., and Leviton, L. C. (1980). Reviewing the literature: A comparison of traditional methods with meta‐analysis 1. Journal of Personality, 48(4), 449-472.
Cooper, M. J., Dimitrov, O., & Rau, P. R. (2001). A rose. com by any other name. The journal of Finance, 56(6), 2371-2388.
Corbin, J., & Morse, J. M. (2003). The unstructured interactive interview: Issues of reciprocity and risks when dealing with sensitive topics. Qualitative inquiry, 9(3), 335-354.
Cordero-Reyes, A. M., Palacios, I., Ramia, D., West, R., Valencia, M., Ramia, N., ... and Grunauer, M. (2017). Natural disaster management: experience of an academic institution after a 7.8 magnitude earthquake in Ecuador. Public health, 144, 134-141.
Cosgrave, J. (2014). Responding to Flood Disasters: Learning from previous relief and recovery operations. ALNAP Lessons Paper. London: ALNAP/OD.
Coveleski, J. (2014). A study of students' perceptions of natural disaster plans and emergency preparedness at a higher education institution (Doctoral dissertation, The Florida State University).

Coyne, I. T. (1997). Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries?. Journal of advanced nursing, 26(3), 623-630.
CPWF. (2013). Assessing Institutional Capacities for Flood Disaster Risk Reduction. Retrieved from https://cgspace.cgiar.org/bitstream/handle/10568/33603/12.3%20Assessing%20institutional%20capacities.pdf?sequence=1andisAllowed=y
Crabtree, A. (2013). Questioning psychosocial resilience after flooding and the consequences for disaster risk reduction. Social Indicators Research, 113(2), 711-728.
Creswell, J. W. (1994). Research design: Qualitative & quantitative approaches. London: Sage Publications.
Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods approaches, (2nd ed.). Thousand Oaks: Sage Publications.
Creswell, J. W. (2007). Qualitative inquiry and research design: Choosing among five traditions (2nd ed.). Thousand Oaks, CA: Sage.
Creswell, J. W. (2013). Steps in conducting a scholarly mixed methods study.
Creswell, J. W., & Plano-Clark, V. L. (2007). Designing and conducting mixed methods research. Thousand Oaks, Calif: SAGE Publications.
Creswell, J. W., and Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.
Creswell, J. W., and Plano Clark, V. L. (2011). Choosing a mixed methods design. Designing and conducting mixed methods research, 2, 53-106.
Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research designs. Handbook of mixed methods in social and behavioral research, 209(240), 209-240.
Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., and Hanson, W. E. (2003). An expanded typology for classifying mixed methods research into designs. A. Tashakkori y C. Teddlie, Handbook of mixed methods in social and behavioral research, 209-240.
Creswell, J.W. (2011). Educational research. New Delhi: PHI Learning Private Limited.
Creswell, J.W., (1998). Qualitative inquiry and research design: Choosing among five traditions.Thousand Oaks, CA: Sage
Croskerry, P., Singhal, G., & Mamede, S. (2013). Cognitive debiasing 1: origins of bias and theory of debiasing. BMJ quality & safety, 22(Suppl 2), ii58-ii64.
Crossan, F. (2003). Research philosophy: towards an understanding. Nurse Researcher (through 2013), 11(1), 46.
Crotty, M (1998). The foundations of social research: Meaning and perspective in the research process. Thousand Oaks, CA: Sage Publications Inc.
Crotty, M. (2020). The foundations of social research: Meaning and perspective in the research process. Routledge.
Crowe, M., and Sheppard, L. (2012). Mind mapping research methods. Quality and Quantity, 46(5), 1493-1504.
Cruz, R. V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., ... and Ninh, N. H. (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability, Chapter 10: Asia. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.
Cutter, S., (1995). Forgotten casualties: women, children and environ- mental change. Global Environmental Change 5 (3), 181}194.
D'Zurilla, T. J., and Nezu, A. M. (2010). Problem-solving therapy. Handbook of cognitive-behavioral therapies, 3, 197-225.
Dalkin S, Forster N, Hodgson P,. (2020). Using computer assisted qualitative data analysis software (CAQDAS; NVivo) to assist in the complex process of realist theory generation, refinement and testing. International Journal of Social Research Methodology 24: 123–134.
Dalkin, S., Forster, N., Hodgson, P., Lhussier, M., and Carr, S. M. (2021). Using computer assisted qualitative data analysis software (CAQDAS; NVivo) to assist in the complex

process of realist theory generation, refinement and testing. International Journal of Social Research Methodology, 24(1), 123-134.
Dalkin, S., Forster, N., Hodgson, P., Lhussier, M., Philipson, P., and Carr, S. (2018). Exposing the impact of intensive advice services on health: A realist evaluation. Health and Social Care in the Community, 27(3), 767–776.
Daniel, J. (2012). Sampling Essentials: Practical Guidelines for Making Sampling Choices (p. 103). Sage Publications.
Dawson, R. J., Ball, T., Werritty, J., Werritty, A., Hall, J. W., and Roche, N. (2011). Assessing the effectiveness of non-structural flood management measures in the Thames Estuary under conditions of socio-economic and environmental change. Global Environmental Change, 21(2), 628-646.
de Goyet, C. D. V. and Morinière, L. (2006). The role of needs assessment in the tsunami response. Tsunami Evaluation Coalition (TEC).
de Goyet, C. D. V., Marti, R. Z., and Osorio, C. (2006). Natural disaster mitigation and relief. In Disease Control Priorities in Developing Countries. 2nd edition. The International Bank for Reconstruction and Development/The World Bank.
Demissie, B., Teklemariam, D., Haile, M., Meaza, H., Nyssen, J., Billi, P., ... and Van Eetvelde, V. (2021). Flood hazard in a semi‐closed basin in northern Ethiopia: Impact and resilience. Geo: Geography and Environment, 8(2), e00100.
Denzin, N. (2010). The fundamentals. An Introduction to Triangulation, D. Rugg, editor. UNAIDS Monitoring and Evaluation Fundamentals, Geneva, Switzerland, 12.
Department for Environment, Food and Rural Affairs (DEFRA). (2001). National Appraisal of Assets at Risk from Flooding and Coastal Erosion, including the potential impact of climate change. Final Report July 2001. Retrieved from https://www.google.com/url?sa=tandrct=jandq=andesrc=sandsource=webandcd=3andved=2ahUKEwjXpt_px8PkAhWX63MBHWwDAMAQFjACegQIAhACandurl=http%3A%2F%2Fsciencesearch.defra.gov.uk%2FDocument.aspx%3FDocument%3DFD2004_1033_TRP.pdfandusg=AOvVaw2BZBaDVC8hNX_zH_r3Fcew
Department for International Development (DFID). (2005). Disaster Risk Reduction: A development concern. Retrieved from http://www.droughtmanagement.info/literature/DFID_disaster_risk_reduction_2004.pdf
Department of Irrigation and Drainage (DID). (2012). Urban Stormwater Management Manual for Malaysia. Retrieved from https://www.water.gov.my/jps/resources/PDF/MSMA2ndEdition_august_2012.pdf
Department of Irrigation and Drainage (DID). (2017a). Managing the Flood Problem in Malaysia. Retrieved from https://www.water.gov.my/jps/resources/auto%20download%20images/584130f6ea786.pdf
Department of Irrigation and Drainage (DID). (2017b). Water related legislation. Retrieved from https://www.water.gov.my/index.php/pages/view/381
Department of Statistics Malaysia. (2017). Department of Statistics Malaysia Official Portal. Retrieved from https://www.dosm.gov.my/v1/
Department of Statistics Malaysia. (2022). Department of Statistics Malaysia Official Portal.
Deshmukh, A., Oh, E. H., and Hastak, M. (2011). Impact of flood damaged critical infrastructure on communities and industries. Built Environment Project and Asset Management.
Designing Buildings Ltd. (2016). Built environment. Retrieved from http://www.designingbuildings.co.uk/wiki/Built_environment
Dey, I. (1993). Creating categories. Qualitative data analysis. London: Routledge. Edwards, SM, li, H. and lee, J.-H. (2002) forced exposure and psychological reactance: antecedents and consequences of the perceived intrusiveness pop-up ads. Journal of Advertising, 31(3), 83-95. doi.org/10.1111/hsc.12695
Diarra, C., Diallo, O., and Katjomuise, K. (2017). What is New in the Istanbul Programme of Action for the Least Developed Countries? Available at SSRN 3075264.

Diener, E., Lucas, R. E., and Scollon, C. N. (2009). Beyond the hedonic treadmill: Revising the adaptation theory of well-being. In The science of well-being (pp. 103-118). Springer, Dordrecht.
Directive, E. U. (2007). 60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks. Official Journal of the European Union L, 288(27), 2007.
Dixon, T., Connaughton, J., and Green, S. (2018). Sustainable futures in the built environment to 2050: a foresight approach to construction and development. Hoboken: Wiley-Blackwell.
Dollah, S., Abduh, A., and Rosmaladewi, M. (2017). Benefits and drawbacks of NVivo QSR application. In Advances in Social Science, Education and Humanities Research (ASSEHR), Proceedings of the 2nd International Conference on Education, Science, and Technology (ICEST 2017) (Vol. 149, pp. 61-63).
Dooley, D., Catalano, R., Mishra, S., and Serxner, S. (1992). Earthquake preparedness: Predictors in a community survey. Journal of Applied Social Psychology, 22, 451–470.
Doyle, L., Brady, A. M., and Byrne, G. (2016). An overview of mixed methods research–revisited. Journal of research in nursing, 21(8), 623-635.
Durcikova, A., and Gray, P. (2009). How knowledge validation processes affect knowledge contribution. Journal of Management Information Systems, 25(4), 81-108.
Durian, D. (2002). Corpus-based text analysis from a qualitative perspective: A closer look at NVivo. Style, 36(4), 738-742.
Dynes, R., & Quarantelli, E. L. (1968). What looting in civil disturbances really means. Trans-action, 5(6), 9-14.
Eccles, R. G., and Krzus, M. P. (2010). One report: Integrated reporting for a sustainable strategy. John Wiley and Sons.
Economic Planning Unit Malaysia. (2010). 10th Malaysia Plan 2011-2015. Economic Planning Unit, Prime Minister Department. Kuala Lumpur: Percetakan Nasional Malaysia Berhad.
Edmondson, A. C., and McManus, S. E. (2007). Methodological fit in management field research. Academy of management review, 32(4), 1246-1264.
Edwards, M. L. (1993). Social location and self-protective behavior: Implications for earthquake preparedness. International Journal of Mass Emergencies and Disasters, 11, 305–322.
Eiser, J. R., Bostrom, A., Burton, I., Johnston, D. M., McClure, J., Paton, D., ... and White, M. P. (2012). Risk interpretation and action: A conceptual framework for responses to natural hazards. International journal of disaster risk reduction, 1, 5-16.
Ely, M., Anzul, M., Freidman, T., Garner, D., and McCormack-Steinmetz, A. (1991). Doing qualitative research: Circles within circles (Vol. 3). Psychology Press.
EM-DAT. (2016). Glossary. Retrieved from http://www.emdat.be/glossary
EM-DAT. (2019). General Classification. Retrieved from https://www.emdat.be/classification
Enarson, E. (2001). International Strategy for Disaster Reduction (ISDR) Expert Group Meeting on "Environmental management and the mitigation of natural disasters: a gender perspective" 6-9 November 2001.
Environment Agency. (2009). Flooding in England: A National Assessment of Flood Risk. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf
Escarameia, M., Tagg, A., Walliman, N., Zevenbergen, C., and Anvarifar, F. (2012). The role of building materials in improved flood resilience and routes for implementation.
Etikan, I., and Bala, K. (2017). Sampling and sampling methods. Biometrics and Biostatistics International Journal, 5(6), 00149.
Etikan, I., Musa, S. A., and Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. American journal of theoretical and applied statistics, 5(1), 1-4.

European Commission. (2017). The EU Floods Directive. What is flood risk management? Retrieved from http://ec.europa.eu/environment/water/flood_risk/flood_risk.htm
European Environment Agency. (2005). Climate change and river flooding in Europe. Retrieved from https://www.eea.europa.eu/publications/briefing_2005_1
European Water Association. (2009). EWA Expert Meeting on Pluvial Flooding in Europe. Brussels, Belgium. Retrieved from http://www.dwa.de/portale/ewa/ewa.nsf/C125723B0047EC38/B5A125AF564B24E2C1257750002C1FD9/$FILE/EWA%20expert%20meeting%20on%20pluvial%20flood_Final%20Report.pdf
Fade, S. A., and Swift, J. A. (2011). Qualitative research in nutrition and dietetics: data analysis issues. Journal of Human Nutrition and Dietetics, 24(2), 106-114.
Faehnle, M., and Tyrväinen, L. (2013). A framework for evaluating and designing collaborative planning. Land Use Policy, 34, 332-341.
Fellows, R. F., & Liu, A. M. (2021). Research methods for construction. John Wiley & Sons.
FEMA (2020). Ecosystem Service Benefits in Benefit-Cost Analysis for FEMA's Mitigation Programs Policy. FEMA Policy FP-108-024-02
Few, R. (2003). Flooding, vulnerability and coping strategies: local responses to a global threat. Progress in development studies, 3(1), 43-58.
Few, R., Ahern, M., Matthies, F., and Kovats, S. (2004). Floods, health, and climate change: a strategic review.
Field, C. B., Barros, V., Stocker, T. F., and Dahe, Q. (Eds.). (2012). Managing the risks of extreme events and disasters to advance climate change adaptation: special report of the intergovernmental panel on climate change. Cambridge University Press.
Fillmore, E. P., Ramirez, M., Roth, L., Robertson, M., Atchison, C. G., and Peek-Asa, C. (2011). After the waters receded: a qualitative study of university official's disaster experiences during the Great Iowa Flood of 2008. Journal of community health, 36(2), 307-315.
Fischer, F. (2000). Citizens, experts, and the environment. Duke University Press.
Fischhoff, B. (2013). Judgment and decision making (pp. 19-38). Routledge.
Fishbein, M., & Ajzen, I. (1975). Belief attitude, intention, and behavior. Reading, MA: Addison-Wesley.
Fisher, R. J. (1993). Social Desirability Bias and the Validity of Indirect Questioning. The Journal of Consumer Research, 20(2), 303–315. https://doi.org/10.1086/209351
Flanagan, R., and Norman, G. (1993). Risk management and construction. Blackwell Publishing, Oxford, UK.
Fleming, G. (2002). Learning to live with rivers—the ICE's report to government. In Proceedings of the Institution of Civil Engineers-Civil Engineering (Vol. 150, No. 5, pp. 15-21). Thomas Telford Ltd.
Flick, U. (2002). An introduction to qualitative research (2nd ed.) London: Sage.
Flint, C. G., and Luloff, A. E. (2005). Natural resource-based communities, risk, and disaster: An intersection of theories. Society and Natural Resources, 18(5), 399-412.
Folke, C., Hahn, T., Olsson, P., and Norberg, J. (2005). Adaptive governance of social-ecological systems. Annu. Rev. Environ. Resour., 30, 441-473.
Fordham, M.H., (1998). Making women visible in disasters: problematising the private domain. Disasters 22 (2), 126}143.
Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). How to design and evaluate research in education (Vol. 7, p. 429). New York: McGraw-hill.
Francis, K. (2010). Finding Meaning in Tragedy: A Social Constructionist Perspective (Doctoral dissertation, CQUniversity).
Francis, R., and Bekera, B. (2014). A metric and frameworks for resilience analysis of engineered and infrastructure systems. Reliability Engineering and System Safety, 121, 90-103.

Frewer, L. J., Scholderer, J., & Bredahl, L. (2003). Communicating about the risks and benefits of genetically modified foods: The mediating role of trust. Risk Analysis: An International Journal, 23(6), 1117-1133.
Frey, J. H., and Fontana, A. (1991). The group interview in social research. The Social Science Journal, 28(2), 175-187.
Frisby, B. N., Veil, S. R., and Sellnow, T. L. (2014). Instructional messages during health-related crises: Essential content for self-protection. Health Communication, 29(4), 347-354.
Frohmann, L. (1997). Complaint-filing interviews and the constitution of organizational structure: Understanding the limitations of rape reform. Hastings Women's LJ, 8, 365.
Frost, C. (1994). Effective responses for proactive enterprises: Business continuity planning. Disaster Prevention and Management: An International Journal, 3(1), 7-15.
Fusch, P., Fusch, G. E., and Ness, L. R. (2018). Denzin's paradigm shift: Revisiting triangulation in qualitative research. Journal of social change, 10(1), 2.
Gaillard, J.C. and Mercer, J. (2013), "From knowledge to action bridging gaps in disaster risk reduction", Progress in Human Geography, Vol. 37 No. 1, pp. 93-114.
Gall, M. D., Borg, W. R., & Gall, J. P. (1996). Educational research: An introduction. Longman Publishing.
Garbett, B. (2014). Building on Flood Risk Sites: What the Law Says. Retrieved from http://www.constructionmanagermagazine.com/management/building-flood-risk-sites-what-law-says/
Garcia-Dia, M. J., DiNapoli, J. M., Garcia-Ona, L., Jakubowski, R., and O'Flaherty, D. (2013). Concept analysis: resilience. Archives of psychiatric nursing, 27(6), 264-270.
Gardner, S. K., Miller, K., Barker, M. J., Loftin, J., Erwin, M., and Maurin, K. (2007). Student affairs and Hurricane Katrina: Contextual perspectives from five institutions of higher education in New Orleans. NASPA Journal, 44(1), 209-232.
Gaume, E., & Borga, M. (2008). Post-flood field investigations in upland catchments after major flash floods: proposal of a methodology and illustrations. Journal of Flood Risk Management, 1(4), 175–189. https://doi.org/10.1111/j.1753-318X.2008.00023.x
Gaur, A., and Kumar, M. (2018). A systematic approach to conducting review studies: An assessment of content analysis in 25 years of IB research. Journal of World Business, 53(2), 280-289.
Gaziulusoy, A. I., and Boyle, C. (2013). Proposing a heuristic reflective tool for reviewing literature in transdisciplinary research for sustainability. Journal of Cleaner Production, 48, 139-147.
Gergen, K. J. (1995). Social construction and the educational process. Constructivism in education, 17, 39.
Getz, D. (2004). Event management and event tourism. University of Calgary, Canada.
Gherardi, S., and Nicolini, D. (2000). The organizational learning of safety in communities of practice. Journal of management Inquiry, 9(1), 7-18.
Ghezeljeh, T. N., Aliha, J. M., Haghani, H., and Javadi, N. (2019). Effect of education using the virtual social network on the knowledge and attitude of emergency nurses of disaster preparedness: a quasi-experiment study. Nurse education today, 73, 88-93.
Gissane, C. (1998). Understanding and using descriptive statistics. British Journal of Occupational Therapy, 61(6), 267-272.
Glaser, B. G., and Strauss, A. L. (1967). The discovery of grounded theory: strategies for qualitative research
Glińska-Lewczuk, K., Gołaś, I., Koc, J., Gotkowska-Płachta, A., Harnisz, M., and Rochwerger, A. (2016). The impact of urban areas on the water quality gradient along a lowland river. Environmental monitoring and assessment, 188(11), 624.
Global Platform for Disaster Risk Reduction Second Session, 16-19 June 2009, Geneva. Retrieved from https://www.preventionweb.net/files/10712_MALAYSIAOfficialStatementFinal.pdf

Godin, K., Stapleton, J., Kirkpatrick, S. I., Hanning, R. M., and Leatherdale, S. T. (2015). Applying systematic review search methods to the grey literature: a case study examining guidelines for school-based breakfast programs in Canada. Systematic reviews, 4(1), 1-10.
Goodman, L. A. (1961). Snowball sampling. The annals of mathematical statistics, 148-170.
Gough, D. (2007). Weight of evidence: a framework for the appraisal of the quality and relevance of evidence. Research papers in education, 22(2), 213-228.
Gough, J., and Gough, J. (1997). Environmental decision making and risk management for groundwater systems. Risk: Health, Safety and Environment, 8, 155–172. Retrieved from http://search.proquest.com/docview/59754937/
Gough, S., and Scott, W. (2000). Exploring the purposes of qualitative data coding in educational enquiry: Insights from recent research. Educational Studies, 26(3), 339-354.
Green, C., and Penning-Rowsell, E. (2010). Stakeholder Engagement in Flood Risk Management. In Flood Risk Science and Management.
Green, C., Johnson, C., and Parker, D. (2007). Institutional arrangements and mapping for the governance of sustainable urban water management technologies: Mapping protocol and case study of Birmingham, England. SWITCH report.
Greenough, G., McGeehin, M., Bernard, S. M., Trtanj, J., Riad, J., and Engelberg, D. (2001). The potential impacts of climate variability and change on health impacts of extreme weather events in the United States. Environmental health perspectives, 109(suppl 2), 191-198.
Gregor, S. (2006). The nature of theory in information systems. MIS quarterly, 611-642.
Grindle, M. S. (2018). Despite the odds. Princeton University Press.
Grothmann, T., and Reusswig, F. (2006). People at risk of flooding: Why some residents take precautionary action while others do not. Natural hazards, 38(1), 101-120.
Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. Handbook of qualitative research, 2(163-194), 105.
Guha-Sapir, D., Below, R., and Hoyois, P. (2014). Annual Disaster Statistical Review 2014. The numbers and trends. Retrieved from http://www.emdat.be/publications
Guha-Sapir, D., Below, R., and Hoyois, P. (2016). EM-DAT: the CRED/OFDA international disaster database.
Gulsecen, S. and Kubat, A., (2006). Teaching ICT to teacher candidates using PBL: A qualitative and quantitative evaluation. Educational Technology and Society, 9 (2): 96-106.
Gunatilleke, G. (2006). Chapter 3: an evaluation of the governance structures. Post tsunami recovery for sustainable human development. Colombo: Marga Institute/Sri Lanka Centre for Development Studies.
Guzzetti, F., Carrara, A., Cardinali, M., and Reichenbach, P. (1999). Landslide hazard evaluation: a review of current techniques and their application in a multi-scale study, Central Italy. Geomorphology, 31(1-4), 181-216.
Haapio, A. (2012). Towards sustainable urban communities. Environmental Impact Assessment Review, 32(1), 165-169.
Hale, K. (2011). How information matters: Networks and public policy innovation. Georgetown University Press.
Hall, J., and Solomatine, D. (2008). A framework for uncertainty analysis in flood risk management decisions. International Journal of River Basin Management, 6(2), 85-98.
Hallegatte, S., and Przyluski, V. (2010). The economics of natural disasters: concepts and methods. The World Bank.
Hamid, Z. A., Roslan, A. F., Dul, M. N., (2015). Strategic Framework Towards Flood Resilience in Malaysia. The Ingenieur.
Hamin, Z., Othman, M. B., and Elias, Z. (2013). Floating on a legislative framework in flood management in Malaysia: Lessons from the United Kingdom. Procedia-Social and Behavioral Sciences, 101, 277-283.
Hart, C. (2018). Doing a literature review: Releasing the research imagination.
Hart, R. A. (2013). Children's participation: The theory and practice of involving young citizens in community development and environmental care. Routledge.

Harvatt, J., Petts, J., & Chilvers, J. (2011). Understanding householder responses to natural hazards: flooding and sea‐level rise comparisons. Journal of Risk Research, 14(1), 63-83.
Hashim, O. (2018). Making Cities Resilient: The Malaysian Experience. Retrieved from http://www.preventionweb.net/files/globalplatform/entry_presentation~17h15.pdf
Hashimov, E. (2014). Qualitative Data Analysis: A Methods Sourcebook and The Coding Manual for Qualitative Researchers.
Haynes, R. B. (2006). Forming research questions. Journal of clinical epidemiology, 59(9), 881.
Hayward, A. L., & Sparkes, J. J. (Eds.). (1975). Cassell's English dictionary (4th ed.). London, UK: Cassell and Collier Macmillan.
Heide, E. A. (2004). Common misconceptions about disasters: Panic, the disaster syndrome, and looting. The first 72 hours: A community approach to disaster preparedness, 337.
Heller, K., Alexander, D. B., Gatz, M., Knight, B. G., and Rose, T. (2005). Social and personal factors as predictors of earthquake preparation: the role of support provision, network discussion, negative affect, age, and education 1. Journal of Applied Social Psychology, 35(2), 399-422.
Hester, R. E. (1998). Risk assessment and risk management (No. 9). Royal Society of Chemistry.
Hilbe, J.M. (2010). Statistical Software for the Social Sciences. In Statistics in the Social Sciences (eds S. Kolenikov, D. Steinley and L. Thombs)
Hirunsalee, S., Denpaiboon, C., and Kanegae, H. (2013). Public attitudes toward the additional roles of university in disaster management: Case study of Thammasat University in 2011 Thailand floods. Procedia Environmental Sciences, 17, 899-908.
Ho, K. H., Ghazali, A. H., and Chong, S. F. (2002). Calibration and evaluation of modified tank model (flood forecasting model) for Kelantan river basin, Malaysia. In Proceeding of the water engineering Conference Malaysia (pp. 23-24).
Ho, M. C., Shaw, D., Lin, S., & Chiu, Y. C. (2008). How do disaster characteristics influence risk perception?. Risk Analysis: An International Journal, 28(3), 635-643.
Hogan, K. (2000). Exploring a process view of students' knowledge about the nature of science. Science education, 84(1), 51-70.
Hoidn, S., and Kärkkäinen, K. (2014). Promoting skills for innovation in higher education: A literature review on the effectiveness of problem-based learning and of teaching behaviours.
Holloway, A. (2015). Strategic mobilisation of higher education institutions in disaster risk reduction capacity building: Experience of Periperi U. Global Assessment Report on Disaster Risk Reduction, 49-72.
Hoover, R. S., and Koerber, A. L. (2009). Using NVivo to answer the challenges of qualitative research in professional communication: Benefits and best practices tutorial. IEEE transactions on Professional Communication, 54(1), 68-82.
Hosenfeld, C. (1984). Case studies of ninth grade readers. Reading in a foreign language, 4, 231-249.
Houghton, C., Murphy, K., Meehan, B., Thomas, J., Brooker, D., and Casey, D. (2017). From screening to synthesis: using nvivo to enhance transparency in qualitative evidence synthesis. Journal of clinical nursing, 26(5-6), 873-881
Houston, J. B., Hawthorne, J., Perreault, M. F., Park, E. H., Goldstein Hode, M., Halliwell, M. R., ... and Griffith, S. A. (2015). Social media and disasters: a functional framework for social media use in disaster planning, response, and research. Disasters, 39(1), 1-22.
Howard, L. (1962). Gilbert F. White. Science and Technology for Development: Report, 1, 343.
Howes, R., and Tah, J. H. (2003). Strategic management applied to international construction. Thomas Telford. https://doi.org/10.4135/9781452272047
Huang, J. L., Curran, P. G., Keeney, J., Poposki, E. M., and DeShon, R. P. (2012). Detecting and deterring insufficient effort responding to surveys. Journal of Business and Psychology, 27(1), 99-114.

Huq, S., Reid, H., Konate, M., Rahman, A., Sokona, Y., and Crick, F. (2004). Mainstreaming adaptation to climate change in least developed countries (LDCs). Climate Policy, 4(1), 25-43.
Hussaini H. A. (2007). Flood and drought management in Malaysia. Ministry of Natural Resources and Environment, Malaysia, Kuala Lumpur, speech given on 21 June 2007.
Indexmundi. (2018). Malaysia Demographics Profile 2018. Retrieved from https://www.indexmundi.com/malaysia/demographics_profile.html
Innes, J. E., and Booher, D. E. (2004). Reframing public participation: strategies for the 21st century. Planning theory and practice, 5(4), 419-436.
International Federation of Red Cross and Red Crescent Societies (IFRC). (2008). A framework for community safety and resilience. In the face of disaster risk. Retrieved from https://www.ifrc.org/Global/Case%20studies/Disasters/cs-framework-community-en.pdf
International Institute for Sustainable Development. (2016). Sustainable Development. Retrieved from https://www.iisd.org/topic/sustainable-development
International Recovery Platform Secretariat. (2012). Guidance Note on Recovery: Pre-Disaster Recovery Planning. Retrieved from https://www.recoveryplatform.org/assets/Guidance_Notes/Guidance%20Note%20on%20Recovery-Pre%20disaster%20Recovery%20Planning.pdf
Irrigation Areas Act 1953. (2006). Laws of Malaysia. Retrieved from http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/EN/Act%20386.pdf
Islam, R., and Walkerden, G. (2017). Social networks and challenges in government disaster policies: A case study from Bangladesh. International journal of disaster risk reduction, 22, 325-334.
Islam, R., Kamaruddin, R., Ahmad, S. A., Jan, S., and Anuar, A. R. (2016). A review on mechanism of flood disaster management in Asia. International Review of Management and Marketing, 6(1S), 29-52.
Jack, E. P., and Raturi, A. S. (2006). Lessons learned from methodological triangulation in management research. Management research news.
Jackson, E. L. (1981). Response to earthquake hazard: The west coast of North America. Environment and Behavior, 13(4), 387-416.
Jackson, K., and Bazeley, P. (2019). Qualitative data analysis with NVivo. SAGE Publications Limited.
Jay, B. N. (2019). Dr M: Powerful NSC Act has to be amended. Retrieved from https://www.nst.com.my/news/nation/2019/04/477852/dr-m-powerful-nsc-act-has-be-amended
Jenkins, K., Hall, J., Glenis, V., and Kilsby, C. (2018). A probabilistic analysis of surface water flood risk in London. Risk Analysis, 38(6), 1169-1182.
Jha, A. K., Bloch, R., and Lamond, J. (2012). Cities and flooding: a guide to integrated urban flood risk management for the 21st century. The World Bank.
Joffe, H., and Yardley, L. (2004). Content and thematic analysis. Research methods for clinical and health psychology, 56, 68.
Johnson, B. B. (1993). Advancing understanding of knowledge's role in lay risk perception. Risk, 4, 189.
Johnson, C. L., and Priest, S. J. (2008). Flood risk management in England: a changing landscape of risk responsibility?. International Journal of Water Resources Development, 24(4), 513-525.
Johnson, J. C. (1990). Selecting ethnographic informants (Vol. 22). SAGE Publications, Incorporated.
Johnson, L., and Brown, S. (2011). Challenge based learning: The report from the implementation project (pp. 1-36). The New Media Consortium.
Johnson, R. B., & Christensen, L. (2008). Educational research: Quantitative, qualitative and mixed approaches (third edition). Thousand Oaks, CA: Sage Publications.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educational Researcher, 33(7), 14–26. https://doi.org/10.3102/0013189X033007014
Johnston, D. M., Lai, M. S. B. C. D., Houghton, B. F., and Paton, D. (1999). Volcanic hazard perceptions: comparative shifts in knowledge and risk. Disaster Prevention and Management: An International Journal.
Jonas, E., Schulz-Hardt, S., & Frey, D. (2005). Giving advice or making decisions in someone else's place: The influence of impression, defense, and accuracy motivation on the search for new information. Personality and Social Psychology Bulletin, 31(7), 977-990.
Jong, P., and Brink, M. V. D. (2017). Between tradition and innovation: developing Flood Risk Management Plans in the Netherlands. Journal of Flood Risk Management, 10(2), 155-163.
Jonkman, S. N., and Vrijling, J. K. (2008). Loss of life due to floods. Journal of Flood Risk Management, 1(1), 43-56.
Jonkman, S. N., Vrijling, J. K., and Vrouwenvelder, A. C. W. M. (2008). Methods for the estimation of loss of life due to floods: a literature review and a proposal for a new method. Natural Hazards, 46(3), 353-389.
Josephson, A., Schrank, H., and Marshall, M. (2017). Assessing preparedness of small businesses for hurricane disasters: Analysis of pre-disaster owner, business and location characteristics. International journal of disaster risk reduction, 23, 25-35.
Kahn, M. B. (2012). Disaster response and planning for libraries. American Library Association.
Kahneman, D., and Snell, J. (1990). Predicting utility. Insights in decision making: A tribute to Hillel J. Einhorn, 295-310.
Kaliyadan, F., and Kulkarni, V. (2019). Types of variables, descriptive statistics, and sample size. Indian dermatology online journal, 10(1), 82.
Kallio, H., Pietilä, A. M., Johnson, M., and Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi‐structured interview guide. Journal of advanced nursing, 72(12), 2954-2965.
Kammerbauer, M., and Minnery, J. (2019). Risk communication and risk perception: lessons from the 2011 floods in Brisbane, Australia. Disasters, 43(1), 110-134.
Kaos, J. (2015). Government sets up new National Disaster Management Agency. Retrieved from http://www.thestar.com.my/news/nation/2015/09/02/government-new-agency/
Kapucu, N. (2008). Collaborative emergency management: better community organising, better public preparedness and response. Disasters, 32(2), 239-262.
Kapucu, N., & Khosa, S. (2013). Disaster resiliency and culture of preparedness for university and college campuses. Administration & Society, 45(1), 3-37.
Kapucu, N., and Özerdem, A. (2011). Managing emergencies and crises. Jones and Bartlett Publishers.
Kasperson, J. X., and Kasperson, R. E. (2013). Global environmental risk. Routledge.
Kates, R. W. (1971). Natural hazard in human ecological perspective: hypotheses and models. Economic Geography, 47(3), 438-451.
Kelle, U., and Bird, K. (Eds.). (1995). Computer-aided qualitative data analysis: Theory, methods and practice. Sage.
Kellens, W., Terpstra, T., and De Maeyer, P. (2013). Perception and communication of flood risks: a systematic review of empirical research. Risk Analysis: An International Journal, 33(1), 24-49.
Kellens, W., Zaalberg, R., Neutens, T., Vanneuville, W., and De Maeyer, P. (2011). An analysis of the public perception of flood risk on the Belgian coast. Risk Analysis: An International Journal, 31(7), 1055-1068.
Keller, C., Siegrist, M., & Gutscher, H. (2006). The Role of the Affect and Availability Heuristics in Risk Communication. Risk Analysis, 26(3), 631–639. https://doi.org/10.1111/j.1539-6924.2006.00773.x

Kelley, K., Clark, B., Brown, V., and Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. International Journal for Quality in health care, 15(3), 261-266.
Kendall, L. (2008). The conduct of qualitative interviews. Handbook of research on new literacies, 133-149.
Kennedy, M. (2007). Recovery. American School and University, vol. 80, no. 2, 18-24.
Kezar, A. (2008). Understanding leadership strategies for addressing the politics of diversity. The Journal of Higher Education, 79(4), 406-441.
Kezar, A. (2011). What is the best way to achieve broader reach of improved practices in higher education?. Innovative higher education, 36(4), 235-247.
Khailani, D. K., and Perera, R. (2013). Mainstreaming disaster resilience attributes in local development plans for the adaptation to climate change induced flooding: A study based on the local plan of Shah Alam City, Malaysia. Land use policy, 30(1), 615-627.
Khalid, M. S. B., and Shafiai, S. B. (2015). Flood disaster management in Malaysia: An evaluation of the effectiveness flood delivery system. International Journal of Social Science and Humanity, 5(4), 398.
Khalid, M. S. B., and Shafiai, S. B. (2016). Flood Disaster Management in Malaysia: A Review of Issues of Flood Disaster Relief during and Post-Disaster. In Int. Soft Sci. Conf (No. 1983, pp. 1-8).
Khan, F., Moench, M., Saadi, F. A., Malik, S., Sabbag, L., and MacClune, K. (2013). Desk study: Indus Floods Research Project; appendix 5.
Khan, H., and Khan, A. (2008). Natural hazards and disaster management in Pakistan.
Kibert, C. J. (2016). Sustainable construction: green building design and delivery. John Wiley and Sons.
Kick, E. L., Fraser, J. C., Fulkerson, G. M., McKinney, L. A., and De Vries, D. H. (2011). Repetitive flood victims and acceptance of FEMA mitigation offers: an analysis with community–system policy implications. Disasters, 35(3), 510-539.
Kirakowski, J. (2000). Questionnaires in Usability Engineering: A List of Frequently Asked Questions (3rd Ed.). Retrieved from: http://www.ucc.ie/hfrg/resources/qfaq1.html
Klein, P., Fatima, M., McEwen, L., Moser, S. C., Schmidt, D., and Zupan, S. (2011). Dismantling the ivory tower: Engaging geographers in university–community partnerships. Journal of Geography in Higher Education, 35(3), 425-444.
Koh, K.-L., Kelman, I., Kibugi, R. and Osorio, R.-L. E. (2015). Adaptation to Climate Change. World Scientific.
Kolenikov, S., Thombs, L., and Steinley, D. (2010). Statistics in the social sciences: current methodological developments. John Wiley and Sons.
Komoo, I. (2018). Menyelami Denyut Nadi Segamat. Retrieved from https://www.utusan.com.my/rencana/utama/menyelami-denyut-nadi-segamat-1.635781
Komori, D., Nakamura, S., Kiguchi, M., Nishijima, A., Yamazaki, D., Suzuki, S., ... and Oki, T. (2012). Characteristics of the 2011 Chao Phraya River flood in central Thailand. Hydrological Research Letters, 6, 41-46.
Kosmo. (2018). Banjir di Dungun Akibat Longkang Tersumbat – APM. Retrieved from http://www.kosmo.com.my/negara/banjir-di-dungun-akibat-longkang-tersumbat-apm-1.782060
Kotulová, H. (2010). Business continuity plans and their apply to industrial accident. Fire Protection, 139-141.
Kreibich, H., Thieken, A. H., Petrow, T., Müller, M., and Merz, B. (2005). Flood loss reduction of private households due to building precautionary measures–lessons learned from the Elbe flood in August 2002. Natural hazards and earth system sciences, 5(1), 117-126.
Krejcie, R, V. and Morgan, D, W,. (1970). Determining Sample Size for Research Activities. Educational And Psychological Measurement. 30. Pp 607-610
Kreps, G. A. (1984). Sociological inquiry and disaster research. Annual review of sociology, 10(1), 309-330.

Krishnan, S. (2016). Building community resilience to disasters in WaSH (water, sanitation and hygiene) during recovery (Doctoral dissertation, UCL (University College London)).
Kron, W., Steuer, M., Löw, P., and Wirtz, A. (2012). How to deal properly with a natural catastrophe database–analysis of flood losses. Natural Hazards and Earth System Sciences, 12(3), 535-550.
Kuhlicke, C., Steinführer, A., Begg, C., Bianchizza, C., Bründl, M., Buchecker, M., ... and Lemkow, L. (2011). Perspectives on social capacity building for natural hazards: outlining an emerging field of research and practice in Europe. Environmental Science and Policy, 14(7), 804-814.
Kunreuther, H., & Useem, M. (2009). Learning from catastrophes: strategies for reaction and response. Pearson Prentice Hall.
Labadie, J. R. (2008). Auditing of post-disaster recovery and reconstruction activities. Disaster Prevention and Management: An International Journal, 17(5), 575-586.
Labov, W. (1981). Field methods of the project on linguistic change and variation.
Lafarge Malaysia. (2015). Building Better Cities in Malaysia. Retrieved from https://www.lafarge.com.my/sites/malaysia/files/documents/Lafarge_Malaysia_Berhad_-_Annual_Report_2015_(1).pdf
Land Conservation Act 1960. (2006). Laws of Malaysia. Retrieved from https://www.jkptg.gov.my/images/pdf/perundangan-tanah/Act_385-land_conserve.pdf
Langlet, D., and Mahmoudi, S. (2016). EU environmental law and policy. Oxford University Press.
Latham, M. (1994). Constructing the team: final report of the government/industry review of procurement and contractual arrangements in the UK construction industry.
Layder, D. (1998). Sociological practice: Linking theory and social research. Sociological Practice, 1-208.
Le Quesne, T., and Green, C. (2005). Can we afford not to? The costs and benefits of a partnership approach to the Water Framework Directive. WWF-UK, Godalming.
Lebel, L., Foran, T., Garden, P., and Manuta, J. B. (2012). Adaptation to climate change and social justice: challenges for flood and disaster management in Thailand (pp. 147-164). Routledge.
Lebel, L., Khrutmuang, S., and Manuta, J. (2006). Tales from the margins: Small fishers in post-tsunami Thailand. Disaster Prevention and Management: An International Journal, 15(1), 124-134.
Lechat, M. F. (1990). The international decade for natural disaster reduction: background and objectives. Blackwell.
Lee, J. Y., Paik, W., and Joo, S. (2012). Information resource selection of undergraduate students in academic search tasks. Information Research: An International Electronic Journal, 17(1), n1.
Lee, K. J. (2019). A case study of collaborative disaster management in Malaysia.
Leech, N. L., and Onwuegbuzie, A. J. (2011). Beyond constant comparison qualitative data analysis: Using NVivo. School Psychology Quarterly, 26(1), 70.
Leech, O. (2011). Beyond Constant Comparison Qualitative Data Analysis: Using NVivo. School Psychology Quarterly, 26(1), 70–84. https://doi.org/10.1037/a0022711
Legrand. (2016). Green building - Ecological Construction. Retrieved from http://www.legrand.com/EN/green-building-description_12850.html
Leiserowitz, A. (2006). Climate change risk perception and policy preferences: The role of affect, imagery, and values. Climatic change, 77(1), 45-72.
LeMAN
Leman, A. M., Rahman Salleh, K. A., Babal, M. N. M., Feriyanto, I., Johnso, D., and Hidayah, S. N. (2016). A review of flood catastrophic management in Malaysia. ARPN Journal of Engineering and Applied Sciences, 11(14), 8738-8742.
Levac, J., Toal-Sullivan, D., and OSullivan, T. L. (2012). Household emergency preparedness: a literature review. Journal of community health, 37(3), 725-733.

Levin-Keitel, M. (2014). Managing urban riverscapes: towards a cultural perspective of land and water governance. Water International, 39(6), 842-857.
Lewis, D. (2003). Theorizing the organization and management of non-governmental development organizations: Towards a composite approach. Public Management Review, 5(3), 325-344.
Lhussier, M., Carr, S., and Forster, N. (2015). A realist synthesis of the evidence on outreach programmes for health
Liang, T. P., Lai, H. J., and Ku, Y. C. (2006). Personalized content recommendation and user satisfaction: Theoretical synthesis and empirical findings. Journal of Management Information Systems, 23(3), 45-70.
Liew, V. K. (2009). Global Platform for Disaster Risk Reduction Second Session, 16-19 June 2009, Geneva. Retrieved from https://www.preventionweb.net/files/10712_MALAYSIAOfficialStatementFinal.pdf
Light, R. J., Singer, J. D., & Willett, J. B. (1990). By design: Planning research on higher education. Harvard University Press.
Lin, L. (2018). Integrating a national risk assessment into a disaster risk management system: Process and practice. International journal of disaster risk reduction, 27, 625-631.
Lindell, M. K. (2013a). Disaster studies. Current Sociology, 61(5-6), 797-825.
Lindell, M. K. (2013b). Recovery and reconstruction after disaster. Encyclopedia of natural hazards, 812-824.
Lindell, M. K., & Perry, R. W. (2012). The Protective Action Decision Model: Theoretical Modifications and Additional Evidence: The Protective Action Decision Model. Risk Analysis, 32(4), 616–632. https://doi.org/10.1111/j.1539-6924.2011.01647.
Lindell, M. K., and Hwang, S. N. (2008). Households' perceived personal risk and responses in a multihazard environment. Risk Analysis: An International Journal, 28(2), 539-556.
Lindell, M. K., and Perry, R. W. (2000). Household adjustment to earthquake hazard: A review of research. Environment and behavior, 32(4), 461-501.
Lindell, M. K., and Prater, C. S. (2003). Assessing community impacts of natural disasters. Natural hazards review, 4(4), 176-185.
Lindell, M. K., and Whitney, D. J. (2000). Correlates of household seismic hazard adjustment adoption. Risk Analysis, 20, 13–25.
Lisø, K. R. (2006). Integrated approach to risk management of future climate change impacts. Building Research and Information, 34(1), 1-10.
Local Government Act 1976. (2012). Laws of Malaysia. Retrieved from http://extwprlegs1.fao.org/docs/pdf/mal130371.pdf
Lock, S., Rubin, G. J., Murray, V., Rogers, M. B., Amlôt, R., and Williams, R. (2012). Secondary stressors and extreme events and disasters: a systematic review of primary research from 2010-2011. PLoS currents, 4.
Loewenstein, G. F., Weber, E. U., Hsee, C. K., and Welch, N. (2001). Risk as feelings. Psychological Bulletin, 127, 267–286.
Lofland, J., and Lofland, L. H. (1971). Analyzing social settings.
Lorenz, D., Dent, P., and Kauko, T. (2017). Value in a Changing Built Environment.
Low, S. P., Benny, R., and Wong K. K. (2006). Tsunamis: some pre-emptive disaster planning and management issues for consideration by the construction industry. Structural survey, 24(5), 378-396.
Lush, A. (2014). Fundamental personal information management activities–organisation, finding and keeping: A literature review. The Australian Library Journal, 63(1), 45-51.
MacKinnon, D., and Derickson, K. D. (2013). From resilience to resourcefulness: A critique of resilience policy and activism. Progress in human geography, 37(2), 253-270.
Macpherson, H. (2004). Participation, practitioners and power: Community participation in north east community forests. ESRC/ODPM postgraduate research Programme, working paper, 13.
Madebwe, T. (2016). Adaptation to Climate Change: ASEAN and Comparative Experiences, Koh Kheng-Lian (Editor-in-Chief).

Madu, C. N. (2017). Handbook of disaster risk reduction and management: Climate change and natural disasters. World Scientific Publishing Company.
Maher, C., Hadfield, M., Hutchings, M., & de Eyto, A. (2018). Ensuring Rigor in Qualitative Data Analysis: A Design Research Approach to Coding Combining NVivo With Traditional Material Methods. International Journal of Qualitative Methods, 17(1), 160940691878636–. https://doi.org/10.1177/1609406918786362
Major, C. H., and Savin-Baden, M. (2010). An introduction to qualitative research synthesis: Managing the information explosion in social science research. Routledge.
Makwana, N. (2019). Disaster and its impact on mental health: A narrative review. Journal of family medicine and primary care, 8(10), 3090.
Malachová, H., and Oulehlová, A. (2016). Application of business continuity management system into the crisis management field. Transactions of the VŠB–Technical university of Ostrava, Safety Engineering Series, 11(2), 43-50.
Malaysia Institute of Architects (PAM). (2015). Strategic Initiative in Flood Disaster Preparedness and Mitigation for Malaysia.
Marris, E. (2017). How labs are coping with Hurricane Harvey's devastating floods. Nature News, 549(7670), 13.
Marton, F., and Pong, W. Y. (2005). On the unit of description in phenomenography. Higher education research and development, 24(4), 335-348.
Masetti, F., and Vatovec M. (2016). Question Of the Week: Have You Addressed Flood Mitigation Strategies? Retrieved from https://facilityexecutive.com/2016/01/question-of-the-week-have-you-addressed-flood-mitigation-strategies/
Maskrey, A., Buescher, G., Peduzzi, P., and Schaerpf, C. (2007). Disaster risk reduction: 2007 global review. Consultation Edition. Prepared for the Global Platform for Disaster Risk Reduction First Session, Geneva, Switzerland, 5-7.
Masur, J. S., and Posner, E. A. (2011). Climate regulation and the limits of cost-benefit analysis. Calif. L. Rev., 99, 1557.
Matczak, P., Lewandowski, J., Choryński, A., Szwed, M., and Kundzewicz, Z. W. (2018). Doing more while remaining the same? Flood risk governance in Poland. Journal of Flood Risk Management, 11(3), 239-249.
Matthews, G., Zeidner, M., and Roberts, R. D. (2004). Emotional intelligence: Science and myth. MIT press.
Maxwell, J. A. (2005). Qualitative research design: An interactive approach (2nd ed.). Sage Publications.
Maxwell, J. A. (2012). Qualitative research design: An interactive approach. Sage publications.
Maxwell, J. A. (2013). Qualitative research design: An interactive approach (3rd ed.). Sage Publications.
McBain, W., Wilkes, D., and Retter, M. (2010). Flood resilience and resistance for critical infrastructure. CIRIA.
McBean, G., and Rodgers, C. (2010). Climate hazards and disasters: the need for capacity building. Wiley Interdisciplinary Reviews: Climate Change, 1(6), 871-884.
McCracken, G. (1988). The long interview (Vol. 13). Sage.
McDonough, S., and McDonough, S. (1997). Research methods as part of English language teacher education. English Language Teacher Education and Development, 3(1), 84-96.
McDougall, W. (2015). An introduction to social psychology. Psychology Press.
McElreath, D. H., Doss, D. A., Jensen III, C. J., Wigginton Jr, M., Kennedy, R., Winter, K. R., ... and Estis-Sumerel, J. M. (2013). Introduction to law enforcement. CRC Press.
McEntire, D. A. (2004). The status of emergency management theory: Issues, barriers, and recommendations for improved scholarship. University of North Texas. Department of Public Administration. Emergency Administration and Planning.
McEntire, D. A. (2007). Local emergency management organizations. In Handbook of disaster research (pp. 168-182). Springer, New York, NY.

McEntire, D. A., and Myers, A. (2004). Preparing communities for disasters: issues and processes for government readiness. Disaster prevention and management: An international journal.
McEwen, L., Holmes, A., Quinn, N., and Cobbing, P. (2018). 'Learning for resilience': Developing community capital through flood action groups in urban flood risk settings with lower social capital. International Journal of Disaster Risk Reduction, 27, 329-342.
McLoughlin, D. (1985). A framework for integrated emergency management. Public administration review, 45, 165-172.
Medd, W., Deeming, H., Walker, G., Whittle, R., Mort, M., Twigger‐Ross, C., ... and Kashefi, E. (2015). The flood recovery gap: a real‐time study of local recovery following the floods of June 2007 in Hull, North East England. Journal of Flood Risk Management, 8(4), 315-328.
Medema, W., McIntosh, B. S., and Jeffrey, P. J. (2008). From premise to practice: a critical assessment of integrated water resources management and adaptive management approaches in the water sector. Ecology and Society, 13(2).
Mejri, O., and Pesaro, G. (2015). Knowledge based strategies for Disaster Risk Reduction: A knowledge management framework to increase understanding and awareness of value of prevention and preparedness. In Safety and Reliability of Complex Engineered Systems-Proceedings of the 25th European Safety and Reliability Conference, ESREL.
Melillo, J. M., Richmond, T. T., & Yohe, G. (2014). Climate change impacts in the United States. Third national climate assessment, 52.
Menoni, S., Molinari, D., Parker, D., Ballio, F., and Tapsell, S. (2012). Assessing multifaceted vulnerability and resilience in order to design risk-mitigation strategies. Natural Hazards, 64(3), 2057-2082.
Mercer, J., Kelman, I., Lloyd, K. and Suchet-Pearson, S. (2008), "Reflections on use of participatory research for disaster risk reduction", Area, Vol. 40, pp. 172-183.
Merz, B., Hall, J., Disse, M., and Schumann, A. (2010). Fluvial flood risk management in a changing world. Natural Hazards and Earth System Sciences, 10(3), 509-527.
Messner, F., and Meyer, V. (2006). Flood damage, vulnerability, and risk perception–challenges for flood damage research. In Flood risk management: hazards, vulnerability, and mitigation measures (pp. 149-167). Springer, Dordrecht.
Metcalfe, G., Jenkinson, K., and Johnstone, K. (2010). A changing climate for business.
Metzger, M. J., & Flanagin, A. J. (2013). Credibility and trust of information in online environments: The use of cognitive heuristics. Journal of pragmatics, 59, 210-220.
Metzger, M. J., Flanagin, A. J., & Medders, R. B. (2010). Social and heuristic approaches to credibility evaluation online. Journal of communication, 60(3), 413-439.
Miceli, R., Sotgiu, I., and Settanni, M. (2008). Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. Journal of environmental psychology, 28(2), 164-173.
Migiro, S. O., & Magangi, B. A. (2011). Mixed methods: A review of literature and the future of the new research paradigm. African journal of business management, 5(10), 3757-3764.
Miles, M. B., and Huberman, A. M. (1994). Qualitative data analysis: An expanded sourcebook. sage.
Miles, M. B., and Huberman, A. M. (1996). Qualitative data analysis: An expanded sourcebook. 2nd ed. Thousand Oaks, CA: Sage Publications.
Miles, M. B., Huberman, A. M., and Saldaña, J. (2014). Qualitative data analysis: A methods sourcebook (3rd ed.). London, UK: SAGE.
Mohit, M. A., and Sellu, G. M. (2013). Mitigation of climate change effects through non-structural flood disaster management in Pekan Town, Malaysia. Procedia-Social and Behavioral Sciences, 85, 564-573.
Morrison, A., Westbrook, C. J., and Noble, B. F. (2018). A review of the flood risk management governance and resilience literature. Journal of Flood Risk Management, 11(3), 291-304.

Morrow, B. H. (1999). Identifying and mapping community vulnerability. Disasters, 23(1), 1-18.
Mort, M., Walker, M., Williams, A. L., and Bingley, A. (2018). From victims to actors: the role of children and young people in flood recovery and resilience. Environment and Planning C: Politics and Space, 36(3), 423-442.
Moustakas, C. (1994). Phenomenological research methods. Sage publications.
Mügge, L. M. (2016). Bridging the qualitative-quantitative divide in comparative migration studies: newspaper data, and political ethnography in mixed method research. Comparative Migration Studies, 4(1), 1-17.
Mulilis, J.-P., and Lippa, R. (1990). Behavioral change in earthquake preparedness due to negative threat appeals: A test of protection motivation theory. Journal of Applied Social Psychology, 20, 619–638.
Munafò, M. R., Nosek, B. A., Bishop, D. V., Button, K. S., Chambers, C. D., Du Sert, N. P., ... and Ioannidis, J. P. (2017). A manifesto for reproducible science. Nature human behaviour, 1(1), 1-9.
Nakagawa, Y., and Shaw, R. (2004). Social capital: A missing link to disaster recovery. International Journal of Mass Emergencies and Disasters, 22(1), 5-34.
Nartova-Bochaver, S., Donat, M., and Rüprich, C. (2019). Subjective well-being from a just-world perspective: A multi-dimensional approach in a student sample. Frontiers in psychology, 10, 1739.
National Clearinghouse for Educational Facilities (NCEF). (2011). Flooding and Schools. Retrieved from http://www.ncef.org/pubs/flooding.pdf
National Disaster Management Agency (NADMA) (2015) Aspek-aspek Perlembagaan dan Perundangan dalam Pengurusan Bencana. Expert report submitted to National Agency for Disaster Management (NADMA), Prime Minister Department (November 2015)
National Disaster Management Agency (NADMA) (2021) Strengthening Local Strategies for Building Disaster Resilience.
National Forestry Act 1984. (2006). Laws of Malaysia. Retrieved from http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/EN/Act%20313.pdf
National Security Council Malaysia (NSC). (2011). Principle and Management Mechanism of National Disaster Relief, Directive No. 20. Retrieved from https://www.rcrc-resilience-southeastasia.org/wp-content/uploads/2017/12/1997_policy_and_mechanism_of_national_disaster_management_and_relief_national_security_council_directive.pdf
Nelson, D. R. (2011). Adaptation and resilience: responding to a changing climate. Wiley Interdisciplinary Reviews: Climate Change, 2(1), 113-120.
Ness, D. A., and Xing, K. (2017). Toward a Resource‐Efficient Built Environment: A Literature Review and Conceptual Model. Journal of Industrial Ecology, 21(3), 572-592.
Neumayer, E., and Plümper, T. (2007). The gendered nature of natural disasters: The impact of catastrophic events on the gender gap in life expectancy, 1981–2002. Annals of the Association of American Geographers, 97(3), 551-566.
Neupane, B. R. (1999). Assessment of capacity for water resource management: A case study of a small watershed in Nepal.
Nguyen, D. N., Imamura, F., and Iuchi, K. (2017). Public-private collaboration for disaster risk management: A case study of hotels in Matsushima, Japan. Tourism Management, 61, 129-140.
NHP. (2017). About Us - Natural Hazards Partnership. Retrieved from http://www.naturalhazardspartnership.org.uk/about-us/
Nitsch, M., Waldherr, K., Denk, E., Griebler, U., Marent, B., and Forster, R. (2013). Participation by different stakeholders in participatory evaluation of health promotion: A literature review. Evaluation and Program Planning, 40, 42-54.
Noland, K. (2014). Risk Communication: A Study of the Effects of Asymmetries in Public and Expert Risk Perception (Doctoral dissertation).

Norris, F. H., Smith, T., and Kaniasty, K. (1999). Revisiting the experience–behavior hypothesis: The effects of Hurricane Hugo on hazard preparedness and other self-protective acts. Basic and Applied Social Psychology, 21(1), 37-47.
Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. American journal of community psychology, 41(1), 127-150.
Novikov, A., and Novikov, D. (2013). Research Methodology: From Philosophy of Science to Research Design (1st ed.). CRC Press.
NST. (2017). New National Flood Forecasting and Warning System almost 100% accurate – New Straits Times. Retrieved from https://www.nst.com.my/news/nation/2017/07/260359/new-national-flood-forecasting-warning-system-almost-100-accurateNumber 2, July. (http://www.nova.edu/ssss/QR/QR3-2/tellis1.html).
O'Brien, G., O'keefe, P., Rose, J., and Wisner, B. (2006). Climate change and disaster management. Disasters, 30(1), 64-80.
O'Faircheallaigh, C. (2010). Public participation and environmental impact assessment: Purposes, implications, and lessons for public policy making. Environmental impact assessment review, 30(1), 19-27.
O'Sullivan, J. J., Bradford, R. A., Bonaiuto, M., Dominicis, S. D., Rotko, P., Aaltonen, J., ... and Langan, S. J. (2012). Enhancing flood resilience through improved risk communications. Natural Hazards and Earth System Sciences, 12(7), 2271-2282.
Occupational Safety and Health Act 1994. (1994). Laws of Malaysia. Retrieved from http://www.dosh.gov.my/index.php/en/legislation/acts/23-02-occupational-safety-and-health-act-1994-act-514/file
Odendahl, T., and Shaw, A. M. (2001). Interviewing elites. Handbook of Interview Research: Context and Method. ed. JF Gubrium and JA Holstein.
Odoni, N. (2014). Flood management needs long-term planning to succeed, says Durham University expert. Retrieved from https://www.dur.ac.uk/news/newsitem/?itemno=20098
OECD. (2015). The Changing Face of Strategic Crisis Management: OECD Reviews of Risk Management Policies. OECD Publishing, Paris.
Oei, T. I., and Zwart, F. M. (1986). The assessment of life events: Self-administered questionnaire versus interview. Journal of Affective Disorders, 10(3), 185-190.
Ofori, G. (2002). Construction industry development for disaster prevention and response. In Proceedings of i-Rec Conference on Improving Post-Disaster Reconstruction in Developing Countries (pp. 23-25).
Oliver-Smith, A., (1991). Successes and failures in post-disaster resettlement. Disasters 15 (1), 12}23.
Oltedal, S., Moen, B. E., Klempe, H., & Rundmo, T. (2004). Explaining risk perception: An evaluation of cultural theory. Rotunde, 85(Apr), 1-33.
Omer, A.M. (2012). Clean energies development in built environment. World Journal of Science, Technology and Sustainable Development, 9(1), 45-63.
Omidvari, M., Nouri, J., and Mapar, M. (2015). Disaster risk assessment pattern in higher education centers. Global Journal of Environmental Science and Management, 1(2), 125-136.
Ontario Ministry of Natural Resources. (2001). Understanding Natural Hazards. Retrieved from Ontario, Canada. Retrieved from http://www.otonabee.com/wp-content/uploads/2012/05/Understanding-Natural-Hazards-Full-Document.pdf
Onwuegbuzie AJ, and Teddlie C (2003). Framework for analyzing data in mixed methods research. In A. Tashakkori and C. Teddlie (Eds.), Handbook of mixed methods in social and behavioral research. Thousand Oaks. CA: sage, pp. 351-383
Oppenheim, A. N. (1992). Questionnaire design, interviewing, and attitude measurement. New York City: St. Martin's Press.
Oppenheim, A.N. (2000) Questionnaire Design, Interviewing and Attitude Measurement. Bloomsbury Publishing.

Oppenheim, A.N. (2001). Questionnaire Design, Interviewing and Attitude Measurement. London: Continuum.
Othman, M., Ahmad, M. N., Suliman, A., and Arshad, N. H. (2013). Towards COBIT-based Framework to Govern Flood Management. In PACIS (p. 118).
Pahl-Wostl, C. (2006). The importance of social learning in restoring the multifunctionality of rivers and floodplains. Ecology and society, 11(1).
Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. Review of educational research, 62(3), 307-332.
Pal, I., and Ghosh, T. (2017). Natural hazards management in Asia. SAGE Publishing India.
Palliyaguru, R., Amaratunga, D., and Baldry, D. (2014). Constructing a holistic approach to disaster risk reduction: the significance of focusing on vulnerability reduction. Disasters, 38(1), 45-61.
Papargyropoulou, E., Padfield, R., Harrison, O., and Preece, C. (2012). The rise of sustainability services for the built environment in Malaysia. Sustainable Cities and Society, 5, 44-51.
Parker, A. M., and Fischhoff, B. (2005). Decision‐making competence: External validation through an individual‐differences approach. Journal of Behavioral Decision Making, 18(1), 1-27.
Parker, D. J., Priest, S. J., and Tapsell, S. M. (2009). Understanding and enhancing the public's behavioural response to flood warning information. Meteorological Applications: A journal of forecasting, practical applications, training techniques and modelling, 16(1), 103-114.
Parker, D., and Handmer, J. (2013). Hazard management and emergency planning: perspectives in Britain. Routledge
Parnham, P. (2000). Review of Building Pathology: Principles and Practice. Structural Survey, 18(2).
Parvaiz, G. S., Mufti, O., and Wahab, M. (2016). Pragmatism for mixed method research at higher education level. Business and Economic Review, 8(2), 67-79.
Patel, S. S., Rogers, M. B., Amlôt, R., and Rubin, G. J. (2017). What do we mean by'community resilience'? A systematic literature review of how it is defined in the literature. PLoS currents, 9.
Pathak, S., and Ahmad, M. M. (2016). Flood recovery capacities of the manufacturing SMEs from floods: A case study in Pathumthani province, Thailand. International journal of disaster risk reduction, 18, 197-205.
Paton, D., Smith, L., Daly, M., & Johnston, D. (2008). Risk perception and volcanic hazard mitigation: Individual and social perspectives. Journal of Volcanology and Geothermal Research, 172(3-4), 179-188.
Patton, M. Q. (1990). Qualitative evaluation and research methods. SAGE Publications, inc.
Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. Health services research, 34(5 Pt 2), 1189.
Patton, M. Q. (2015). Qualitative research & evaluation methods: Integrating theory and practice (4th ed.). SAGE Publications.
Paul, S. K., and Routray, J. K. (2010). Flood proneness and coping strategies: the experiences of two villages in Bangladesh. Disasters, 34(2), 489-508.
Peacock, W. G., Morrow, B. H., and Gladwin, H. (Eds.). (1997). Hurricane Andrew: Ethnicity, gender, and the sociology of disasters. Psychology Press.
Pelling, M. (2003). The vulnerability of cities: natural disasters and social resilience. Earthscan.
Pereira, J. J., Tiong, T. C., and Komoo, I. (2010). Chapter 8 Mainstreaming climate change adaptation and disaster risk reduction: A Malaysian approach. In Climate change adaptation and disaster risk reduction: An Asian perspective (pp. 147-167). Emerald Group Publishing Limited.
Perrow, C. (2011). Normal accidents: Living with high-risk technologies-Updated edition. Princeton University Press.

Perry, M. (2007). Natural disaster management planning: A study of logistics managers responding to the tsunami. International Journal of Physical Distribution and Logistics Management, 37(5), 409-433.
Pitt, M. (2008). The Pitt Review: Lessons learned from the 2007 floods. Cabinet Office, London, 505(4).
Plein, C. (2019). Resilience, adaptation, and Inertia: Lessons from disaster recovery in a time of climate change. Social Science Quarterly, 100(7), 2530-2541.
Pokrywka, F. J. (2016). Pandemic Planning: Are Universities Really Prepared? (Doctoral dissertation, University of Pittsburgh).
Polit D.F. et al., (2001) Essentials of Nursing Research: Methods, Appraisal and Utilisation. Philadephia, Lippincott.
Polkinghorne, D. E. (2005). Language and meaning: Data collection in qualitative research. Journal of counselling psychology, 52(2), 137.
Pollard, A., and Collins, J. (2005). Reflective teaching. A and C Black.
Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., & Pidgeon, N. F. (2011). Uncertain climate: An investigation into public scepticism about anthropogenic climate change. Global Environmental Change, 21(3), 1015–1024. https://doi.org/10.1016/j.gloenvcha.2011.03.001
Pourezzat, A. A., Nejati, M., and Mollaee, A. (2010). Dataflow model for managing urban disasters: the experience of Bam earthquake. International Journal of Disaster Resilience in the Built Environment, 1(1), 84-102.
Price, B. (2002). Laddered questions and qualitative data research interviews. Journal of advanced nursing, 37(3), 273-281.
Price, R. K., and Vojinovic, Z. (2008). Urban flood disaster management. Urban Water Journal, 5(3), 259-276.
Proctor, S. (1998). Linking philosophy and method in the research process: the case for realism. Nurse Researcher (through 2013), 5(4), 73.
Proctor, S. (1998). Linking philosophy and method in the research process: the case for realism. Nurse Researcher, 5(4), 73–90. https://doi.org/10.7748/nr1998.07.5.4.73.c6074
Quarantelli, E. L. (1997). Ten criteria for evaluating the management of community disasters. Disasters, 21(1), 39-56.
Queirós, A., Faria, D., and Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. European Journal of Education Studies.
Raaijmakers, R., Krywkow, J., and van der Veen, A. (2008). Flood risk perceptions and spatial multi-criteria analysis: an exploratory research for hazard mitigation. Natural hazards, 46(3), 307-322.
Rani, W. N. M. W. M., Kamarudin, K. H., Razak, K. A., and Asmawi, Z. M. (2020). Climate Change Adaptation and Disaster Risk Reduction in Urban Development Plans for Resilient Cities. In IOP Conference Series: Earth and Environmental Science (Vol. 409, No. 1, p. 012024). IOP Publishing.
Rani, W., Nifa, F., Ismail, M., and Khalid, K. (2017). Planning for post disaster recovery: Lesson learnt from flood events in Kelantan Malaysia. In AIP Conference Proceedings (Vol. 1891, No. 1, p. 020143). AIP Publishing.
Ranke, U. (2016). Natural Disasters: Definitions and Classification. In Natural Disaster Risk Management (pp. 55-182). Springer, Cham.
Rappaport, J. (1987). Terms of empowerment/exemplars of prevention: Toward a theory for community psychology. American journal of community psychology, 15(2), 121-148.
Rautela, P. (2016). Lack of scientific recordkeeping of disaster incidences: A big hurdle in disaster risk reduction in India. International Journal of Disaster Risk Reduction, 15, 73-79.
Ravitch, S. M., & Carl, N. M. (2019). Qualitative research: Bridging the conceptual, theoretical, and methodological. Sage Publications.
Ravitch, S. M., and Carl, N. M. (2019). Qualitative research: Bridging the conceptual, theoretical, and methodological. Sage Publications.

Regmi, P. R., Waithaka, E., Paudyal, A., Simkhada, P., and van Teijlingen, E. (2016). Guide to the design and application of online questionnaire surveys. Nepal journal of epidemiology, 6(4), 640–644. https://doi.org/10.3126/nje.v6i4.17258
Renaud, F. G., Sudmeier-Rieux, K., and Estrella, M. (2013). The role of ecosystems in disaster risk reduction. United Nations University Press.
Renn, O. (1992). Concepts of risk: a classification.
Renn, O. (2008). Coping with Uncertainty in a Complex World, 455 pp. London (Earthscan).
Renner, B., Knoll, N., & Schwarzer, R. (2000). Age and body make a difference in optimistic health beliefs and nutrition behaviors. International Journal of Behavioral Medicine, 7(2), 143-159.
Rice, R. G., and Spence, P. R. (2016). Thor visits Lexington: Exploration of the knowledge-sharing gap and risk management learning in social media during multiple winter storms. Computers in Human Behavior, 65, 612-618.
Risk Management Guidelines (2017). Panduan Pengurusan Risiko. UiTM.
Ritchie, J., Lewis, J., Nicholls, C. M., and Ormston, R. (Eds.). (2013). Qualitative research practice: A guide for social science students and researchers. sage.
Ritchie, J., Spencer, L., and O'Connell, W. (2003). Carrying out data analysis. Qualitative research practice: a guide for social science students and researchers.
Rivera, C., Tehler, H., and Wamsler, C. (2015). Fragmentation in disaster risk management systems: a barrier for integrated planning. International Journal of Disaster Risk Reduction, 14, 445-456.
Robinson, H. S., Carrillo, P. M., Anumba, C. J., and Al-Ghassani, A. M. (2004). Developing a business case for knowledge management: the IMPaKT approach. Construction Management and Economics, 22(7), 733-743.
Rodik, P., and Primorac, J. (2015). To use or not to use: Computer-assisted qualitative data analysis software usage among early-career sociologists in Croatia. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 16, No. 1).
Rodzi, M. Z. M., Zakaria, N. H., and Ahmad, M. N. (2016). Ontology Based Knowledge Integration Framework for Managing Flood in Malaysia. Journal of Advanced Management Science Vol, 4(6).
Rogers, P., and Hall, A. W. (2003). Effective water governance (Vol. 7). Stockholm: Global water partnership.
Rohman, M. A. P., Hamid, N., Fuad, F. (2017). Sediakan pelan tindakan kecemasan – Noh. Retrieved from http://www.bhplus.com.my/berita/nasional/2017/11/347694/sediakan-pelan-tindakan-kecemasan-noh
Rohrmann, B. (1999). Risk perception research: Review and documentation (Studies in Risk Communication 69. Retrieved from http://www.kfa-juelich.de/mut/hefte/heft_69.pdf). Juelich: Research Center Juelich.
Rollason, E., Bracken, L. J., Hardy, R. J., and Large, A. R. G. (2018). Rethinking flood risk communication. Natural hazards, 92(3), 1665-1686.
Ronan, K., and Johnston, D. (2005). Promoting community resilience in disasters: The role for schools, youth, and families. Springer Science and Business Media.
Roosli, R. (2010). Managing disasters in Malaysia: the attitude of officials towards compliance with the MNSC Directive 20 (Doctoral dissertation, Northumbria University).
Roosli, R., and Collins, A. E. (2016). Key lessons and guidelines for post-disaster permanent housing provision in Kelantan, Malaysia. Procedia Engineering, 145, 1209-1217.
Roosli, R., and O'Brien, G. (2011). Social learning in managing disasters in Malaysia. Disaster Prevention and Management: An International Journal, 20(4), 386-397.
Rose, J., and Jayawickrama, J. (2016). Capacity building of institutions for disaster risk reduction. Built Environment Project and Asset Management.
Ross, A. (1996). Science wars. Duke University Press.
Rotimi, J. O. B., and Wilkinson, S. (2014). Improving environmental management legislation to facilitate post-disaster reconstruction. International Journal of Disaster Resilience in the Built Environment, 5(1), 23-37.

Russell, L. A., Goltz, J. D., and Bourque, L. B. (1995). Preparedness and hazard mitigation actions before and after two earthquakes. Environ- ment and Behavior, 27, 744–770.
Sadler, T. D. (2004). Informal reasoning regarding socioscientific issues: A critical review of research. Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 41(5), 513-536.
Said, A. M., Ahmadun, F. L. R., Rodzi Mahmud, A., and Abas, F. (2011). Community preparedness for tsunami disaster: a case study. Disaster Prevention and Management: An International Journal, 20(3), 266-280.
Saifulsyahira, J., Edre, M. A., AF, A. F., & Juni, M. H. (2016). Governance of flood disaster management: Malaysian case study. International Journal of Public Health and Clinical Sciences, 3(1), 17-30.
Sakurai, A., Bisri, M. B. F., Oda, T., Oktari, R. S., Murayama, Y., and Affan, M. (2018). Exploring minimum essentials for sustainable school disaster preparedness: A case of elementary schools in Banda Aceh City, Indonesia. International journal of disaster risk reduction, 29, 73-83.
Salancik, G. R., and Pfeffer, J. (1978). A social information processing approach to job attitudes and task design. Administrative science quarterly, 224-253.
Saldaňa, J. (2012). The coding manual for qualitative researchers (2nd ed.). Thousand Oaks, CA: Sage.
Saldaña, J. (2016). The coding manual for qualitative researchers (3rd ed.). Thousand Oaks, CA: Sage.
Sale, J. E., Lohfeld, L. H., and Brazil, K. (2002). Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. Quality and quantity, 36(1), 43-53.
Salkind, N. J. (Ed.). (2010). Encyclopedia of research design (Vol. 1). Sage.
Sanders, E. B. N. (2005). Information, inspiration and co-creation. In Proceedings of the 6th International Conference of the European Academy of Design. Bremen: University of the Arts.
Sanderson, W. C., Arunagiri, V., Funk, A. P., Ginsburg, K. L., Krychiw, J. K., Limowski, A. R., ... and Stout, Z. (2020). The nature and treatment of pandemic-related psychological distress. Journal of contemporary psychotherapy, 50(4), 251-263.
Sandman, P. M. (1993). Responding to community outrage: Strategies for effective risk communication. AIHA.
Sarkar, M. S. K., Begum, R. A., Pereira, J. J., and bin Jaafar, A. H. (2013). Addressing disaster risk reduction in Malaysia: Mechanisms and responds. In 2nd International Conference on Environment, Agriculture and Food Science (ICEAFS2013), August (pp. 25-26).
Sarkar, S. K., Begum, R. A., Pereira, J. J., and Jaafar, A. H. (2013). Addressing disaster risk reduction in Malaysia: Mechanisms and responds. In 2nd International Conference on Environment, Agriculture and Food Sciences (pp. 81-85).
Scandlyn, J., Simon, C. N., Thomas, D., and Brett, J. (2010). Theoretical framing of worldviews, values, and structural dimensions of disasters. Social vulnerability to disasters, 27-49.
Schanze, J., Hutter, G., Offert, A., Penning-Rowsell, E. C., Parker, D., Harries, T., ... and Koniger, P. (2008). Systematisation, evaluation and context conditions of structural and non-structural measures for flood risk reduction.
Schensul, J. J., and LeCompte, M. D. (2010). Designing and conducting ethnographic research: An introduction.
Schensul, S. L., Schensul, J. J., and LeCompte, M. D. (1999). Essential ethnographic methods: Observations, interviews, and questionnaires (Vol. 2). Rowman Altamira.
Scherr, S. J., and Gregg, R. J. (2005). Johannesburg and beyond: the 2002 World Summit on Sustainable Development and the rise of partnership. Geo. Int'l Envtl. L. Rev., 18, 425.
Schiff, M. (1977). Hazard adjustment, locus of control, and sensation seeking: Some null findings. Environment and Behavior, 9, 233–254.

Schipper, L., and Pelling, M. (2006). Disaster risk, climate change and international development: scope for, and challenges to, integration. Disasters, 30(1), 19-38.
Schneider, F., Kläy, A., Zimmermann, A. B., Buser, T., Ingalls, M., and Messerli, P. (2019). How can science support the 2030 Agenda for Sustainable Development? Four tasks to tackle the normative dimension of sustainability. Sustainability Science, 14(6), 1593-1604.
Schneiderbauer, S., Pisa, P. F., Delves, J. L., Pedoth, L., Rufat, S., Erschbamer, M., ... and Granados-Chahin, S. (2021). Risk perception of climate change and natural hazards in global mountain regions: A critical review. Science of the total environment, 146957.
Schudson, M. (1989). How culture works. Theory and Society, 18(2), 153-180.
Schwab, J., Topping, K. C., Eadie, C. C., Deyle, R. E., and Smith, R. A. (1998). Planning for post-disaster recovery and reconstruction (pp. 483-484). Chicago, IL: American Planning Association.
Schwandt, T. A. (2007). Epistemology. The Blackwell Encyclopedia of Sociology.
Scolobig, A., Prior, T., Schröter, D., Jörin, J., and Patt, A. (2015). Towards people-centred approaches for effective disaster risk management: Balancing rhetoric with reality. International journal of disaster risk reduction, 12, 202-212.
Scott, M., White, I., Kuhlicke, C., Steinführer, A., Sultana, P., Thompson, P., ... and Russell, E. (2013). Living with flood risk/The more we know, the more we know we don't know: Reflections on a decade of planning, flood risk management and false precision/Searching for resilience or building social capacities for flood risks?/Participatory floodplain management: Lessons from Bangladesh/Planning and retrofitting for floods: Insights from Australia/Neighbourhood design considerations in flood risk management/Flood risk management–Challenges to the effective implementation of a paradigm shift. Planning Theory and Practice, 14(1), 103-140.
Scottish Environment. (2007). Towards sustainable flood management in Scotland. Retrieved from http://www.scotlink.org/pdf/Towards%20Sust%20Flood%20Management%20LINK%20Briefing.pdf
Seligman, M. E., and Csikszentmihalyi, M. (2014). Positive psychology: An introduction. In Flow and the foundations of positive psychology (pp. 279-298). Springer, Dordrecht.
Sellnow, T., and Sellnow, D. (2010). The instructional dynamic of risk and crisis communication: Distinguishing instructional messages from dialogue. The Review of Communication, 10(2), 112-126.
Şen, Z. (2018). Flood modeling, prediction and mitigation. Springer.
Seneviratne, K., Baldry, D., and Pathirage, C. (2010). Disaster knowledge factors in managing disasters successfully. International Journal of Strategic Property Management, 14(4), 376-390.
Seneviratne, T. K. K., Amaratunga, D., Haigh, R., and Pathirage, C. P. (2010). Knowledge management for disaster resilience: Identification of key success factors.
Setola, R., Luiijf, E., and Theocharidou, M. (2016). Critical infrastructures, protection and resilience. In Managing the Complexity of Critical Infrastructures (pp. 1-18). Springer, Cham.
Seymour, D., Crook, D., and Rooke, J. (1997). The role of theory in construction management: a call for debate. Construction Management and Economics, 15(1), 117-119.
Shah, A. A., Gong, Z., Ali, M., Jamshed, A., Naqvi, S. A. A., and Naz, S. (2020). Measuring education sector resilience in the face of flood disasters in Pakistan: an index-based approach. Environmental Science and Pollution Research, 27(35), 44106-44122.

Shah, A. A., Ye, J., Pan, L., Ullah, R., Shah, S. I. A., Fahad, S., and Naz, S. (2018). Schools' flood emergency preparedness in khyber Pakhtunkhwa province, Pakistan. International Journal of Disaster Risk Science, 9(2), 181-194.
Shah, M. A. R., Rahman, A., and Chowdhury, S. H. (2018). Challenges for achieving sustainable flood risk management. Journal of Flood Risk Management, 11, S352-S358.

Shah, Wu, W., Gong, Z., Pal, I., and Khan, J. (2020). Multidimensional six-stage model for flood emergency response in schools: a case study of Pakistan. Natural Hazards (Dordrecht), 105(2), 1977–2005. https://doi.org/10.1007/s11069-020-04386-x
Shaluf, I. M. (2007). Disaster types. Disaster Prevention and Management: An International Journal, 16(5), 704–717.
Shaluf, I. M. (2008). Technological disaster stages and management. Disaster Prevention and Management: An International Journal, 17(1), 114-126.
Shaluf, I. M. and Ahamadun, F. L. R. (2006). Technological disaster prevention–the case of Malaysia. Disaster Prevention and Management: An International Journal, 15(5), 783-792.
Sharma, S. K. (2019). Disaster Risk Reduction And Disaster Management In Government Planning And Policy Agenda. In Economics of Natural Disasters (pp. 181-256).
Sharp, J. (2008). The route map to business continuity management. In Meeting the Requirements of.
Sheffield, J., Gregg, J., and Lee, J. (2016). A commentary regarding campus safety and security for institutions of higher education. In Allied Academies International Conference. Academy of Educational Leadership. Proceedings (Vol. 21, No. 1, p. 18). Jordan Whitney Enterprises, Inc.
Sherly, M. A., Karmakar, S., Parthasarathy, D., Chan, T., and Rau, C. (2015). Disaster vulnerability mapping for a densely populated coastal urban area: An application to Mumbai, India. Annals of the Association of American Geographers, 105(6), 1198-1220.

Shiwaku, K., Ueda, Y., Oikawa, Y., and Shaw, R. (2016). School disaster resilience assessment in the affected areas of 2011 East Japan earthquake and tsunami. Natural Hazards, 82(1), 333-365.
Shreve, C. M., and Kelman, I. (2014). Does mitigation save? Reviewing cost-benefit analyses of disaster risk reduction. International journal of disaster risk reduction, 10, 213-235.
Shultz, J. M., Cohen, M. A., Hermosilla, S., Espinel, Z., and McLean, A. (2016). Disaster risk reduction and sustainable development for small island developing states. Disaster health, 3(1), 32-44.
Sinar Harian. (2018). Empangan Pecah Punca Banjir Lumpur. Retrieved from https://www.sinarharian.com.my/article/2733/EDISI/Terengganu/Empangan-pecah-punca-banjir-lumpur
Sjoberg, L. (1998). Worry and Risk Perception. Risk Analysis, 18(1), 85–93. https://doi.org/10.1111/j.1539-6924.1998.tb00918.x
Slimak, M. W., and Dietz, T. (2006). Personal values, beliefs, and ecological risk perception. Risk analysis, 26(6), 1689-1705.
Slovic, P. (1997). Trust, emotion, sex, politics, and science: Surveying the risk assessment battlefield. U. Chi. Legal F., 59
Slovic, P. (2010). The feeling of risk: New perspectives on risk perception. Routledge.
Slovic, P. E. (2000). The perception of risk. Earthscan publications.
Slovic, P., Finucane, M. L., Peters, E., and MacGregor, D. G. (2002). "The affect heuristic," in Heuristics and Biases: The Psychology of Intuitive Judgment, eds T.
Slovic, P., Finucane, M. L., Peters, E., and MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. Risk Analysis, 24, 311–322.
Slovic, P., Finucane, M. L., Peters, E., and MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. Risk Analysis: An International Journal, 24(2), 311-322.
Smith, K. (2013). Environmental hazards: assessing risk and reducing disaster. Routledge.
Smithers, T. (1996). On knowledge level theories of design process. In Artificial Intelligence in Design'96 (pp. 561-579). Springer, Dordrecht.
Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of business research, 104, 333-339.

Soane, E., Schubert, I., Challenor, P., Lunn, R., Narendran, S., and Pollard, S. (2010). Flood perception and mitigation: the role of severity, agency, and experience in the purchase of flood protection, and the communication of flood information. Environment and Planning A, 42(12), 3023-3038.
Sönmez, S. F., Apostolopoulos, Y., and Tarlow, P. (1999). Tourism in crisis: Managing the effects of terrorism. Journal of travel research, 38(1), 13-18.
Sotirios, S. (2013). Social research (4 ed.). England: Palgrave MacMillan.
Spence, P. R., and Lachlan, K. A. (2010). Disasters, crises, and unique populations: Suggestions for survey research. New Directions for Evaluation, 2010(126), 95-106.
Spence, P. R., Lachlan, K. A., Westerman, D., and Spates, S. A. (2013). Where the gates matter less: Ethnicity and perceived source credibility in social media health messages. Howard Journal of Communications, 24(1), 1-16.
Spencer, L., Ritchie, J., and O'Connor, W. (2003). Analysis: practices, principles and processes. Qualitative research practice: A guide for social science students and researchers, 199, 218.
Spennemann, D. H., and Look, D. W. (1998). From conflict to dialogue, from dialogue to cooperation, from cooperation to preservation. Disaster management programs for historic sites, 175-188.
Srinivasan, S., O'fallon, L. R., and Dearry, A. (2003). Creating healthy communities, healthy homes, healthy people: initiating a research agenda on the built environment and public health. American journal of public health, 93(9), 1446-1450.
Stake, R. E. (1995). The art of case study research. Sage.
Stake, R. E. (2005). Qualitative case studies.
Stake, R. E. (2010). Qualitative research: Studying how things work.
Stake, R.E. (1995). The Art of Case Study Research: Perspective in Practice. London: Sage.
Starbird, K., Palen, L., Hughes, A. L., & Vieweg, S. (2010). Chatter on the red: what hazards threat reveals about the social life of microblogged information. In Proceedings of the 2010 ACM conference on Computer supported cooperative work (pp. 241-250).
Steckler, A., McLeroy, K. R., Goodman, R. M., Bird, S. T., and McCormick, L. (1992). Toward integrating qualitative and quantitative methods: an introduction. Health education quarterly, 19(1), 1-8.
Stedman, N. L., and Adams, B. L. (2012). Identifying faculty's knowledge of critical thinking concepts and perceptions of critical thinking instruction in higher education. Nacta Journal, 56(2), 9-14.
Stemler, S. E. (2004). A comparison of consensus, consistency, and measurement approaches to estimating interrater reliability. Practical Assessment, Research, and Evaluation, 9(1), 4.
Stojic. M., (2013). Disaster Management: Staying Ahead of the Storm. Retrieved from http://eijournal.com/print/articles/disaster-management
Strachota, E. (2006). The Use of Survey Research to Measure Student Satisfaction in Online Courses. Paper presented at the Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, University of Missouri-St. Louis, MO, 4-6 October.
Stueckemann, E. (2019). Examining the role of source credibility in the vaccination debate: An experimental study of the influence of heuristic cues on source credibility assessments and attitude change.
Subedi, D. (2016). Explanatory sequential mixed method design as the third research community of knowledge claim. American Journal of Educational Research, 4(7), 570-577.
Sutton, J., League, C., Sellnow, T. L., and Sellnow, D. D. (2015). Terse messaging and public health in the midst of natural disasters: The case of the Boulder floods. Health communication, 30(2), 135-143.
Tagg, A., Davison, M., and Wetton, M. (2016). Use of agent-based modelling in emergency management under a range of flood hazards. In E3S Web of Conferences (Vol. 7, p. 19006). EDP Sciences.

Tahir, W., Jani, J., Endut, I. R., Mukri, M., Kordi, N. E., and Ali, N. E. M. (2016). Flood Disaster Management in Malaysia: Standard Operating Procedures (SOPs) Review. In ISFRAM 2015 (pp. 31-43). Springer, Singapore.
Tan, M. L., Ibrahim, A. L., Yusop, Z., Duan, Z., & Ling, L. (2015). Impacts of land-use and climate variability on hydrological components in the Johor River basin, Malaysia. Hydrological Sciences Journal, 60(5), 873-889.
Tashakkori, A., & Teddlie, C. (1998). Mixed methodology: Combining qualitative and quantitative approaches. Sage Publications, Inc.
Tatebe, J., and Mutch, C. (2015). Perspectives on education, children and young people in disaster risk reduction. International Journal of Disaster Risk Reduction, 14, 108-114.
Tatham, P., and Spens, K. (2011). Towards a humanitarian logistics knowledge management system. Disaster Prevention and Management: An International Journal, 20(1), 6-26.
Taylor, S. J., and Bogdan, R. (1996). Introduction to Qualitative Research Methods : A Phenomenological Approach in the Social Sciences, alih bahasa Arief Furchan, John Wiley dan Sons, Surabaya, Usaha Nasional
Taylor, S. J., and Bogdan, R. (1998). Introduction to qualitative research methods: A guidebook and resource. New York, NY: Jon Wiley and Sons.
Teddlie, C., & Tashakkori, A. (2006). A general typology of research designs featuring mixed methods. Research in the Schools, 13(1), 12-28.
Tellis, W. (1997). Introduction to case study. The Qualitative Report, Volume 3, Number 2, July. (http://www.nova.edu/ssss/QR/QR3-2/tellis1.html).
Terpstra, T., Gutteling, J. M., Geldof, G. D., and Kappe, L. J. (2006). The perception of flood risk and water nuisance. Water science and technology, 54(6-7), 431-439.
Terpstra, T., Lindell, M. K., and Gutteling, J. M. (2009). Does communicating (flood) risk affect (flood) risk perceptions? Results of a quasi‐experimental study. Risk Analysis: An International Journal, 29(8), 1141-1155.
Thaler, T., and Hartmann, T. (2016). Justice and flood risk management: reflecting on different approaches to distribute and allocate flood risk management in Europe. Natural Hazards, 83(1), 129-147.
Thaler, T., and Priest, S. (2014). Partnership funding in flood risk management: new localism debate and policy in England. Area, 46(4), 418-425.
Thayaparan, M., Siriwardena, M., Malalgoda, C. I., Amaratunga, D., Lill, I., and Kaklauskas, A. (2015). Enhancing post-disaster reconstruction capacity through lifelong learning in higher education. Disaster Prevention and Management, 24(3), 338-354.
The Cabinet Office's Civil Contingencies Secretariat (2011). Responding to Emergencies. The UK Central Government Response (updated on 19 April 2013).
The Capacity for Disaster Reduction Initiative (CADRI). (2016). Disaster risk reduction. Retrieved from http://www.cadri.net/en/areas-we-work/disaster-risk-reduction
The Ministry of Higher Education (MoHE). (2017). Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pendidikan Tinggi). Retrieved from http://bendahari.uthm.edu.my/v2/PPPM/Ringkasan-Eksekutif-PPPM-2015-2025.pdf
The National Archives. (2019). The Building Regulations andc. (Amendment) Regulations 2015. Retrieved from http://www.legislation.gov.uk/uksi/2015/767/regulation/2/made
The Star. (2014). Najib: Massive floods due to climate change. Retrieved from http://www.thestar.com.my/news/nation/2014/01/19/najib-massive-floods-due-to-climate-change-govt-to-look-into-mitigation-plans-to-reduce-impact/
Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. American journal of evaluation, 27(2), 237-246.
Tierney, K. J. (2003). Conceptualizing and measuring organizational and community resilience: Lessons from the emergency response following the September 11, 2001 attack on the World Trade Center.
Timmins, F., and McCabe, C. (2005). How to conduct an effective literature search. Nursing standard, 20(11), 41-47.
Tipson, F. S. (2013). Natural Disasters as Threats to Peace. United States Institute of Peace.

Tourism Malaysia. (2016). Malaysia Information. Retrieved from https://www.tourism.gov.my
Town and Country Planning Act 1976. (2006). Laws of Malaysia. Retrieved from http://www.pht.org.my/legislation/Town_and_Country_Planning_Act.pdf
Tran, P., Shaw, R., Chantry, G., and Norton, J. (2009). GIS and local knowledge in disaster management: a case study of flood risk mapping in Viet Nam. Disasters, 33(1), 152-169.
Trauth, E. M. (1997). Achieving the research goal with qualitative methods: lessons learned along the way. In Information systems and qualitative research (pp. 225-245). Springer, Boston, MA.
Turner, A., Mulla, A., Booth, A., Aldridge, S., Stevens, S., Begum, M., and Malik, A. (2018). The international knowledge base for new care models relevant to primary care-led integrated models: a realist synthesis.
Turner, S. F., Cardinal, L. B., and Burton, R. M. (2017). Research design for mixed methods: A triangulation-based framework and roadmap. Organizational Research Methods, 20(2), 243-267.
Tweed, F., and Walker, G. (2011). Some lessons for resilience from the 2011 multi-disaster in Japan. Local Environment, 16(9), 937-942.
Twigg, J. (2004). Disaster risk reduction: mitigation and preparedness in development and emergency programming. Overseas Development Institute (ODI).
Twigg, J. (2007). Disaster reduction terminology: a common-sense approach. Humanitarian Exchange, 38, 2-5.
Umakoshi, T. (1997). Internationalization of Japanese higher education in the 1980‘s and early 1990‘s. Higher Education, 34(2), 259-273.
UN (2015). Handbook on the Least Developed Country Category: Inclusion, Graduation and Special Support Measures Second Edition.
UNDRR. (2019a). What is Disaster Risk Reduction? Retrieved from https://www.unisdr.org/who-we-are/what-is-drr
UNDRR. (2019b). History. Retrieved from https://www.unisdr.org/who-we-are/history
UNICEF. (2014). Towards a learning culture of safety and resilience: Technical guidance for integrating disaster risk reduction in the school curriculum. UNESCO.
Uniform Building By-Laws (UBBL) 1984. (2006). Laws of Malaysia. Retrieved from http://portal.ppj.gov.my/c/document_library/get_file?p_l_id=18332andfolderId=23508and name=DLFE-2504.pdf
UNISDR (2005). Hyogo Declaration, Resolution adapted by delegates of the World Conference on Disaster Reduction, Kobe, Hyogo, Japan, 18 – 22 January. Retreived from https://www.unisdr.org/2005/wcdr/wcdr-index.htm
UNISDR (2009). Making disaster risk reduction gender sensitive: Policy and practical guidelines.
UNISDR (2012). Disaster risk and resilience. Thematic Think Piece, UN System Task Force on the Post-2015 UN Development Agenda. Retrieved from https://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/3_disaster_risk_resilience.pdf
UNISDR. (2007). Towards a Culture of Prevention: Disaster Risk Reduction Begins at School.
UNISDR. (2015). Sendai framework for disaster risk reduction 2015–2030. In Proceedings of the 3rd United Nations World Conference on DRR, Sendai, Japan.
UNISDR. (2017). Terminology. Retrieved from https://www.unisdr.org/we/inform/terminology
United Nations (UN) (2015). Resolution adopted by the Economic and Social Council on 23 July 2015.
United Nations Environment Programme (UNEP). (2005). One Planet Many People. Retrieved from http://na.unep.net/atlas/onePlanetManyPeople/book.php

United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER). (2019). Risks and Disasters. Retrieved from http://www.un-spider.org/risks-and-disasters
United Nations. (2006). Global Survey of Early Warning System. Retrieved from http://www.unisdr.org/2006/ppew/info-resources/ewc3/Global-Survey-of-Early-Warning-Systems.pdf
Urwin, K., and Jordan, A. (2008). Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. Global environmental change, 18(1), 180-191.
Utusan. (2014). 343 Pelajar UiTM Kelantan dipindahkan ke Tempat Selamat. Retrieved from https://www.utusan.com.my/berita/nahas-bencana/343-pelajar-uitm-kelantan-dipindahkan-ke-tempat-selamat-1.41418
Utusan. (2017). 4 Langkah Kurangkan Risiko Banjir di Segamat. Retrieved from https://www.utusan.com.my/berita/wilayah/4-langkah-kurangkan-risiko-banjir-di-segamat-1.454214
Utusan. (2018). Pusat Penempatan Banjir dibuka di Dungun. Retrieved from https://www.utusan.com.my/berita/wilayah/terengganu/pusat-penempatan-banjir-dibuka-di-dungun-1.799724
Van Aalst, M. K., Cannon, T., and Burton, I. (2008). Community level adaptation to climate change: the potential role of participatory community risk assessment. Global environmental change, 18(1), 165-179.
Van Asselt, M. B., and Renn, O. (2011). Risk governance. Journal of Risk Research, 14(4), 431-449.
Van de Ven, A. H., and Johnson, P. E. (2006). Knowledge for theory and practice. Academy of management review, 31(4), 802-821.
van den Honert, R. C., and McAneney, J. (2011). The 2011 Brisbane floods: causes, impacts and implications. Water, 3(4), 1149-1173.
van Herk, S., Zevenbergen, C., Gersonius, B., Waals, H., and Kelder, E. (2013). Process design and management for integrated flood risk management: exploring the multi-layer safety approach for Dordrecht, The Netherlands. Journal of Water and Climate Change, 5(1), 100-115.
Van Ree, C. C. D. F., Van, M. A., Heilemann, K., Morris, M. W., Royet, P., and Zevenbergen, C. (2011). FloodProBE: technologies for improved safety of the built environment in relation to flood events. Environmental science and policy, 14(7), 874-883.
Vázquez, M., Liz, M., and Aracil, J. (1996). Knowledge and reality: some conceptual issues in system dynamics modeling. System Dynamics Review: The Journal of the System Dynamics Society, 12(1), 21-37.
Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. MIS quarterly, 21-54.
Venkatesh, V., Brown, S. A., and Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. MIS quarterly, 21-54.
Vigil, J. M., and Geary, D. C. (2008). A preliminary investigation of family coping styles and psychological well-being among adolescent survivors of Hurricane Katrina. Journal of Family Psychology, 22(1), 176.
Villanova, R. M. (1984). A Comparison of Interview and Questionnaire Techniques Used in the Connecticut School Effectiveness Project: A Report of Work in Progress.
Von Hayek, F. A. (1989). The pretence of knowledge. The American Economic Review, 79(6), 3-7.
Vu, T. T., and Ranzi, R. (2017). Flood risk assessment and coping capacity of floods in central Vietnam. Journal of hydro-environment research, 14, 44-60.

Wachinger, G., Renn, O., Begg, C., & Kuhlicke, C. (2013). The Risk Perception Paradox-Implications for Governance and Communication of Natural Hazards. Risk Analysis, 33(6), 1049–1065. https://doi.org/10.1111/j.1539-6924.2012.01942.x
Wachinger, G., Renn, O., Bianchizza, C., Coates, T., De Marchi, B., Domènech, L., ... & Pellizzoni, L. (2010). Risk perception and natural hazards. CapHaz-Net WP3 Report.
Wahab, M. T. A. (2013). Malaysia's official statement. In: Second session of global platform for disaster risk reduction.
Wahlberg, A. A., and Sjoberg, L. (2000). Risk perception and the media. Journal of risk research, 3(1), 31-50.
Walsham, G. (1995). Interpretive case studies in IS research: nature and method. European Journal of information systems, 4(2), 74-81.
Wang, J. J. (2016). Study on the context of school-based disaster management. International Journal of Disaster Risk Reduction, 19, 224-234.
Warner, J., Edelenbos, J., and van Buuren, A. (2012). Making space for the river: governance challenges. Making space for the river: governance experiences with multifunctional river flood management in the US and Europe, 1-14.
Warschauer, M. (2003). Technology and social inclusion. Cambridge, MA: MIT Press.
Weaver, P. (2010). Definition of Construction Management. Retrieved from https://mosaicprojects.wordpress.com/2010/09/02/definition-of-construction-management/
Wedawatta, G., and Ingirige, B. (2012). Resilience and adaptation of small and medium-sized enterprises to flood risk. Disaster Prevention and Management: An International Journal, 21(4), 474-488.
Wedawatta, G., Ingirige, B., and Proverbs, D. (2014). Small businesses and flood impacts: the case of the 2009 flood event in Cockermouth. Journal of Flood Risk Management, 7(1), 42-53.
Weitzman, E., and Miles, M. B. (1995). Computer programs for qualitative data analysis. Sage.
Weng, C. N. (1997). Aspek-aspek Geografi Fizikal Malaysia: Satu Koleksi Kertas-kerja Akademik.
Weng, C. N. (2015). Impacts of disasters and disaster risk management in malaysia: The case of floods. In Resilience and Recovery in Asian Disasters: Community Ties, Market Mechanisms, and Governance (pp. 239–265). https://doi.org/10.1007/9784431550228_12

Wenzel, F., Bendimerad, F., and Sinha, R. (2007). Megacities–megarisks. Natural Hazards, 42(3), 481-491.
Westra, S., Fowler, H. J., Evans, J. P., Alexander, L. V., Berg, P., Johnson, F., ... & Roberts, N. M. (2014). Future changes to the intensity and frequency of short‐duration extreme rainfall. Reviews of Geophysics, 52(3), 522-555.
White, G. E. (1972). From sociological jurisprudence to realism: Jurisprudence and social change in early twentieth-century America. Va. L. Rev., 58, 999.
White, I., Connelly, A., Garvin, S., Lawson, N., and O'hare, P. (2018). Flood resilience technology in Europe: identifying barriers and co‐producing best practice. Journal of Flood Risk Management, 11, S468-S478.
White, I., O'Hare, P., Lawson, N., Garvin, S., and Connelly, A. (2013). Six steps to flood resilience: guidance for local authorities and professionals.
White, R. (2018). Climate change criminology. Policy Press.
Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. Journal of risk research, 11(3), 351-374.
Whittle, R., Medd, W., Deeming, H., Kashefi, E., Mort, M., Walker, G., and Watson, N. (2010). After the rain - learning the lessons from flood recovery in Hull. Final project report for 'Flood, Vulnerability and Urban Resilience: a real-time study of local recovery following the floods of June 2007 in Hull'.

Wiseman, J., and Parry, E. (2011). Cumbria Business Survey 2010-Research report prepared for Cumbria Intelligence Observatory. Birmingham: BMG Research.
Wisner, B., Adams, J., and Adams, J. (Eds.). (2002). Environmental health in emergencies and disasters: a practical guide. World health organization.
Wisner, B., and Luce, H. R. (1993). Disaster vulnerability: scale, power and daily life. GeoJournal, 30(2), 127-140.
Wisner, B., Gaillard, J. C., and Kelman, I. (Eds.). (2012). Handbook of hazards and disaster risk reduction and management. Routledge.
Wong, K. Y., and Aspinwall, E. (2006). Development of a knowledge management initiative and system: A case study. Expert Systems with Applications, 30(4), 633-641.
World Humanitarian Summit. (2015). Towards the World Humanitarian Summit: A global partnership for principled and effective humanitarian action. Asia News Monitor.
World Water Assessment Programme (2006) The United Nations World Water Development Report 3: Water in a Changing World. UNESCO, France and Earth Scan, Paris, London.
World Water Assessment Programme. (2006). Water for People Water for Life. The United Nations World Water Development Report. Retrieved from https://sustainabledevelopment.un.org/content/documents/WWDR_english_129556e.pdf
Wright, S., and Wordsworth, R. (2013). Teaching through 10,000 Earthquakes: Constructive Practice for Instructors in a Post-Disaster Environment. International Journal of Teaching and Learning in Higher Education, 25(2), 144-153.
Yatim, Y. M. (2009). Fire Safety Models for High-Rise Residential Building in Malaysia (Doctoral dissertation, Heriot-Watt University).
Yin, R. K. (1994). Case study research: Design and methods, London. Ed. Sage Publications.
Yin, R. K. (2003). Case study research: Design and methods (Vol. 5).
Yin, R. K. (2009). How to do better case studies. The SAGE handbook of applied social research methods, 2, 254-282.
Yin, R., (1994). Case study research: Design and methods (2nd ed.). Beverly Hills, CA: Sage
Yin, R., and Moore, G., (1987). The use of advanced technologies in special education.
Yin, R.K., (1984). Case Study Research: Design and Methods. Beverly Hills, Calif: Sage
Young, R. A. (2012). Stewardship of the built environment: Sustainability, preservation, and reuse. Island Press.
Young, R. A., and Collin, A. (2004). Introduction: Constructivism and social constructionism in the career field. Journal of vocational behavior, 64(3), 373-388.
Yushmah, M. Y. S., Bracken, L., Zuriatunfadzliah, S., Norhaslina, H., Melasutra, M. D., Amirhosein, G., ... and Shereen Farisha, A. S. (2020). Understanding urban flood vulnerability and resilience: a case study of Kuantan, Pahang, Malaysia. Natural hazards., 101(2), 551-571.
Yusoff, I. M., Ramli, A., Alkasirah, N. A. M., and Nasir, N. M. (2018). Exploring the managing of flood disaster: A Malaysian perspective. Geografia: Malaysian Journal of Society and Space, 14(3).
Yusoff, S., and Aziz, R.A. (2018). Bencana Alam dan Impak Banjir Besar 2014 Terhadap Komuniti Tempatan di Hulu Dungun, Terengganu: Satu Perspektif Sosiologi Bencana. USM. Retrieved from http://eprints.usm.my/41159/1/ART_93.pdf
Zainal, Z. (2007). Case study as a research method. Jurnal Kemanusiaan, 5(1).
Zakaria, N., and Mustaffa, C. S. (2014). Source credibility, risk communication and well-being: A conceptual framework. Procedia-Social and Behavioral Sciences, 155, 178-183.
Zaleskiewicz, T., Piskorz, Z., and Borkowska, A. (2002). Fear or money? Decisions on insuring oneself against flood. Risk, Decision and Policy, 7(3), 221-233.
Zamawe, F. C. (2015). The implication of using NVivo software in qualitative data analysis: Evidence-based reflections. Malawi Medical Journal, 27(1), 13-15.
Zdziarski II, E. L. (2001). Institutional preparedness to respond to campus crises as perceived by student affairs administrators in selected NASPA member institutions. Texas A&M University.

Zevenbergen, C., van Herk, S., Escarameia, M., Gersonius, B., Serre, D., Walliman, N., ... and de Graaf, R. (2018). Assessing quick wins to protect critical urban infrastructure from floods: a case study in Bangkok, Thailand. Journal of Flood Risk Management, 11, S17-S27.
Zevenbergen, C., Veerbeek, W., Gersonius, B., and Van Herk, S. (2008). Challenges in urban flood management: travelling across spatial and temporal scales. Journal of flood risk management, 1(2), 81-88.
Zimmerman, M. A. (2000). Empowerment theory. In Handbook of community psychology (pp. 43-63). Springer, Boston, MA.
Zou, P. X., Zhang, G., and Wang, J. (2007). Understanding the key risks in construction projects in China. International Journal of Project Management, 25(6), 601-614.

Appendices

Appendix A: Questionnaire Survey Form

QUESTIONNAIRE SURVEY FORM:
FOR THE UNIVERSITY BUILDING OCCUPIER

My name is Nurashikin, and I am a 2nd year Master student from the school of Mechanical, Aerospace and Civil Engineering, The University of Manchester, United Kingdom. I am currently researching the topic of Natural Disaster Risk Reduction (NDRR) for my study, focusing on the flooding recovery efforts at the Malaysian University - UiTM. The crucial part of the research is this questionnaire, and you are invited to take part in this research. Please feel free to complete the survey, and any additional comments are welcome. All responses and answers will be made anonymous and confidential. I would very appreciate if you could spend 4-5 minutes of your time to complete the survey. Thank you very much.

SECTION A: RESPONDENTS' PROFILE

---

1. **Gender:**

   Male ☐
   Female ☐

2. **Age group:**

   18-20 ☐
   21 – 30 ☐
   Above 30 ☐

3. **Employment status:**

   Government sector ☐
   Private sector ☐
   Self – employed ☐
   Unemployed ☐
   Student ☐
   Retired ☐
   If other; please specify:
   _____

4. **Highest current education level:**

   No schooling completed ☐
   Completed schooling ☐
   College or vocational training ☐
   Foundation study ☐
   Diploma ☐
   Bachelor's Degree ☐
   Master's Degree ☐
   Doctorate Degree ☐
   Prefer not to say ☐

5. **University campus you currently reside or studying:**

   UiTM Segamat (Johor) ☐

UiTM Dungun (Terengganu) ☐
UiTM Machang (Kelantan) ☐
UiTM Shah Alam (Selangor) ☐
If other; please specify:
_____

6. How long you have lived in this university campus?

Less than 1 year ☐
1-3 years ☐
3-5 years ☐
More than 5 years ☐

SECTION B: FLOODING AT MALAYSIAN UNIVERSITY

EXPERIENCE IN FLOODING

7. Have you been affected by flooding at your university campus?

Yes ☐
No ☐

If your answer is YES, please answering the following questions (8and9)
If you answer is NO, proceed to question (No. 10)

8. To what extent have you been affected by flooding at your university campus?

Flooding has caused minor disruption ☐
(*e.g., class postponed, delay to work, roads not accessible, minimal damage to properties*)
Flooding has caused moderate disruption ☐
(*e.g., loss of communication or relocation to flood evacuation centre*)
Flooding has caused major disruptions ☐
(*e.g., serious injury, loss of life of a person you know*)
All of the above ☐
If other, please specify.
_____

9. Please estimate the total of your financial loss during the whole flooding events at your university campus:

No loss ☐
Less than RM 1,000 ☐
RM 1,001 - RM 5,000 ☐
RM 5,001 - RM10,000 ☐
More than RM 10,000 ☐

UNDERSTANDING FLOODING RISKS

10. What do you think the possible cause(s) of flooding at your university area?
(You can tick more than one answer for this question)

(a) Heavy rainfall ☐
(b) Monsoon ☐
(c) Coastal and tidal (*Sea rising / strong winds blowing sea water to the coast*) ☐
(d) Flood defences failure ☐
(e) Reservoir or dam failure ☐
(f) Drainage failure ☐
(g) River flooding ☐
(h) Sewer flooding ☐
(i) Not sure ☐
(j) If other; please specify

_____

11. **What about flooding at the university area you are afraid of?**
(You can tick more than one answer for this question)

Personal health and safety ☐
Relocation of people ☐
Damage or loss to personal belongings ☐
Interruption of studies or work ☐
Making buildings you live or work unsafe ☐
Communication disruption ☐
The difficulty and cost of getting back to a normal state ☐
Not sure ☐

12. What do you expect from the university flooding management team if flooding happens?

Receive accurate instructions ☐
Fast relocation ☐
Appropriate placement for affected people ☐
Enough basic needs ☐
Sufficient workforce or rescue teams ☐
All of the above ☐

REDUCING FLOODING RISKS

13. Where did you get information on how to deal with flood risks?

General reading (book, magazine, journal, scientific paper, newspaper)	☐
Friends or relatives	☐
Information leaflet by the university	☐
Health and safety talk by the university (not include training)	☐
Government and local authorities	☐
Internet and social media (TV, radio, Facebook, Twitter)	☐

If other; please specify

_____

14. Do you think the signage or the directories for an emergency evacuation at the university helpful?

Yes, it is helpful	☐
No, it is not helpful	☐
I don't know if there is any	☐
Not sure	☐

15. Do you feel safe occupying the university building at the moment in regards of the flooding event?

Yes, I feel safe occupying all the university buildings	☐
No, I only feel safe occupying some of the university buildings	☐

If your answer is NO, please name the area(s) that you have not feeling safe to occupy.

_____

16. Are you interested to join any activities involving flooding risk projects, partly or wholly? (e.g., volunteering, raising awareness to the community)?

Yes	☐
No	☐
Not sure	☐

17. Which medium you would like to receive information on safeguarding you from flooding?
(You can tick more than one answer for this question)

Public broadcasting (eg: government mass media, Internet,TV,radio)	☐
University official website	☐
Email from the university	☐
University newsletters	☐
SMS/text alert from the university	☐
Not interested	☐
Not sure	☐

18. To what extent do you agree with the following statements concerning the university flooding:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
(a) The university area that previously not subjected to flooding is now at high risks					
(b) I am aware of the potential flood risks that I may face					
(c) I know which are the high risks buildings or location during flooding at the university area					
(d) I know which administrator to contact if you had concerns about flooding at the university area					
(e) I am well informed about the precaution steps at the university if flooding happens					
(f) I believe "Sustainable Flood Management" (put concerns to the economic, environmental, and social effects) should be implemented in the university flooding emergency and recovery planning					

If you have any comments and suggestions, kindly state your opinion in the space below:

_____

If you wish to receive an executive summary of the research, please enclose an email:

-End of questions-

Your contributions are much appreciated.

Thank You.

Appendix B: Interview Questions Lists

INTERVIEW QUESTIONS

(UNIVERSITY FACILITY MANAGEMENT OFFICE)

SECTION 1: UNIVERSITY FLOODING EXPERIENCE

1)	What are the lessons from the previous flooding events?
2)	What are the "real problems" that exist in the university current process in handling post-flooding?
3)	Please comment on your personal experience of the flooding in the university

SECTION 2: UNIVERSITY FLOOD MANAGEMENT

1)	What are the university plans and process for pre- and post-flooding event?
2)	Is there any university policies and regulations concerning the emergency event, especially flooding?
3)	Who is responsible for sorting out and the coordination of men, materials, and equipment to fulfil request for post-flooding remediation?

SECTION 3: UNIVERSITY BUILDING PHYSICAL INSPECTION

1)	After floodwater becomes to recede, what is the impact of the flood has done to the infrastructures that you see?
2)	Have the University made any changes to the existing property/building to protect it against flooding in the future?
3)	How to determine which infrastructure that has been affected by the flooding should undergo process such as upgrading?

SECTION 4: POST-FLOODING CONSTRUCTION

1)	What is the process being done by the university to assess and analyse the building damage or structural damage?
2)	What are the other roles of the team or individual regarding building remediation after flooding?
3)	Does the University have any plans to improve building sustainability and resiliency in the upcoming? (Built Back Better)