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Community Response to Flood Disaster: A Case Study of Flooding in Penang, Malaysia

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A thesis submitted in fulfilment of the requirements for the award of the
degree of Doctor of Philosophy (*Geography*)

DEPARTMENT OF GEOGRAPHY, DURHAM UNIVERSITY

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ABSTRACT

In November 2017, Penang Island, Malaysia, experienced the heaviest rainfall ever recorded on the island. The city is very low lying, has undergone massive development in the last three decades and is built predominantly of high-rise buildings on steep slopes with land-reclamation megaprojects. Rapid urbanisation is another serious environmental issue, leading to forest clearance, which means the area which can act as a sponge to absorb excess water gets continually smaller; as a result, the city flooded. There were several other flooding incidents across Malaysia in 2016-2017, but Penang was the worst-affected area, recording 51 flash floods between January 2016 and mid-October 2017. As a consequence, a large proportion of the 220,000 homes in the city were flooded.

This research demonstrates a comprehensive investigation of community resilience and the factors affecting vulnerability at the household and organisational levels via the experience of flood response in Teluk Kumbar, Penang Island. Over recent decades, the increased incidence of flood disasters has been accompanied by a dramatic proliferation of human inequalities, economic damage, environmental degradation, recovery costs, institutional vulnerability, and political processes.

This research uses a multi-method approach in which the qualitative and quantitative data were conducted sequentially. The data set comprises in-depth semi-structured interviews with 28 experts to examine the construction of flood management knowledge and its relation to decision-making. Additionally, 100 individuals, including

both male and female, were surveyed through a questionnaire, and 29 of them participated in six separate focus-group discussions. Six months of fieldwork allowed naturally occurring talk, unstructured interviews, and photovoice data related to locals' daily lives to understand their social behaviours when responding to flooding emergency times.

This dissertation is an endeavour to capture people's perception and response to measure the effectiveness of the community's coping strategies, social capital, adaptive capacity and identify factors that influence vulnerability to flooding hazard as a matter of exposure to risk and susceptibility. One of the main stated objectives has emphasised the necessity of improving community resilience regarding proactive preparedness and their response to flood mitigation initiatives.

According to the study's findings, there is a strong correlation between people's local knowledge, their social capital and how they developed their coping capacity, preparedness and decision-making. In particular, the thesis centered on the absence of local people's voices in local participation because of the political involvement and bureaucratic nature. In fact, it was also clear that it's negatively impact effective emergency flood management and the response capacity of local residents.

Overall, results revealed that community preparedness should be well articulated with the involvement of the local people that are ready to deal with any eventualities. Specifically, this thesis uses the 2017 flood events to re-examine the theoretical and conceptual understanding of progress in integrating resilience capacity building and

ongoing attention on flood mitigation in flood disaster preparedness at the community level. Further, this research makes a practical and significant valuable contribution for local government - public institutions (e.g. NADMA, Malaysia National Security Council, Penang City Council), decision-makers, nonprofit volunteer organisations, local community groups and relevant significant stakeholders, including professional practitioners related to flood management and recovery.

Keywords: flooding; disaster risk reduction; community; coping strategies; disaster

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“Verily, all things have We created by measure” (54:49)

Dedicated to all those who lost their lives in natural disasters

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LIST OF ABBREVIATION

APM	-	Civil Defences Department
ATM	-	Malaysian Armed Forces (Army)
Avg.	-	Average
BOMBA	-	Malaysian Fire and Rescue Department
DRR	-	Disaster Risk Reduction
DID	-	Department of Irrigation and Drainage
e.g.	-	For example
etc.	-	Etcetera, and so on
JKR	-	Public Works Department
JKM	-	Social Welfare Department
JPBBP	-	Flood Disaster Management Committee (Federal) @ <i>Jawatankuasa Pengurusan Bencana Banjir Persekutuan</i>
JPBBN	-	Flood Disaster Management Committee (State) @ <i>Jawatankuasa Pengurusan Bencana Banjir Negeri</i>
JPBBD	-	Flood Disaster Management Committee (District) @ <i>Jawatankuasa Pengurusan Bencana Banjir Daerah</i>
mm	-	Millimeter
Max.	-	Maximum
Min.	-	Minimum
MET	-	Malaysian Meteorological Department
N	-	Number of samples
NADMA	-	National Disaster Management Agency
NSC/MKN	-	National Security Council
NGOs	-	Non-Government Organisations
NVivo	-	Software for Qualitative data analysis
P	-	P-Value
Ph.D.	-	Doctor of Philosophy
PDRM	-	Royal Malaysian Police
RELA	-	People's Volunteer Corps
SD	-	Standard Deviation

SMART	-	Special Search and Rescue Team
S.E.	-	Standard Error
Sig.	-	Significance
SPSS	-	Statistical Package for Social Science
TNB	-	Malaysia Electrical Power Agency
KM	-	Kilometer
UN	-	United Nation
UNDP	-	United Nation Developing Programme
UNISDR	-	United Nation International Strategy for Disaster Reduction
X ²	-	Chi Square Statistics

LIST OF SYMBOLS

%	-	Percent
<	-	Less than
>	-	More/greater than
≤	-	Less than and equal to
=	-	Equal to

GLOSSARY OF TERMS

TERM	DETAILS
ADAPTATION	<i>“The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”</i>
CAPACITY	<i>“The combination of all the strengths, attributes and resources available within a community, society or organisation that can be used to achieve agreed goals”</i>
CAPACITY BUILDING	<i>“The process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems and institutions”</i>
COPING CAPACITY	<i>“The ability of people, organisations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters”</i>
CLIMATE CHANGE	<i>“A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”</i>
DISASTER	<i>“A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources”</i>
DISASTER RISK MANAGEMENT	<i>“The systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster”</i>
DISASTER RISK REDUCTION	<i>“The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events”</i>
EARLY WARNING SYSTEM	<i>“The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals,</i>

	<i>communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss”</i>
ENVIRONMENTAL DEGRADATION	<i>“The reduction of the capacity of the environment to meet social and ecological objectives and needs”</i>
EXPOSURE	<i>“The reduction of the capacity of the environment to meet social and ecological objectives and needs”</i>
HAZARDS	<i>“A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage”</i>
MITIGATION	<i>“The lessening or limitation of the adverse impacts of hazards and related disasters”</i>
NATURAL HAZARD	<i>“A serious disruption of functioning of a community or a society causing widespread human, material, economic or environmental losses which exceeds the ability of the affected community or society to cope using its own resources”</i>
PREPAREDNESS	<i>“The knowledge and capacities developed by governments, professional response and recovery organisations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions”</i>
PREVENTION	<i>“The outright avoidance of adverse impacts of hazard and related disasters”</i>
PUBLIC AWARENESS	<i>“The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards”</i>
RECOVERY	<i>“The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster affected communities, including efforts to reduce disaster risk factors”</i>
RESILIENCE	<i>“The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions”</i>
RESPONSE	<i>“The provision of emergency services and public assistance</i>

	<i>during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected”</i>
RISK	<i>“The combination of the probability of an event and its negative consequences”</i>
RISK ASSESSMENT	<i>“A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend”</i>
STRUCTURAL AND NON-STRUCTURAL MEASURES	<p><i>Structural measures: “Any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard resistance and resilience in structures or systems”</i></p> <p><i>Non-structural measures: “Any measure not involving physical construction that uses knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education”</i></p>
SUSTAINABLE DEVELOPMENT	<i>“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”</i>
VULNERABILITY	<i>“The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard”</i>

(Glossary of terms from the UN International Strategy for Disaster Reduction – UNISDR, 2009)

CHAPTER ONE

Chapter 1: Research Introduction

“It was Sunday morning, October 29, 2017. Eight days earlier, heaviest rainfall had poured off the steep slopes of the island’s central mountain range...”

– Fieldwork diary, 2018

1.1 Context

Natural disasters are becoming more frequent, more severe, and more intense around the planet. Catastrophes such as earthquakes, tsunamis, cyclones, and flooding are projected to cost USD 314 billion per year (UNISDR, 2015b). Growing concerns over the limited success of responses to a changing climate are often associated with community resilience (CR), and disaster risk reduction (DRR) approaches. CR is seen as a community's ability to deal with environmental and socioeconomic threats (Adger 2000, Tompkins and Adger, 2005) and it is most often generated from a diverse set of factors (Norris et al. 2008).

Although various studies have addressed climate change problems facing communities, many such efforts have limited engagement with local communities. Floods, like other natural catastrophes, can result in deaths, injuries, health risks, property destruction, social and economic disruptions, and negative environmental externalities (UN/ISDR, 2009). In Malaysia, flood disasters have become the most devastating environmental disturbance for its community. This country has a lengthy history of floods due to the fact that it is subject to monsoon winds and high convectional rainfall throughout the entire year. Flooding is the single-most damaging disaster in Malaysia with annual disaster damage around RM915 million (Ahmad Hussaini, 2007). This includes the

costs of rescue and flood relief activities, as well as public works and utility rehabilitation and compensation.

In light of this, many suggest that community-based participatory action research methodologies can help to overcome the limits of such efforts by allowing local communities to discuss climate impacts and identify practical solutions to problems in their own communities (Khailani and Perera 2012).

Recent floods in Malaysia in December 2017 were centered on Northern regions and the East Coast of Peninsular Malaysia, especially in Penang, Kedah and Kelantan and caused more than 10,000 people to be evacuated, claimed seven people's lives, caused millions of Malaysian Ringgit in damage of infrastructure, and hundreds of people lost their property and incomes in the areas impacted. The social and political components of flooding garnered increased attention, which facilitated the growth of community-based methods to disaster risk management in Malaysia. Public participation in decision-making influenced communication, local knowledge and information exchange, and risk acceptance, all of which are necessary to identify the causes of human vulnerability and develop solutions (Sadeka et al., 2015).

Previous research has demonstrated that communities seem to be unable to act because they lack opportunities for cross-scale coordination during the flood management cycle. As mentioned by Mark Pelling (2003) in his book "The Vulnerability of Cities", communities build and maintain skills to initiate planning, including adaptive solutions aimed at reducing vulnerabilities which can also be seen as a product of efficiency of socio-economic and political context of community capacity. Research integrating

individual and community response capacity to natural disasters is limited and has not been comprehensively explored in Malaysia (see Khailani & Perera, 2013; Chan, 2015; Nur, Zakaria, & Hussin, 2015).

Exploring relationship between vulnerability from the flooding, and the local future resilience towards floods, the demographics of the region, the location of the houses, the inappropriate and erroneous information and evacuation plan, the administration of the transit centre, and the lack of preparedness by the community are all factors that contributed to the flood (Safiah et al, 2020). While Tracey (2010) also discussed that the government's and other relevant agencies' poor transmission of early warning information and flood control infrastructures caused victims to have insufficient time to prepare for catastrophes, leading the rehabilitation process to be delayed. On the other hand, flooded residents often hold the 'authorities' to be responsible for allowing them to flood. This might be highly precise to certain organisations perceived to be liable, or it can be more generic and cover a wide range of agencies. This may be advantageous in terms of building a shared identity and purpose, but it is counterproductive to a positive working relationship with flood experts.

Yet contrary to the stereotype, the people sensitivity to the flood may be divided into three categories based on the discussion: geographical setting (location), socioeconomic, connected agencies (societal network and insurance firm), and catastrophe phase (during the flood) (Ilan and Stough, 2015); Melanie, 2015; Almarzouqi, 2017; Safiah et al., 2020). All of the characteristics stated are crucial in deconstructing vulnerability. The majority of the vulnerabilities mentioned by the participants in the debate are connected to the housing area's location. Houses near

riverbanks, swamps, and lowland areas are subject to flooding. This is because when rivers overflow owing to excessive rainfall and runoff from higher locations, these areas are readily inundated. Flooding has also grown as a result of rapid urban growth without regard for the neighbouring dwelling area. In fact, Vale (2014), stressed on socio-political complexity of the deployment of the term 'resilience'. Making sense of the resilience of cities also depends on the nature of the threat to security, to the economy and to the environment. Cities and their residents are asked to prepare for floods.

Does this suggest that locals should be relocated inland and away from their livelihood if Malaysia's flood prone area communities are vulnerable to future floods? Is it appropriate to evict current residents in order to build high rise housing such as condominium made of more durable materials along the Penang coast? Is the purpose to build a city that is resilient for the affluent at the expense of the poor? Or would it be feasible to provide the impoverished with well constructed housing and working spaces as well? Genuine attempts to address identified vulnerabilities may all too quickly devolve into opportunism.

Even with this extensive knowledge, there are three significant gaps in this academic and policy discussion. Most previous studies on disaster response in Malaysia did not pay particular attention to how individuals and communities work together with local governments to respond to disasters (by local coping, adapting capacity, resilience) to flood disasters. These communities are frequently the first victims of floods because they lack preventive measures due to a lack of effective flood-management resources, and hence have limited capacity to cope with property and income losses (IPCC, 2007).

Understanding the way in which communities respond to flood events is central to exploring the ways in which individuals and communities are vulnerable to flooding.

Actually, this study emphasises more locally based management of risks, with exploration on the use of local knowledge and coping measures. Interestingly to share here, I promote adaptive capacity as window of opportunity to support a more comprehensive disaster risk reduction approach. Major development in this area, which community in this context, needs to be aware about how to perceive resilience as the best ability to cope. Several studies found that, greater community resilience meaning community can recover more quickly (Adger et al., 2005; Walker & Salt, 2006; Walsh, 2007). I would say that achieving resilient especially post-disaster recovery involves understanding how to define, characterise and measure different set of disaster resilience.

Defining and conceptualising resilience has long been the cause of a considerable debate both in theory and in practice. To some, resilience represents a paradigm shift in how people and organisations confront and cope with events that disrupt the status quo (Manyena, 2006). The notions of resilience, community resilience, and social capital are still in their infancy. This is mostly due to a lack of agreement on how to define and characterise resilience as a theoretical foundation. Confusion about terminologies, as well as uncertainties about how to evaluate and improve resilience, cast a pall over community disaster resilience and social capital studies. The goal of this study is to define and deconstruct the notion of resilience, identify community resilience qualities, learn more about the function of social capital, and come up with practical solutions for communities to improve resilience.

So, this thesis will attempt to move resilience from the domain of theory to practise by performing a comprehensive assessment of the resilience literature published in academic publications since year 2000. This task necessitates a thorough examination of the concept of resilience in isolation from its context-specific arrangement in order to provide a solid theoretical foundation for the findings and scholarly clarity to a concept that, despite its widespread use in disaster and community development policy lacks consensus. After establishing a theoretical and conceptual basis for the notion of resilience, it is only feasible to comprehend the concept of community resilience and the function of social capital.

Community resilience focuses on building the strengths of community members to mobilise and come to their own aid during times of crisis. Therefore, the concept of social capital reflects this vision because it also places importance on bottom-up policy dissemination and bolstering formal and informal networks of community resources. The other challenge of a disproportionate focus on disaster response can be met with a more wholesome consideration of the entire disaster cycle, mainly the state of a community before disastrous events. Disaster resilience pays special attention to the period before a disaster (Simpson, 2016). In the context of catastrophe studies, resilience theory claims that stronger and more socially linked societies are able to bounce back more rapidly and efficiently following a disturbance. Following a general discussion of resilience, subsequent chapters will focus on the idea of community disaster response.

Furthermore, as idea of vulnerability also has grown. As we know, vulnerability is variables that enhance a person's exposure to a danger or risk (Blaikie et al, 1994;

Manyena et al, 2011). It is actually conceptually important to linking vulnerability-resilience model analysis through the lens of disaster risk. According to Birkmann (2006), the concept of vulnerability has achieved a high degree of recognition in different fields, such as disaster management, environmental change research and development studies. In (subsection 2.3), it is worth to understand the different levels of impact between social groups depending on a variety of factors such as levels of readiness to prepare, ability to cope and recover according to disaster events in which understand the ways vulnerability are shaped. Aspects that may significantly show the development in operationalizing community resilience is the relevance of understanding social interactions to cultural factors and religion.

The work for this thesis was undertaken during a four-year period (2016-2021) and has seen three major floods that have at times paralysed the whole island and significant parts of the mainland, leaving 21 dead and 10,000 displaced in Penang. During my research, I assisted in the flood-relief operation during the second wave of flooding in December 2017. Subsequent visits to Penang Island, specifically at Teluk Kumbar, in 2017 and 2018, have provided a context in which to observe the responses and coping processes necessary at government, NGO and the community levels. Due to its proximity to some of the country's most devastating calamities, Penang is a great case study, with numerous of these occurrences occurring in recent years.

Penang is vulnerable and prone to numerous hazards, both natural and anthropogenic. The multitude of natural hazards affecting Penang is a direct result of the state's high degree of geological, topographical, and meteorological unpredictability. This research is undertaken in the context of a significant increase in flooding to understand how

people view the risk, vulnerability and resilience when faced with complex and uncertain change in the setting of an ongoing rapid rise in development density. Increasingly rapid industrialisation and urbanisation can increase the potential for natural disaster, recently becoming unpredictable and worsening.

Changes of land use, such as replacement of natural forests with impervious urban areas, affect the urban floodplains and areas upstream which reduces the capacities of most rivers to drain away excess water from the rainfall. Penang State Government insists on continuing the projects, citing examples like mountainous city of Hong Kong, which is “*high concentration of developments on hilly terrain and the steepest slopes without much fuss*”. The Hong Kong government, on the other hand, has focused its efforts on a methodical Landslip Prevention and Mitigation programme (LPMit) that retrofitting slope engineering works and building construction technology over the past 35 year (Parry & Ng, 2010). There has been actually “fuss” in understanding and mitigating this risk with plenty of geological and geomorphological including public expectation analyses is being carried out. Thousands of continuous mitigation works, drainage tunnels and smart monitoring technology has been established in this Mega City of hilly Kowloon, which to mitigate natural terrain landslide.

There has been a lot of effort put into understanding and mitigating this risk, which has influenced how the city implements low-impact and effective landslide protection solutions in response to a mix of high seasonal rainfall and dense urban expansion on steep terrain across a total land area of around 1100 km² (Choi & Cheung, 2013). As evidence for these solutions, during the preceding 20 years, the risk of landslides to Hong Kong residents has decreased dramatically. Penang Island is also undergoing

urbanisation, rapid growth, and democratisation, all of which are common trends in high- to middle-income countries. All of these factors are thought to have a substantial impact on catastrophe risk and resilience. Because of these differences, there has also been consensus concerning about how people adapt to living with flood risk and what are the key thing that shape the capacity? Are people in Penang Island resilient, or should we learn from them, in particular how they adapt?

The research will also contribute to community resilience by identifying the measures needed to improve preparedness. To provide this information, the problem, research questions, objectives, and research design are presented herein.

1.2 Problem Statement

In response to attention ‘grabbing phenomenon’ of flooding, there is a need to identifying the community’s response as part of the preparation before floods, emergency responses during floods and recovery after flooding to identify the impacts of flood on the livelihoods of Teluk Kumbar, Penang Island. This research focuses on adaptation of successful management, social capital, the public’s ability to act and represent local interests in the decision-making process, disaster risk reduction, community-government-politics partnerships that are captured by the lived experiences of individuals.

Similarly, although vulnerability, resilience and sustainable livelihoods have been increasingly recognised in the hazards literature, there is limited Malaysia’s local perspective on recovery and risk reduction aiming at reducing flood vulnerabilities. In

fact, I explore on adaptive and response capacity then I argued how these elements shapes disaster as a learning machine.

1.3 Research Questions and Objectives

The following questions are expected to be answered in order to achieve the study's research objectives:

- *What are the factors of local communities that form the response and recovery in terms of flood management in Penang?*

This study has embraced the need of having to live with and cope. An important outcome of this study was that mosques serve as a window of opportunity for disaster risk reduction improvement. For example, from a humanitarian standpoint, the use of religious organisations, such as mosques, as shelters, where in term of social capital mosque has shown its proactive role in educating people about flood disasters, providing training and functioning as institution that help improve the preparedness of residents. In such a scenario, the community becomes resilient to the disaster and allows them to live in an area that vulnerable to floods. This is to answer the first objective on response and recovery undertaken in post-recovery for the City of Penang.

- *How can factors of local knowledge contribute to the coping strategies and improving flood vulnerabilities?*

This study managed to demonstrate that local or indigenous coping mechanisms are frequently effective, for example one resident showed me where her family managed to channel out the flood water in their house very fast with a hole they built in every room. As a result, flood water that fills the interior of the house is discharged directly into the ditch outside the house. These residents are used to employing a variety of

indigenous strategies based on their previous experiences facing floods. It is worth mentioning that these factors have led to achieve the second research objectives on the factors of local communities that form response and recovery.

- *To what extent government and community participation be incorporated into disaster management strategy, in order to enhance community resilience?*

The role of government organisations in flood disaster relief is complex. In real practice, response and recovery phases and operations overlap to such a degree that it becomes difficult to establish a borderline, especially in emergencies. Therefore, the importance and roles of the strategic partnership among all stakeholders are reviewed, which expressly pointed out the gaps and limitations and helped change the function of the government authorities (e.g., federal; state and local governments; government organisations). This question is centered on focus to explore the role of local government's intervention strategies play in term of flood disaster risk reduction in objective three.

The research aim and objectives of the study were systematically fulfilled by formulating a research design, *to assess how people in Teluk Kumbar, Penang Island respond to flooding through identification of key coping strategies at community level.*

The objectives of the study are to:

- *To analyse the response and recovery undertaken in post-flood Teluk Kumbar, Malaysia.*
- *Critically analyse whether different groups of people have different coping strategies related to different causes of vulnerability.*

- *Determine the ways in which the government supports local communities to cope with floods.*

1.4 Development of the Conceptual Framework

As a starting point, it should be highlighted that while the literature contains several definitions of vulnerability and resilience in the context of natural hazards, no consensus has yet been reached despite the existence of numerous frameworks. For the purposes of this thesis, vulnerability and resilience are defined as follows:

Vulnerability is typically linked to prevention, preparedness and mitigation. It is mostly recognised as a pre-disaster issue that refers to the circumstances that cause a disaster when a danger and a system's exposure to it collide (Cutter et al, 2003).

Resilience is primarily concerned, but not only, with reaction, rehabilitation, rebuilding, and recovery, as well as risk mitigation to address future threats (Berkes and Ross, 2013). It is a post-disaster concern; the conditions that enable damaged systems to resist and recover from disasters. Additionally, it could be a pre-disaster concern, as a system's ability to tolerate severe disaster impacts is highly dependent on pre-disaster conditions. A simplified adaption of the selected definitions offered in Chapter two is used to establish these definitions, which presents the literature review.

As a result of this inadequacy, the theoretical framework presented in Figure 1.1 has been developed to illustrate the relationship between community response capacities with its factors: resilience, adaptive capacity and coping mechanisms. My research focuses particularly on the resilience, coping capability, adaptive actions of the

community being transformability without ignoring the experiences of vulnerability, exposure, and inaction. It show a comprehensive analysis that lead to its own framework, namely **Community Response Capacity** that integrate the theoretical foundation and establishes a set of hypotheses that have been tested throughout this thesis.

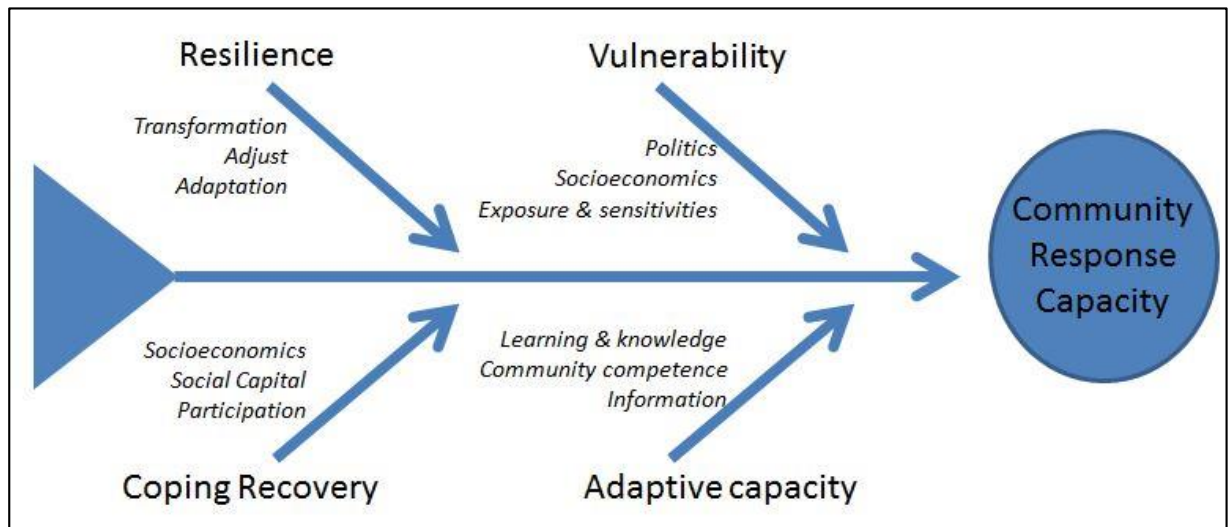


Figure 1.1: Community Response Capacity Theoretical Framework

Theoretically it contributes to discussions of community responses capacity. The concept of the **community-led recovery** provides a way of understanding how communities both respond to, and can be changed by, flooding. It can explain the expanding on understandings of the local's community engagement, learning and well knowledgeable, therefore it provides an understanding of the processes in managing disaster. In addition to this, re-affirming the importance of building a strong and connected community provides a basis from which community responses could be supported and developed. For example, government collaborate with community to help one another in various way. The theory will also help determine the extent to the

value of **resilience** concept functions in **transformative** and an operational term for disaster and development.

It also further extent that **community self-reliance** lead the recovery on the ground by transiting into a collective reaction in **coping recovery**. For example in practice, communities are managing their own shelters and taking care of themselves, providing mass assistance to one another, evacuating one another on their own, and making their own decisions. The study findings suggest people to work together and crucial in maintaining these communities resilient during floods. The theoretical framework will also help understanding the local socioeconomics structures, participation patterns and the context which is essential to understand the communities' response.

Furthermore, this study also contributes to the current literature on the importance of **social capital** in establishing resilience. I attempt to defend the households with greater social status to sustain a lower impact of hazard because they have the ability to adopt adequate mitigation measures, and their recovery period is shorter than those who lack with social capital resources. This research has practical solution to improve community resilience relevant to **adaptive capacity**. Such preventive measures were discussed in the literature review as the development of the institutional and community resource capacities, early warning signals, use of flood risk communication technology to manage flood disaster, availability and readiness of emergency support expertise during disaster, people education on disaster prevention and awareness, and enforcement of building polices and government planning restrictions.

The framework above is a flow chart that illustrates the theoretical framework adopted from the reviewed literature. It also gives a visual impression of how the study will be organised and the data analysed. Central to the framework is how individual people or communities adapt to a change in their reality, where society is changing through capitalising on new possibilities in order to solve the consequences of flooding.

1.5 Thesis Structure

This thesis is organised into eight chapters: Introduction, Literature Review, Site Overview, Research Methodology, Interconnectedness of Community and Organisation in Responses to Flooding, Vulnerabilities, Discussion, Conclusion and Recommendations. A case study approach was used to accomplish the objectives of the study.

Chapter two presents an extensive literature survey and theoretical insight into the concept of disaster coping, adaptation and resilience. This is to enhance the overview of the definition of vulnerability and understanding these principles that can be applied to adaptive capacity in Penang. It is devoted exclusively to the study of natural disasters and hazards. For practical applications and policy decision-making, broad insights are created from the existing literature.

Chapter three provides information on Malaysia and Penang Island in the context of flood disasters. It also discusses relevant institutions for flood management in Malaysia, the National Disaster Security Council Policy (MKN20), a brief history of floods in

Penang related to physical and land use characteristics of Penang, and effects on physical and infrastructural, human and social, and financial and economic damages.

Chapter four introduces the research methods and the identification of the most appropriate ways of gathering the information required. Also included is a brief overview of the communities that make up the local research area.

Chapter five describes a realistic scenario of how the Penang community responds to flooding, particularly aspects of coping, risk management and awareness. This chapter also discusses the progress in integrating local knowledge in disaster preparedness associated with response, mitigation measures and adaptive strategies.

Chapter six discusses the institutional, financial, infrastructural and societal vulnerabilities based on current understanding. This chapter answers the question: What determines vulnerabilities from flood disasters? It is commonly acknowledged that the level of socioeconomic development, as well as the characteristics and quality of local governance, have an impact on the human consequences of disasters.

Chapter seven provides information on recommendations include placing value on local knowledge into current flood management strategies to enhance community participation and empowerment. This chapter is study that examines the resilience of communities to riverine flood disasters and the interventions undertaken by groups to enhance their capacity to cope with flood disasters.

Chapter eight summarises the project's findings as well as the concepts of interdependency and response priorities. This chapter also provides an explanation of the ethics and research contribution associated with the research.

1.6 Summary

The main focus of this introduction chapter was to briefly introduce community involvement/participation for better future strategies in managing flood disasters. The chapter briefly discussed local knowledge and its significance in disaster management practice regarding the research background. The chapter explains that disaster management gaps exist due to local people's knowledge or suggestions not being prioritised in disaster management strategies or practices. Additionally, the chapter also discussed the study's research objectives, questions, and significance and provided a brief overview of the thesis' structure. The following chapter will evaluate pertinent literature in order to uncover theoretical aspects relating to disaster susceptibility, community resilience, and flood catastrophe recovery.

CHAPTER TWO

Chapter 2: Operationalisation Of Community Disaster Response

“It is a regular sight to witness the public had undertaken the voluntary role as benevolent volunteers as this is in accordance with the quest of viable disaster management”

– Malaysia National Security Council Officer, 2019

In this chapter, I present and critique the literature on which the research is founded. At the outset, section 2.1, I explore the conceptual terminology of vulnerability to incorporate diverse methods that include the perception of risk and mechanisms that mediate vulnerability, including the concept of community. The following sub-section discusses how response capacity relates to disaster resilience (Section 2.2). This section presents fundamental concepts on which the research is founded, including the adaptive and capacity response. Section 2.3 discusses vulnerability in the context of hazard disaster as the key element that shapes the community response to disaster, to use disaster as a learning machine. Section 2.4 provides an overview of a crosscutting discussion of recovery and risk reduction. The research presented in this thesis attempts to understand vulnerability as a pre-existing condition that exists before, during and after a flood event that impacts coping capacity, adaptive capacity and levels of resilience. This chapter also includes an explanation of the community emergency response and participation and flood preparedness (Section 2.5).

2.1 Conceptualising Hazard-Risk And Theorising Resilience

2.1.1 Defining hazard and risk and their interrelationship

Risk can be defined as “*the probability that exposure to a hazard will lead to a negative consequence*” (Wisner et al, 2006: 58). In the case of disasters, risk can be defined as the possibility of harm due to a variety of hazard events (Lewis & Kelman, 2010). One of the contributors to disaster risk such as damage in the environment. Those contributors include, but not limited to climate related environmental phenomena for examples poor wealth, injuries, social oppression, death, economic crisis, discrimination, and destruction of livelihood (UN/ISDR, 2005). The potentially risky elements are grouped into three categories: human, economic and geographical. Yet, Wisner et al., (2012) considers disaster risk as multidisciplinary which can be used in a variety of situations – challenges and opportunities. Similarly, Kelman et al., (2015) outline the risk concept as a result of the transference between climate change hazard, multitude of exposure and vulnerability.

A hazard is defined as “*an event with the potential to cause harm to a vulnerable target*” (Few, 2007: 52), with the possibility of a (natural) hazard occurring and the potential for (human) losses establish the total level of risk in an area. (Few, 2006; Smith and Petley, 2009). Due to this reason, when a risk becomes a reality, it is referred to as an emergency or a crisis. However, it is termed a disaster if it causes extensive and severe damage (Alshadadi, 2017).

A hazard can refer to a generic threat that indicates a future risk and may have negative consequences for all parties involved. According to Parker (2000) and Smith and Petley (2009), flooding is a result of natural phenomena interacting with human culture in

order to limit the effects of potential dangers. Additionally, in agreement with Cutter (1996: 539), managing a location's and population's vulnerability entails a combination of social and physical fragility (“...*socioeconomic indicators, cognition of risk, individual/societal ability to respond*”) and physical risk dependent upon (“...*site and situation, proximity*”). Managing the vulnerability of an area or community requires an understanding of both social and physical fragility. Smith and Petley (2009:532) summarised three main ways in which people can adjust to hazards: mitigation (financial measures, such as cash aid), protection (structural protection, such as construction of dams, channel improvement, river diversion, and embankment) and adaptation as a means of attempts to reduce vulnerability and increase awareness.

2.1.2 Disaster risk reduction

The notion of disaster risk reduction (DRR) has emerged as a technique of reducing physical, social, economic, and environmental vulnerabilities in recent literature. To facilitate this reduction, it should include hazard management. Both the Global Assessment Reports on Disaster Risk Reduction in 2004 and 2009 identify vulnerability as the primary explanation for disaster risk. Returning to the key dimensions of DRR, Birkmann (2006) observes susceptibility, exposure, coping capacity, and adaptive capacity, as well as different thematic areas such as physical, social, economic, environmental, and institutional vulnerability. The concept have all been widened and broadened in the pursuit of a more comprehensive approach encompassing susceptibility, exposure, coping capacity, and adaptive capacity.

Many studies have found that reducing vulnerability can lead to a reduction in risk in relation to disasters. Wisner et al. (2004), UNDP (2004) and UNISDR (2009)

emphasised the critical nature of resource access and the political economic systems that define vulnerability and risk. Following the reports, it has been argued that little effort has been made to comprehend institutional fragility. The UNISDR Global Assessment Report on Disaster Risk Reduction (2013) was arguably the first global report to make a compelling case for the need of governance and institutions in ensuring disaster risk reduction's sustainability. Although previous research, such as Schneiderbauer and Ehrlich (2006), referred to the formal administrative community as having "institutional quality" or "institutional setting".

The Sendai Framework for Disaster Risk Reduction, UNISDR (2015a), goes further by identifying seven global targets and four action priorities that were developed and agreed in order to support and invest in disaster risk reduction internationally and to support the human dimension of recovery and social vulnerabilities. Thus, the theory of DRR asserts that disaster risk reduction activities consist of a series of activities, are used to categorise catastrophe risk reduction initiatives from during emergency, relief intervention (after disaster risk management), rehabilitation, mitigation, prevention, disaster preparedness (before disaster), early warning systems, and back to emergency again in a full cycle.

2.1.3 Current definition of disaster resilience

In a broad sense, vulnerability reduction has begun to be implemented by building and improving community resilience through prevention, mitigation, and preparedness capability. Several studies of hazards and disasters have found that greater community resilience ensures that the community can recover more quickly. In the event of a disaster, the local community is the foremost party impacted with losses associated with

natural disasters. Therefore, the community needs to be aware about how to perceive resilience as the ability to best cope with disasters. As a result, several governments around the world, including Malaysia, are creating awareness and recovery programmes to strengthen their local populations' resilience. (Figure 2.1).



Figure 2.1: Penang resilience initiative programme run by state government

(Source: Buletin Mutiara, Penang State Officials)

Achieving resilient post-disaster recovery therefore involves understanding how to define, characterise and measure disaster resilience. Practically, this is extremely important to be able to objectively determine whether progress has been made in building resilience (Cutter et al., 2008b). To this end, recent literature has focused more

on social resilience – for example Adger (2000); Pelling (2003); Maguire & Hagan (2007); Lorenz (2010, 2013); Hutter et al., (2013). Even with this extensive knowledge and a way to move forward, the concept of resilience has been explicit operationally defined and applied differently to overcome its vagueness.

It is interesting to briefly compare different understandings of resilience. By better defining and by doing so in different context, Adger (2000) and Pelling (2003) operationalising resilience as a result of social capacity, power access, political, and environmental change with the ability of groups or communities to cope with external stresses and disturbances. In contrast, Lorenz (2013) defines the capacities of a social system that constitute resilience to be coping, adaptive, and participative capacities. According to this definition, he conceptualises adaptive capacity as the ability to modify the system's structure to prevent future disasters, while arguing that the coping capacity is the system's property when coping with past hazardous events.

A broader definition of resilience is related to participative capacity which can be seen to promote the system's ability to change its structure when subjected to interventions by other systems. Referring to Hyogo Framework for Action, hazard as the stressor:

“...the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.” (UNISDR, 2015c: 24)

The discussion illustrates that the development of resilience theory from different disciplinary perspectives has led to a better understanding of the application of

resilience and how it can mitigate the impact of a disaster in the context of DRR. Most researchers such as Mitchell and Harris (2012); Djalante (2013); Weichsegartner & Kelman (2015) consider the social, shocks, stresses, physical, environmental, economic, and political factors that influence vulnerability and resilience. These types of resilience depict hypothetical indicators to measure vulnerability, and then apply these indicators to improve disaster resilience at a community level.

2.1.4 Adaptive governance of risks

Adaptive capacity is related to the ability to learn incrementally, which means resilience should be reframed using transition and transformation (Pelling, 2011; Bulkeley and Tuts, 2013). The most important arguments regarding the adaptive capacity aspect of resilience are the transition and transformation needed to evolve the response. This idea has been summarised by Folke et al. (2010), who suggested that resilience concepts incorporate a measure of individuals, groups, and communities' adaptive and transformational capacity. In this sense, the adaptive dimension in the context of communities usually refers to a process, action, or result in a home, community, group, sector, or area, such as a district or country, that describes how these systems cope with, manage, or adjust to a changing circumstance, stress, danger, or opportunity (Barry & Wandel, 2006). This definition relates to losing resilience which implies a loss of adaptability (Hanna, 2014).

As the role of access to political power has been identified as one of the root causes of vulnerability, Walker (2004) noted that adaptation is usually implicit in the field of political ecology. This is also referred to as the relationship between ecosystems and political economy, which are often considered issues of adaptive management of risks

when researchers attempt to operationalise the concept related to political and social power relations, resources use, and economies.

In order to understand the adaptive dimension further, there has also been discussion on adaptive capacity and resilience by IPCC (2007: 56) that views adaptation as “*the system’s capacity to absorb and recover from the occurrence of a hazardous event*”. It could be argued that adaptive capacity should relate to the ability to foresee, adapt to, and respond to the socio-economic and ecological consequences (Bulkeley and Tuts, 2013). Adaptive capacity, therefore, concerns underlying structures of vulnerability, such as levels of poverty and entitlements.

2.1.5 Resilience as a concept of community capacity response

To comprehend the concept of resilience, which has been utilised in a variety of contexts in social and socio-ecological research, it can be considered in relation to human action as the fundamental consequence of disasters (Carpenter et al., 2001; Pelling, 2003; Pelling et al., 2004). Researchers have attempted to operationalise resilience in the international development literature. The relationship between disasters and development is well-considered, and the resilience concept is emphasised broadly, incorporating capacity to survive, resist, adapt, absorb disturbance and recover from disruptive events (e.g. Schipper and Pelling, 2006; Cutter et al., 2008).

However, there is a need for more robust efforts in research exploration on the position of resilience, specifically around whether resilience is just about maintaining the system or is it about transforming systems? In considering the value of resilience concept functions in transformative and an operational term for disaster and development,

several debates in the disaster risk literature have been argued to translate these ideas into a capacity response. Understanding the local social structures, network patterns and the context for these is essential to understanding the communities' response. The types of responses identified (unstructured, structured and formal) are closely linked to the types of social structures. These in turn formed the basis of collective community responses to flooding.

Considering Manyena's (2006) view that resilience-oriented capacity-building processes comprise specific approaches, strategies and methodologies that transform the ability of individuals or groups to allow the most effective adaptation measures to be identified. This analytical notion includes the most vulnerable individuals groups, so they can perform functions to 'bounce forward' or 'move on' following a disaster event. At present, I think the 'bounce forward' conception is too optimistic. In the pre-disaster stage, potential victims can understand resistance and self-ability to learn to survive the destabilising events with minimal or no assistance. Another debate suggests that the notion of 'build back better', which relates to resilience, can be interpreted as the ability to shift to a greater level of preparation in the face of uncertainty and change (Practical Action, 2013).

Another similar concern has been raised by Pelling (2011), where he interpreted resilience as a framework that includes adaptive, absorptive, and transformative capacity. Within the community responses, proactive forms of adaptation can be implemented by drawing on government and external parties. In general, disasters will disrupt the villagers' daily lives leaving them powerless to recover as recognised by UNISDR (2009). Consequently, the affected communities will often need external

involvement to help rebuild their lives. External involvement can be from upper levels of government and civil society organisations outside the affected areas such as NGOs, and member of other communities (Joakim, 2013). Earlier researchers who concentrated on connections between disaster events and the contribution of religion often looked at interpretations about a disaster responses by local religious leader's perspective (Schlehe, 2010). Religious leaders can play important roles in encouraging and promoting community responses to a disaster and to working toward effective recovery afterwards. In situations involving a lack of trust between communities and governments, religious leaders can respond as authority officials whenever the communities need trusted leaders for guidance and support (Bagir, 2012).

The discourse of community as a resource provides a basis from which community responses could be supported and developed, as does the widespread appreciation of such assistance. The extent and type of this assistance is, however, very dependent on the form of local community created by residents. From this perspective, resilience is formulated to build disaster community resilience and allow people to take responsibility on a capacity or ability basis of how individuals, a group of people, a community, or society can continue to operate in the event of a disaster. Through an analysis of the conditions and responses of the affected villages, as well as responses from key stakeholders, the results chapter responds to one of the key objectives of the research: To analyse the response and recovery undertaken in post-flood Teluk Kumbar, Malaysia.

2.2 Understanding Vulnerability In The Context Of Hazard Studies

The idea of vulnerability has grown and become highly significant in catastrophe risk reduction talks. The reason for the growing interest in vulnerability, thereby reducing levels of resilience, is that natural hazards are closely linked with the societal political and economic conditions. Many impoverished people, for example, reside in risky regions such as landslide zones, flood zones, or volcanic zones, making them vulnerable to natural disasters. It is nevertheless vital to recognise that if such people's economic situations were different, the consequences of natural disasters might be reduced more easily.

The notion of vulnerability is a key concept in understanding disasters. Vulnerability is described as variables that enhance a person's exposure to a danger as a result of external action. (e.g. climate change) or increase the susceptibility to the consequence of the hazard. Vulnerability theories (e.g. Joakim, 2008; Pelling, 2003; Wisner et al., 2004; Birkmann, 2007) have evolved from being human-centered methods that focused on the individual's inherent vulnerability to ways that encompass susceptibility, exposure, coping capacity and adaptive capacity and the building of resilience.

Despite the abundant knowledge and scientific development, all the attempts to explain the factors affecting vulnerabilities could use the sustainable livelihoods approach that provides a link between social, economic and environmental vulnerabilities in the face of natural disasters (Brinkmann, 2007 & Wisner, 2006). Many of the main vulnerability models (see Blaikie et al., 1994; Pelling, 2003; Wisner et al., 2004) see access to and

use of resources and assets as a crucial component of vulnerability; hence, the link between vulnerability and livelihoods is significant.

A number of frameworks and models have been developed (Table 2.1) to provide an understanding of different aspects of vulnerability within the context of hazards. From these frameworks and models it is clear that the main points of convergence are related to the exploration of vulnerability from a social-ecological perspective (see Blaikie, et al., 1994; Cardona, 2004; Wisner, et al., 2004) and root causes of vulnerability (see Blaikie, et al., 1994; Pelling, 2003; Wisner, et al., 2004; Birkmann 2007; Joakim, 2008). It is therefore critical to understand that vulnerability is mainly about the exposure of people to risks due to socio-economic or environmental factors.

In order to manage vulnerability effectively, we need to know how vulnerability is generated (which hazard), how it increases, to whom and how it builds up over time (Cardona, 2011). From a vulnerability and risk perspective, Bankoff (2004) explains that people are not at risk because they are exposed to hazards, but because of access to resources, everyday patterns of social interaction and organisations, it has increased vulnerability to disasters. Thus, the combination of multiple hazards is heightened as a result of complex interactions, environmental and social conditions.

Table 2.1: Key frameworks and models in vulnerability theory

Concept	Theorist
Importance of livelihood security	Blaikie et al., 1994; Watts & Bohle, 1993
Focus on the underlying causes of vulnerability	Wisner et al., 2004
Including capacity/resilience	Birkmann, 2007; Cardona, 2004
Types of vulnerability, including physical, social, human - Individual, organizational, community, infrastructural, political, economic, social, location, landscape, environmental	Pelling, 2003, 2011; Joakim, 2008

According to Cannon (2008), in addition to drivers of vulnerability, some global processes play an essential role in the emergence of vulnerability. These include fast and inefficient urbanisation, globalisation and population increase, diseases, government failures, social and economic disparities, environmental degradation, hydrometeorological and climatological disasters, and global financial pressures.

In addition, as identified by Blaike et al. (1994), hazard and related consequences can be considered as separate from assessing, addressing and incorporating social processes of vulnerability. Criticism of vulnerability also encompasses issues of generalisations where they complicate categories of vulnerable people. The common approach to deal with generalisation is to cluster the people according to characteristics such as special cases (e.g. traumatized, ill, poor), social constructions (e.g. poor woman, poor ethnic communities), and the intersectionality of significant determinants of vulnerability (e.g. gender with health; socioeconomic with loss; education status with adaptive) (Cutter et al., 2003; Cannon & Muller-Mahn, 2010).

In contrast, classifications based on specific characteristics do not always capture vulnerability. Levine & Mosel (2014) identified that not all members of a group are necessarily vulnerable, or they might potentially be vulnerable in certain circumstances for example a person who died because of illness a few hours after a natural disaster occurs. Therefore, the strategy of relying on categorical vulnerability in order to determine differential vulnerability is overly simplistic.

Given the lack of overlap in the vulnerability of people to such risks, focus should not be on only natural hazards but also on “social environment” and its related processes. In this regard, Wisner et al. (2003) proposed two analytical models to understand vulnerability in a better way. First, root causes to unsafe conditions need to be specified and measurable in the progress of vulnerability; and secondly, to understand why certain individuals or groups are more susceptible than others which is likely to be related to livelihood, access and future disaster risk distribution patterns.

Dimension of vulnerability level will be effected by causal factors is certainly true as particularly assessed in the work undertaken by Rakodi (2002), when a household or individual's resources are insufficient to enable them to access sufficient goods and services to attain a tolerable minimum level of wellbeing, they are considered as poor. He adds that low socioeconomic status can also be defined by a lack of assets and an incapacity to amass a diverse range of them, but also by “*lack of choice with respect to alternative coping strategies*”. However, Khailani and Perera (2013) proposed that within rural communities with homogenous socioeconomics, urban residents with limited social capital were not well organised in action taking.

2.3 Linking Vulnerability And Resilience Through The Lens Of Disaster Risk

Despite calls to promote disaster risk reduction as a link between vulnerability and resilience, it is conceptually important to identify and review the extensive literature available on vulnerability-resilience model analysis. In this regard, Pelling (2003) and Walker (2004) argued that some of the main factors that influence the level of vulnerability depend on access to knowledge information and social power relations that are often treated as issues of adaptive management of risks, which plays a more significant role in the resilience dialogue. This argument emphasised empowerment as one plausible framework that can address individual entitlements to resources in shaping recovery capacity.

This capacity corresponds with the degree of damage, such that greater damage reflects the increased time it takes for the system to restore back to a normal state (Vale et al, 2005). This is the stage when short-term and long-term activities function to bring life back to the normal, pre-event condition, given that the recovery period depends on the resilience of communities and the availability of resources. In the work of Moreton (2016: 126), “*recovery capacity refers to the ability of a system to regain function after a disturbance*”. It is also important to clarify that recovery capacity does not relate to the system reverting to its former level of disruption, but rather to the system's functional recovery (Balsells et al., 2013).

There are arguments to argue that a community's resilience is dependent on availability to a variety of capacities such as social capital, income, community competency, and economic development (Norris et al., 2008). If people of a community do not receive

help or assistance during disasters, it will be exceedingly difficult for them to recover from the negative effects of the disaster and to withstand any future threats. Others, such as Lewis and Kelman (2010) pointed out that if the purpose is effective disaster risk reduction, then local communities should be educated and empowered about disasters and how to mitigate them through resilience programmes. This view is closely connected with the PAR model of Wisner et al. (2004) that identifies a series of elements that influence the root causes of vulnerability (such as power structure, debt crisis and civil security). Then it leads to dynamic pressures (such as women's status, rights, and livelihoods) which specifically conducted to unsafe conditions (such as fragile self-protection and social protection). However, the work of Wisner et al. (2004) does not make a distinction between formal and informal institutions that lead to such marginalisation within the local community to reduce vulnerabilities, without denying the entitlements of the locally marginalised to be enhanced. Clearly, Pelling (2003) has argued that in a marginalised society, societal institutions (including state, religion, kinship and family), cultural norms and policies can shape power structures and resource distribution.

In any event, when extreme flood events occurred there are possible of critical incidents: tress and bridges to collapse, power outages, road closures, out of service businesses and transportation, and emergency residential evacuations. Depending on the intensity of the flood, it may take several days or months to restore normal city operations and allow residents to return to their homes. Walker (2004:2) states *“Rebuilding communities can be viewed as opportunities to modify building regulations to ensure resilience building, which is essential to reduce potential flood impacts”*. This

quote illustrates the interconnectedness between structural reconstruction with mitigation activity that allow for community rapid recovery.

When building flood-response plans, social, economic, and ecological systems must be taken into account. All of these aspects are interconnected, therefore it is critical to have good procedures in place to respond successfully when an extreme event occurs, allowing for rapid emergency response and recovery (Asrat, 2015). As a result, assessing flood impacts, vulnerabilities, and hazards is required. Flood risk assessments can be used to determine types of vulnerabilities and risks in afflicted locations. The results of the assessments can be utilised to plan for flood disaster mitigation. In the interest of non-structural post-flood recovery, this will be assumed involves legislation, reviewing policy, protocols such as land-use activities emergency response standard procedures, and public education and awareness programmes.

In disaster preparedness, legislation is critical in defining roles and duties for preparing in flood-prone areas. Regulations, communication of service facilities, emergency response processes, public education methods, and awareness programmes are all part of post-flood recovery planning. Yet, this supports other literature that expressed in the following quote in Satterthwaite (2013:54), which “*collaboration can lead to major flood planning that improves urban resilience*”.

As a simple model, preparedness for flooding arises as a result of hazard awareness, and it worth considering that has important social and technical dimensions. Despite the listed drawbacks, Raaijmakers al. (2008) use the term of preparedness that relate to “situational factor actions” taken by individuals prior to a flood event and measures

driven by a set of protective behavior (experience with a hazard) in place by residents to reduce damage before flooding occurs.

Therefore, this research seeks to understand the different levels of impact between social groups of individual, household, groups of communities and expert stakeholders depending on a variety of factors such as the levels of readiness to prepare, the ability to cope and recover according to disaster phase event in which understanding of the ways vulnerability are shaped.

2.4 Operationalising Community Resilience; The Role Of Culture, Religion And Social Capital

2.4.1 Social interactions, culture and religion

The relevance of understanding social interactions to cultural knowledge that a community has acquired through generations is influenced by interpretations of the important sources on how to handle disasters for effective coping capacity and disaster risk reduction (Kulatunga, 2010). Culture may exaggerate the importance of adaptation and recovery to disaster, for example, Arunotai (2008) points out that in his study, many of the local community during the Indian Ocean Tsunami in 2004 successfully survived the natural disaster and promoted resilience, while many tourists and migrants were hugely affected with damages, loss, posttraumatic stress and anxiety. This was because local people had the cultural knowledge on how to deal with such hazards, and they inherited this knowledge from older generations (parents-grandparents), while the tourists and migrants faced challenges and constraints without such sociocultural knowledge.

Despite the fact that in many societies affected by disasters, cultural and social fabric have been important features of the DRR, researchers argue that cultural factors and knowledge have a considerable effect on the behaviour of people who face natural disasters. Research by Clarke & Jennings (2008) and Chester et al (2010) explain that people sometimes do not consider the risks they might face during disasters. However, they prioritise other economic and cultural factors, such as religion, social values, tradition and intimate relation with the location, to rationalise disasters or other traumatic events. Some examples of the material culture factor that we use to protect us against disasters can be houses, properties, agricultural production, crafts, clothes, and locations.

Added to this context is non-material culture, these considerations include life values, beliefs, local rules, common language, type of networks, political systems and family patterns (Kendal, 2010). In seeking to develop non-cultural capital, Kulatunga (2010) divides it into four main components: “language, symbols, values and norms”. By comparison, Kendal (2010) argues that belief or related to fatalism is the most important component in non-material culture, as it refers to the reality of certain things. Many researchers have discussed the relation between culture and religion. For example, Boyer (2003) proposed that religion is found in some way or another in all forms of culture. In studying the relationship between religion and culture, as Cohen (2009) and Patel et al. (2017) claimed, religion can be conceptualised as an important specific form of cultural capital. However, it can be used to categorise cultural practices, for example, encouraging local knowledge of hazards and local capacities to be integrated into disaster preparedness plans (Brown, 2018). Another aspect that may be valuable to the understanding of religious culture has been pointed out by Sasaki and Kim (2011) that

religion has played a very important role in developing different cultures through ideologies and traditions, and culture that frames the way in which religion can be interpreted.

Religions in themselves are institutions that play an important role in actors' understanding of the disaster recovery process (Chester, 2005). A useful framework within which to consider the role of religion to rationalise disasters or other traumatic events can be borrowed from Chester et al (2012), which stratifies religious culture and its social significance at three levels: explanations, coping mechanisms, and rituals.

In regard to disaster resilience, Paradise (2005) stated a magical consciousness may assume that “...*one of the most significant resilience factors is religious faith*”. Religion may shape peoples' understanding in a way that religious leaders can play important roles that leads community responses to a disaster and to working toward effective recovery afterwards. Despite a critical social capital and religion, by contrast, can be exemplified by the notion that the disasters in connection with lack of trust between communities and religious leaders may sometimes be promoted as a form of divine punishment (Joakim & White, 2015).

Integrating religion as institutions that deal with risk using their own prescriptions to disaster risk reduction has demonstrated the integration of religious leader's roles and religious organisational structures into disaster management planning. For example, Harun-ur-Rashid (2004) stressed the social importance and valuable function of mosques in rehabilitation, reconstruction, and recovery, which is the realisation of disaster management. The mosque has special importance in the life of Muslims, and it

is usually used as a training and teaching support centre. Hence, it is important to note that this is one of the reasons the mosque is a good option to be used as a centre for disaster management.

Similarly, Intan et al. (2015) explained the effectiveness of policies and disaster management strategies depends on the operational effectiveness at the local level. One of the results demonstrated that Islamic institutions have a very strong influence on policies and strategies for pre-disaster and post-disaster management in an Islamic country. The mosque is a social building that will serve as the last bastion of Islamic unity. This is due to the mosque's full neutrality and lack of political sway.

Quoted from that article, "...The mosque has the potential to be used as a center for disaster management at local level. Factors that benefit the advantages of this mosque are relevant central location, social welfare activities clearly exists and its importance as a center of social activity, regardless of its physical aspects".

Wisner (2010) also stressed the positive contribution of religious institutions in mitigating the negative impacts of disaster risk reduction at the local level. Conceptually, social capital implies that religious institutions are usually the first respondents and have very good relations in the local community. The mosque is a very important holy place in the life of every Muslim. Muslims gather in the mosque five times a day to perform the five prayers (*Fajar, Zuhur, Asar, Maghrib and Isha*). The mosque also has a special ceremonial for Muslims on Friday because all Muslims (especially men) must go to the Friday prayer, so they gather there to listen to a lecture by imam about things related to Islamic knowledge and daily issues in the life of

Muslims including subjects related to how individuals and communities deal with disasters.

Despite the importance of religious and disaster management, Wisner (2010) considered that religious leaders should be trained and well acknowledge within the local policies and strategies of disaster risk reduction. For example, Cheema (2012) revealed the mosque to be the first contact point to initiate the first response and relief operations after the Pakistan 2005 Earthquake. Religious leaders can play important roles where for example, one of the most significant findings highlighted that the respective emergency service providers wanted to contact the community, and they had to approach the mosque.

Religion institutions have also been highlighted as providers of social support during the recovery process and have been found to play an important role in looking after vulnerable people because it is the best place to find dedicated volunteers who wish to help to relieve the suffering of others people. Cheema (2012) found that the mosque was the best place to support the livelihoods of the community because local people had the chance to gather in the mosque and consult the *Imam* (Muslim leader/preacher) who provides spiritual and psychological support to the affected people, especially those who lost family members.

Utuberta and Md Esa (2016) conducted a study on the role of mosques in disaster management during flooding in Malaysia. The study's main aim was to document the role mosques played in disaster management during and after the disaster. The researchers found that the mosque had a very important role in disaster management as

a centre of information, socialising with the local community and providing education for disaster risk reduction.

Likewise, the role of religious institutions, such as mosques, temples and churches, in dealing with post-disaster recovery is an important factor (Joakim & White, 2015). Recent research by Tammar (2017) in Saudi Arabia, a country dominated by Muslims and their culture, found that people were enthusiastic about volunteerism in line with their religious teachings. Mosques were found to contribute to the community by recruiting and providing training, especially to the youth, about disaster awareness and disaster risk reduction. Tammar (2017) also claimed that mosque's volunteers in Jeddah, Makkah were prompted to join the local government team to deliver relief such as drinking water, to find safe places for children, to transport the injured to health centres and hospitals, and to provide the necessary first aid and medicine.

Recognising the mosque as a critical local institution to coordinate and organise disaster relief and DRR is also supported by Alshadadi (2017), who found that the majority of the participants in the study believed that the mosque could be used as a temporary primary school after a disaster as well as for providing communication and information sharing for the community. Disasters often destroy educational facilities, and the mosque plays a crucial in providing classes; getting children back into regular routines such as schooling presents as part of the community service (Alshadadi, 2017).

Similarly, mosques were the best place to organise response and relief activities such as identifying vulnerable households through the distribution of *Zakat* (Islamic welfare funds) and distributing goods. As an important component of disaster-related

information, mosques can have a very important role in the empowerment of vulnerable communities, including women, by having increased chances of communication and information. Saputra et al. (2014) and Alshehri (2015) also proposed to connect the mosque with the early warning system and other information support and knowledge about disasters.

As can be seen from the above discussion, the mosque has had a very important role in the life of Muslims in the past and can play a crucial role in delivering important messages to local residents. The mosque has a very important role in disaster risk reduction phases (from aid distribution, information, training, to psychological support). It can be a centre for information sharing and coordination, an important place for promoting education and awareness of the importance of disaster risk reduction and protecting vulnerable people and boosting resilience to disasters.

Therefore, DRR policy change requires actions within and without religious institutions to promote disaster risk reduction. This means in many communities affected by disasters instead of religions being considered as sources of magical consciousness to risk in some ways, they should be regarded as institutions that are starting to play roles in reducing risk.

2.4.2 The effect of vulnerability on social capital

Understanding the ways in which social capital is related to ways of coping and social power requires an extended study for problem identification. Social capital is relevant to explaining how networks can reduce vulnerabilities by distributing resources and transferring knowledge (Bebbington 2008). A debate on “synergy” has evolved that

highlights the importance of vertical ties that connect people to the main political decision-makers and gives social capital and its analysis a more overtly political aspect. For example, Malaysian disaster management decision-making is deeply political and partisan, oriented with two main political parties, the *UMNO/Barisan Nasional* (current government) and *Pakatan Harapan* (current opposition). Likewise, scholars such as Pelling (2011) have stated vulnerability of flooding is possibly increased due to the war of attrition between these different parties regarding the distribution of completed projects and bias in funding distribution.

In Malaysia, politics and prejudice have affected the coping capacity of local residents to hazards, where there is an issue with the resource or relief distribution (Tej Karki, 2016). Only to those areas where their loyal voters lived will assistance be distributed fairly. This limitation has encouraged individuals to withdraw from the participatory system and concentrate on individual mitigation or household or family-based coping mechanisms. Tej Karki (2016) highlighted that vulnerable household with a lack of representation in community empowerment do not want to engage with political or public participation because they felt unrepresented by their community leader.

An additional factor that significantly influences coping mechanisms in Malaysia is the heavy reliance on government support. There are surveys of residents in flood-prone areas in Kuala Krai, Malaysia, that revealed about two-thirds of the surveyed residents had no preparation, lack of flood information and were unaware of their risk at the time of the flood in 2014 (Nurul Syazwani Yahaya, Choun-Sian Lim, 2015). In fact, improvement and strengthening in coping were found when there are good neighbourhood relations and participation (social capital) in a community's activities

or organisations such as voluntary associations, self-efficacy, exercising participation, and self-determination, which can result in building trust and mutual responsibilities for the good of the community (Smith, 2013).

Thus, what can be challenged here is not only vulnerability but also that opportunities for coping are influenced by social engagement, politics of place, household and community empowerment (co-optation and leadership), in other words, to improve access to influential decision-makers where it is seen as a form of an opportunity to develop adaptation strategy and resilience. There is debate in the literature whether or not individuals, societies or places can be simultaneously resilient as shaped by the level of vulnerability. Cutter et al. (2008) highlighted that conceptualising resilience in relation to vulnerability encompasses coping and recovery strategies as well as the post-disaster event livelihood adaptive capacity of a social system. Such thinking demonstrates that adaptation capacity has been conceptualised as a component of vulnerability is thought to reduce with increasing vulnerability (Pelling, 2011 & Cutter et al., 2008). A study from Smith (2013) found that improvement and strengthening in coping were found when there are good neighbourhood relations and participation (social capital) in community's activities or organisations such as voluntary associations, self-efficacy, exercising participation, and self-determination resulted in building trust and mutual responsibilities for the good of the community.

In the case of flood studies by Pelling (2011), those neighbourhoods with better protective structures and community participation were less vulnerable to future flood events through an increased sense of social capital, which improved people's coping capacity. However, Chan (2012) found that vulnerability to flooding disasters in

Malaysia is not solely influenced by the notion of poverty as a deterministic approach rooted in political economy, but more importantly by awareness, perception, attitude, experience, length of residence and social relations. This literature evaluation demonstrates a strong alignment of the coping – resilience concepts that are embraced by the concept of vulnerability, even though it has been viewed differently by different authors.

From the above discussion, vulnerability can be considered the function of exposure to hazard that shapes adaptive and coping capacity at a certain time. As explored in the more recent recovery literature, vulnerability reduction forms a central component of effective reconstruction and rehabilitation from disaster events as vulnerable groups may be more susceptible to losses and experience more difficulty during recovery (Brown, et al., 2008; Wisner, et al., 2004). Vulnerability is also connected with the access to opportunities, which defines the ability of people to deal with the impact of the hazard to which they are exposed. It means the characteristics of a person or a group of people in terms of their capacity to anticipate, cope with, resist, and recover from the impact of the risk or hazard.

2.4.3 Coping strategies for flood disasters

Indigenous knowledge of how vulnerable people respond or act towards hazards and other threats is essential and referred to as “coping mechanisms” or “coping strategies” (Twigg, 2004). This definition encompasses both community and individual skills, resources and capacities available and experiences to deal within a range of expectations of a situation according to different stages of adversity or crisis (Dewi, 2007). A consequent interaction between vulnerability and coping can be analysed

through local experiences or capacity of learning knowledge, socioeconomics and social capital.

The importance of access to information such as education about floods and disaster risk awareness is considered crucial to learning to live with change and uncertainty. People might obtain their knowledge based on previous experiences, identification of environmental indicators such as early warning signals, weather forecasts, past generations (traditional knowledge) and current understanding of their own situation (Dekens, 2007; Ainulotfi et al., 2014). This thinking aligns with proposals by Berkes and Ross (2013), that learning by doing should be considered as local or community-based capacity to absorb, adjust, learn, and improve a changing situation. However, the occurrence and constraint of economic-social and political arrangements play a vital role in providing a more comprehensive understanding of local knowledge for mitigating and adapting to floods.

Yet, local knowledge may operate as the system capacity with more transitional or transformational approaches that can “shift the balance of political or cultural power in a society” (Pelling, 2011). A consequent interaction between vulnerability and coping can be analysed through local experiences or capacity of learning knowledge, socioeconomics and social capital.

Taking one case study in Johor, Malaysia, as an example, the local authorities’ ability to supply food and relief materials in flooded areas was considered to have failed during the flood event in 2006. The residents learned from that incident, so during subsequent flooding in 2007, they stayed upstairs in their houses with food packages and used gas

portable cookers for food preparation (Tej, 2016). In this way, people adapted to live with the flood, increasing the range of knowledge for learning and problem-solving. Therefore, it is important for this study to know the driving forces that influence the learning capacity to respond to floods and what this means for people's vulnerability.

It has previously been assumed that economically stable people (in terms of financial assets) sustain lesser impacts in response to hazards, can employ suitable mitigating measures, and have a faster recovery than those with limited financial resources (Blaikie et al., 1994). Socio-economic indicators related to income and social relationships such as household size and occupations are important factors of coping strategies in a study of vulnerability to flooding. Such understandings are supported by research exploring coping mechanisms in response to floods in Malaysia by Chan (2015).

The research found that socio-economic structural components of the community significantly influenced the type of coping measures employed by the community. Smith (2006) found that there are changes in ways of coping when the economic, social and institutional conditions of the community or the households change. So, a possible argument is that the loss of productive assets, if not addressed properly, can expose households to deprivation risk (making them vulnerable).

2.5 Summary

In this section, as components of DRR, major factors of disaster hazard risk, a cycle of disaster risk management, and community resilience in disaster risk management have been illustrated. An important question that remains is how best to define a community response to a change in boundary conditions with respect to translating or placing its power and politics. Certainly, this relates to how political and social capital through community participation play key roles in how communities and individuals respond to disasters highlighting preparedness and response. Understanding of social capital could be influenced by the accountability of community leaders with government, political parties, funding agencies to favour the community needs. The war of attrition among political parties (government and opposition) did not contribute to developing social capital.

Meanwhile, the factors of vulnerability comprise political-institutional, economic, socio-culture and environmental factors. A political-institution factor is caused by a lack of legislation, unclear stakeholders' role/responsibility, and lack of political support. An economic factor comes from lack of financial resources, poverty of people, and socio-cultural factors include poor education or knowledge, superstitious belief and local culture tradition of people. Furthermore, the environmental factors integrate with the impact resulted from the interaction of all the above mentioned.

In regards to developing the strategy to improve the resilience of the local communities by reducing vulnerability, supporting communities impacted by a disaster but not controlling the communities is essential. It is possible by enhancing and improving the community's resilience in prevention or mitigation and preparedness stages. Local

institutions should be strengthened, tapping into local coping mechanisms and knowledge, and lastly, efforts need to support community leaders after a disaster. In other explanation, better resilience of the community ensures that the community can recover soon. Therefore, these are all questions that need to be answered in this research.

This study uses information on how communities in case study area understand resilience and the need to be aware of catastrophic events as a learning and communication platform to begin a movement toward enhanced mitigation, coping, and preparedness programmes. Further, it was realised that it would be useful to observe a variety of research theories and methods that have been taken (refer to Table 2.2), which enabled me to refer to the inherent interdisciplinary of disaster research which takes a mixed method approach from a range of angles. Thus, my research could capture specific findings in a way that is pertaining to the strengths of other individual research strategies associated in this research to facilitate corroboration of the findings.

Table 2.2: Methods used by other researchers

Author	Year	Title	Qualitative methods	Quantitative methods
Anggraini Dewi	2007	Community-Based Analysis of Coping with Urban Flooding : a Case Study in Semarang, Indonesia	Semi-structured interviews Sketch Mapping	Household surveys (Questionnaires)
Katie Jane Oven	2009	Landscape, Livelihoods and Risk: Community Vulnerability to Landslides in Nepal Katie	Semi-structured interviews Document analysis Ethnographic diaries	Household surveys (Questionnaires) Household poverty assessment
Tracey Coates	2010	Conscious Community: Belonging, identities and networks in local	Semi-structured interviews	

		communities' response to flooding	Focus group discussions	
Adjie Pamungkas	2012	Vulnerability assessment for disaster risk management: A case study of floods in Centini Village, Indonesia	Semi-structured interviews Documents analysis	
Michelle Annette Meyer	2013	Social Capital And Collective Efficacy For Disaster Resilience: Connecting Individuals With Communities And Vulnerability With Resilience In Hurricane-Prone Communities In Florida	In-person interviews	Household surveys (Questionnaires)
Riyanti Djalante	2013	Building resilience to disasters and climate change: pathways for adaptive and integrated disaster resilience in Indonesia	In-depth open-ended interviews Observation Textual analysis	
Meskinazarian, Ahoura	2013	Social resilience of post-earthquake Bam	In-person interviews Document Analysis Observation	
Hanna A. Ruszczyk	2014	Local understandings of community resilience in earthquake prone Nepal	Semi structured interviews Focus group discussions Ethnographic diaries	Questionnaire survey
Sanghmitra Pandurangrao Pandit Submitted	2014	Bridging the Gap between Communities at Risk of Flooding and Flood Risk Communication Agencies: Developing Effective Flood Risk Communication Strategies	In-person interviews and focus group discussions	Questionnaire
Pei-Wen	2014	Spatial planning and urban resilience in the context of flood risk A comparative study of Kaohsiung, Tainan and Rotterdam	Interviews Documents analysis Observation	
Greg S. Oulahen	2014	The Production of Unequal Vulnerability to Flood Hazards in Metro Vancouver, Canada	Informal interviews Focus group discussions	Household surveys (Questionnaires) Geographic information system (GIS) - structured survey

Eric Chu	2015	Urban Adaptations Observed: The Politics of Governing Climate Resilience in Indian Cities	Comparative place-based case method encompassing archival research Document analysis Key-informant interviews	
Turki Hamad Alshadadi	2017	Evaluation of the Potential for Disaster Risk Reduction in the Kingdom of Saudi Arabia	In-person interviews Focus group discussions Observation	Questionnaire
Almarzouqi, Ibrahim	2017	An analysis of disaster vulnerability in the United Arab Emirates	Interviews Document analysis Diaries and photographs Focus group Field observation	
Annisa Gita Srikandini	2018	Politics of Disaster Risk Governance in Indonesia and Myanmar: A study into the dynamics of governance network on Disaster Risk Reduction (DRR)	Document review techniques Participant observation Engaged in an internship programme	Questionnaire
Anggaryani Mita	2020	School-Based DRR Programs in Disaster-Prone Areas: The Case of Yogyakarta	Interviews	Questionnaire

The next chapter reviews the flood scenario in Malaysia that specifies the description of geographical and social characteristics of Teluk Kumbar and Penang Island.

CHAPTER THREE

Chapter 3: The Context of Flooding in Malaysia and Penang Island

“The emerging risks and vulnerabilities associated with climate change are the outcomes of physical processes. But things need to be changed because it will happen again...”

– UNDP 2018; 3

This chapter introduces the characteristics of my case study in relation to flood management between organisations at various governance levels, nationally and locally. The characteristics include the contextual information of demographic, socio-economic, cultural, political characteristics and disaster management settings. The discussion initially presents an overview of the flood history in Malaysia in order to provide a broad description of flooding and related vulnerabilities. This is followed by the outline of the context of recovery and risk reduction initiatives under the Malaysia National Security Council, including legal framework for disaster response. The summary of the rationale for selecting Teluk Kumbar as the case study site is discussed in order to have a better understanding of the research area, incorporating familiar aspects of the local community and flood scenarios.

3.1 Flood Disaster Management In Malaysia

Flooding is the most severe and frequent natural disaster in Malaysia. When flooding occurs in Malaysia it causes tremendous negative impacts on property, public utilities, agriculture, the economy, causes loss of lives and obstructs social activities. It shows that Malaysia is not immune from this type of environmental disaster. The following discussion shows a much clearer view and understanding of the study site selection regard flooding disaster, focused in Teluk Kumbar, Penang Island.

3.1.1 Floods in Malaysia and vulnerabilities.

In Malaysia, flood disaster is due to the adverse effects of two monsoon seasons that induce convective rainfall. The earliest recorded major flood was in 1926, followed by 1949 and 1971. According to The United Nation University - Institute for Environment and Human Security (UNU-EHS) figures, Malaysia experienced 58 natural disasters between 1980 and 2010, claiming a total of 1,239 fatalities. Flood events have continued over the years, and the overall territory of the country is now prone to flooding, accounting for an estimated 9% of Malaysia's total landmass. Annual rainfall ranges between 2,000 and 4,000mm, with 150 to 200 rainy days (Malaysian Meteorological Department). The northeast monsoons are severe each year, lasting from mid-November to January and bringing at least 60% more precipitation than typical.

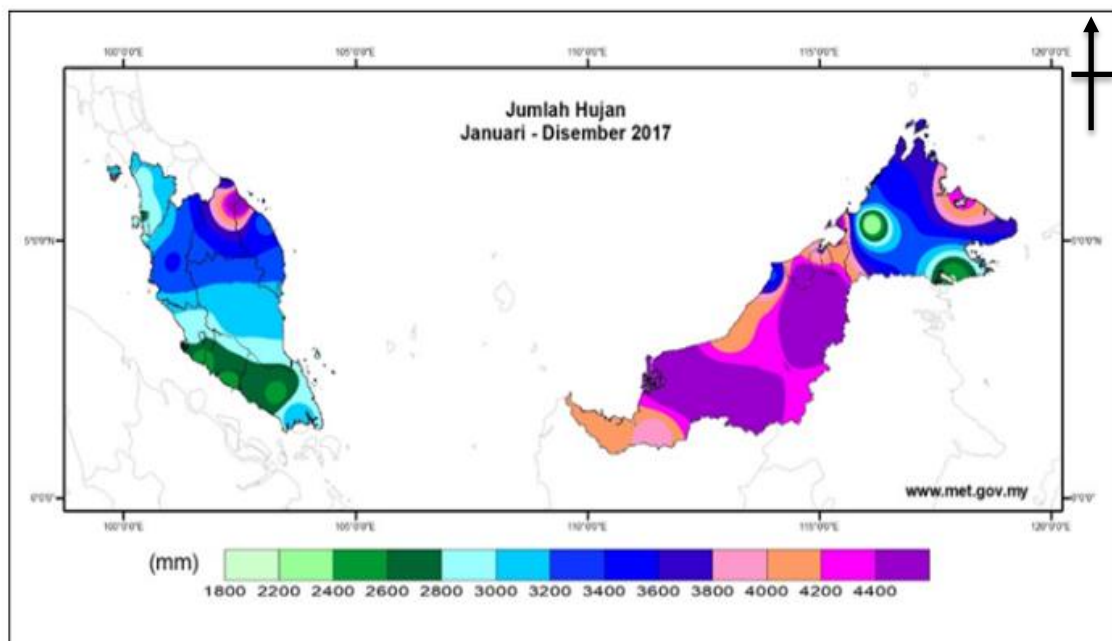


Figure 3.1: Total annual rainfall 2017

(Source: Penang Environmental Impact Assessment Report 2020)

Rainfall can become extremely heavy in certain months, causing flows in rivers to overtop the banks; catchment areas and structural measures such as drainage channels are not able to accommodate the water flow and inundate the surrounding areas. Based on the annual report from National Flood Forecasting and Warning Centre Division of Water Resources and Hydrology Malaysia (PRABN) in 2018, on 26 October 2017, a tropical depression was detected in the South China Sea. The tropical trajectory from the Joint Typhoon Warning Center (JWTC) showed that this tropical depression was moving across southern Thailand resulting in the constant rain in Kedah and Penang.

Table 3.1: Information on Flood Incidents All Over Malaysia Year 2016/2017

Negeri	Bilangan Kejadian Banjir	Purata Hujan Harian Tertinggi (mm)	Tempoh Banjir Maksimum (Hari)	Jumlah Perpindahan Mangsa Banjir	Taksiran Kerugian (RM)	Kedalaman Banjir Maksimum (m)
Perlis	2	68	1	-	30,000.00	0.5
Kedah	41	185	1	890	4,124,800.00	1.5
Pulau Pinang	46	192	1	-	-	1.2
Perak	31	115.5	2	117	-	1.2
Kelantan	4	469	9	40,263	33,070,000.00	6
Terengganu	4	429	10	28,638	2,272,000.00	2.5
Pahang	69	429	4	10,432	13,143,000.00	3
Selangor	115	57.9	1	70	-	1.5
Melaka	8	156	2	71	-	0.6
Negeri Sembilan	14	215.6	1	404	577,500.00	1.5
Johor	8	255.5	16	11,715	-	2
Sabah	6	169	1	16	-	1.5
Sarawak	45	282	3	3,313	-	1.8
WP Kuala Lumpur	6	106.5	0.17	-	-	1.5
WP Labuan	5	36.5	1	-	-	0.5
Jumlah	404		Jumlah	95,929	53,217,300	

(Source: Annual Flood Report 2018, Department of Irrigation and Drainage Malaysia)

Table 3.2: Information on Flood Incidents All Over Malaysia Year 2015/2016

Negeri	Bilangan Kejadian Banjir	Jumlah Hujan Harian Tertinggi (mm)	Tempoh Banjir Maksimum (Hari)	Jumlah Perpindahan Mangsa Banjir (Orang)	Taksiran Kerugian (RM)	Kedalaman Banjir Maksimum (m)
Perlis	5	128.0	6	243	-	0.5
Kedah	37	145.0	3	1,722	10,123,600.00	1.5
Pulau Pinang	26	130.0	1	70	-	1.5
Perak	91	150.0	28	6,704	8,573,000.00	2.0
Kelantan	5	166.0	5	97	25,000.00	1.5
Terengganu	3	393.0	2	2,556	-	1.5
Pahang	20	202.0	4	489	-	1.5
Selangor	135	152.0	8	1,152	-	1.5
Melaka	18	214.5	4	5,072	-	1.2
Negeri Sembilan	17	143.0	0.25	374	6,700,000.00	1.5
Johor	13	113.0	5	731	-	1.0
Sabah	19	220.7	8	6,596	-	7.0
Sarawak	84	342.0	10	20,176	5,005,000.00	6.0
WP Kuala Lumpur	8	130.0	0.08	-	-	1.5
WP Labuan	15	237.5	-	29	-	1.0
Jumlah	496		Jumlah	46,011	30,426,600.00	

(Source: Annual Flood Report 2018, Department of Irrigation and Drainage Malaysia)

The occurrence of floods in Malaysia is caused by various factors. Heavy rain that continued with intensity high is a major factor in the occurrence of floods. Table 1.3 shows the current highest daily rainfall distribution flood incidents for 2016/2017 and 2015/2016. Table 3.1 and 3.2 shows that all states receive rain daily maximum exceeding 100 mm during flood events was recorded in 2016/2017 except the state of Perlis and Labuan. The states of Kelantan, Terengganu, Pahang and Sarawak are the states that recorded the distribution maximum daily rainfall exceeds 300 mm. Such rainy conditions have caused floods within a few hours to several days.

Typically, flooding is due to rivers overflowing their banks, high tides, and flash floods in Malaysia that effect of growing river runoff exacerbated by elevated coastal water levels. There are 189 river basins in Malaysia, and 85 of these rivers are prone to

recurrent flooding (DID, 2011) (Figure 3.2). The highest water level recorded reached up to 4.4 metres depending on location (Fauzi, 2013). In general, all states in Malaysia experienced floods during 2017 to 2018. Table 3.2 also shows state most frequently hit by floods was Selangor with a total of 115 flood incidents and followed by Pahang with 69 incidents and Perlis recorded the least number of floods with 2 incidents. Figure 3.2 show the incidence of floods throughout Malaysia. While, the largest flood area for peninsular Malaysia is the state of Johor with an area of 2367 sq km, followed by Terengganu with 2223 sq km, and Kelantan with 1640 sq km.

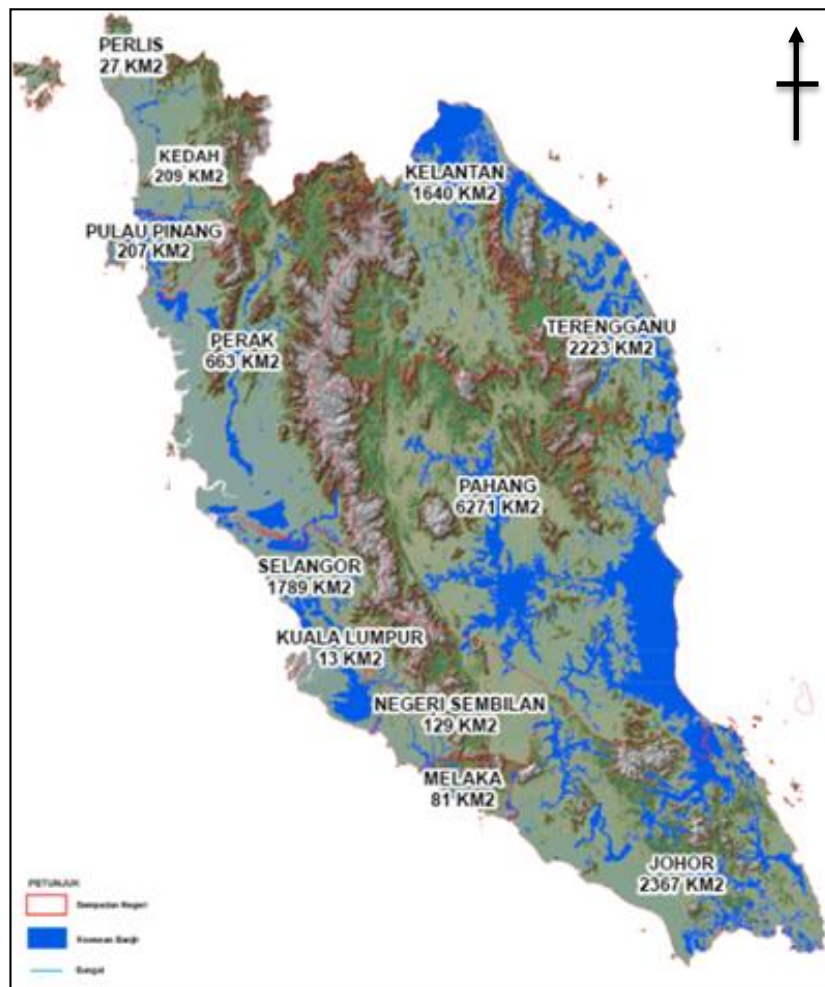


Figure 3.2: Flood-prone areas in Peninsular Malaysia

(Source: Drainage and Irrigation Department Malaysia)

Meanwhile, based on the report from Department of Irrigation and Drainage of Malaysia (DID) in their 2017 Annual Report, apart from the rain factor, there are several other factors that cause flooding:

- i. The drainage system cannot accommodate surface runoff because it is clogged with garbage and silt resulting from construction or earthworks in the surrounding area;
- ii. The inability of the existing drainage system to accommodate the sudden increase in surface runoff as a result of heavy rainfall of high intensity in a short time;
- iii. River water overflow caused by continuous and thorough rainfall as well as water discharge from dam;
- iv. Sedimentation of the river bed resulting in rivers becoming shallow and narrow;
- v. Changes in land use patterns as a result of high and rapid local development resulted
- vi. Lack of water permeable area;
- vii. Construction in river reserve areas;
- viii. The effect of sea water tides. The problem of floods occurs when the sea level is high and heavy rains occur at the same time. As a result water from the drainage system is either a natural river or drainage takes a long time to drain water; AND
- ix. Areas low and at risk for flooding.

Besides that, rapid urbanisation in locations such as Penang, Kuala Lumpur, Johor, and Selangor, where uncontrolled hillside construction and a lack of strict development control enforcement in recent years have exacerbated floods. This is supported by Dutch Risk Reduction Team research findings in 2018 that over the last two decades, as a result of economic growth, there has been a rapid growth in urban centres and expansion in the development of land, property and infrastructure in the suburban areas.

This has led to many environmental problems such as deforestation, decimation of water catchments, destruction of endangered fauna and flora, soil erosion, landslides, water pollution, sedimentation and downstream flooding. Furthermore, it has resulted in the potential for greater flood damage as well as increased incidences of occurrence of flash flood, which result in a lot of disruption to socio-economic activities.

Records demonstrate that flooding is the single most damaging disaster in Malaysia, with annual disaster damage of around USD210 or RM915million (Aldrich, 2014). This covers costs associated with rescue and flood relief activities, costs associated with the rehabilitation of public works and utilities, and compensation. Recently Malaysia has suffered severe flooding from December 2017 to January 2018, which claimed at least 28 lives and displaced around 120,000 people. The recent mega flood destruction in November 2017 in Peninsular Malaysia's Northern States (Kedah, Penang, and Perak) resulted in the displacement of 10,000 people due to 48 hours of severe rain. As many as 7,412 people were evacuated from their homes in Penang, 3,839 people in Kedah and 928 people displaced from two districts in Perak (Malaysian Civil Defence Department Report 2017).

This massive flood caused severe damage to houses and left the area in disastrous condition. This caused river flooding since the runoff exceeds river water drainage capacity. The existing drainage and river systems were unable to hold the high volumes of water that flowed. Some of the utility structures built across the rivers and main drains were too low and blocked water flow during the floods. Multiple hill slope developments possibly also aggravated the situation by disrupting natural drainage and causing landslides.

3.1.2 National Disaster Security Council Policy (NSC.20)

In 1997, Malaysia formulated a national policy, management mechanism and disaster aid policy known as the Directive No.20. The National Security Council (NSC), as the leading agency, is the principal body that executes appropriate actions during disasters and coordinates disaster management. The existence of a Disaster Management and Relief policy under Directive No. 20 assists all sectors involved in carrying out their mission more efficiently and effectively, avoiding mismanagement of energy and time, confusion, conflict and contradiction, or conflict of interest while working in a disaster (National Disaster Security Council, 2016).

Through this instruction, if the Royal Malaysian Police (PDRM) receives a catastrophe report (either from the District Control Centre, Contingent Control Center, or Malaysia Control Center), the police are obliged to respond immediately to determine the disaster level. Following Directive 20, the Honourable Prime Minister declares a disaster region in accordance with administrative procedures and executive orders, based on recommendations by the Central Disaster Control and Relief Committee.

Additionally, the NSC was built to manage the emergency fund. The National Catastrophe Relief Fund is responsible for coordinating financial aid to disaster victims at the state and federal levels. Financial aid is provided for a variety of circumstances, including loss of income, damaged or destroyed homes, agricultural damage, livestock and aquaculture damage, and burial costs for disaster-related fatalities (Malaysia National Disaster Security Council, 2016).

The Order of NSC Directive No. 20 established guidelines for coordinating the management of national disasters and ensuring that all national disaster policies and mechanisms are coordinated and implemented at all levels of disaster management units (Disaster Management and Relief Committees) at the federal, state, and local levels. The federal government established the National Disaster Management Agency (NADMA) in October 2015 to assume responsibility for disaster risk management.

On the one hand, *Majlis Keselamatan Negara* (National Security Council) will take the lead in organising and supporting the recovery, rebuilding, and rehabilitation process in the case of a natural disaster in Malaysia, particularly floods. Under the Order of MKN No. 20 (Revised version), this secretariat has the responsibility to coordinate the management of national disaster, and to ensure that all of the national disaster policies and mechanisms are adhered and implemented at all level of disaster management units.

3.1.3 Institutions involved in flood management

The agencies involved in flood disaster management have their committee and need the involvement of many other agencies to carry out all aspects of disaster management and relief. Relief operations or management procedures in overcoming the flooding situation at every stage by the appropriate government authority level is based on Directive No. 20 developed by National Security Council (*Majlis Keselamatan Negara*). The disaster response activities include determining logistical support and tool requisitions and providing facilities and necessities to victims and rescuers in the areas of food, medical care, evacuation, and other emergency aid.

Hence responsibility is managed collectively through the standing order of the National Security Council. The disaster management and relief committee are managed accordingly. At the federal level in Malaysia, the newly formed National Disaster Management Agency (NADMA) coordinates the disaster management system. The District Officer heads the disaster management team at the community level, with the District Police Officer, the District Fire and Rescue Department Officer, and various other government departments and agencies. According to Directive No.20, when a situation of flooding is reported, Central/Federal Flood Disaster Management and Relief Committee (JPBBP), State Flood Disaster Management and Relief Committee (JPBBN) and District Flood Disaster Management and Relief Committee (JPBBD), wherever applicable, are responsible for evaluating the situation and deciding the level and nature of assistance needed, or whether to take over disaster management themselves (Figure 3.3).



Figure 3.3: Level of disaster management in Malaysia

(Source: NADMA Annual Report 2018)

Level one disastrous incidents include controllable local incidents with no potential of spread, although these may result in a brief loss of life and damage to assets. Local or district authorities manage such events with little or no support from external resources. Level 2 incidents are deemed to cover a wide area in more than two districts and have the potential to spread. Such events could cause loss of life and damage assets and are more complex than disasters classified as level 1 in terms of difficulty in rescue and search operations. These events are likely to affect daily public activities. At this level, these occurrences must be regulated by State Level Authority, with or without the assistance of limited external resources. Level 3 events can result from Disaster Level 2 by becoming more complex and affecting a wide area or more than two states, or have the potential to spread very fast. Such incidents need support from external resources and are handled by the National Authority (Figure 3.4).

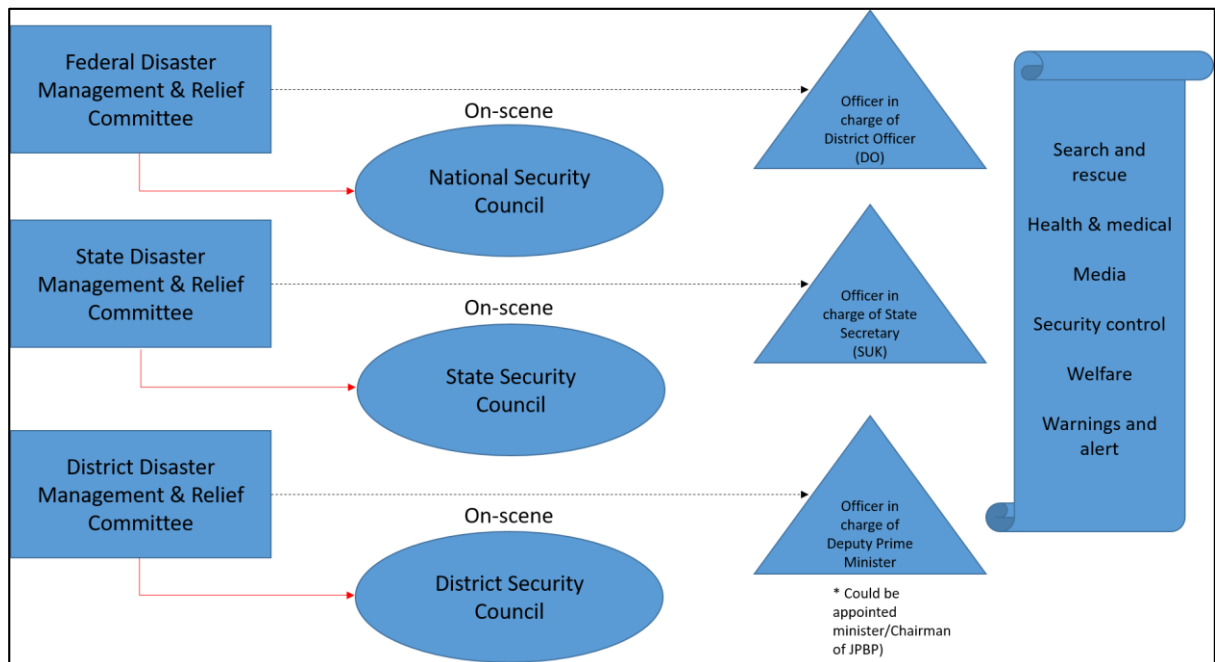


Figure 3.4: Governance Structure of Disaster Management in Malaysia
(Adaptation from: National Security Act Report, 2016)

Disaster Management and Relief Committee membership consists of the main rescue agencies, such as Special Search and Rescue Team Malaysia (SMART), Emergency Medical Department, Malaysian Armed Forces (ATM), the Royal Malaysian Police (PDRM), and the Malaysian Fire and Rescue Department (BOMBA). Supporting rescue agencies include the People’s Volunteer Corps (RELA) and the Civil Defences Department (APM). Relief and recovery agencies include the Malaysian Meteorological Department (JMM), Public Works Departments (JKR), Social Welfare Department (JKM), Geological Survey Department, Malaysia Electrical Power Agency (Tenaga Nasional Berhad), Information Department and National Security Division in the Prime Minister, Meteorological Department, Local Authorities (PBT) and Department of Irrigation and Drainage (DID). The committee operates with the bottom-up approach responsible for formulating a policy and framing a strategy towards flood management and introducing awareness and education programmes for the public around prevention and preparation for the flood disaster.

3.1.4 Government and local governance institution system

Communities are split into a variety of administrative divisions within five formal levels of government administration under Malaysia's new democratic political-administrative system. The following table summarises the many levels of administrative terminology used in urban, local government, and rural areas according to federal, state, district, sub-district, village, and Rukun Tetangga units. The functions and responsibilities are inextricably linked to the implementation and management of government-funded programmes and socioeconomic initiatives.

Table 3.3: Administrative divisions in Malaysia

Government Level	Leader Title	English/Western administrative equivalent
Federal	<i>Menteri</i> (Minister)	Central Government
Negeri	<i>Menteri Besar/Ketua Menteri</i> (Chief minister)	State
Daerah	<i>Pegawai Daerah</i> (District Officer)	District
Mukim	<i>Penghulu</i>	Sub-District (<i>Mukim</i>)
Kampung	<i>Jawatankuasa Kemajuan dan Keselamatan Kampung (JKKK)</i> (Village Development and Security Committee)	Rural-Village
Rukun Tetangga	<i>Ketua Kampung; Pengerusi Taman</i> (Village Head, Resident Head)	Neighbourhood-Household

Within the context of Malaysia, the district officer (DOS) has been mandated to oversee the general administration of local government institutions in Malaysia and is considered a salaried government officer. At the sub-district level, the *Penghulu* presides over several villages or sub-districts, or *Mukim* where *Penghulu* have traditionally been respected members of the communities and act as the first responder capable of acting as a leader in common social-administrative features.

The lowest level of the government's administration is the village level; village committees have been instituted in all rural communities called the Committee for Village Development and Security or known as *Jawatankuasa Kemajuan dan Keselamatan Kampung* (JKKK), an institution/entity appointed by the State Government. The headman or village head is an ex-officio in the JKKK committee with the intended role of an intermediary between the community and the local government to plan and implement village development transformation plan policies. According to Razinah, et al. (2016), head villages usually are respected people with good religious backgrounds who can resolve societal problems related to Islam, such as family matters, divorces, family property distribution, and small theft between the villagers.

As the community's closest agent in decision-making, JKKK facilitates a variety of political, economic, and social issues and works with youth to enhance living standards and quality of life in rural areas (Abdullah, et al, 2015). The selection process of this position is thus open to political manipulation, making it a "top-down" administrative and ironically political set-up that is appointed indirectly and subjected to the local political affiliations by the government.

In this case study, Teluk Kumbar has four JKKK and is represented by one Penghulu to assist the State Government and the Local Authorities (PBTs) in interacting directly with the local residents and bringing any issues related to the welfare and enhance neighbourhood sustainability. A Rukun Tetangga or Resident Society (RT) is also established in Teluk Kumbar that provides opportunities and encourages participation of people in programmes that focus on security issues, unity and community welfare

(Figure 3.5). This society is chaired by the village head (Ketua Kampung)/resident chairman (Pengerusi Taman) without direct involvement from the Local Authority, and work is voluntary. Thus, in contrast to the Penghulu, the Rukun Tetangga has direct contact with the JKKK leaders, despite the fact that the JKKKs participate in official meetings and communications.



Figure 3.5: Photo with Kampung Nelayan Teluk Kumbar Village Committee (JKKK)

3.2 Penang Island Flooding and Characteristics

3.2.1 Geographical and land-use characteristics of Penang

Penang is an island and the state located in the North-western coast of Peninsular Malaysia, within latitudes 5° 12'N to 5°30' N and longitudes 100°09'E to 100°26'E (see

Figures 3.6). Figure 3.7 depicts Penang is divided into two districts and 29 sub-districts (*mukim*). The two districts are South West (*Barat Daya*) with 22 *mukim* and Northeast (*Timur Laut*), divided into seven *mukim*. Penang is now one of Malaysia's largest cities by population and the most highly urbanised, with approximately 1.7 million people in the state with 700,000 inhabitants on the island (Connolly, 2019). The climate of Penang is warm and humid, which has tropical rainfall throughout the year. The average temperature ranges between 26 and 30°C, with the highest recorded at 32°C. Rainfall is heavy and is experienced especially from August to November.



Figure 3.6: The geographical location of Penang city in Malaysia

(Source: Wikipedia & New Straits Times)

Penang Island is mainly covered in forest and is characterised by numerous high hills that hold significant water catchments and forest reserves. According to the Penang Structure Plan, the state of Penang has approximately 103,938 hectares of available land, of which approximately 42,837 hectares (41%) are already developed with

various land use categories such as residential, commercial, industrial, and public amenities to meet the needs of the people. In addition, 70% of Penang's forested land is privately owned, posing political and ecological challenges in terms of how the government would allow for additional development without jeopardising the natural environment's sensitivity. Penang's predominant land uses are water catchment regions, forested land, and agricultural land (Table 3.3).

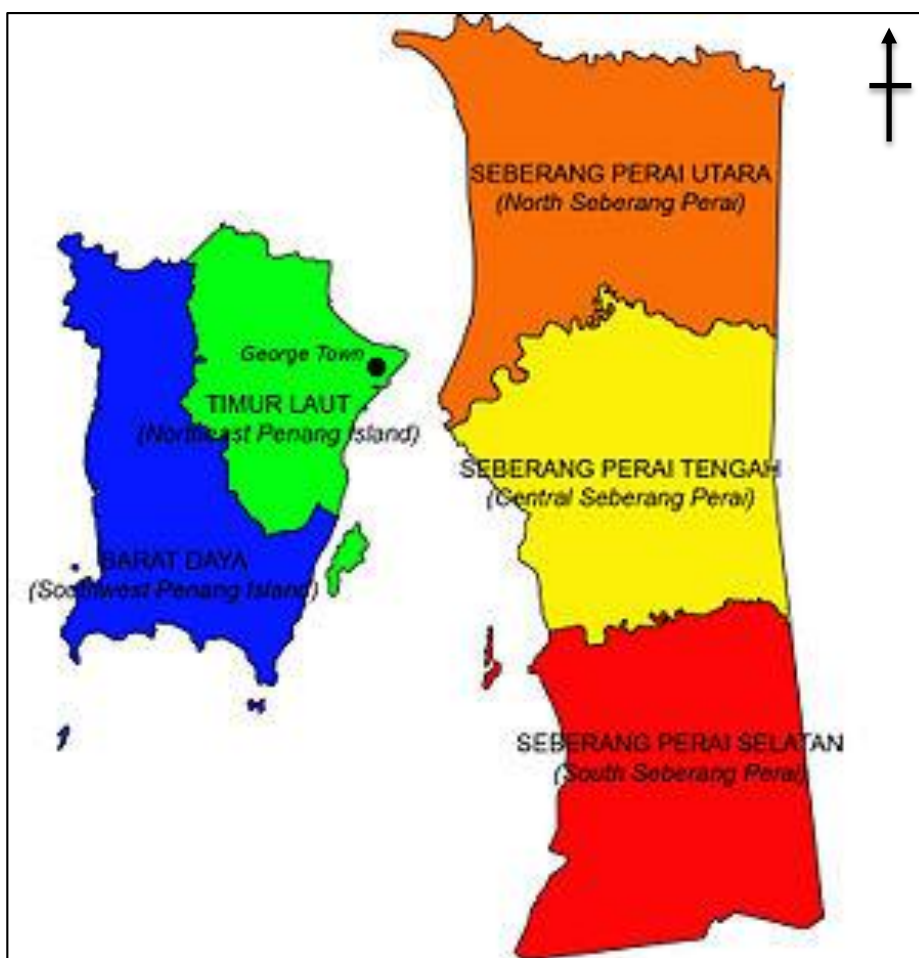


Figure 3.7: Penang district map (Source: Penang Structure Plan 2020)

The development of the Penang Island watershed is notable, as the urban area increased steadily through the holistic study period from 1995 to 2018 (see figure 3.8). Land has

become one of the circumscribed source in Penang Island due to its hilly topography and limited flat lands, which is about to exhaust. Therefore, developers move to hilly areas for new projects.

Table 3.4: Land Use in Penang

Land Use	TL		BD		SPU		SPT		SPS		Total	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Developed Areas	6,794	21.4	4,018	12.7	7,709	24.3	8,014	25.3	5,178	16.3	31,713	30.5
Housing	4,764		2,260		4,642		5,143		3,780		20,589	19.8
• Villages	45		1,005		2,231		2,521		2,063		7,865	7.6
• Housing Scheme	4,719		1,255		2,411		2,622		1,717		12,724	12.2
Industry	55		734		615		2,711		1,093		5,208	5.1
Commercial	468		120		162		82		67		899	0.8
Institution	1,151		809		2,111		30		85		4,186	4.0
Recreational/Open space	356		95		179		48		153		831	0.8
Agriculture	1,155	2.1	8,609	15.3	17,882	31.8	12,667	22.6	15,840	28.2	56,153	54.4
Paddy Field	0		1,040		8,942		1,716		1,226		12,924	12.4
Other agriculture	1,155		7,569		8,940		10,951		14,614		43,229	41.6
Forestry	5,071	48.7	3,587	34.5	124	1.2	921	8.9	702	6.7	10,405	10.0
Forest	5,071		3,187		0		592		445		9,295	9.8
Mangroves	0		400		124		329		257		1,110	0
Water Body	128	2.3	369	6.5	877	15.4	2,196	38.7	2,102	37.1	5,667	5.5
Total	13,148		16,583		26,592		23,798		23,822		103,938	100.0

Note : Area in hectares
 TL - Timur Laut BD - Barat Daya SPU - Seberang Perai Utara
 SPT - Seberang Perai Tengah SPS - Seberang Perai Selatan

(Source: Penang Environmental Impact Assessment Report 2020)

Hilly areas are considered high potential for development due to the attractive setting they provide. Examples of environmental risk and hazards includes downstream flood, soil erosion, downstream river siltation, landslide, slopes failures which raises many issues such as danger to life, damage to property, environment and economy. Nevertheless, it is indisputable that climate change will amplify the vulnerabilities Penang already faces at present, such as flooding, with climate change threatening the very ecosystems that Penang people rely on for survival.

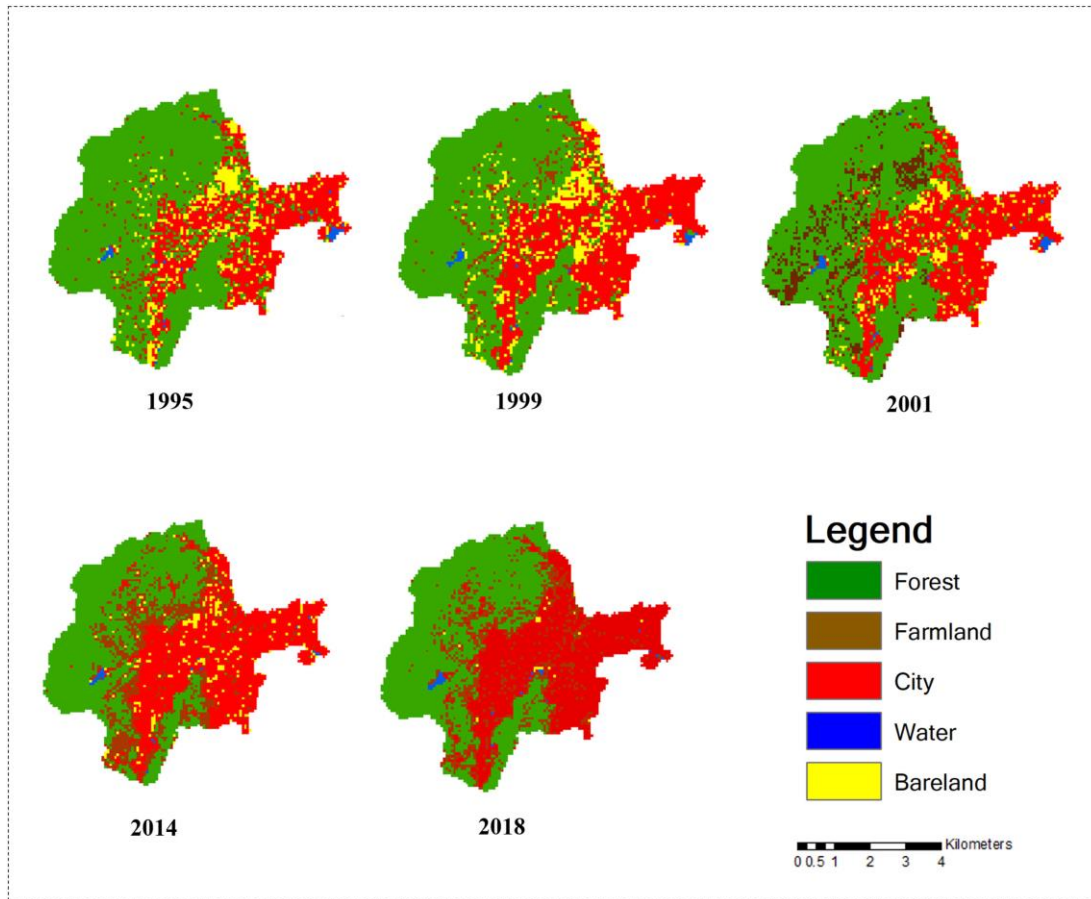


Figure 3.8: Land use map of the Pinang Island Watershed (1995–2018).

(Source: National Flood Forecasting and Warning Centre Division of Water Resources and Hydrology Malaysia (PRABN))

As new high-rise condominiums and luxury housing developments spring up around the island, the threat of intensive urban transition grows and open to risks and challenge to people and the environment according to Anilarasu, (2010) in his postgraduate thesis ‘Hill Land Development Challenges in Penang Island’. Thus, as reported in many mainstream media, Penang is under environmental pressure, resulting in socio-ecological hazards such as landslides and catastrophic flooding (Figure 3.9). The drastic pressure of development has changed the pattern of land use and building activities in Penang. The main issue that the City Council of Penang Island has identified is the

massive number of planning applications received by the state development authority (Ahmad, 2005). This is due to the dispersion of development, especially land use development for housing, high rise apartments, followed by business and mixed-used development. Industrial growth in Penang has also left an enormous impact on changes in land-use patterns.



Figure 3.9: Local newspaper report on Penang socio ecological issues

(Source: New Straits Times, November 2017)

Prolonged flood events could spark significant social and economic disruptions and conflicts as thousands of people would be displaced. Rising sea levels are an issue that the state government needs to take seriously considering that a significant portion of land in Penang is coastal and low-lying. This also applies to the Penang South Islands (PSI) reclamation project.

Apart of that, it might helpful to consider why flooding is becoming more of an issue in Penang; specifically the relative impacts of climate change. The melting of glaciers has contributed 45 per cent to the rise in sea levels and about 38 per cent is due to thermal expansion. It has been stated that ‘glacial shrinkage is past the point of no return’ with glacial masses continuing decline even if the global temperatures and GHG emissions do not increase further (Nature, 2018).

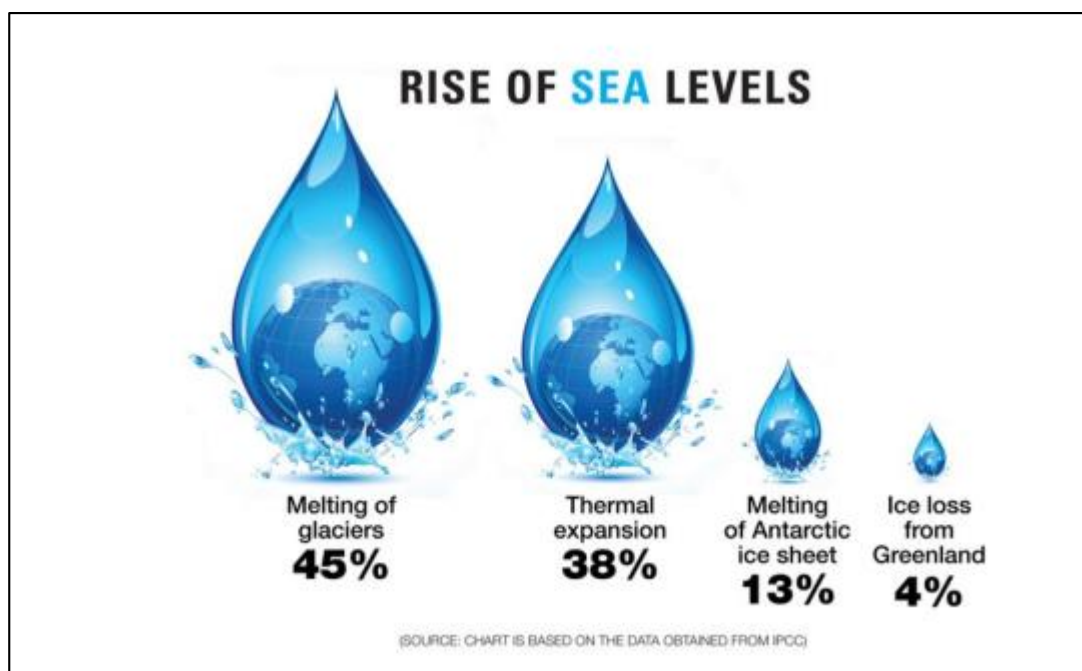


Figure 3.10: Sources contributing to sea level rise

(Source: Penang Green Agenda 2030, 2021)

A study by the National Hydraulic Research Institute of Malaysia (NAHRIM) on projected sea level rise shows that the west coast of peninsular Malaysia should expect an average sea level rise of 0.07–0.14m in 2040 and 0.25–0.52m in 2100 (Ghazali et al., 2018; NAHRIM, 2019).

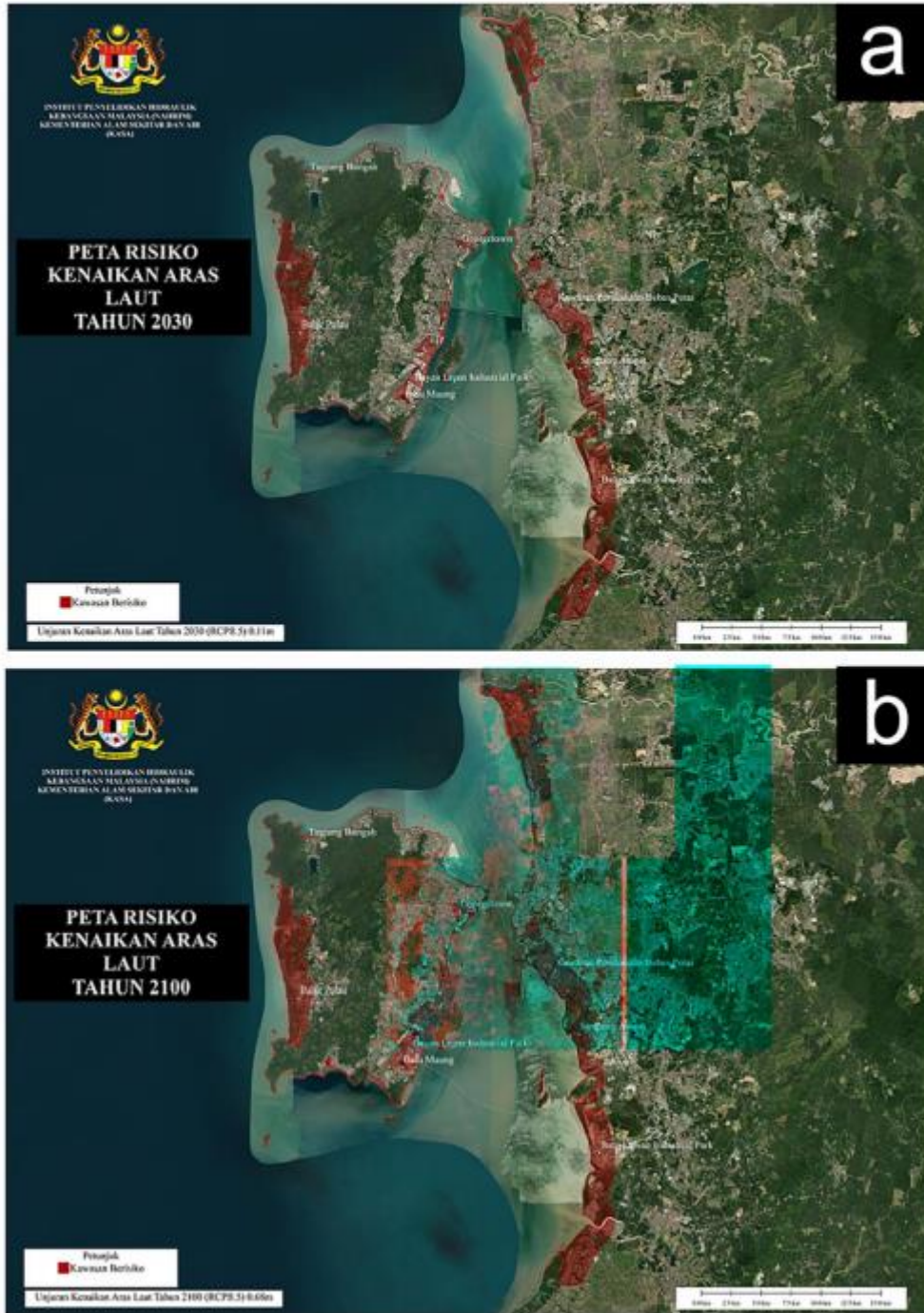


Figure 3.11: Risk of ocean inundation in (a) 2030 and (b) 2100 due to rising sea levels

(Source: NAHRIM, 2017)

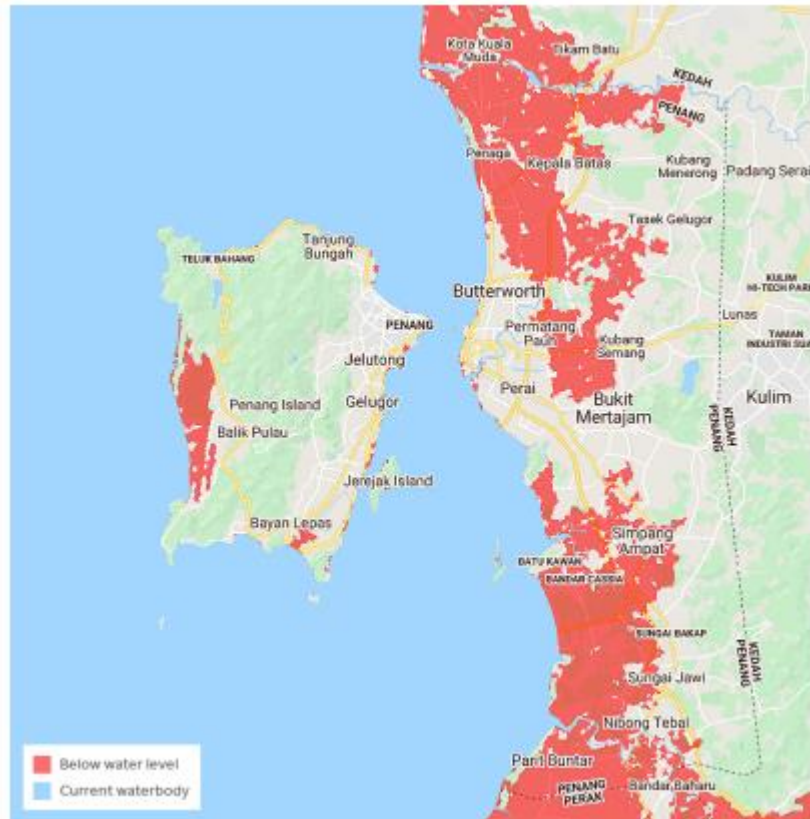


Figure 3.12: Land projected to be below the annual flood levels in 2050.

(Source: Climate Central, assessed in January 2022)

In another estimation by Climate Central (2020) ‘based on global-scale datasets for elevation, tides, and coastal flood likelihoods’, larger areas of Penang’s mainland would potentially be inundated by 2050 compared to the NAHRIM projection (Fig. 14). However, it should be noted that the Climate Central’s simulation has its limitations as the data used was less accurate for areas outside of the United States and the projection is ‘not based on physical storm and flood simulations and do not take into account factors such as erosion, future changes in the frequency or intensity of storms, inland flooding, or contributions from rainfall or rivers’. So, for Penang, estimations based on projected sea level increases of 0.11 m and 0.68 m for 2030 and 2100 respectively

indicate land loss in the Balik Pulau area on Penang Island and around the coastline of the state's mainland (NAHRIM, 2017).

3.2.2 Recent history of flooding in Penang

Between 2013 and 2018, Penang was impacted by 119 flash flood occurrences (Department of Irrigation and Drainage Annual Flood Report 2017/2018). In September 2017, a devastating flood in Penang caused 100 locations to be affected, and displaced more than 1,000 victims. The water level rose from 0.3 m to 0.5 m in certain areas (Yaakob, 2017). The recent mega flood devastation during November 2017 in the Northern States of Peninsular Malaysia (Kedah, Penang, Perak) witnessed a displacement of 10,000 people caused by heavy torrential rain that fell continuously for 48 hours. As many as 7,412 people were evacuated from their homes in Penang, 3,839 people in Kedah and 928 people were displaced from two districts in Perak (Malaysian Civil Defence Department Report 2017). This massive flood caused severe damage to houses and left the area in disastrous condition. Torrential rain fell from 3rd to 6th November 2017, resulting in 7 people dead in Penang (National Flood Forecasting and Warning Centre Division of Water Resources and Hydrology Malaysia Report 2017/2018). In addition, floods were reported to be occurring every year prior to the commencement of this research (Table 3.4). Many people were traumatised by the flooding as their homes and belongings were damaged by the waters. According to newspaper reports, this heinous circumstance has been dubbed 'the worst in Penang's history'.

Table 3.5: Flood statistics in Penang 2017/2018

Year	Number of incidents
Seberang Perai Tengah	6
Seberang Perai Utara	4
Seberang Perai Selatan	7
Timur Laut District	8
Barat Daya District	8
TOTAL OF FLOODING (2017-2018)	33

(Source: National Flood Forecasting and Warning Centre Division of Water Resources and Hydrology Malaysia (PRABN))

The Southwest District is the second highest district with 8 cases of floods. Floods usually occur in the same place or area. Most of them are due to heavy rains and river water overflow, namely Telok Kumbar River, Telok Awak River, Pinang River and Relau River. In addition, the existing drainage system is also unable to cope with high surface runoff in a short period of time. The flood area involved is Kampung Naran, Kampung Nelayan, Kampung Sulup, Persiaran Relau, Jalan Sultan Azlan Shah, Taman Iping and Jalan Makhamah Bayan Lepas. The recorded evacuation for the whole Penang state is 7,412 people. The displaced are staying in 41 emergency centres set up by Penang state and federal authorities (Annual Report 2017, MET Malaysia). Whereas, Barat Daya district recorded 112 people were been evacuated.

In the past, intense rainfall and flooding naturally arose from convective systems or monsoon seasons, combined with low-lying flat terrain. However, deforestation adversely impacts the role of forests as natural flood control systems (Chan, 2003). With deforestation a much higher proportion of rainfall becomes surface run-off, flows into rivers and other water bodies, leading to floods. In addition, rapid development within or near river basins generates even more run-off and reduces river capacity, resulting in an increase in frequency and magnitude of floods (Chan, 2012). A flood can also be worsened or caused by the expansion of impermeable surface areas, soil erosion and landslides that increase sediment load in surface run-off, clogged waterways, the high volume of surface flow accumulated downstream and ‘limited capacity to channel off discharge’ (Kam, 2017).

24/01/2017	Daerah Barat Daya	Kg. Naran, Kg Nelayan, Kg Sulup, Persiaran Relau, Jln Dato Ismail Hashim, Jln Sultan Azlan Shah, Tmn Iping, Jalan Tengah (Atas Jalan), Bayan Baru	Tiada
27/05/2017	Daerah Barat Daya	Tmn Iping, Jalan Makhamah Bayan Lepas	Tiada
30/05/2017	Daerah Barat Daya	Kg Naran	Tiada
14/07/2017	Daerah Barat Daya	Kg. Naran, Kg Nelayan, Kg Sulup, Persiaran Relau, Jln Dato Ismail Hashim, Jln Sultan Azlan Shah, Tmn Iping, Jalan Tengah (Atas Jalan), Bayan Baru	Tiada
12/08/2017	Daerah Barat Daya	Taman Iping – atas jalan, Kg Nelayan, Kg Sulup	Tiada

Tarikh	Daerah	Tempat/Kawasan Terlibat	Jumlah Perpindahan
15/08/2017	Daerah Barat Daya	Flat Jalan Hasan Abas, Kg Nelayan, Medan Nelayan, Kg Teluk Awak	Tiada
21/09/2017	Daerah Barat Daya	Kg Sulup – Teluk Kumbar, Kg Nelayan, Kg Paya, Rumah Murah Kg Nelayan	Tiada
4 - 5/11/2017	Daerah Barat Daya	Kg Sg Pinang- Balik Pulau, Kg Bukit Kecil-Balik Pulau, Jln Pantai Aceh- Balik Pulau, Jln Depan Giant- Bayan Lepas, Masjid Bayan Baru, Taman Manggis-Balik Pulau, Taman Seri Indah – Balik Pulau, Olive Tree – Sungai Relau, Lintang Pondok Upeh –Balik Pulau, Kg Sulup –Teluk Kumbar, Kg Nelayan – Teluk Kumbar	112 orang

2.3.2 Kekerapan Banjir mengikut Daerah di Negeri Pulau Pinang Tahun 2017/2018

Daerah	Kekerapan
Seberang Perai Tengah	6
Seberang Perai Utara	4
Seberang Perai Selatan	7
Daerah Timur Laut	8
Daerah Barat Daya	8

Figure 3.13: Flood Events in the State of Penang in 2017/2018

(Source: Annual Flood Report 2018, Department of Irrigation and Drainage Malaysia)

**Translated label/legend description.

Tarikh	Daerah	Tempat/Kawasan terlibat	Jumlah perpindahan	Kekerapan banjir
↓	↓	↓	↓	↓
Date	District	Area/effected area	Total of evacuates	Flood occurrences

Flood events appear predominantly in Penang due to intense short-duration rainstorms during which heavy rainfall coincides with a high tide. Generally, throughout the year 2017, Malaysia has experienced normal weather and climate conditions with some extreme incidents, such as the presence of tropical depression which has caused some states to suffer quite severe effects. Bayan Lepas Meteorological Station monthly rainfall exceeded the long-term average for that station. According to the Annual MET Malaysia 2017 Report, continuous heavy rains and strong winds occurred in Kedah and Penang especially in Bayan Baru, Bayan Lepas, Batu Feringghi, Balik Pulau and Seberang Perai on 4th and 5th November 2017.

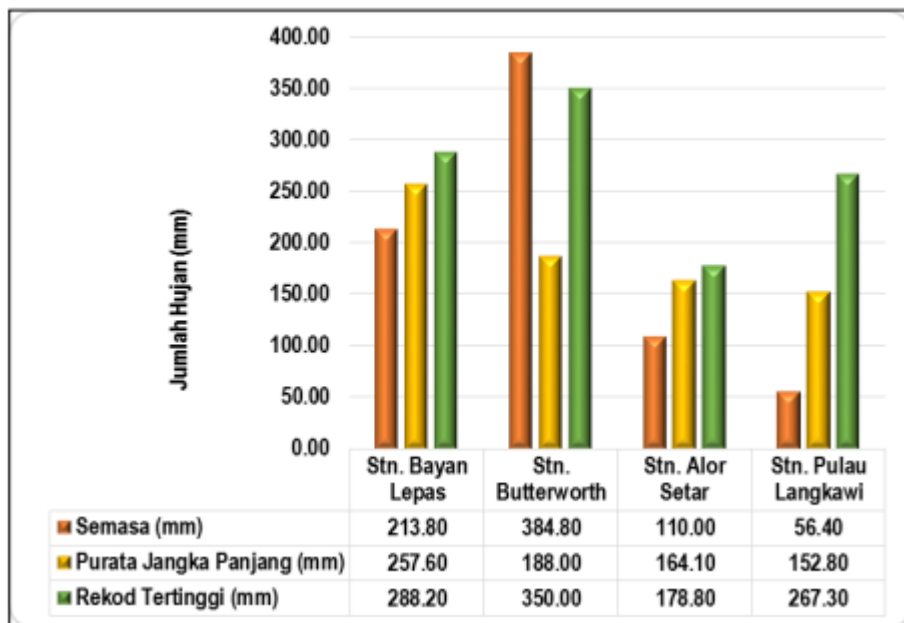


Figure 3.14: Daily rainfall summary of 2017 for Penang and Kedah

(Source: Annual Report 2017, Malaysian Meteorological Department)

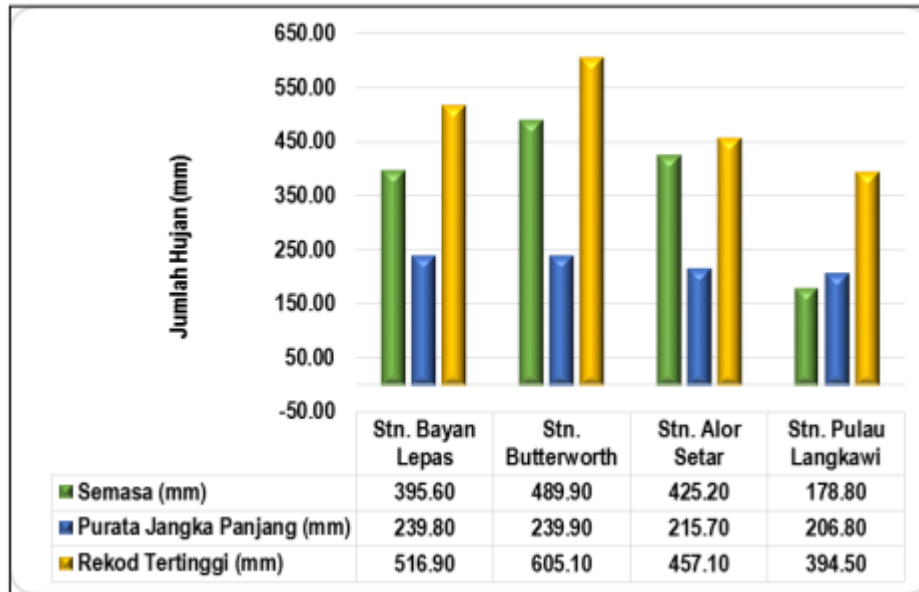


Figure 3.15: Monthly accumulated rainfall of 2017 for Penang and Kedah
(Source: Annual Report 2017, Malaysian Meteorological Department)



Figure 3.16: Visit to Bayan Lepas Meteorological Station

Importantly, Penang experiences an average of 184 thunderstorm days (TDs) annually, together with the increase of rainfall intensity which is ‘the ratio of the total amount of rain (rainfall depth) falling during a given period to the duration of the period’ (Othman, M., Ahrasan, N. & Tan, T., 2021). It is usually expressed ‘in depth units per unit time, usually as mm per hour (mm/h)’. As Fig. 3.14 and 3.15 shows, rainfall in Northern Peninsular Malaysia, including Penang, has increased in recent years compared to the base years. This is potentially due to climate change.

Flooding covers Penang Island in mud, plastering floors, walls, doors, and shelves, as well as anything below the flood level, which can climb to more than 2 metres. The carpet will be saddened, the floorboards will be moist, and the muck and sewage will almost certainly leave a foul odour behind. Everything below the flood level must be discarded and replaced, including carpet, electrical fixtures, skirting boards, and all food, canned or not. The extent of the damage will be exacerbated by the prolonged period of time that the structures will be submerged. For instance, structural damage might occur as a result of warping and breaking timber studs. Some companies were inundated for up to two weeks after the water level peaked, while others remained closed and undergoing restoration more than a month after the initial occurrence.



Figure 3.17: Effects of the 2017 flooding event at Masjid Village, Teluk Kumbar



Figure 3.18: Effects of the 2017 flooding event at Suluk Village

3.2.3 Recovery projects and future planning in Penang

Affected flood areas in 2017 were the biggest catastrophe in Penang which resulted in damage to homes, vehicles and losses of income. 108 people were evacuated to the nearest public hall and Primary School in Teluk Kumbar that were set up as temporary shelter centres. For three days the people lived in the temporary evacuation hall although there was basic initial relief such as food donations and health services. Residents received small donations and personal support from various government agencies, political organisations, non-governmental organisations (NGOs), and members of other communities. On the recommendation of the National Disaster Committee and the State Disaster Management Committee, the Government gave short-term support in the form of financial aid "*Bantuan Wang Ehsan*". Penang State Government announced the one-off RM400 financial aid to flood victims who suffered property damage.

Through the deployment of a community-led response, the recovery programme may have reduced vulnerability. However, both structural and non-structural mitigation measures could be used to lessen Penang's vulnerability to flooding. Penang concentrated on flood prevention following observations and report readings in order to speed the third phase of the Sungai Pinang Basin (SPB) Flood Mitigation Project. According to the DID report, this mitigation effort began in 1996 as part of Malaysia's 7th Malaysia Plan and lasted until 2004 as part of Malaysia's 8th Malaysia Plan. It cost RM8.3 million to preserve settlement sites near Sungai Pinang's mouth from floods. The government can only afford a staged implementation of the project.

Other than that, Penang has applied for RM28 million on November 2018 to implement three more flood mitigation projects in the state through the Department of Irrigation (DID), announced by the Penang Chief Minister. The flood mitigation projects, to be implemented by DID, cover Teluk Kumbar (RM10 million), Pondok Upeh (RM10 million) and Teluk Bahang (RM8 million). So far, according to the Budget 2019, The Penang state government had allocated RM150 million to implement nine high impact projects in the state. Previously, in the last 10 years, Penang government together with federal agencies have implemented close to RM400 million worth of flood mitigation and drainage projects which involved the construction of a pump house, a collector drains stretching, upgrading of road side drains stretching 3.5 km and the construction of a 140 m box culvert jacking (Malay Mail, 2018).

3.3 Selection of Case Study Sites: Teluk Kumbar, Penang Island

In order to conduct the research, it is necessary to select several study sites that would provide useful information regarding community response, flood vulnerability and coping strategies. To maximise the utility of this study, the cases needed to be selected carefully. Thus, as a result of the high incidence of flooding in Teluk Kumbar, the decision was made to study this area based on the initial assessment and pilot meeting. It provides an important case study to explore and analyse disaster response occurring within a context of resilience and the effectiveness of recovery and risk reduction initiatives within Teluk Kumbar as a town within the Southwest Penang Island District or known as *Barat Daya*. This is followed by an overview of the selected sites, including a summary of how these locations were selected for inclusion in the research.

3.3.1 Identity of sites

The *Barat Daya* district has an area of 176 km² and a population of 310,982 as of 2013 (Figure 3.11). This research was focused around five villages located within the Barat Daya in *Mukim* 11 which is located in Teluk Kumbar. Teluk Kumbar is a sub district (mukim) located within the Southwest Penang Island District. Teluk Kumbar has a population of 1,084, according to Malaysia's Department of Statistics, with Malays constituting the majority (77 per cent), followed by Chinese (20 per cent) and non-Malaysians (1.85 per cent) (Table 3.6).

Table 3.6: Barat Daya population distribution in Penang Island

District/State	2009	2010	2011	2012	2013
Barat Daya	189,500	192,200	207,004	306,440	310,982
Pulau Pinang	1,458,200	1,475,000	1,600,968	1,625,835	1,647,716

(Source: Department of Statistics, Malaysia)

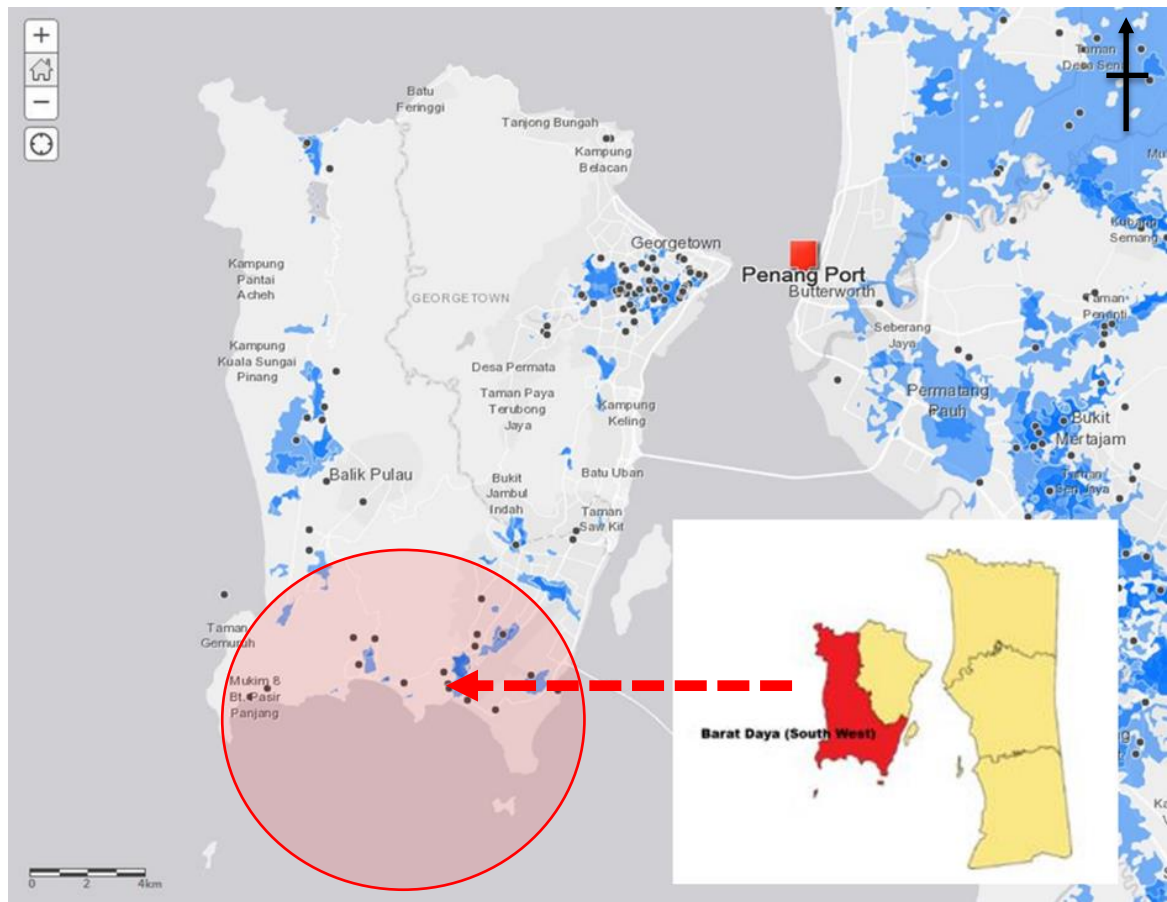


Figure 3.19: Study site location (Source: Edited from Penang Structure Plan 2020)

In terms of religion, there are in total nine official religious institutions in Teluk Kumbar, the majority of which are exclusively Muslim entities (Table 3.7). Rapid development in land use in the *Barat Daya* district has changed the social structure of settlements and socio-economic capabilities of the local communities. Traditional settlements for example in *Mukim* Teluk Kumbar (*Kampung* Nelayan, Gertak Sanggul and *Kampung* Suluk) are facing issues with the development of land use which been squeezed in between newly developed area with an influx of new residents of Non-*Bumiputera* or Indigenous (Non-Malays).

Table 3.7: List of worship place in Teluk Kumbar

No.	Name of building	Religious
1.	Masjid Ridwaniah, Sg. Batu	Islam
2.	Surau Taman Teluk Kumbar	Islam
3.	Masjid Maqbul	Islam
4.	Surau An-Nur	Islam
5.	Surau Al-Ikhwan, Kampung Nelayan	Islam
6.	Temple Cheng Chooi Chor Soo	Buddha
7.	Vella Paalam	Hindu
8.	St. Timothy	Christian
9.	Sanctuary Worship	Christian

Across numerous areas impacted by the Penang floods, study locations were chosen based on the magnitude of the flooding impact, the severity of reported flooding cases, the accessibility of flooding-affected communities and other related stakeholders, and the communities' willingness to participate in the research. After informal social networks with the local communities' representatives, pilot meetings with flood managers and review of information from newspapers, suitable sites were selected; Nelayan Village, Teluk Kumbar, Gertak Sanggul, Masjid Village and Suluk Village.

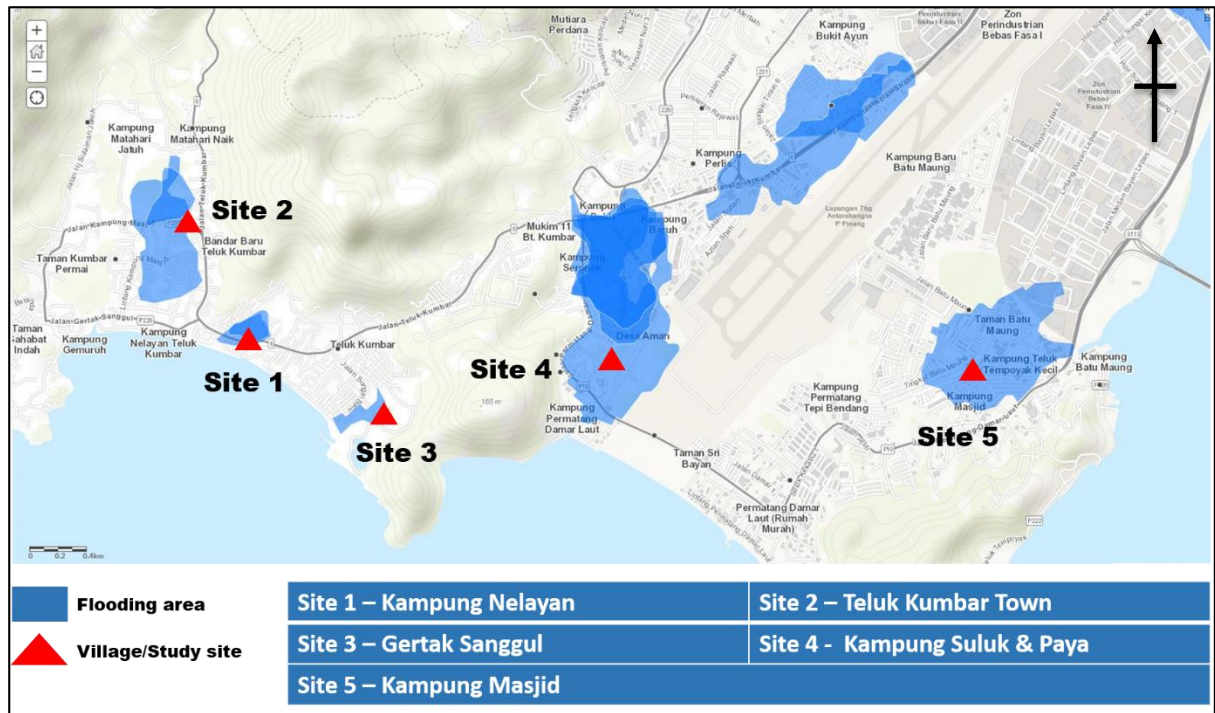


Figure 3.20: Location of sites in Teluk Kumbar Mukim

Traditional settlements like Kampung Nelayan, Gertak Sanggul, Kampung Masjid and Kampung Suluk are examples where these areas have traditional diversity in housing patterns, but some of the houses are not constructed according to the Local Council of Penang Islands Planning and Development Control Policy Plan. The application of land use change, believed to happen due to the dispersion of development since the mid-1980s has resulted in a huge pressure on activities of planning applications that has exacerbated the flooding problem. The study locations depicted in Figure 3.20 and 3.21 are the locations of the fieldwork.

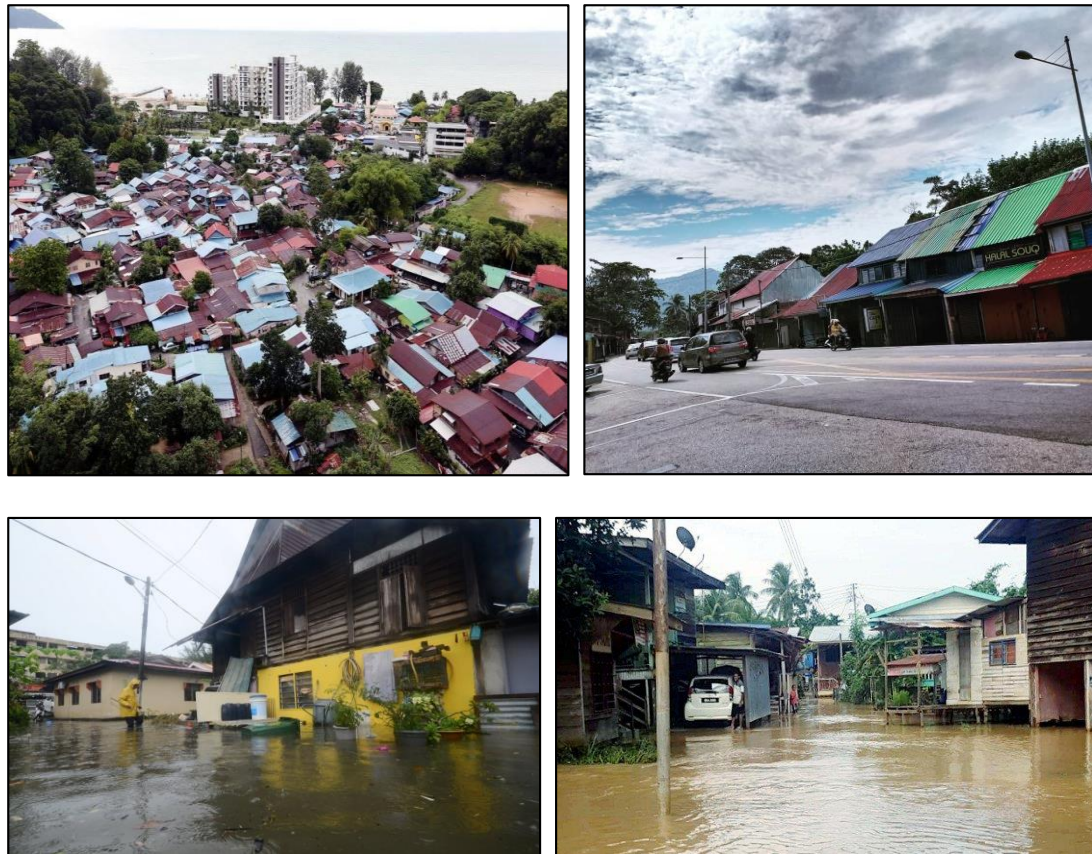


Figure 3.21: Photographs of Gertak Sanggul, Teluk Kumbar Town and Suluk Village

These villages also known as some of the oldest settlements (sometime in the late 18th century) in Penang and called the ‘Traditional Village’ that were established based on the local’s inscription. Teluk Kumbar has a low population density and a low rate of population growth based on demographic characteristics in 2010. As a result, interviewees expressed pride in their families’ generations-long residence in these settlements. Most of the people living in these areas depended on industrial work in Bayan Lepas Free Trade Zone that gazetted as industrial-based new towns (Nghah, Rahman, Zan, & Zakaria, 2015). Fishing as the main economic activity is still popular among the villagers. Others are believed to be involved with retail and trade as the main sources of income. In general, based on informal conversation, there are families that working as government and administration sector.



Figure 3.22: Photographs of Masjid & Nelayan Village

In addition, Teluk Kumbar town is a mixed residential and commercial area including old shop buildings that are still being reserved. This area includes areas such as local health centre facilities, medium industrial and business operating, government offices use, high rise residential which at the same time give pressure of developments on its neighbourhood. Applications for land reclamation are getting higher due to the dispersion of development response to housing and industrial developments in Penang. Teluk Kumbar has a limited drainage system that is prone to becoming clogged by rubbish. This is also due to occurrence of informal settlements in Teluk Kumbar and

poses multiple challenges for the local government to regulate area planning and infrastructure development (Penang Institute, 2018).

Increasingly, land is a scarce resource which is much sought after in Penang Island, including Teluk Kumbar area. This is because Penang is largely made up of steep topography and much of the lowland areas are already developed. Penang is one of the many rapidly industrialising states in Malaysia as mentioned in the earlier discussion with a largely urban population. Although land reclamation has eased the pressures somewhat, it is not enough to satisfy the high demand for land on the island. As such, developers have turned to the remaining hill land on the island.

Many hills and their environs are already being developed and many hill projects are in the pipe line. This has led to many environmental problems such as deforestation, decimation of water catchments, destruction of endangered fauna and flora, soil erosion, landslides, water pollution, sedimentation and downstream flooding (Chan, 2012). There are lot of challenges on hill land development in Penang state, starting from planning stage till handing over to valuable clients and purchasers. In terms of drainage and flood mitigation infrastructure, the situation has gotten worse recently. At the present time, local peoples have no control over rapid land use developments for housing, especially hill terraces and luxurious housing units such as apartments and condominium around Gertak Sanggul, Relau, Sungai Ara and Bayan Lepas. Many projects in the hilly areas failed due to several geotechnical and environmental factors. The factors that affect this environmental risk and their relevant mitigation must be identified earlier before any recurrence of hazard to the environment.



Figure 3.23: Photographs of Teluk Kumbar Town

Five communities were chosen on the basis of residents and villagers recommendations and also on the basis of recommendations from surrounding resident and village leaders. Decisions were made based on the extent of house and building damage, as well as locations prone to flooding, as well as consultations with government officials. Teluk Kumbar small-town, Suluk, Masjid, Gertak Sanggul and Nelayan villages were chosen due to the high degree of community impacted by the floods.

3.3.2 Social characteristics of Teluk Kumbar

In terms of demographics (ethnic groupings, socioeconomic status, and society engagement), each site is similar, and Teluk Kumbar has a number of community groups (including women's and youth groups) that are involved in disaster risk reduction efforts. These women's group (Gertak Sanggul, Kampung Suluk and Teluk Kumbar) have more than 10 members for each organisation and were established in the last last ten years under Rukun Tetangga. These groups are also supported by political organisations and the welfare department from state government and the spirit of common tradition working together (*gotong royong*) by groups from the local

community, especially villagers. Based on Kamus Dewan, *Gotong royong* is one of the core tenets of Malaysia society and can be defined as the spirit of mutual assistance and cooperation among neighbours, particularly operating at the scale of the village in rural areas, family members and community.

The spirit of mutual support facilitated both the initial relief effort as well as the longer term reconstruction process through the provision of labour to clear rubble and debris, construct temporary and permanent housing, as well as facilitated the consultation process and community involvement in the planning and decision making process. The dozen or more men involved in the project worked in pairs spread out along the span of the bridge, removing cracked and broken planks along with rusty nails, and replacing them with new planks. This support is significant because of the social capital that exists as part of their local culture (Thompson, 2004). Therefore, their coordinated respond to the flooding also included training by the related disaster management and response agencies such as RELA, APM and BOMBA.

Nowadays, youth groups are now developed in Teluk Kumbar, for examples groups of Majlis Belia Teluk Kumbar, Pemuda UMNO Gertak Sanggul and Belia 4B Kampung Suluk. These organisations are a source of social capital and flood relief volunteers that the government and community leaders (Penghulu and JKKK) may tap into to help the community cope with disasters. These youth groups have been trained in the topic of disaster first aid and flood management. There are also Voluntary Disaster Management Committees at a village or mosque level such as Jemaah Qariah Masjid Teluk Kumbar. The mosque in Teluk Kumbar had a generator, cooking utilities, and allowed the

villagers to use the prayer hall for temporary shelter during the flooding and the committee members helped facilitate requests for immediate assistance.

Since flooding is a cyclical event in most of the areas of Teluk Kumbar, the community developed their own pattern of adaptations for responding to the impending event. The action taken by a group of villagers can be significant because of the he action taken by a group of villagers can be significant because of the substantial social cohesion that exists in the community. For example, '*gotong royong*' (working actions are a strength in responding to hazards. *Gotong royong* is part of their culture and includes responding to the floods through community-based response team. Community governance structures have also incorporated the spirit of gotong royong through neighbourhood associations (namely as *Rukun Tetangga*).

In order to conduct the research, it was necessary to select several village sites that would provide useful data regarding livelihoods, vulnerability and resilience in the post-disaster recovery period. Thus, villages were selected among a range of following criteria:

- Flood history and livelihood post disaster recovery.
- Preliminary assessment of the village indicating some form of resilience and adaptive transformation or continued levels of vulnerability, present and potential risk of flooding and existing flood risk.
- Villages exhibiting characteristics or experiences that would provide data on the role of identified vulnerability and resilience factors, such as internal/external social networks, role and strength of village institutions, leadership qualities, education levels, income levels/type of income source etc.

- Willingness of the village to participate and provide support throughout the research process.



Figure 3.24: Community Based Response Team (Rukun Tetangga) command centre at Kampung Masjid

A total of 10 villages were visited for initial assessments and pilot meetings and discussions were held with local village leaders as well as villagers, and government officer before selecting suitable village sites. As one of the main criteria for selecting villages was a high degree of experienced vulnerability, *kampung* (villages) and *kawasan* (areas) were selected based on levels of housing and building damage and areas with over 50% of buildings and houses submerged in floodwaters were targeted. Of these 10 villages, five were selected for the final research as they met the selection

criteria outlined above. In this research, a community or village is defined as an area that local residents feel a sense of belonging.

3.4 Summary

This chapter provided details on flood-management governance and background information of the local government system in Malaysia. It contained a brief review of Penang Island and *Mukim* of Teluk Kumbar as case study places to offer sufficient background for the study sites, a description of the features required, and an overview of the overview community's difficulties and concerns in the case study areas. The chapter concludes with the background description of each fieldwork community that experienced flooding. The following chapter will outline the research methods and data collection techniques.

CHAPTER FOUR

Chapter 4: Methodology: Exploring Frameworks For Community Response

“There are many ad hoc instructions given without facilitate the management of disasters”

– Teluk Kumbar Chief Village, 21 July 2018

4.1 Research Framework

This chapter presents a detailed account of the methodology adopted for this research, how this phenomenological study was organised and conducted including the reasons behind the choice of methodology operations. The research aim and objectives were systematically fulfilled by formulating a research design to assess how people in *Teluk Kumbar*, Penang Island respond to flooding through identification of key coping strategies at the community level. The research framework that underpinned my approach on community response and flood impacts and vulnerability establishes the boundaries of my research. The objectives are to:

- *To analyse the response and recovery undertaken in post-flood Teluk Kumbar, Malaysia.*
- *Critically analyse whether different groups of people have different coping strategies related to different causes of vulnerability.*
- *Determine the ways in which the government supports local communities to cope with floods.*

The research requires an interdisciplinary approach as the most appropriate to justify the philosophical and research methodological, because the problem being researched is centred on disaster response and management, which embeds human responses with a natural hazard. The main method used for gathering information involved collection of data from a range of participations: individuals, groups and agencies experiences around flood hazards. By employing questionnaire surveys, one-on-one interviews, and focus group discussion research methodologies, this study used both quantitative and qualitative research strategies. Given this complexity and range of exploratory approaches, I chose a single, detailed case study which focused on one community at risk to explore the ways in which the concept of flood adaptation is entwined with that of vulnerability and resilience (Figure 4.1).

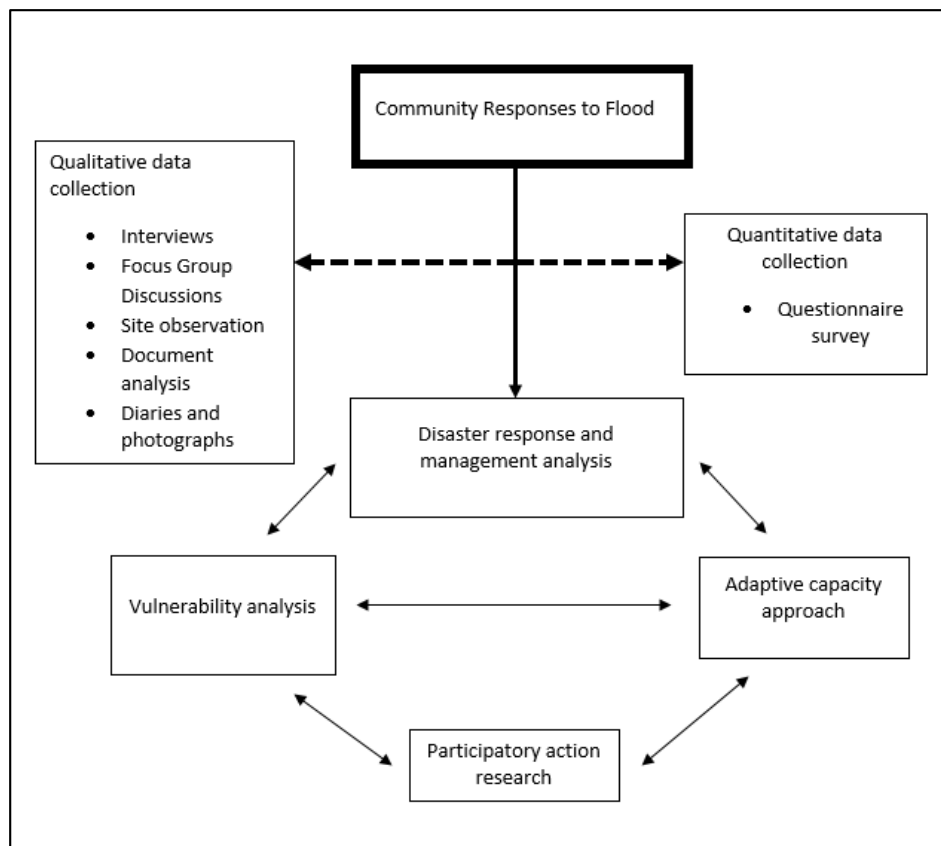


Figure 4.1: Basic flow diagram of the research undertaken

The justification for utilising three different types of social science procedures is addressed in section 4.2, which explains the selection of data-collection tools and methodologies: questionnaires, semi structured interviews and focus group discussions. Section 4.3 illustrates the research design used in order to summarise the procedure that was followed and the activities applied to the study. Taking into ethical consideration and problem encountered the discussion in section 4.4 outlines how these were confronted and the compromises that had to be made in the process. Finally, in section 4.5, the essential parts of the technique employed to address the research questions are summarised.

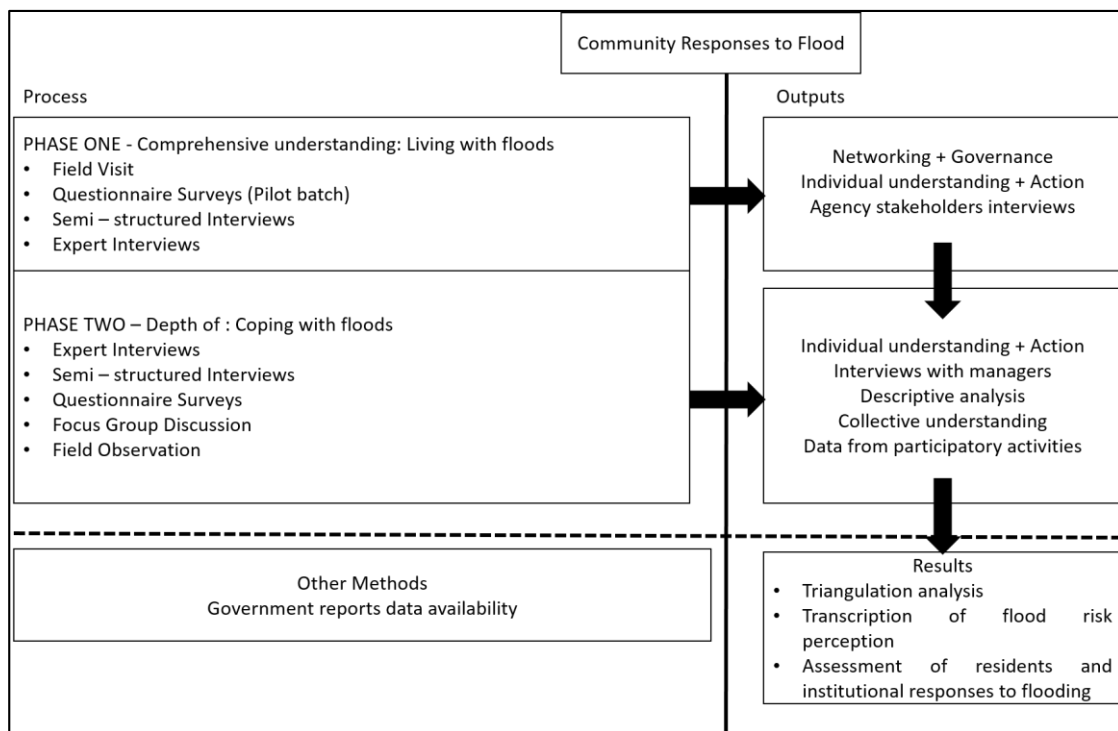


Figure 4.2: Research methodological diagram

The mixed methods approach was carried out in two stages in this framework (outlined in Figure 4.2):

Phase 1: A quantitative and qualitative approach was employed to explore the perceptions of households about their vulnerability and resilience in the recovery phase of flood hazards. A statistical analysis was then used to identify possible relationships between the vulnerable households and other variables that were found in the questionnaire. I found interview approach contributes to explore the complex interactions between various small and large-scale social, economic, political and environmental processes that create disaster events and influence disaster recovery.

Phase 2: Multi methods approach was used to conduct an in-depth study of the affected households from their own perspectives by using the techniques of focus group interviews and surveys among groups of householders from the five village's use as case study areas. Semi-structured interviews were performed to provide information from the perspectives of stakeholders and to obtain their views on flood risk disaster management. The findings from different methods were then integrated and checked for consistency by triangulation.

4.1.1 Positionality

It is necessary in any research to declare the positionality and identity of the researcher as they undertake the research. As noted by Skelton (2001:86), positionality is defined as *“things like our “race” and gender...but also our class experiences, our levels of education, our sexuality, our age, our able-ness, whether we are a parent or not. All of these have a bearing on who we are, how our identities are formed and how we do our research. We are not neutral, scientific observers, untouched by emotional and political contexts of places where we do our research.”*

In the discipline of human geography, it is important that the positionality of the researcher and those researched are scrutinised to lead to significant learning process about the nature of research and its process (Crang & Crook, 2007).

My own conceptual journey of researching has been influenced by my educational and professional background, especially involvement with flood aid volunteerism. I found that my experience working with flood recovery missions enabled me to easily interact with the people I researched. For example, I was capable of building trust among respondents. They were more than likely to respond that they believe I want to hear or comment, anticipating my understanding of a rising danger and hazard situation. I possess a bachelor's degree in town planning and a postgraduate degree in real estate and planning equipped me with a certain amount of understanding of community planning, catastrophe recovery, and development. I can therefore relate to such complex understandings and identify the most important issues concerning resilience progress, which lead to understanding the local communities' social relations process involved for responding to floods.

My locality status as Malaysian and northerner of the country placed me in a comfortable position. I had the ability to understand their accent and recorded the very real issues of local respondents; they seemed to appreciate that their voices were being taken seriously and being researched. Therefore, positioning myself with my interviewees as 'locals', through which I retained certain rural identity made the interviewees more straight forward, facilitating access to people and their knowledge. However, I did not position myself either as an outsider or an insider in order to explore as much as possible without any oversimplification.

4.1.2 Research methodological approaches

Quantitative data collected included questionnaire data, which aimed to assess residents' knowledge and perceptions of flood risks, and their responses to flooding. 100 participants were selected based on a purposive sampling technique (approximately 30 questionnaire surveys were conducted per site/village) in order to identify people who had been directly impacted by the flood events in that area (questionnaires were only delivered to houses that were known to have experienced flooding). Meanwhile, qualitative data collection involved a series of in-depth, 28 semi-structured interviews with resident's representatives who live in areas directly affected by flood, community group such religious, institutional stakeholders such government agencies, politics, academician involved in the flood response. I accumulated more information also by interviewed group of Non-Governmental Organisations.

With consideration of the specific research objectives and methodology tasks, these key informants were chosen to provide particular insights and expertise about post-disaster recovery in the City of Penang, specifically in Teluk Kumbar. As mentioned earlier, the participants of the one-to-one interview exercise were from community, government agencies, NGO, academics, politician, and residents representatives. To broaden the population base for the research enquiry in terms of numbers and to obtain a more diverse sample, further focus group discussions were carried out in Teluk Kumbar, Penang. Conducting 5 focus group discussion with a group of 24 individuals was fascinating as they revealed their memories of occurrences. As a result, an awareness of how the community as a whole was affected and how it responded was achieved. A summary of the data collected is presented in Table 4.1.

Table 4.1: An overview of the data collected

Quantitative analysis	Qualitative analysis
Questionnaire, sampling wider population (n = 100).	In depth interviews, sampling resident representatives of Teluk Kumbar (28 interviewees). Focus group discussion with resident's representatives directly affected by flooding (5 groups from 24 representative of people).

4.2 Community Social Characteristics

During the fieldwork building a relationship of trust with the informants was really important, especially to get know the community profile and learn about the local conditions and the reality on the ground (Figure 4.3). Key informant contacts were identified through walk over surveys undertaken in order to encounter local people. A few previous researches were referred to such as “*Landscape, Livelihoods and Risk: Community Vulnerability to Landslides in Nepal*” by Oven (2009), “*Social resilience of post-earthquake Bam*” by Meskinazarian (2013) to get insight on the strategies for dealing with community members.

The interviewees from social groups such as youth, women, and mosque were met by chance in the streets or in public social spaces like markets, night markets, coffee shops, mosques and football fields (Figures 4.3 and 4.4). While the NGOs activists were contacted through social media platform (Facebook). Through interviews with the staff of different NGOs, I was introduced to other contacts of NGOs.



Figure 4.3: Informal visit to village heads



Figure 4.4: Voluntarily involved with flood relief aid at Suluk Village, 2017

4.3 Data-collection Methods

4.3.1 Questionnaire survey

4.3.1.1 Design of questionnaire

I found a structured survey to be useful and insightful in my fieldwork, which was undertaken with residents living in flood risk areas of *Teluk Kumbar*, Penang Island. These enabled me to have flexibility to explore topics of responses to flooding in great depth. Questionnaires helped to enrich the responses and vulnerabilities of the community based on their experiences and provide a way to meaningfully encounter their informal responses. In designing the questionnaire, existing literature including Narayan, et al (2004): “Measuring Social Capital” was used. According to these references, by combining quantitative and qualitative methodologies, it is possible to enrich the research and efficiently analyse case study perspectives.

Following Crang and Cook (2007), I prepared and ran pilot test questions before the start of research fieldwork. I randomly pilot tested the questions with 30 respondents in selected villages at *Teluk Kumbar* and found it to be useful in understanding how certain words were utilised, how the questions were interpreted and the format of the answers. It was interesting to assess which questions were easy to understand by the interviewed residents, which questions needed to be adjusted or withdrawn and which questions had emotive responses.

The questionnaire was designed to collect information on seven sets of variables; demographic characteristics of respondents:

- Experience of flooding

- Impact of flooding
- Recovery and assistance
- Flood management
- Coping mechanism
- Awareness

The survey was conducted to gather information on the community, household's responses in dealing with floods and community coping mechanisms. A hundred households within flood - prone residential areas were identified and details of housing damage ever happened were sought and entered into a database. Due to the complicated nature of the questionnaire and large amount of information expected to be gathered, reducing the length proved problematic. To maintain simplicity of the questionnaire is important, in order to make it understandable to the intended population, and reducing it would have made it more complicated. Due to complication, I adopted a quantitative technique using Likert scale analysis to parse the data and locate the key themes. This provided a clear and simple method to undertake an initial analysis. A Likert scale is defined as *'a psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements'* (Pohl 2008, pp.41- 63).

Equally, the time to complete, although fairly long at 20 minutes, was deemed acceptable given those that had been flooded were expected to have high interest to complete a long instrument. After the questionnaire was finalised, it was necessary to make sure that it is clear and easy enough for the respondents of different backgrounds to answer. This was undertaken by investigating validity of the questionnaire. The main purpose of pre-testing or checking the validity of the questionnaire was to learn lessons

and modify the instrument for the full stage survey. The second aim was to validate the questionnaire in terms of wording of the questionnaire, structure, length, clarity and ease of understanding.

4.3.1.2 Pilot survey

The initial draft pilot questionnaire was designed to ensure the appropriateness and understanding of the questions were suitable. During the first two weeks of the pilot study, I spent my whole day exploring potential field sites, talking to people, village representatives, and spend time at the local coffee shop with the villagers.

The pilot was conducted from 12 September 2017 to 2 November 2017 in order to feed into research strategy design, the design of questionnaires, and to find suitable interview questions to be included in the research. The pilot survey began with visits to the three study areas; the plan was to conduct 15 questionnaires in *Kampung Suluk*, 10 in *Kampung Masjid* and 5 in *Kampung Teluk Kumbar* (Table 4.2). Each survey lasted between 10 to 15 minutes. During the initial fieldwork, the floods had just happened and many affected areas were still not fully recovered by the time I visited the areas. Generally, community members always referred back to their latest experiences prior to the recovery phase during my surveys.

In order to obtain in-depth information about the factors influencing flood response and hazard perception in the study areas, informal surveys proved the most suitable method. If formal surveys had been held in these communities, people might have felt that they were being forced to answer the questions. This situation would have made people reluctant to be involved with any further research and the community would not have welcomed the researcher into their settlement.

Table 4.2: Breakdown of pilot interviews conducted

Method	Expert Interviews			Questionnaires
Perspectives	Managers (NGO, Government)	Business	Community Leaders (Village, Politician, Religious)	Household/people
Analysis	Governance, Policy, Political, Networks	Economics, Business impact	Group interaction, Flood management	Community response, Flood impact
Initial fieldwork target for collection	10	5	5	50
Total received	6	2	2	30 (2 damaged)

The design of questions was kept simple and straightforward to ensure the adequacy of the questionnaire. Likert-scale questions with boxes were easily understood and were used by the interviewees. Since most people were at work during the day and were busy in the evening with household chores, it was most appropriate to meet them in late evenings or over the weekend. Door-to-door visits were therefore mostly carried out in the evening and during weekends (Figure 4.5). This approach also allowed sensitive issues to be tackled, which would not have been answered during a formal discussion where it was restricted by government policy.

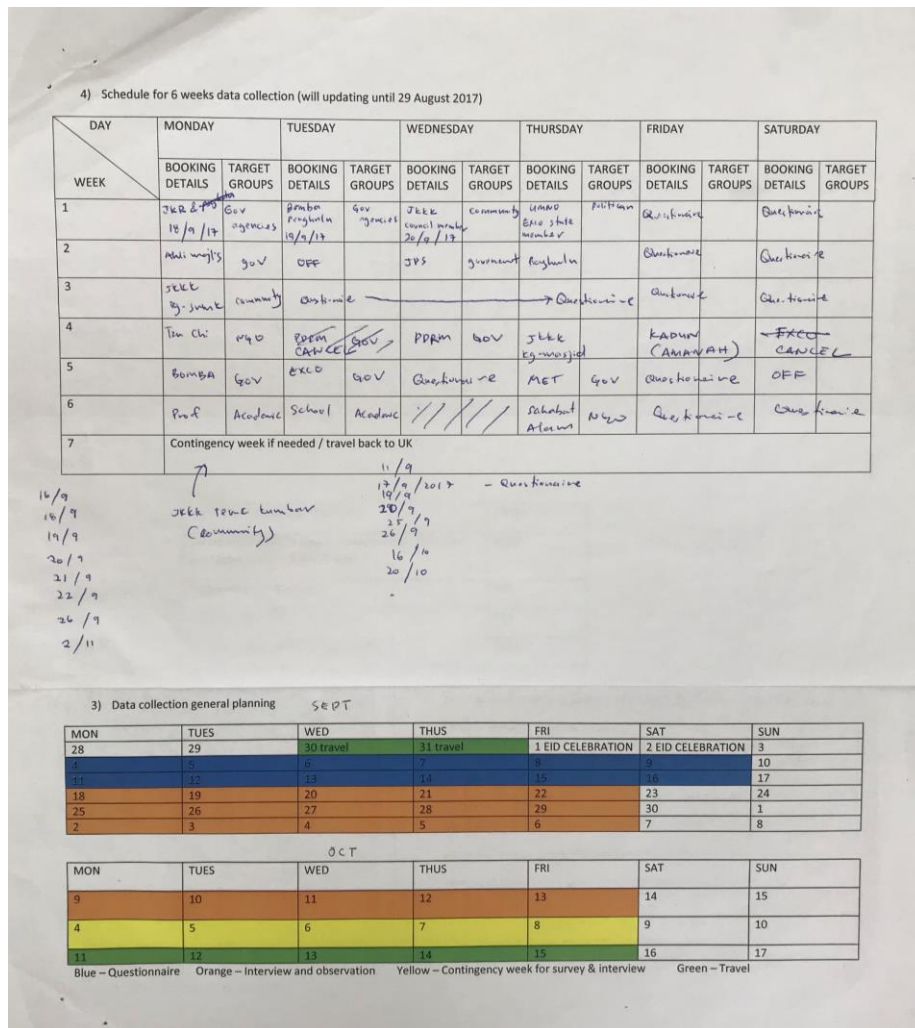


Figure 4.5: Data collection schedule planning

The data from the pilot survey was entered into an Excel table, and a preliminary analysis was carried out to extract information about the sample data's properties that could be used to improve the main questionnaire. The following is a brief description of the significant changes in the design of the primary questionnaire, as well as the rationale behind these modifications:

- a. The section under respondent's personal information in the pilot questionnaire was renamed 'Household characteristics' to include explicitly 'membership of household' and 'tenure'. Questions on education level and

employment were added to the main survey. The questions related to impact were retained and were largely unchanged, as the respondents found the questions relevant and easy to answer.

b. The section on vulnerability was retained as it drew considerable interest from the respondents. Vulnerability encompassed exposure to risk and socio-economic conditions as well. The questions were accessible, and the issue of vulnerability was part of the research questions. Some questions required rewording to facilitate a better understanding. It was observed that most households had limited fluency in English and were not used to filling in questionnaires. Door-to-door visits and personal interaction with the respondents was therefore planned for the full survey.

Most of the questionnaires completed by the enumerators had to be translated into the local Malay language. The questionnaire format was revised in light of the above considerations, but the overall structure was maintained. However, the title of the pilot questionnaire was changed to include recovery and resilience-building explicitly. It was decided that where additional information would be required, appropriate questions would be fielded through other activities, such as focus groups and interviews with local representatives and agency stakeholders.

Within this study, pre-testing and piloting testing aims to ensure that each question is measuring what it is intended to measure and produces a reliable and valid measurement. This process helped identify questions that did not make sense to participants or problems with the survey that might have led to biased answers. It

allowed for refinements in the ordering of questions, and determined whether additional or specifying questions were needed or whether questions should be eliminated; additionally, it helped validate the survey as a whole. In this study also, content validity refers to expert opinion concerning whether the scale items represented the proposed framework or the concepts the survey was intended to measure (Rattray & Jones, 2007). To ensure that the survey instrument was measuring what it was intended to measure, was appropriate for my purpose, and that the data collected were accurate, the validity of the survey was checked.

4.3.1.3 Main survey collection process and responses

Final data collection for the questionnaire took place from February to May 2018 (Figure 4.6). The questionnaire was given to all identifiable addresses in *Teluk Kumbar* in three batches. The first batch (50 questionnaires) was surveyed to assess household response rate at *Teluk Kumbar* town area, followed by a second batch (50 questionnaires) that was carried out at *Gertak Sanggul* and *Paya* Village. A third batch of questionnaires (50 sets in total) was then sent to assess by interviews at the area of *Masjid*, *Gertak Sanggul* and *Suluk* Village. In total, 100 participants' from 150 target respondent questionnaire were received, assessed and used for analysis (Figure 4.7). The response rate was 66%.

Field work Questionnaire (Final)

Stage	1 st batch	2 nd batch	3 batch
Areas	Teluk Kumbar	Gertak Sanggul 1 and Paya Village	Masjid, Gertak Sanggul 2 and Suluk Village
Target for collection	50	50	50
Total received	22	43	35
Total damaged	3	2	0

Enumerator : 1) ADAM 2) ANAS	Enumerator : 1) ADAM 2) ANAS	Enumerator : 1) ADAM 2) AMY 3) ANAS
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Figure 4.6: Breakdown of final questionnaire survey conducted



Figure 4.7: Questionnaire survey

In the Bayan Lepas District, five sites (villages) were severely impacted by floods: Teluk Kumbar, Suluk, Masjid, Paya, and Gertak Sanggul Village, which impacted about 150 to 180 families. Sampling was undertaken according to purposive sampling

techniques where the respondents were selected according to the characteristics such as had experienced and affected by Penang flooding in 2017 (Table 4.3). However, no statistical data was recorded on individuals involved directly with the flood. However, informal information was obtained through the Village Head (*Ketua Kampung*) and was used as a reference in determining respondents'. Sampling criteria was based on self-clarification of household having experiences dealing with risk of flooding.

Table 4.3: Number of respondents surveyed

Area	Total population	Targeted sample	Number of samples used for quantitative	Percentage of total population in sample
<i>Teluk Kumbar</i>	1284*	150	100	7.7%

*Statistic according to Penang State Government Report, 2013

The majority of respondents were found to be women (54%), compared to male (46%) representation. The household survey shows that 45 people were more than 51 years old, while 22 of the sampled population were below the age of 30 and 18 of respondents were between 41-50 years of age. The remaining 15 respondents are from the 31-40 age group. This can be explained by the fact that the survey interviews were performed during the daytime, when most individuals were at work (age of 50 and below). Based on the survey, the participants in Teluk Kumbar, are mostly of Malay ethnicity (N=93), whereas there were seven participants who were Indian. Approximately one third of the participants (N = 31) were unemployed, 59.7% of them (N = 52) employed and nine of the participants were retired. Among employed participants, 12 reported having never worked outside the house (e.g., housewives). They were self-employed selling

breakfast food and other food hawkers. The remaining 12 participants were currently employed as government servants at the time of data collection. Eight students participated in this survey.

One-third of the participants (N = 41, 41.4%) reported currently receiving a medium level of income in between RM4000-RM7009, followed by participants reported to have medium-low (N = 30, 30.3%), and low income (N = 28, 28.3%), and one participant refused to share the income status. Most of the participants (69) were married, while 21 were single, and ten were widowed or divorced. The majority of participants were high school graduates (49%), followed by university/tertiary graduates (23%), primary school (22%), literate participants with no formal education (5%), and 1% of participants refused to answer.

Many respondents had been living for more than 20 years (N=57) in Teluk Kumbar. Ten respondents stayed in the area between 11-19 years, 19 participants lived there for 6-10 years, and the remaining 8 participants lived there for between 1-5 years. The main reason they are living in that area is that they owned (N=62) the property. Local residents in the survey experienced flooding within the last three years (94%). Among all participants, 45% had been evacuated at least 1 to 3 times in the last three years. Approximately 28% of respondents had been evacuated from their houses 4-5 times during floods, followed by 12% who had been evacuated more than 5 times. The remaining 12 participants reported no experience of evacuation. The majority (N=52) had been evacuated to the temporary public shelter at the community hall, 28 to religious places such as neighbourhood mosques. Between 18 and 8 respondents

respectively stayed at their family or friend's house and/or hotel. Table 4.4 below presents information on participants' socio-demographic characteristics.

Table 4.4: Socio-demographic representation in quantitative study

Variables	<i>f</i>
Gender	
Female	54
Male	46
Age	
21-30	22
31-40	15
41-50	18
Over 50	45
Ethnicity	
Malay	97
Indian	3
Marital status	
Single	21
Married	69
Widowed/Divorce	10
Education level	
Non-formal education	5
Primary education	22
Secondary education	49
Tertiary education	23
Employment status	
Government servant	12
Student	8
Unemployed	31
Private sector employee	28
Retiree	9
Self employed	12
Household income	
Less than RM2000	28
Between RM2001-RM3999	30
Between RM4000-RM7009	41
No response	1
House/property status	
Rented	24
Owned	62
Living period	
1-5 years	8
6-10 years	19
11-19 years	10
More than 20 years	57
No response	6

Flood experience	
Yes	98
No	2
Evacuation experience	
0	15
1-3	45
4-5	28
More than 5	12
Evacuation location	
Public evacuation centre	52
Hotel / motel	2
Family or friends house	18
Religious place	28

(N = 100)

4.3.1.4 Data entry and analysis

Once I collected my data, both primary and secondary, I began the task of data entry. As and when received, the responses from each of the questionnaires were manually recorded in a spreadsheet form and transferred to SPSS (PASW Statistics 22) software and coded in tabular form of appropriate variables (Figure 4.8). Two main methods were then used to assess the dataset:

Descriptive statistics: summaries of the full dataset (Mayhew, 1997), with responses expressed generally as a percentage of all responses received.

Non-parametric tests: "...methods of hypothesis testing and estimation that are valid under less restrictive assumptions than classical techniques" (Gibbons, 1993), used to assess where statistically significant associations exist between variables.

4.3.2 Interviews

4.3.2.1 Design of interview questions

I conducted one to one interviews with 28 representatives from 7 group classifications (government agency; community - religious; community - village and development security committee; NGO; politics; and academic institution) who were all involved in disaster risk and management on a national level in Malaysia, specifically in Penang. This to explore the complex interactions between various small and large-scale social, economic, political and environmental processes that create disaster hazard and influence disaster recovery.

The interviewed organisations were determined following a desk study of all organisations involved in flood risk management and recovery. I began by looking at many websites, newspapers, and social media in English and Malay with information on Malaysia's flood recovery and management. In both languages, I also reviewed the progress reports from NGOs and government agencies to identify key organisations and individuals that potentially became my key informants for this data collection. I intended to look at how a system, at all scales from individuals to whole communities with all their internal (social and economic structure, local government, politics) and external (NGOs, civil societies) forces, reacts to a devastating flood event and how the complex interweaved relations of their reactions shape their everyday lives and future flood responses.

The interviews were carried out to determine their specific responsibilities with regard to recovery and resilience building measures and understand why the communities were

generally dissatisfied with the flood mitigation programmes of the authorities. The interviews contained open-format questions where stakeholders were free to account for their involvement in the recovery phase of a flood disaster and their role as a stakeholder in flood disaster management. Many organisations from all over Malaysia with different expertise and backgrounds came to Penang Island to assist with disaster response and recovery. I searched for different approaches used by the relief organisations to involve the flood-affected communities in Penang Island during the emergency and recovery period (Figure 4.9, 4.10, 4.11).



Figure 4.9: Teluk Kumbar Mosque committee



Figure 4.10: Teluk Kumbar Primary School teachers



Figure 4.11: Interview with Bayan Lepas *Penghulu* and State Assembly Member, ADUN

Semi-structured interviews were conducted: more specifically, with four village committee leaders (JKKK), three political party members, two academician from public universities, and fourteen officers from government agencies departments that engaged with development planning and flood management of the Penang Island Barat Daya district. Five interviews were carried out with NGOs and one community group - religious. Interviews took place on two separate visits at the fieldwork location in Bayan Lepas, Teluk Kumbar and various government official buildings. Each interview was approximately one hour in length, depending on the responses of the interviewee. Table 4.5 shows the lists of organisations interviewed.

Table 4.5: List of key informants and information obtained

Organisation	Areas of responsibility	Information obtained
Town Planning Department (TownPlan)	Government agency	Perception on progress and challenges for disaster risk reduction and challenges for planning at the local government level, sub national and national government.
NADMA	Government agency	Development of national guidelines and recovery action plans for disaster risk reduction. Challenges in implementing certain recovery and preparedness programmes and activities.
Department of Irrigation and Drainage (Penang State)	<i>Government agency</i>	Drainage systems and river water level in Teluk Kumbar, particularly those connected to the <i>Ara</i> and <i>Bayan Lepas</i> River maintenance.
Department of Civil Works (Penang State)	<i>Government agency</i>	Standard operating procedure of flood management and construction of flood mitigation project such as river banks to avoid landslides.
Department of Welfare and Community (JKM)	<i>Government agency</i>	Temporary evacuation centre management. Flood victim's registration information. Process of distribution government aid.
Teluk Kumbar Local Medical Centre	<i>Government agency</i>	Medical-health preparation on the condition affairs at the time of disaster situation.
Meteorology Department (MET)	<i>Government agency</i>	Weather forecast and warning applications to facilitate information. Understanding on the cause of flood (rain), knowledge on rainfall, and know where the flood area is.
Fire Brigade (BOMBA)	<i>Government agency</i>	Rescue operations such as finding missing victims if reported cases of drowning victims during floods event. Flood contingency plans
Teluk Kumbar Police Officer (PDRM)	<i>Government agency</i>	Rescue operation and issues. Safety operation and assistance during flooding.
Malaysia Civil Defence Force (ANGKATAN)	<i>Government agency</i>	Training and information on flood preparedness for public, eg; community volunteer team "Single

PERTAHANAN AWAM)		Defence Emergency And Respond Team” (SDERT).
Penang State Ex-Officio Office (Local Government, Traffic and Flood Mitigation)	<i>Government agency</i>	Flood resilience program. The “Penang Bangkit Information data on construction of flood drainage system, river banks to avoid landslides, flood mitigation project and compensation, community service assistance.
State Community Convenor District Officer (Penghulu)	<i>Government agency</i>	Village development and security committee (JKKK) tasks and responsibility. Coordination at relief centres. SOP of compensation and community service assistance.
Local Council Member	<i>Government agency</i>	District planning for flood mitigation. Community engagement projects.
Teluk Kumbar Mosque	<i>Community – Religious</i>	Community involvement and function of mosque as emergency shelter
Suluk Village JKKK	<i>Community – Village Development and Security Committee</i>	Preparation for flood management operation
Masjid Village JKKK	<i>Community – Village Development and Security Committee</i>	Preparation for flood management operation
Paya Village JKKK	<i>Community – Village Development and Security Committee</i>	Preparation for flood management operation
Teluk Kumbar Village JKKK	<i>Community – Village Development and Security Committee</i>	Preparation for flood management operation
Sahabat Alam Malaysia (SAM)	<i>Non-Government Agencies</i>	Action towards environmental issues
Tzu Chi	<i>Non-Government Agencies</i>	Preparation of essential items for flood victim
Briged Bakti	<i>Non-Government Agencies</i>	Campaigns, lectures, and seminars with residents, schools, and departments on how to deal with flood emergency situations such as first aid
Global Peace Mission Malaysia	<i>Non-Government Agencies</i>	Responsibility and planning for relief aid. Engagement with other organisations. Training.
Penang Forum Steering Committee	<i>Non-Government Agencies</i>	Responsibility and planning for relief aid. Engagement with other organisations. Training.
Bayan Lepas State Assembly Office (Keadilan Rakyat Party)	<i>Politics</i>	Flood preparedness in term of budget allocation, compensation, and flood mitigation project plan.
Amanah Party	<i>Politics</i>	Transportation accessibility during rescue and evacuation. Community volunteer team (Arif) Flood preparedness.
State Assemblyman (Barisan Nasional Party)	<i>Politics</i>	Flood preparedness in term of budget allocation, compensation, and flood mitigation project plan. Engagement with Village development and security committee.
University Malaya	<i>Academic Institutions</i>	Study of politics in disaster management
Teluk Kumbar Primary School	<i>Academic Institutions</i>	Preparation of essential items for flood victim. Setup a smart support team.
Total of interviewee: 28		

4.2.2.2 Recruitment of the participants and conducting the interviews

Organisations were chosen in order to gain understanding of their perception on how government organisations, as the key organisations responsible for flood management in Malaysia, are or are not, able to meet their expectation. Moreover, organisations at different levels were chosen so that I could gain a better perspective on how they perceive each other in terms of responsibility and capacity in planning and response to the flood disaster.

Interestingly during the fieldwork, we were provided tea and light refreshments from the locals. Additionally, we were provided tours of their homes and they excitedly pointed out features of the buildings and I noticed aspects of everyday life in areas that were impacted by the flood and subsequent recovery efforts. The research assistants and I spent extended periods of time in the selected villages, attending social events as well as multiple tours and walkabouts through each village.

These observations and informal discussions provided a deeper understanding of the daily living conditions and cultural context of village life in the region, as well as a deeper appreciation of the issues and recovery processes that occurred after the flood event. This information was recorded through field notes, journal entries and photos.

4.3.3 Focus groups

4.3.3.1 Design of focus group discussion questions and guide

Focus group techniques gained support from the academic community in the 1980s when the data obtained from questionnaire surveys yielded limited information, especially in the study of human interactions with society and the environment

(Nyumba, 2018). Organising focus groups with from three to five participants was preferred since it was found to be more manageable (Krueger and Casey, 2009). In this study, participants for the focus group interviews were chosen up to six participants per discussion session since it was found to be more manageable. A focus group enabled me to explore participants' views and experiences relating to flooding impact, coping strategies, recovery, resilience, disaster assistance and their perception of various issues related to the research questions.

4.3.3.2 Recruitment of the participants and conducting the interviews

Focus group interviews with householders were held at the Teluk Kumbar Community Centre, Teluk Kumbar Primary School, Bayan Lepas Community Hall and Teluk Kumbar Mosque meeting room and Gertak Sanggul Community Hall (Figure 4.12, 4.13, 4.14, and 4.15). Prior to the meetings, arrangements had to be made to obtain authorisation to use the meeting places. The focus group discussion event participants were contacted by my research assistants. 5 focus group discussions were conducted with community members of the village, NGO, religious, education and Village Representative Committee (JKKK) groups. Mosque and Community Hall notice information boards were used for advertising the invitation letter in easily visible spots to invite participants living in areas identified as at risk of flooding for a focus group discussion.



Figure 4.12: Venue setting and preparation at JKKK Bayan Lepas Community Hall

The focus group talks were done in the Malaysian language (*Bahasa*), with the assistance of two research assistants. One female assistant facilitated the discussion in a culturally sensitive manner, while another male assistant took notes. This enabled the researcher to address participants' remarks and reactions throughout the debate immediately. After greeting the participants and explaining the meeting's aim, the moderator informed them that their anonymity would be rigorously maintained and that their comments would be audio recorded exclusively for research purposes. Mutual respect and secrecy were maintained throughout the sessions, which are necessary components of research ethics. The discussions lasted for about an hour and half and included a short break for refreshments.

Table 4.6: Focus group discussion details

No	Stakeholder	Stakeholder groups	Interest in relation to research	Numbers of stakeholders
1	Village Development and Security Committee (JKKK)	Civil society	Local leaders who have major concern in flood events in order how they cope with floods, and how the villages' residents are impacted upon.	5 representatives from each village: <ul style="list-style-type: none"> • Teluk Kumbar Village, • Suluk Village, • Nelayan Village, • Masjid Village, • Paya Village
2	Community	Resident society	Effected population/resident	5 representatives from each village: <ul style="list-style-type: none"> • Teluk Kumbar Village, • Suluk Village, • Nelayan Village, • Masjid Village, • Paya Village
3	Non-Government Agencies	NGOs – from outside of community	NGO which has participate in disaster events and have widespread network in community empowerment and flood risk	5 representatives from each NGO: <ul style="list-style-type: none"> • Penang Forum, • Water Watch Penang, • Penang Green Council, • Bridged Bakti • Tzu Chi
4	Religious	Resident society	Responsible for social responsibilities - practices of Muslim religious personality as coping strategies	3 representatives from: <ul style="list-style-type: none"> • Maqbul Mosque Committee
5	Teacher	School	Coordinator of relocation and shelter for flood victims.	6 representatives from school: <ul style="list-style-type: none"> • 3 teachers from Teluk Kumbar High School • 3 teachers from Sungai Korok Primary School
Total respondents: 24 representatives				



Figure 4.13: Local participate on survey and focus group discussion at the mosque



Figure 4.14: Focus group discussion with NGO and teacher group



Figure 4.15: Focus group discussion with Teluk Kumbar JKKK and resident group

4.3.3.3 Analysis of qualitative data

In terms of the qualitative analysis, the data were analysed using both the categorised data in the spreadsheet (i.e. examining themes within the data subset of hazard mitigation strategies) as well as exploring themes through analysis of the entirety of each interview. The interviews were translated and transcribed verbatim, with all the digital recordings of the interviews and focus group discussions were transcribed verbatim and then checked for any errors. Qualitative analysis software NVivo 7® and MS Word® were used to perform qualitative data analysis using grounded theory approach. Grounded theory approach involves coding a dataset and generating concepts and / or categories and comparing the next dataset against those categories or concepts until theoretical saturation (which means that no more addition to the domain of the category or concept is being achieved by examining the datasets anymore) is reached.

The translated interview documents provided a detailed summary of interviewee comments, allowing for detailed qualitative analysis. These interviews were coded using open coding: open coding is an inductive process whereby data and concepts in the interviews are linked and labelled based on previously identified theoretical constructs, as well as emerging patterns and trends (Morse & Richards, 2002; Strauss & Corbin, 1990). This type of analytic description involved the “identification of recurrent patterns or themes, attempting to construct a cohesive representation of the data” (Warren & Karner, 2010, p. 218). These recurrent themes were then linked back to identified issues in the research literature in order to develop interpretations of the phenomena occurring in the case study.

I used inductive process where data and concepts in discussions are linked, then I labelled based on previously identified theoretical constructs. To overcome difficulties using the software, I also had to manually read and code some of my data (Figure 4.16). The following items were used during the session to enable the participants to identify their vulnerability to flood hazards and to propose solutions: A3 sheets of paper, writing material (pencils, pens), an audio-recorder.

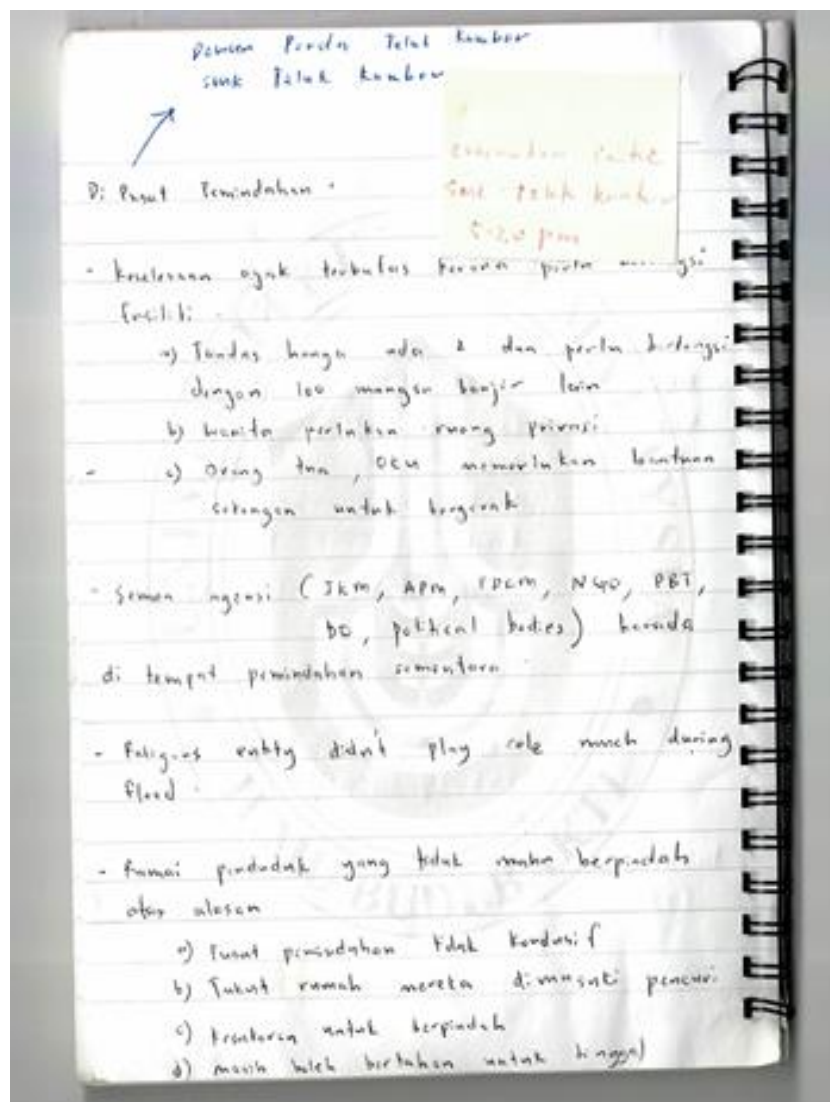


Figure 4.16: Notes during FGD

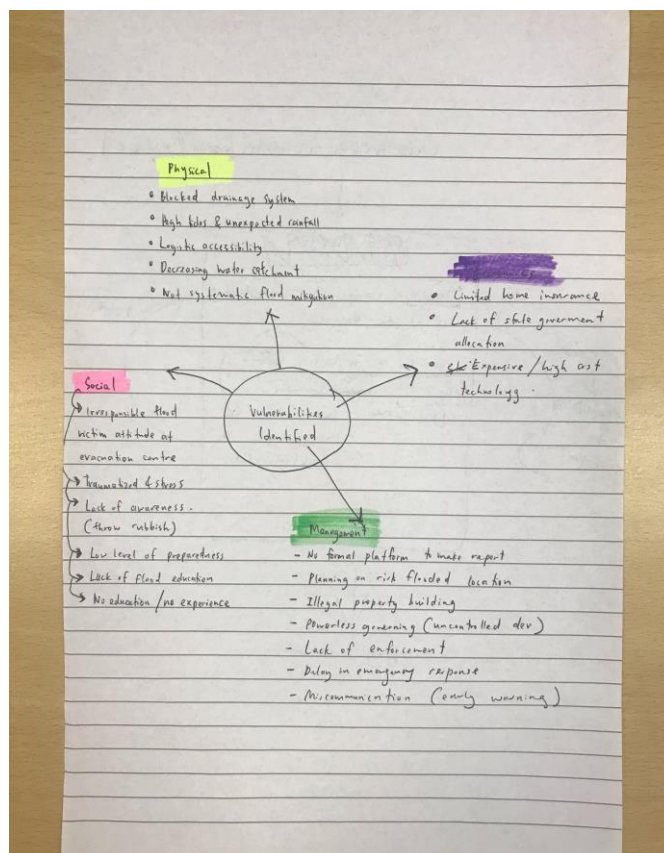
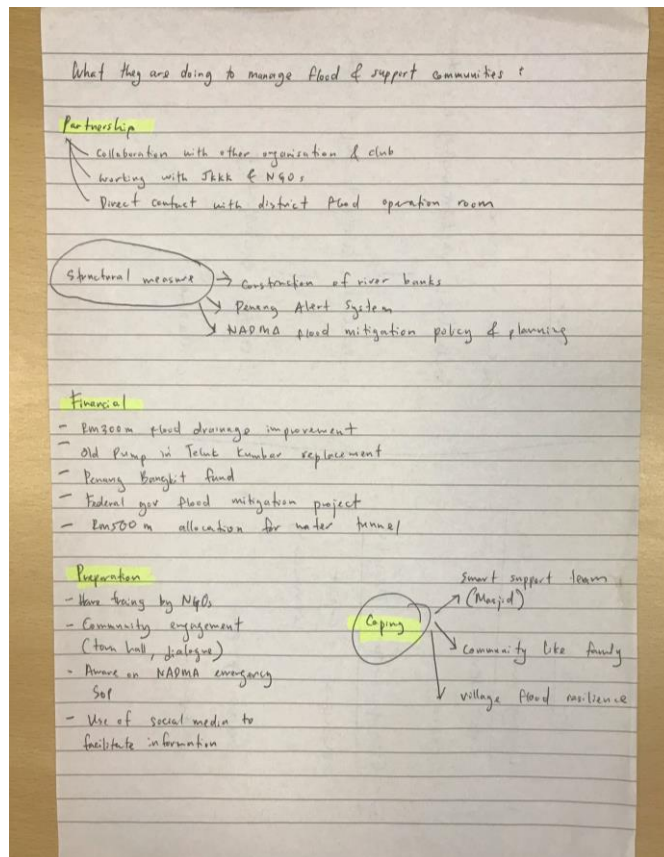


Figure 4.17: Example of early notes idea emerging from the data

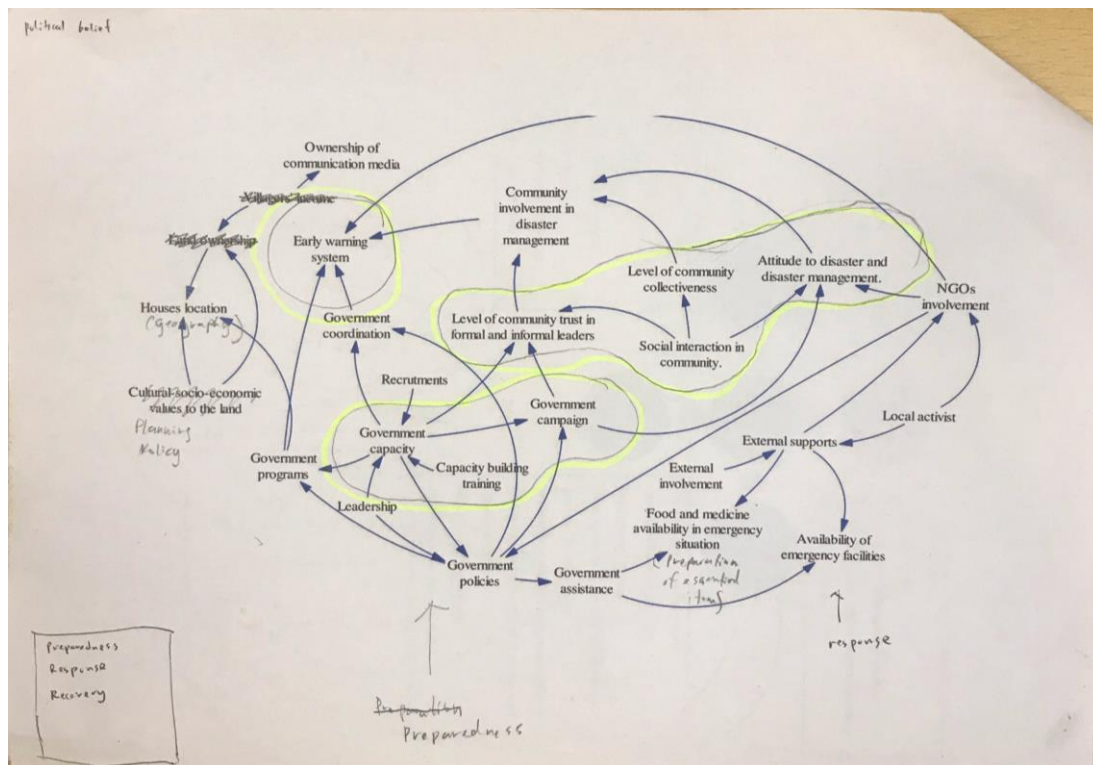


Figure 4.18: Manual mind map abstract from raw data

In order to establish an appropriate research design, the example of coding scheme used for the research is presented in Fig. 4.17 and 4.18. Referred to literature review about validity and credibility of the outcomes of a qualitative analysis exercise reveals that in addition to issues of ethics, ‘bias’ and the level of ‘objectivity’ or ‘critical spirit’ of the researcher remain the central concerns, especially in relation to feminist, ethnic and insider-outsider research. In simple words, qualitative analysis is an interpretative process, and despite use of rigorous approaches, the preconceptions, assumptions and ‘worldview’ of the researcher are likely to influence the process and any emerging theory (Lacey & Luff 2001).

4.3.4 Document reviews

4.3.4.1 Analytic methods for newspaper and local unpublished articles

Relevant local news which reported cases of flooding were obtained from the archives of local newspapers in Malaysia. Below are the examples of the most recent flood disaster impacts in Penang Island (Figure 4.19). These were used to understand the background and issues about recent flooding. The data included reports, online articles, websites, and guidance material.



Figure 4.19: Newspaper reported about flood in Penang

(Source: STAR and New Straits Times)

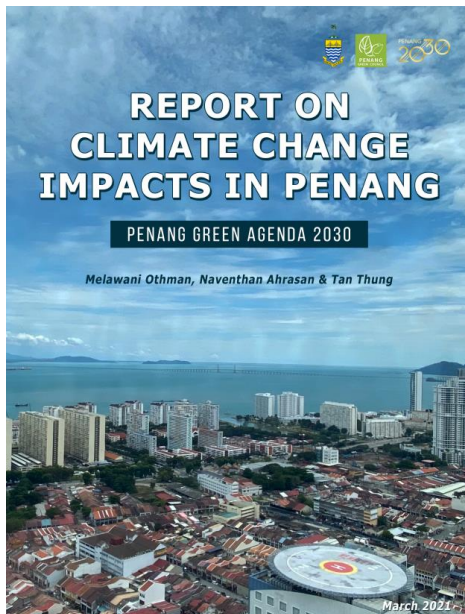


Figure 4.20: Locals article reported on Flood in Penang

4.3.4.2 Analytic methods for policies and other government documents

As published data from the three regions were very limited or unavailable, it was necessary to support the case studies with secondary data related to socio-demographic

profiles, flood-risk zones, and the frequency and severity of floods and their impacts.

Such data were obtained from the following sources:

(i) Department of Statistics Office of Malaysia (DOSM): It provided the socio-demographic profile, such as the population in each location, average household size, and the level of literacy and income level of inhabitants.

(ii) Ministry of Housing (2010): The Ministry provided flood risk area zones and land use maps/aerial imagery of the study site.

(iii) Department of Irrigation and Drainage Malaysia (2016/2017): Ministry Of Environment And Water provided a survey on flood conditions.

(iv) Meteorology Department: This service provided information on weather and flood-warning systems.

(v) National Disaster Management Agency Malaysia (NADMA): This agency provided standard of procedure of local disaster risk reduction processes, methodologies, guidelines and tools developed back into the policy framework.

Some international websites, published reports and working documents related to disaster management, reconstruction, recovery, and community were studied, such as those produced by UN-Habitat, Red Cross, UNICEF, ReliefWeb, and WHO.



Figure 4.21: Flood report from government department officials

4.3.5 Other data-collection methods

4.3.5.1 Diary notes

A reflective field diary was utilised throughout the fieldwork (see Fig. 4.22). My efforts to be reflexive and my positionality were documented. It highlighted my evolving knowledge, thoughts, emotions and opinions (following Storey, 1997). My understandings and misunderstandings of people were documented in the field diary. Descriptions of the physical and emotional space were important. Field notes were also taken during and after the interviews. Although this was time intensive while in *Teluk Kumbar*, Penang Island, these notes were important when transcribing and analysing

the data produced because I was able to recall information and insights that I had forgotten.

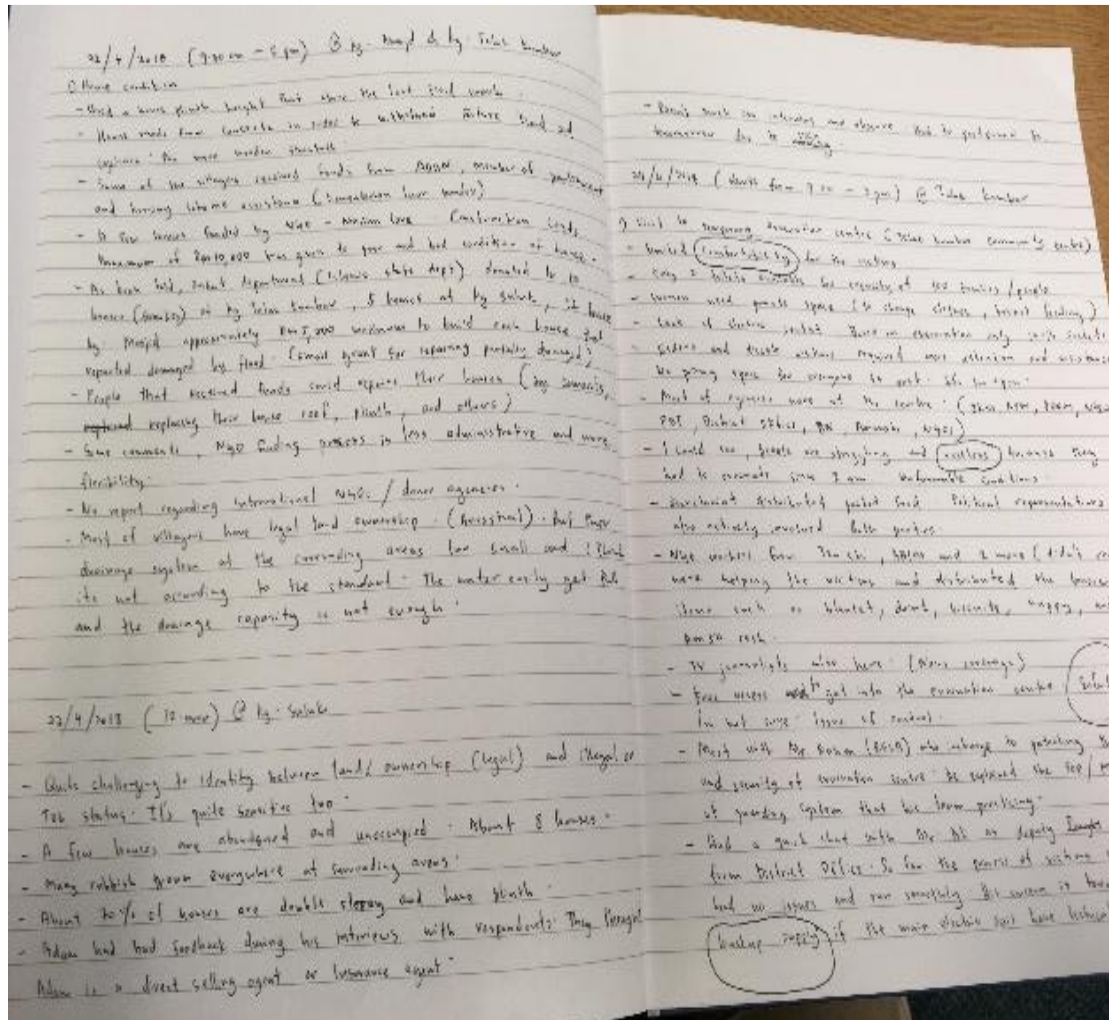


Figure 4.22: Fieldwork diary notes

4.3.5.2 Field observation

Participant observation is an extended and inductive methodology which intended studies what people say to do, why and what they are seen to do and what say to others. This is the core means by which ethnographers seek to understand the grounded social order in the context of their day-to-day lived experiences as an inquisitive insider (Cloke, et al., 2004; Crang and Cook, 2007). This extended and inductive methodology

recognises the researcher acts and learns to act in an unfamiliar circumstance as the main research tool. These characteristics are echoed in my discussions throughout this chapter. Direct ethnographic observation was used as an ongoing research method to “*provide a rounded account of the lives of particular people*” and to contribute to an overall understanding of the people and social interaction capital of Teluk Kumbar, Penang, as well as the recovery experience after the massive flood in 2017.

When I first went to my field sites just two weeks after the flood happened, I told them that I wanted to learn how they live. The houses mostly are traditionally built, with cement and wood walls structure, although a few well-off people have expanded their house’s basic structure to double storey floors (Figure 4.21). Most houses remained unchanged, but the effects of the flood were still visible in their lives. Yet the Teluk Kumbar community is psychologically resilient and there was no obvious trauma apparent in their appearance. Some thought it a luxury, some thought that I was doing a secret survey for relief distribution and some gave no thought to it.

In the first few weeks, I was not in a rush to collect data. I used to go to the tea stalls, the Teluk Kumbar local office and local bazaars, and also to the workshop sessions organised by different NGOs. These observations and informal discussions provided a deeper understanding of the daily living conditions and cultural context of village life in the 5 study areas, as well as a deeper appreciation of the issues and recovery processes that occurred after the flood event. This also support my understanding on community-level understanding of the recovery effort, and further entrench vulnerabilities and conflicts behind the data.



Figure 4.16: Flooded houses in Teluk Kumbar

I attempted to be as ordinary as possible. I had no qualms about sitting on a dusty seat or on an earthen floor. People were not overly demanding, which was the finest thing I discovered about them. They had a lot of questions for me about my family, my life, and myself. This was useful for breaking the ice at first. I watched conflict resolution in the village court, which also provided me with insight into local power relations. I witnessed many people bribing to enhance their fortunes, even though they frequently prayed to God and sought His justice.

My observations and interactions with the community really aided me in grasping local facts and settings and identifying key informants for in-depth interviews and focus group discussions. This background knowledge was also valuable in analysing the interview schedule, incorporating developing topics, and making required research strategy revisions.



Figure 4.23: Observation and engagement during fieldwork

After searching for department phone numbers on the department's official website, I was able to contact the majority of the government officers in charge. After I managed to book the dates for the interviews, I started the initial fieldwork with the ground observation phase (ethnographic observation). During my first visit to the Bayan Lepas area, I was fortunate because the level of participation and acceptance among the communities towards me was very strong. The willingness of the communities to

participate had helped my fieldwork progress run smoothly. Some of the villagers had volunteered to give me a tour of their places where it was flooded recently (Figure 4.24).



Figure 4.24: Observation and site visit with locals

Moreover, from my observation, it demonstrated greater local knowledge of flooding in that local areas which I see how communities they were living in, thus demonstrating the reflexive nature of knowledge that is adjusted based on knowledge and experience. This strategy also emphasises the value of public knowledge which is equally valuable as that of scientific, technical, administrative and political knowledge. The additional

information I sought was mainly related to flood politics and information which could be useful during a flood event.

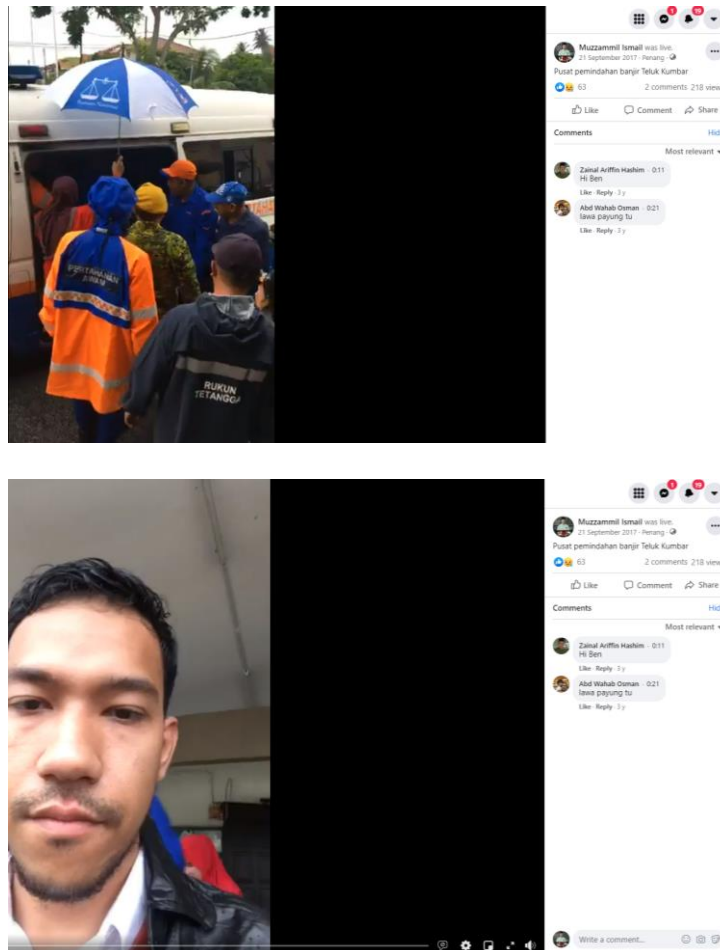


Figure 4.25: Video recording during flood event

The information gained from my interviews with the local community enabled me to narrow down my ethnographic observation understanding of how the community view the issues around flooding, mainly in the *Teluk Kumbar* area. I documented selected communities with video, photography, and diary entries, attending social activities such as *gotong-royong*, small discussions, and meetings with people (Figure 4.25). Taken together, these informal chats were invaluable resources for developing a more nuanced understanding of the challenges. Based on the field observations, most of the residents

of these sites were Malays, and large numbers of them were blood relatives with strong social relationships.

4.4 Ethical Issues, Limitations, and Challenges

The households' confidentiality and anonymity were maintained. The homeowner's name, age, income, and ethnic origin were not elicited during the survey, ensuring interviewees of their privacy and respect. The principle of informed consent, which states that an individual should be free to participate or decline to respond, was followed throughout this investigation.

When working with diverse social groups in a community, recruiting volunteers for focus group interviews and interactive activities can be problematic. Rabiee (2004) noted that low-income participants frequently lack confidence and self-esteem. This was overcome in this study by myself making regular site visits to develop confidence with community groups and reassure participants of their anonymity. In other ways, it also aided the researcher's confidence in proceeding with more investigation, as the locales were deemed unsafe.

My interactions with them during the interview process proved to be difficult. Logistics and transportation issues were frequently encountered. In one instance, the research assistant and enumerator became unwell, necessitating a delay in the survey process. Because the majority of individuals worked during the day and were engaged with domestic tasks in the evenings, it was most convenient to see them in the late evenings

or on weekends. As a result, door-to-door visits were primarily conducted in the evenings and on weekends.

One of the lesson that I received during the fieldwork is the research area's culture and societal milieu also influenced respondent replies. There were issues linked with respondents feeling uncomfortable in expressing their ideas regarding income, cash, and savings, particularly among the poorer, more disadvantaged households. In lieu of providing compensation or gifts to households that participated in the research, the decision was made based on recommendations from other Malaysian academic colleagues, to provide a KFC voucher for each participant (Figure 4.26).



Figure 4.26: Voucher for questionnaire participant

4.4.1 Participant consent

Before the interviews began, I prepared and verbally delivered my ethical statement to all participants in the fieldwork. I obtained oral informed consent from all respondents and stressed the need of maintaining anonymity and using pseudonyms for my thesis. I had prepared a variety of questions for the various types of folks I would interview in the communities (key informants and individuals). Additionally, I had a set of questions for donors, INGOs, and practitioners that I was able to use successfully with minor modifications.

4.4.2 Research assistant

For my three months of fieldwork, I assigned two educated Universiti Sains Malaysia students who spoke Malay and English. Both of them spoke reasonably excellent English, and before conducting interviews in the villages, we discussed about my study focus, research questions, and amended fieldwork questions. It was critical to me that they recognised my motivations for investigating and learning. They assisted me in translating the fieldwork questions into Malay and in revising the English translation. We then discussed the questions and vocabulary once more to ensure that the translation was consistent.

In actuality, the research assistants supplemented my "eyes and ears" and served as my "cultural broker." I relied largely on their ability to persuade communities to complete the questionnaires; their desire to collaborate on the study project enabled us to collaborate and ensure the successful fieldwork based on Turner (2010). Throughout the fieldwork, I was conscious of their positionality and how their beliefs and attitudes

regarding the topics covered and persons questioned would influence how they understood and answered any questions I had.

4.5 Summary

This chapter discussed and justified the study's methodology. Case studies in Teluk Kumbar, along with a mixed-methods approach, were found to be the best suitable for answering the study questions through in-depth analysis. A framework for the study design was created to demonstrate the various steps that would need to be followed throughout the research effort. Findings were gathered through participatory activities in which participants from Teluk Kumbar who were directly impacted by flooding discussed specific issues and shared perceptions and ideas, assisting people in taking the appropriate actions, particularly with regard to flood management and response. In the next chapter, I will include a presentation on the interconnectedness of Teluk Kumbar's community and organisation in response to flooding.

CHAPTER FIVE

Chapter 5: Interconnectedness Of The Community In Response To Flooding

“We’ve been here for 20 years or so together. I mean, we provide assistance each other.”

– Haji Mokhtar, Mosque Imam, 19 May 2018

This chapter quantitatively explores the link between community and organisation in responses to flooding. This chapter starts by presenting the results of the questionnaire survey in order to evaluate the perception and preparedness of the local community in the Teluk Kumbar, Penang to face the vulnerabilities of recurrent flooding in the island. An analysis of questionnaire survey is presented based on 100 responses living in Teluk Kumbar that were directly affected by flooding in 2016, 2017 and 2018. It was hypothesised on the possible impact of flood disaster and experiences on disaster risk reduction mechanism concerning the aspect of (a) evacuation experiences, (b) financial and non-financial assistances, (c) coping, (d) risk management, (e) social capital, (f) local’s awareness, and (g) media usage would be inversely related.

5.1 Experience of Flooding

I began the study by looking at how floods cause displacement and a prolonged stay in evacuation centres for many impacted households. The factors of people's exposure to floods and their vulnerability and resilience to flood disasters have a positive and statistically significant empirical association with flood experience. This is especially crucial for groups who may not have the same level of access to fundamental social and economic services as others.

5.1.1 Experience and evacuation

The questionnaire attempted to assess the spatial pattern of flood impacts in the Mukim of Teluk Kumbar. The communities had lived in Teluk Kumbar for decades and have frequently experienced flooding every year, with the 2017 flood the most devastating flood event in recent history. The majority of respondents (n=45) replied that they had been evacuated at least 1-3 times for the last three years in Teluk Kumbar. As can be seen from the table 5.1, fifteen people stated they had no experience of being evacuated. Participants were asked about the place they preferred to stay during the flooding. According to the interviewees, majority (n=52) chose a public evacuation centre (community hall) as the place where they should safely stay during the evacuation. This indicates that the majority of participants had no trouble to choose a suitable shelter in response to flood disaster needs.

Table 5.1: Flood experience

Severity	Frequency
0	15
1-3	45
4-5	28
More than 5	12

The data therefore shows there are a number of sources of flooding in the Penang. Based on community perspective, this situation can be exacerbated with excessive rainfall such as the event of 2017. The data suggest, people ranked heavy rainfall as the main cause of flooding in area. According to the interviewees, it then followed by improper drainage, tide, blocked drainage, uncontrolled development, and lack of water catchment. Indeed, this draws attention to the fact that multiple sources of flooding

introduces varied hazard source therefore makes preparedness, mitigation, and risk reduction measures particularly required to adopt.

Table 5.2: Sources of flooding (according to hierarchy)

Factor of flooding	Hierarchy						RANKING
	1	2	3	4	5	6	
Heavy rainfall	59	24	11	3	1	0	1
High river water (tides)	0	24	45	24	3	2	3
Improper drainage system	37	30	17	14	0	0	2
Blocked drains (trash)	1	15	17	25	20	20	4
Rapid development	2	5	5	22	53	11	5
Lack of water catchment	0	4	2	9	20	63	6

The communities live with floods and know how to cope with them. With this information, I intend to proceed with a comprehensive assessment of flood impacts on assistance, losses, recovery interventions, and adaption measures, among other things.

5.1.2 Financial and non-financial assistances

It can be observed through the survey that 49 of survey respondents still relied upon formal assistance from government for financial support. Research conducted has also shown that the local communities' had expectation that the organisation such as NGO and religious institutions would help to support them.

Table 5.3: Financial assistances

Stakeholders	Frequency
Family within community	10
Neighbors	1
Organisation (religion, NGOs, etc)	31
Government	49
Would not need help	1
Not answered	6

They consider that financial assistance from the government remains important due to financial pressures. The assistance should come from the authority such as repairing flood damage to buildings, business losses due to activity disruption, and tangible losses which involving items with a monetary value. The alleviation measures the participants mentioned can be cash compensation, business support schemes, building or asset repair and renew grant, which support the community to recover and improves ability to withstand future flooding. While 6 respondents chose not to answered financial source of assistances.

Table 5.4: Insurance, compensation and financial assistance - have home insurance

Home Insurance	Frequency
Yes	11
No	72
Not answered	17

From the respondents' responses in questionnaire survey (n=72), it was deduced verbally that the majority of participants doesn't have disaster insurance, not willing to have insurance. This might be some of the villagers are incapable of paying the insurance premiums due to their financial situation.

From the information presented in Table 5.5, it can be seen that a number of respondents agreed to choose the government as their first choice selection of non-financial assistance such as access to information, preparedness practical support, and basic need items supply. This is achieved by analysing the responses of the participants who choose government actor (n=34) and organisations (n=27) that remains important as source of non-financial assistance option.

Table 5.5: Non-financial assistances

Stakeholders	Frequency
Family within community	8
Neighbors	17
Organisation (religion, NGOs, etc)	27
Family outside community	1
Financial or corporate bodies	7
Government	34

From my survey (refer Table 5.6), respondents did not rely on family and corporate bodies to receive financial support as they believed that the government is the only actor that can plan strategically to help them recover from flood crises. It is interesting to notice that the community preferred contact with formal authority, for rescue (n=33) and the local authority (n=32) in order to seek any flood assistance. According to the flood affected sample population in Teluk Kumbar, it was observed that only 10 respondents choose to contact politicians. However, an important factor is that locals predominantly choose to communicate with their community leaders (n=30).

Table 5.6: Preferable seeing for assistance

Evacuated places	Numbers of respondent choose
Local authority bodies	32
Rescue bodies	33
Community leaders	30
Politician	10

5.2 Coping Mechanisms

5.2.1 Flood-adaptation strategies

Different forms of preparation and adaptation were noted from the responses based on the 2017 flood incident the occurred in Teluk Kumbar. Throughout the survey, the residents were asked to detail the precautions they have taken to keep their homes safe from flooding. The following table 5.7, shows the majority of respondents took different approaches to preparation.

Table 5.7: Coping-preferred adaptation strategies

Insurance	Less preferred	Moderate	Most preferred
Remove possessions from ground floor	20	5	74
Evacuate to safer grounds	9	3	87
Place flood guard (plywood/timber)	6	23	48
Make furrows at the backyard or front space	14	23	31
Avoid keeping sentimental possessions, animals	20	18	60
Listen and alert to media	14	10	74
Move to temporary shelter	16	7	74
Permanently moving to another flood free area	46	11	40
Move to neighbour, friend, relative place	37	12	38
Stockpile food and necessary items	16	11	71
Permanent changes to the ground floor interior	33	24	42
Develop flood management plan	30	30	38
Keep emergency materials	11	28	59
Didn't do any preparation at all	61	14	15

It can be seen that 74 respondents preferred removing their possessions from the ground floor, 87 respondents also preferred to evacuate to safer grounds. Other methods included placing flood guards and making furrows at the backyard or front space (31 and 60 respondents respectively). A similar number of people removed possessions from the ground floor, were attentive to alerts from the media and moved their items to temporary shelters. Although, it is noted that 46 and 37 respondents respectively moved to another flood free area permanently or to a neighbor's or relative's place. Another popular action (71 respondents) was to stockpile food and necessary items and 42

respondents permanently changed the ground floor interior. 38 respondents also developed a flood management plan and 59 respondents happened to keep emergency materials. It is important to note that 61 respondents did not have any preparations at all.



Figure 5.1: Resident showing one of their coping - water drain idea

Households used different methods to save their belongings. Due to the varying heights of floodwaters, one of the interviewees stated that their family had raised the floor of their bedrooms as well as the platform of the kitchen and pantry. My observations in the field also demonstrated that local or indigenous coping mechanisms are frequently effective, for example one resident showed me where her family managed to channel out the flood water in their house very fast with a hole they built in every room (Fig.

5.1). As a result, flood water that fills the interior of the house is discharged directly into the ditch outside the house.



Figure 5.2: Villager in Masjid Village built higher rack (*para*) to avoid flood water

It was discovered during the field case study that some of the people have their own coping strategies to protect their home utensils and valuable items from flood water, which locally called as '*para*' (Figure 5.8). Almost every year, the village is flooded by water from the two rivers (*Sungai Bayan Lepas* and *Sungai Dua*) covers the land surface at high speed, often with less than 3 hours warning, providing residents with little time to leave with their possessions. As indicated by a few interviewees, in order to increase the capacity to respond to flooding effects, they devised their own protective mechanisms against flooding. The usage of coping strategies demonstrates a significant pattern in how various Teluk Kumbar households react to flooding. During

emergencies, these residents are used to employing a variety of indigenous strategies based on their previous experiences facing floods.



Figure 5.3: House built with retention wall at surrounding



Figure 5.4: Houses in Teluk Kumbar with retention wall and raised high platform

It was reported that a variety of actions had been taken; some common actions included the installation of weeping tiles or foundation drainage pipes, the installation of a sump pump and ensuring that it drains away from the house, raising the height of new or renovation construction, and not storing valuable items in the basement or crawl space. It is reassuring to learn that residents have reported that they have implemented these precautions.

5.2.2 Social capital

The responses from the community demonstrated that different forms of social capital contribute to people becoming resilient (Table 5.8). People in Teluk Kumbar have naturally learnt how to care for each other more than ever and how to tackle challenges together. In Teluk Kumbar case study, social capital refers to a variety of formal and informal social links that exist within a particular community and contribute significantly to bridging to other groups.

This finding is consistent with the statements made by researchers such as Putnam (2000) and Aldrich (2012) in their respective writings on the subject. His view of social capital is that social capital as trust, networks and civic engagement. Aldrich' main sources of interpretation was there needs to be a balance of trying to build community resilience through enhanced social capital and interfering with the dynamics on a local level.

Table 5.8: Social capital

Social Capital	Less preferred	Moderate	Most preferred
Willing to help their neighbours during flood event	17	11	81
Ready to respond to the community's needs	9	14	75
Community doesn't get along with each other during disaster recovery	49	31	19
Local community groups provide effective support and communication between other organisations	9	35	55
Supporting those in greatest need after a disaster would be a priority for my community	8	32	59
Community would not cooperate	25	41	31
Community has a feeling of being left out from government support	25	56	17
Government allows us to participate in environmental decision making	12	56	31
Did not participate	60	14	12

It is possible to examine the preference of the respondents when it comes to the type of social capital mentioned. It is clear that most of the interviewees, 81 and 75 respondents respectively, were willing to help their neighbours during a flood event and are ready to respond to the community's needs. The circumstance of stronger sense of togetherness and social capital are also relevant; 49 respondents expressed that they don't agreed with the statement that 'community does not get along with each other during a disaster recovery'. It was surveyed that 55 respondents preferred that local community groups to provide an effective support and communication which created stronger social bonds among community members. In addition, most people were very proactive in evacuating their neighbours, as is evident a total of 59 respondents choose to support those in greater need and would be a priority matter during a crisis.

The exceptional information in this table displayed some participants expressed they moderately argued, would have a community that would not cooperate (n=41); moderately would have a feeling of being left alone (n=56) as well as thought of government allows everyone to participate in any form of environmental decision making (n=56). Furthermore as indicated, 60 respondents didn't agree with that community 'didn't participate in any form of social capital' which clearly emphasises the social capital that contributes to the resilience of their communities.



Figure 5.5: Neighbours helping each other in Teluk Kumbar

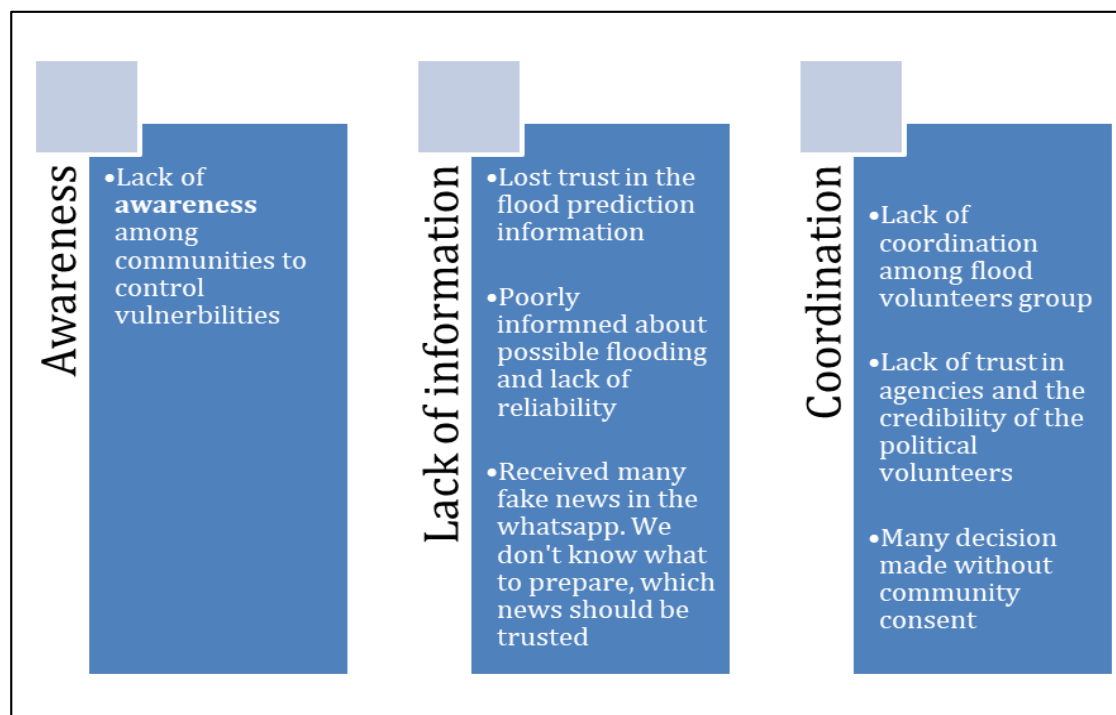
(Source: Teluk Kumbar Penghulu)

Almost all the people interviewed with the survey reported that they were willing to help and give support to each other. Indeed, it was discovered that the spirit of giving, support, and solidarity, which is rooted in local community traditions, contributed to sentiments of togetherness. On the other hand, this indicated the importance of family bonds, empathy, and neighbourhood belief and spirit in building resilience to flood disasters, particularly in the post-disaster period (Kirschenbaum, 2006).

In general, there was a strong sense of community in Teluk Kumbar; people had learnt from the calamity that it is extremely vital to stay together. However, the interviewees highlighted that the support from the government (relief response) in all five study areas was not ideal, and there was a lack of mutual trust among their own communities. Thus, it was widely assumed that local communities would be eager to assist in the restoration of devastated villages and to cope among themselves.

5.2.3 Restrictions to minimise the impact of flooding

The responses on the restrictions faced by the community provide an in-depth perspective on what limited resources were available for taking preparedness and response actions. In reality people have different perceptions about the ways in which they may be able to reduce the number of disturbances.



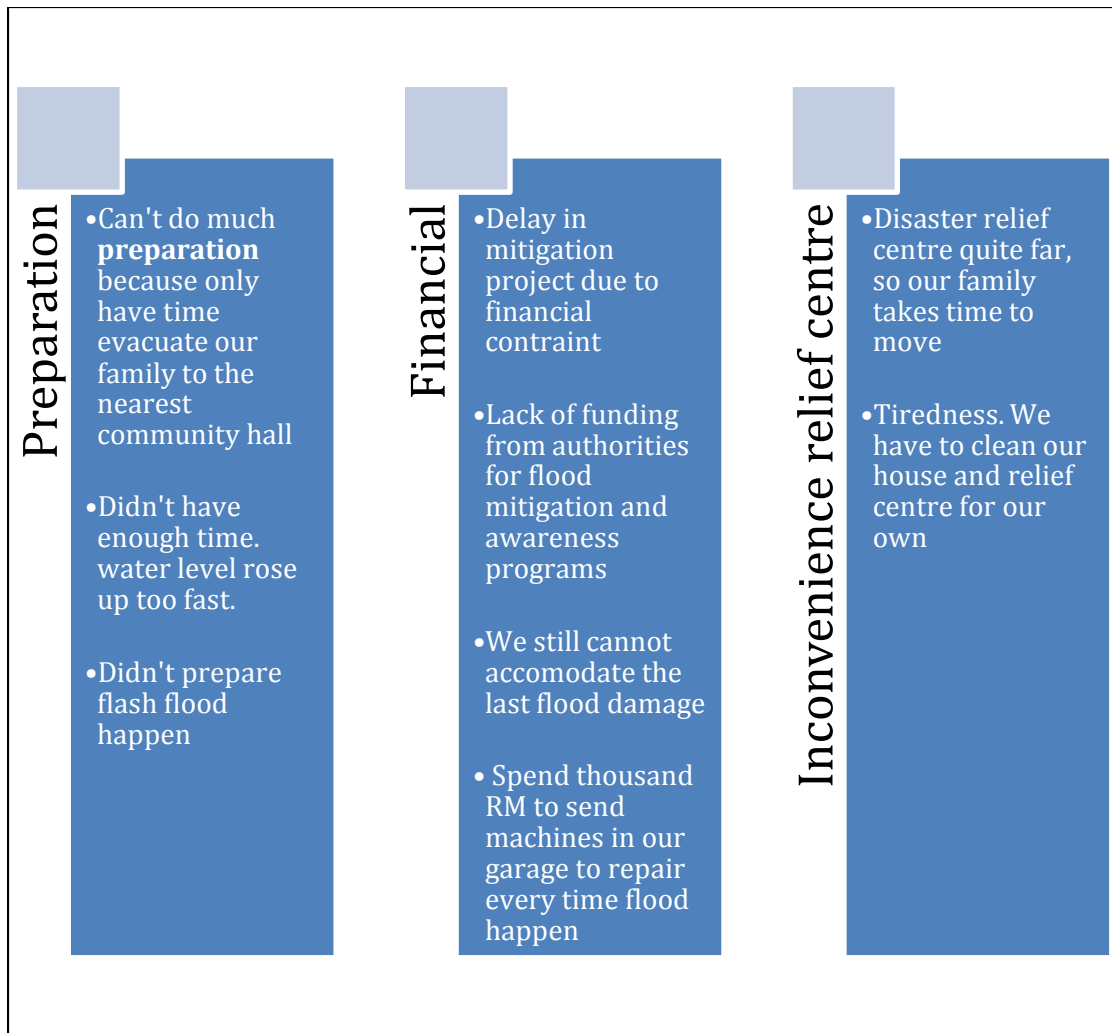


Figure 5.6: List of restrictions to minimise the effects of flooding

Respondents expressed that the flood was very sudden and they were flooded during one night. During this flood the community faced hardships, particularly with loss or disruption of their livelihoods for an extended amount of time. Figure 5.6 presents a list of restrictions utilised to minimise the effects of floods. The first restriction is the lack of preparations as many are not able to do much because floodwater entered their houses very quickly, which did not allow enough time to evacuate their entire families to the nearest community hall. Other factors influencing this include the water level rising too fast.

Another restriction is financial constraints. Due to financial constraints, there is a delay in the mitigation of projects. There has also been a lack of funding from authorities for flood mitigation and awareness programmes. The third restriction was the inconvenience of the relief centre. There are two factors to this restriction, the distance of the relief centre can be far away from most residential areas and a certain amount of maintenance is required when it comes to sustaining the relief centre.

Other restrictions noted include the lack of awareness and poor quality of information and coordination that is present in most circumstances. Due to a lack of useful information and fake news, many people have lost trust in flood prediction information which results in many people not being able to know how and what to prepare. One of the last restrictions is the lack of coordination among flood volunteering groups. This occurs due to a lack of trust in the relevant agencies and the lack of credibility of political volunteers. In overall, people could be stranded by the flooding and face the risk of accident and suffering due to poor coordination, lack of advance preparation, short response time, very limited connections, and limited capacities.

5.2.4 Importance of community involvement

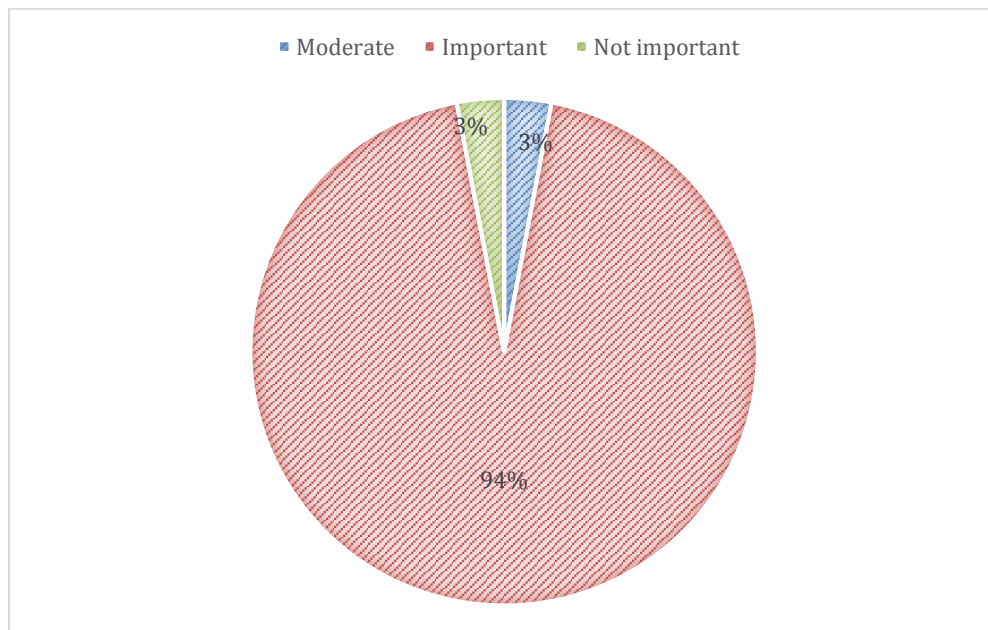


Figure 5.7: Importance of community involvement in responding to flooding

Figure 5.7 represents the importance of community involvement in response to flooding. The research conducted concluded that 94% of the respondents considered the involvement of the community as important. It was found that the community in Teluk Kumbar has a strong sense of community reciprocity, trust, and connections capacity to enhance the acceptability of flood risk and leads to better bonding social capital. Notwithstanding, the findings have been summarised into a sense of coping, and certainly, the resilience of the devastated communities will be improved.

5.3 Flood-risk Management

This section explores the level of flood awareness and satisfaction of the respondents about the availability of information. Findings indicated that people were aware about

the flood risk and flood-related information was appropriately communicated about a range of protective and preventive measures.

5.3.1 Awareness

In this section I examine flood-risk management in more detail. There are numerous formal and informal sources of information that can be gathered, including the news media, experts, social media, government officials, and friends and family members (Howe, 2011).

Table 5.9: Locals' awareness of flood management

Awareness	Disagree	Moderate	Agree
Aware that live in a flood risk zone	1	8	89
Increase in the number of floods	2	4	92
Understand the flood warnings	13	31	54
Flood warning information is easy to understand and readily available	21	30	47
Cannot rely on government	32	26	37
Local infrastructure in my neighbourhood is satisfactory right now to handle the flood and effective	22	41	35
Authorities have acting fast to reconstruct	15	46	37
Government should invest on educational programmes	4	22	72

A large number of respondents indicated, 89 respondents aware that they live in a flood risk zone, while 92 respondents affected by increase in the number of flood incidents that have been occurring over the recent years and 54 interviewees understood the issue of flood warnings respectively (Table 5.9). Though to a moderate extent, a total of 41 agreed that local infrastructure in the neighborhood is satisfactory at the moment to

handle a flash flood effectively. In general, these interviewees (n=46) believed that government initiatives were moderately well organized with some improvement needed and authorities have done the best to conduct any form of reconstruction. The last piece of information that is worth noting is that 72 respondents highly agree that the government should invest more in educational programmes to improve the flood risk awareness and preparedness. Some of the efforts of local government (see, Figure 5.8) to strengthen community capacities in order to reduce the risk of flood hazard, increase preparedness, and enhance mitigation efforts.

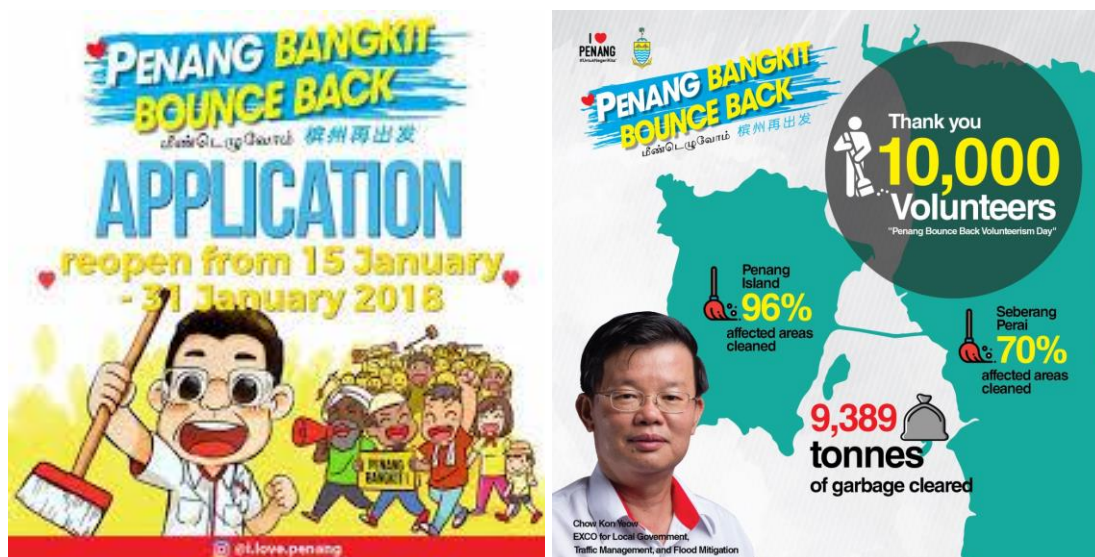


Figure 5.8: Penang State government flood awareness campaigns

(Source: Penang State Government Website)

5.3.2 Flood information communication

The results also show that information and communication approach can be obtained via a multitude of formal and informal means. The news media, experts, government officials, and phone calls and text messages from friends and family, according to Howe

(2011), are the primary sources of immediate information. The findings of the case studies revealed that the majority of the interviewees would prefer to get better access to information through their close family members, other relatives, neighbours, and news from newspaper, television and radio (Figure 5.9). The flood information is crucial for identifying damaged areas, expediting relief distribution, and assisting front-line responders in accelerating recovery during a flood danger.

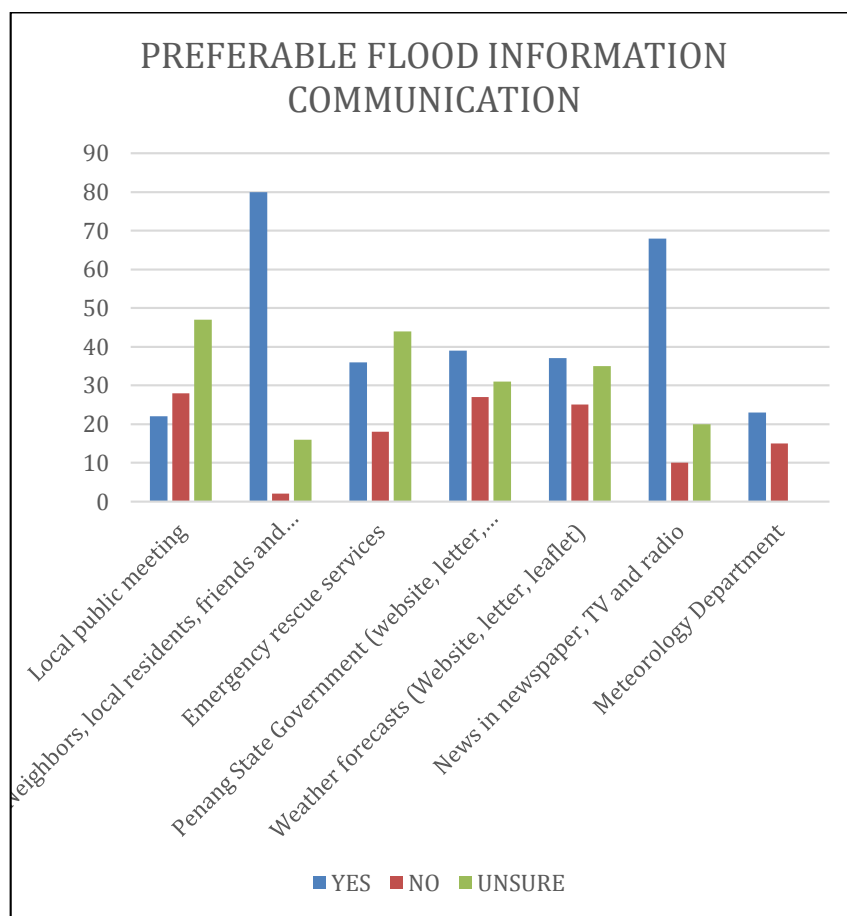


Figure 5.9: Preferable flood information communication

5.3.3 Media usage pattern

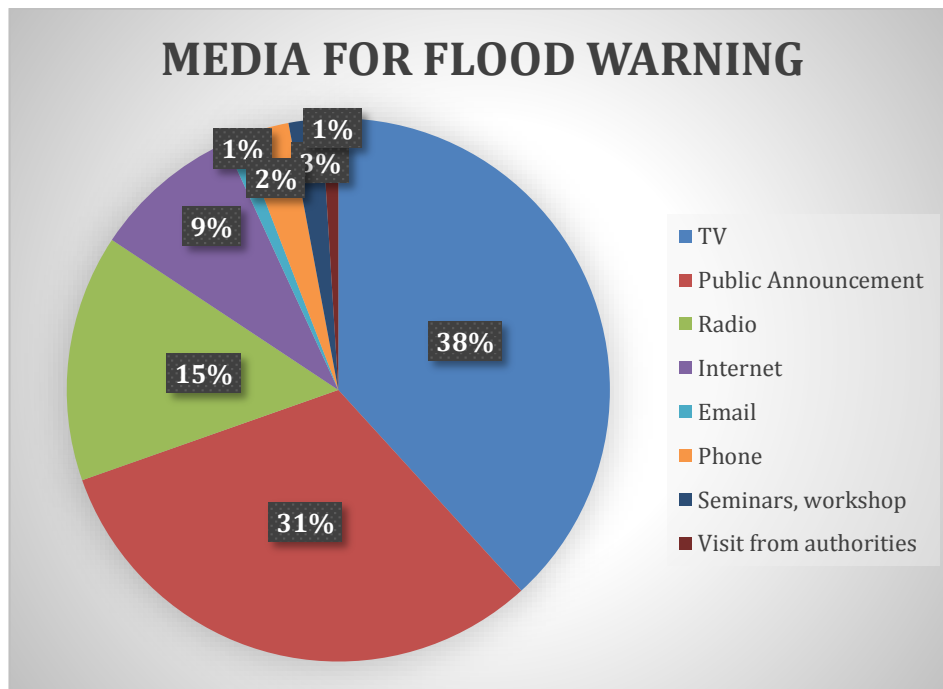


Figure 5.10: The most appropriate media for flood warning

Figure 5.10 shows a pie chart of the most appropriate forms of media during a flood warning identified in the survey. The dominant forms of media preferred consist of the radio (15%), public announcements (31%) and 38% (TV). The following forms of media were much less preferred; the internet, email, phone and seminars or workshops, as well as visits from authorities. As noted earlier, this has significance for local government disaster communication authority to reach the population at risk of flooding through traditional media, not only new media such as email or phone SMS.

5.4 Impact Of Flooding

5.4.1 Recovery and total loss

Massive floods may lead to displacement and household's property lost. Out of the recorded responses, 43 respondents lost between RM501-RM1000. Further, 31 of the respondents indicated losses below RM500. From the responses shown in Figure 5.11, it can be observed that less than ten respondents' losses were more than RM4001.

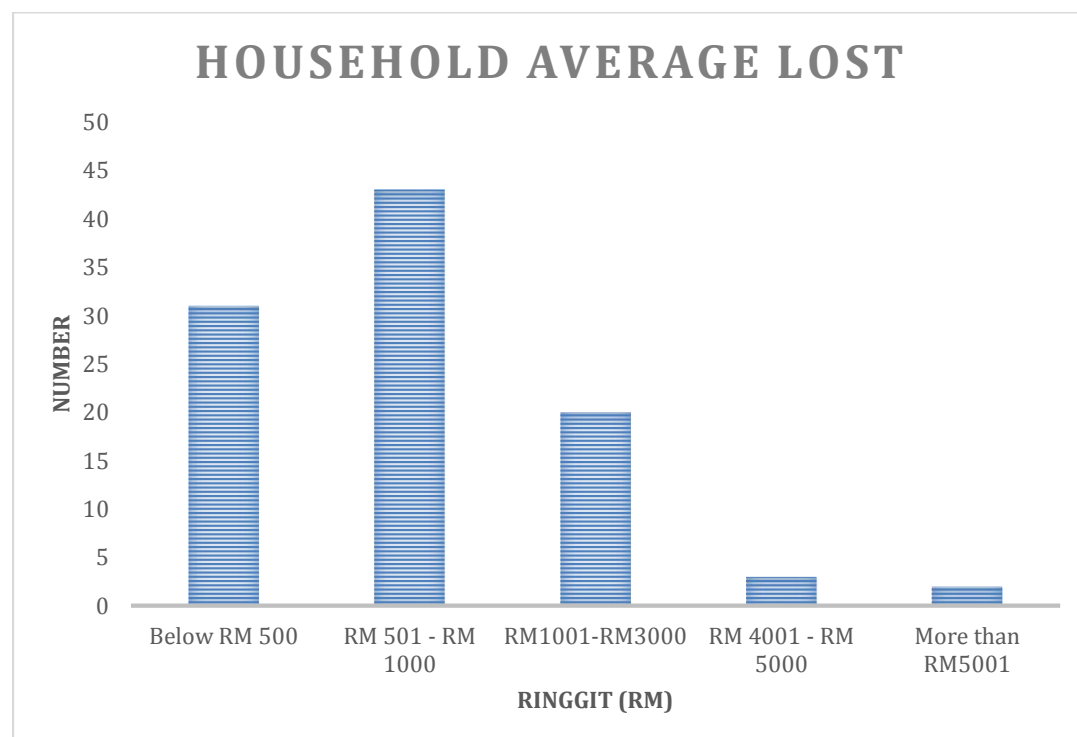


Figure 5.11: Household average loss during the 2017 flood in Penang

Noteworthy is the very strong positive association that locals had taken some preventive or protective action to limit the losses; even they perceived their area to be at medium to high risk of flooding. Also evident was that the community members needed to buy some equipment, furniture, and to repair or reconstruct their houses. According to this research, the efficiency of household emergency assistance and relief aid, which can

sometimes be delayed, is the key consideration related with post-disaster household recovery.

It is also important to consider how quickly those impacted by flooding return back to normal from a flood disaster. (Figure 5.12) The majority of respondents agreed that their house was back to normal within weeks (n=61). The recovery process took around one to three months. Once the flood water receded the area was left with dirt, waste and damage to non-replaceable items or furnishings. Based on the interviews, the community received assistance from the various stakeholders, agencies, including military and volunteers to operate the post event relief.

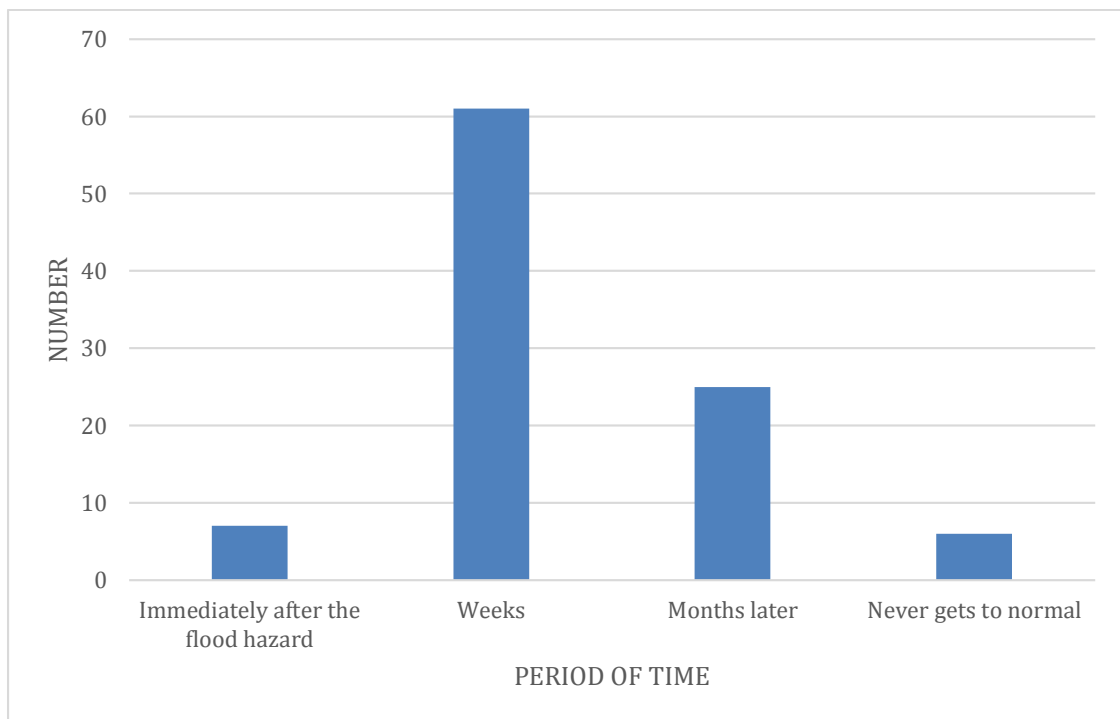


Figure 5.12: Recovery - Back to normal

However, six respondents noted that their house never returned to normal. The majority of the respondents, (n=62) expressed the community started returning to normal life at least after weeks. Less than ten respondents expressed that they were able to return to their normal life immediately after the flood event.



Figure 5.13: Post-flood conditions in one of the study area sites (Source: Penghulu)

5.4.2 Recovery and assistance

Table 5.10: Received recovery programme

Recovery program	Numbers of respondent
Health care	26
Disaster preparation and management	14

Flood aid	85
Financial aids (financial grant, soft loans)	34
Employment/economic development	1

With reference to Recovery and Assistance, based on the collected data, and as shown in Table 5.10, most interviewees (n=85) received recovery programs available which is flood aid initiative that contributed to a faster recovery. Whilst, only one respondent received employment and economic development recovery programme. From the table above, the result can be interpreted that during the flood there are many organisations (government agencies, NGOs, corporate bodies, individuals) that helped the communities, mainly with different relief goods. However, only the government provided financial support such as compensation or small financial loans/grants to the community.

Table 5.11: Response on programme availability

Know about programme	Yes
Aware about programme	4
Willing to participate	86
Household willingness to participate	13
Program availability near to residential area	85
Distribution of aids – bias due to politics	12
Distribution of aids – bias due to ethnics	14

It was observed that the majority of respondents were willing to participate, but not aware about the programs available. Table 5.11 refers to the magnitude of responses on programme availability. Only four respondents were aware about the programmes, although 86 people were willing to participate in these programs. It can also be observed that, few respondents believed that there was a political bias or racial unfairness towards flood disaster aid distribution. This indicates that communities from all sites were acutely aware of the need for recovery support and training and were willing to engage. Figures 5.14 and 5.15 illustrate disaster hazard awareness program in schools organised by an NGO – Mercy Malaysia and the local school respectively.



Figure 5.14: MERCY disaster preparedness workshop at Teluk Kumbar Primary School

(Source: Teluk Kumbar Primary School)



Figure 5.15: Student flood awareness training course in Sungai Batu Primary School
(Source: Sungai Batu school teacher)

Table 5.12: Government assistance

Insurance	Yes	No	No Response
Receive government compensation	69	28	3
Receive government assistance (other than compensation)	33	63	3
Receive government advice	13	84	2
Aware about flood management policy	32	65	2

In table 5.12, it is possible to examine the presence of compensation and government assistance. This table shows that 69 people received government compensation. However, there is still a significant amount of people not receiving government

assistance or advice. As expected, 65 people responded that they were not aware about the flood management policy.

A significant difference was also observed between interviewee replies to questions about sources of assistance and aid during the flood events and the value of government activities in assisting those affected by the crisis following the disaster. The majority of the interviewees at Teluk Kumbar reported that the government, either state or federal government, responded to disburse cash compensation to the families, although the process was somewhat delayed.



Figure 5.16: Invited by a NGO aid programme during the flood event in 2017

According to key informants, the non-governmental organisations (NGOs) delivered housing supplies and provided relief and other services, such as non-perishable food supplies and drinking water, blankets and beds, household appliances and home cleaning, as well as mental support to those affected by the disaster. Moreover, the

NGOs provided aid and assistance to the afflicted areas, which were highly active and had an effective network in place.

5.5 Understanding Socio-Demographic Characteristics Relationship With Coping And Adaptation Capacity

As discussed in the theoretical chapter, socio-demographic characteristic significantly affect coping mechanism, awareness, flood risk management, recovery capacity and risk communication perception (Lindell & Whitney 2000; Ahsan, 2013; Ajibade, McBean, & Bezner-Kerr, 2013; Pandit, 2014; Rapaport et al., 2018). In order to test the relationship between two or more groups of variables, cross tabulation, chi square, and ANOVA test were used to analyse the categorical and ordinal data sets. All of the cross-tabulations were used to support assumptions in this research and develop a better understand of whether people from different socio-demographic characteristics differed in the frequency with which they agreed or disagreed with the statements about disaster responses.

5.5.1 Effects of age – preferred media use and awareness

This subsection assesses whether the age of respondents had a significance effect on the choice of media for flood awareness and warning. As discussed in the theoretical section, socio demographics factors such as age, gender and education have a tendency to influence the use of media, particularly related with flood awareness and warnings (Pandit, 2014).

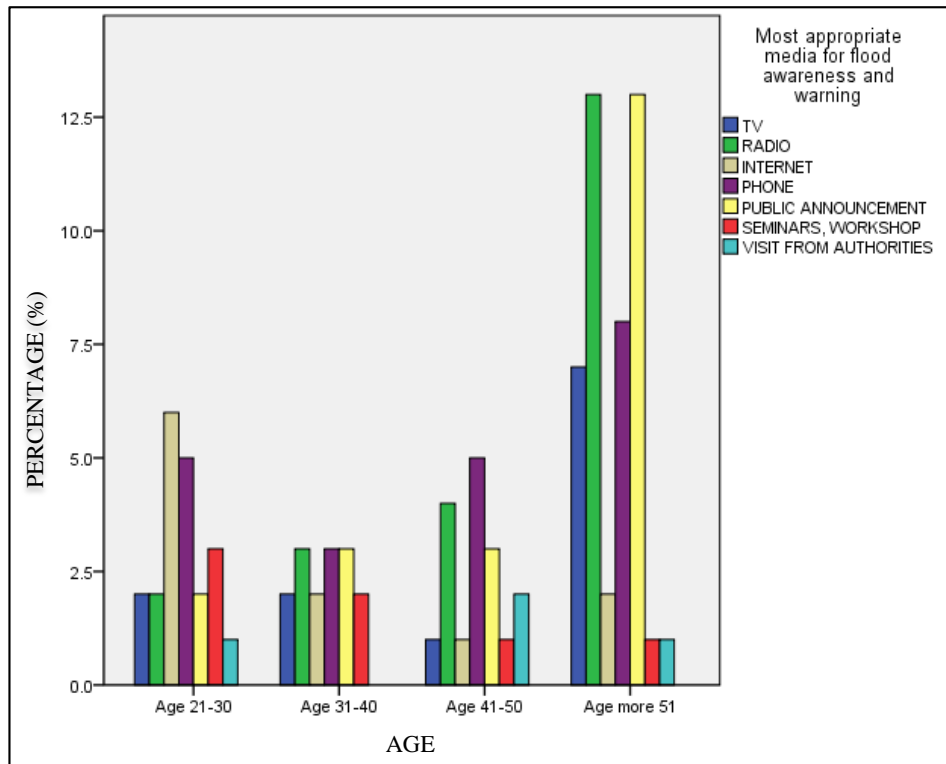


Figure 5.17: Age – Appropriate Media Preferable for Flood Awareness

From ages 21 to 30 years old, about six respondents mainly use the internet to receive information about flooding. From ages 31 to 40 years old, the same amount of people used the radio, phone and public announcements. From ages 41 to 50 years old, the top three forms of media preferred were the phone, radio and public announcements. For people aged 51 years old and over, more than 12% respondents used the radio and public announcements to gain flood awareness or warnings.

In summary, it was evident that younger people prefer to use mobile phone and internet as source of information to get flood warnings. In contrast, elderly people prefer to get information from the radio and public announcements. It is also evident that internet, email and text messaging was noted as high costs as well as technical or personal difficulty in using them, especially for those elderly and living traditional lifestyle.

From the above analysis, it is inevitable that a range of media communication should be employed for flood risk communication in order to reaching various section of the population.

5.5.2 Length of experience – back to normal & coping and adaptation

In this study, I wanted to examine whether the period of experiences would also influence the community's recovery in terms of capacity to recover the house back to normal and to what extent level of adaptation strategy considered by households varied. Thus, only the top three choices of flood adaptation variables are discussed in this analysis. It can be noted that the adaptation strategy of remove possession from the ground floor was recorded as the first choice by the most respondents. This was followed by evacuation to safer grounds, listening to warnings given through the media and also moving to temporary shelter.

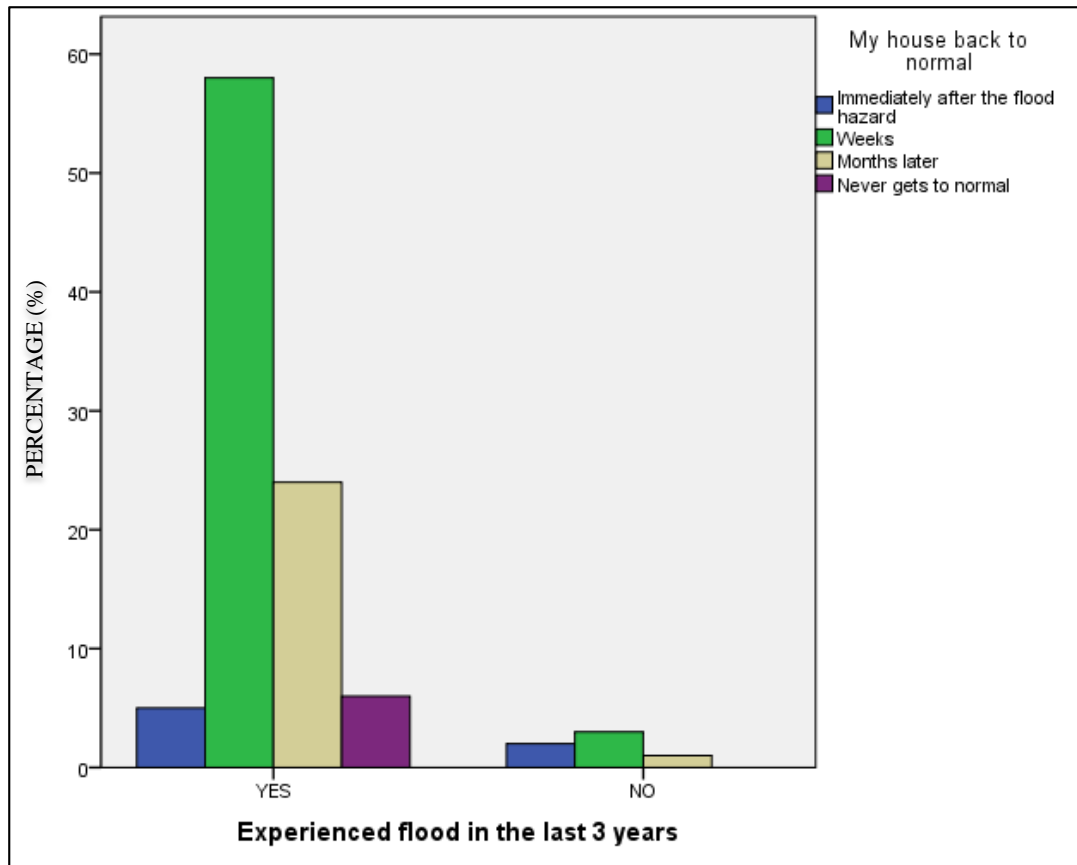


Figure 5.18: Flood of Experience – Back to Normal

Figure 5.18 demonstrates whether flood experience in the three last years has influenced the period of time taken by the community to restore themselves back to normal. Those who had experienced floods within the three years were more prepared and more able to minimise the risk and losses within weeks (58%). This indicates that these respondents have a good understanding of the risk of flooding and that they have therefore taken preparation or had a flood action plan based on their previous experiences to limit impact of future flooding on their property and family.

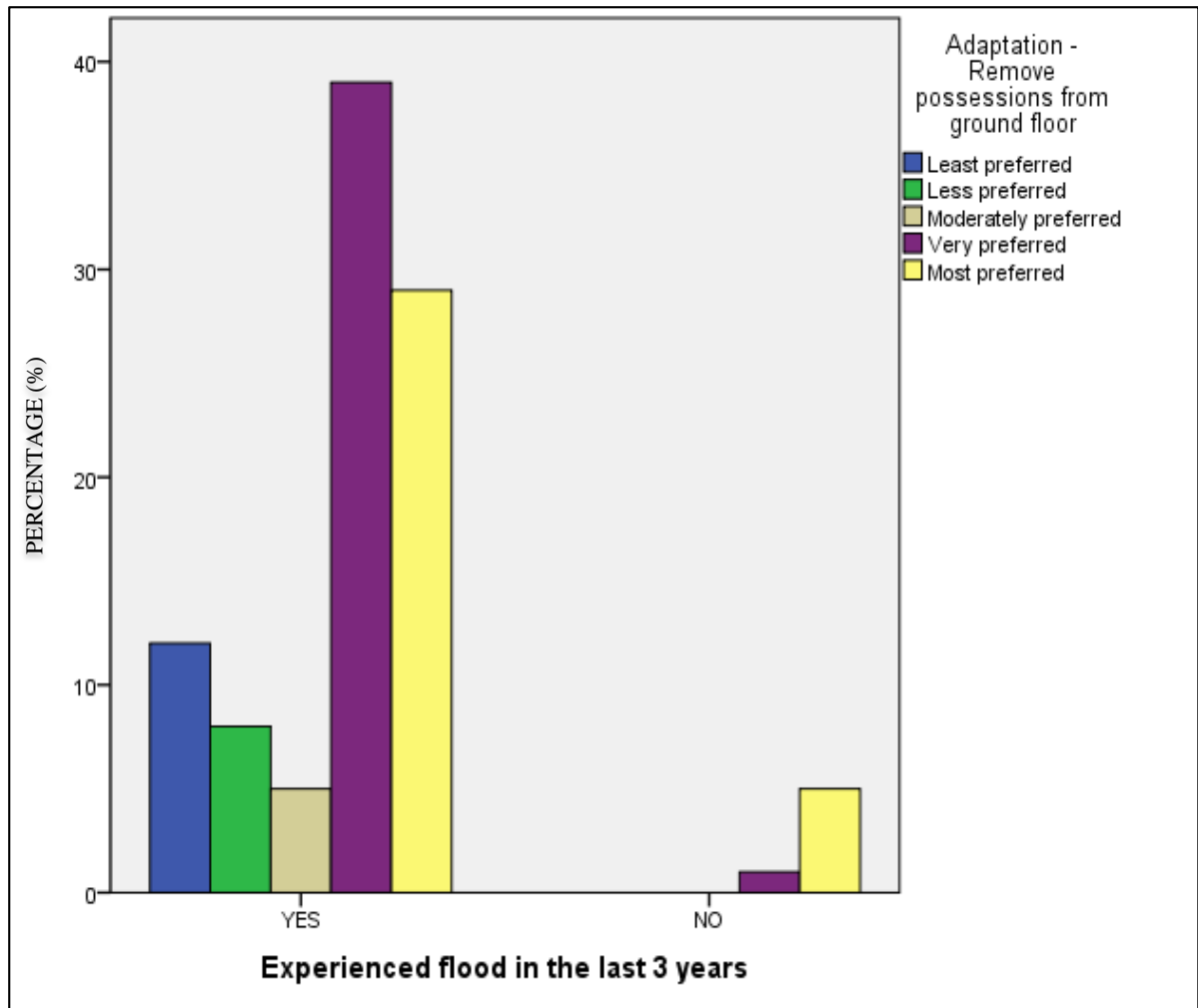


Figure 5.19: Flood of Experience – Adaptation (Remove Possessions from Ground Floor)

Figure 5.19 shows that almost 70% respondents choose to remove possessions from the ground floor as a method of adaptation (very and most preferred). It can be observed that the number of respondents with prior flood experience preferred to take coping action to remove possessions from ground floor to limit the impact of flooding. In this context, respondents with prior experience had extensive tacit knowledge regarding appropriate emergency response to adapt risk avoidance strategies.

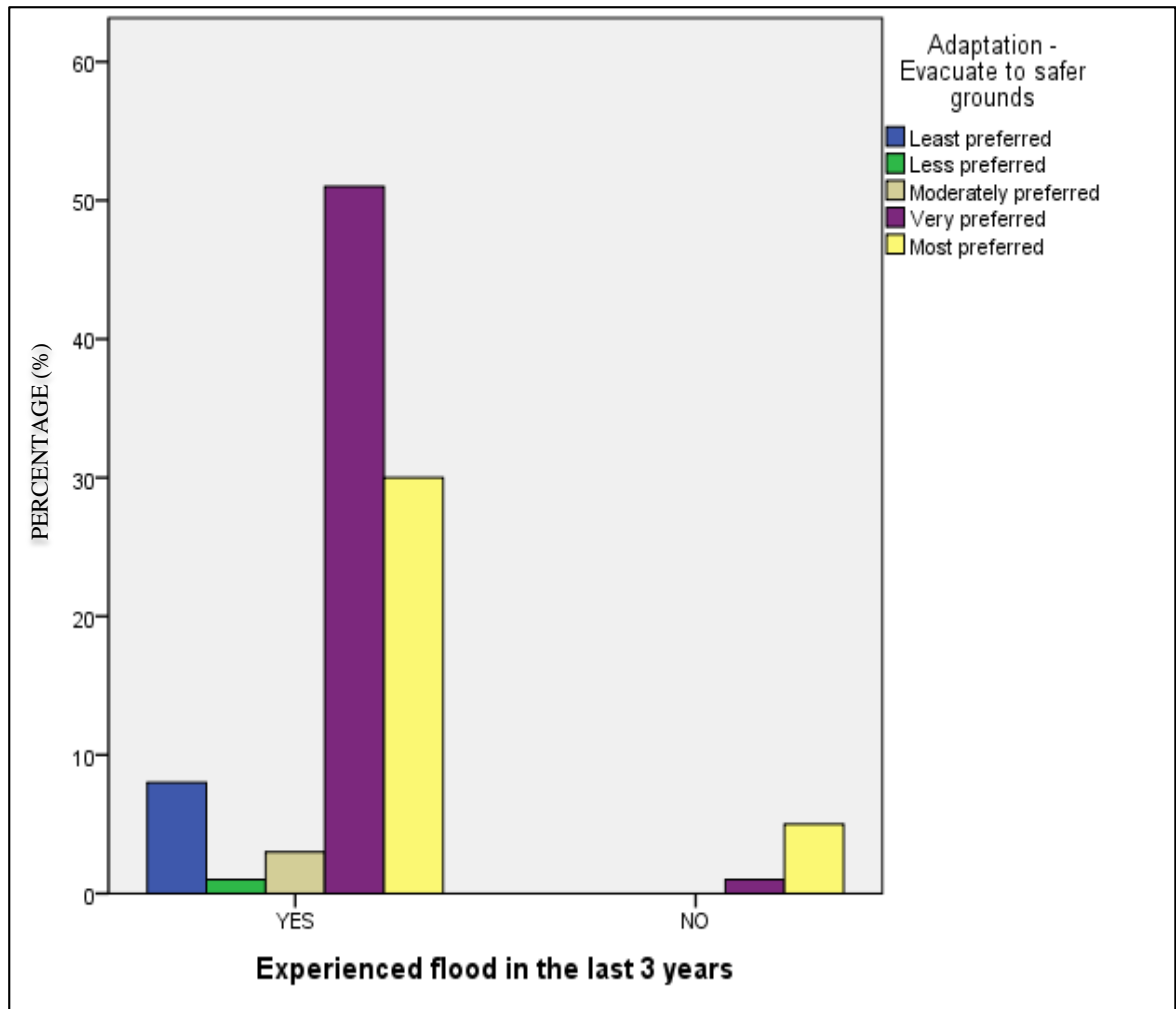


Figure 5.20: Flood of Experience – Adaptation (Evacuate to Safer Grounds)

Figure 5.20 shows that 80% respondents choose evacuate to safer grounds. Therefore, the majority of participants, especially those who have experience in facing previous floods, showed they were able to be reactive and response-led with intentions on evacuation.

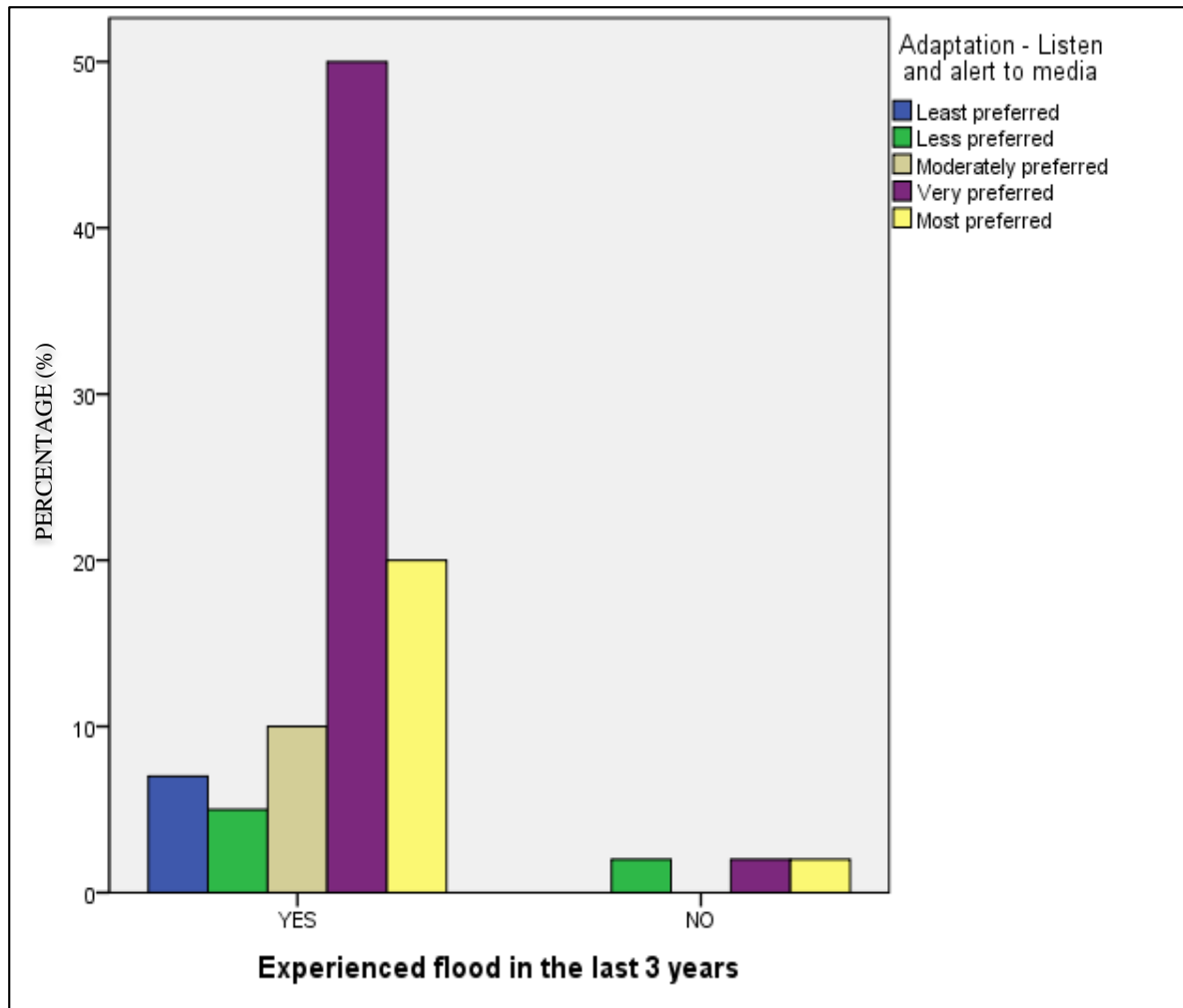


Figure 5.21: Flood of Experience – Adaptation (Listen and Alert to Media)

Figure 5.21 illustrates the preference of people whom listen to alerts in the media as a form of adaptation. Almost 50% respondents very prefer this method of adaptation. Therefore, it can be concluded that experience with flood factor has an effect on the choice to listen the information which the respondents were using for flood risk awareness and warning.

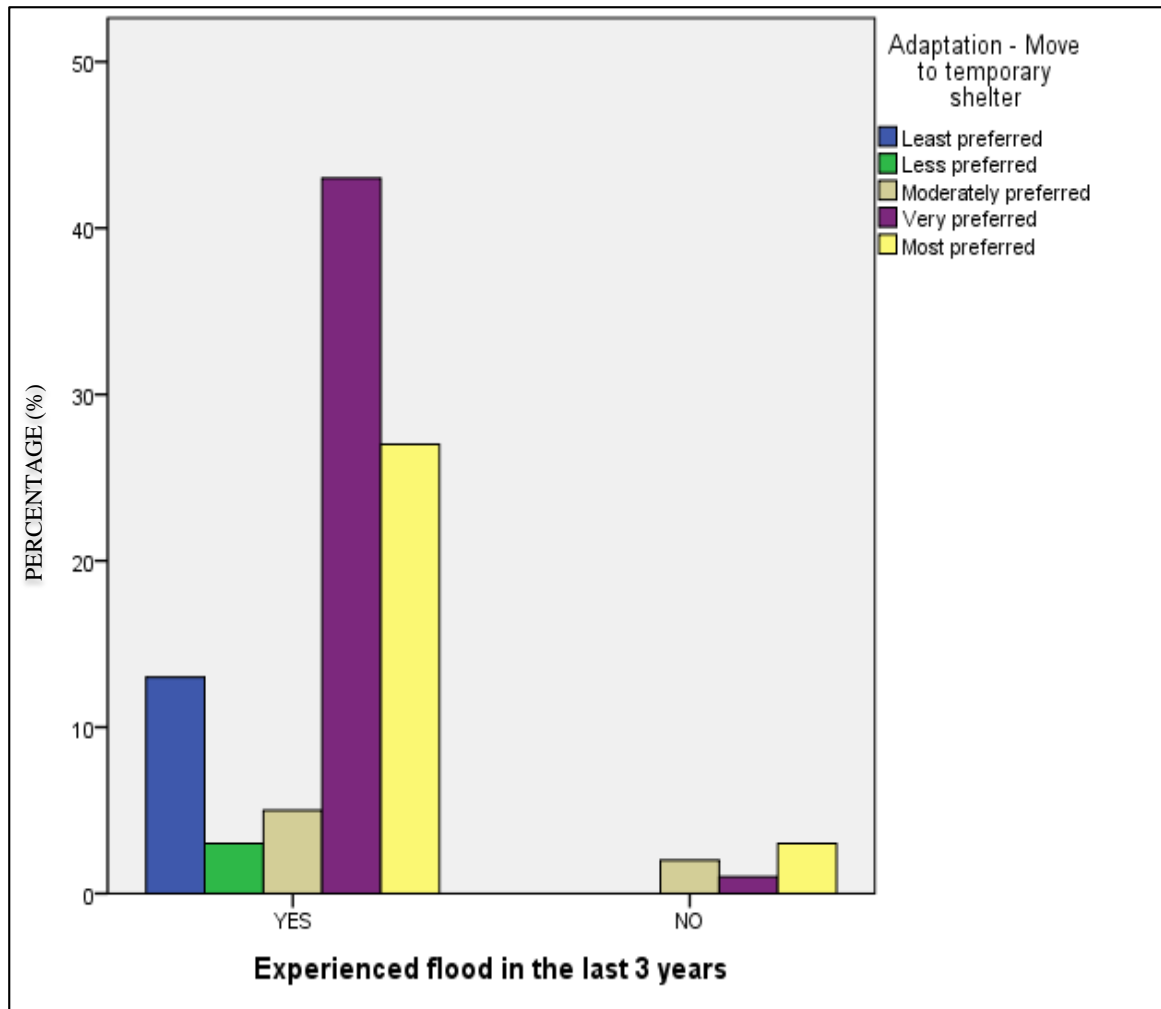


Figure 5.22: Flood of Experience – Adaptation (Move to Temporary Shelter)

Figure 5.22 shows the preference of people whom move to temporary shelters as a method of adaptation. More than 70% respondents choose this method. Reflecting on these data, those who have experience understand that when the water level rises, the risk that their house could not cope with the floodwater was high. They also moved items to the upper floors of housing and took necessary preparation before they evacuated to the temporary relief centre. However, about 12% were worried about evacuating and had no intentions on leaving their property.

5.5.3 Back to normal – insurance, compensation and financial assistance

Figure 5.24 illustrates the various periods of time for people to acquire any form of insurance, compensation, financial assistance or even government compensation. More than 40% respondents responded that on average it takes weeks to recovered back to normal.

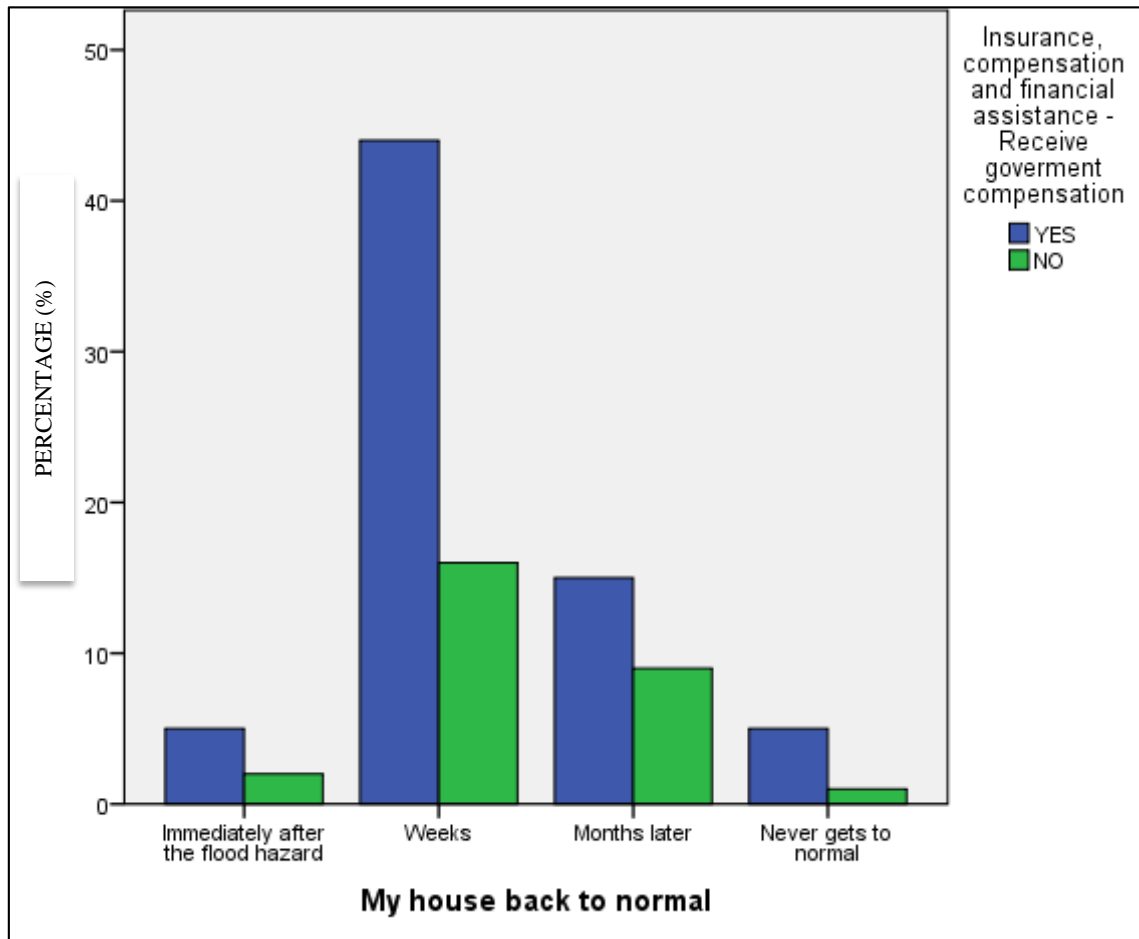


Figure 5.24: Flood of Experience – Adaptation (Evacuate to Safer Grounds)

The government assisted the community household through the flooding compensation scheme. In fact, communities entitled to compensation or that had insurance seemed to recovery within a relatively short period (weeks) due to well-coordinated help during and after floods.

5.5.4 Association between socio demographic factors and domains of social capital

The findings on social capital (dependent variables) were examined to explore whether there are relationships among different types of socio demographic (independent variables). Pearson correlation coefficients were calculated to analyse the bivariate relationship for dichotomous or continuous variables. Meanwhile, Spearman's Rho was used to address the uncertainty in the correlation coefficient dependent on the distribution of data for ordinal variables in this investigation. These tests were the most appropriate because they were more straightforward and less impacted by extreme values. Furthermore, using ANOVA measurement, the level of vulnerability and resilience of a family or a person to flood hazards in Teluk Kumbar can be reflected in a variety of indicators. The significant value chosen was $p < 0.05$ and study power of 80% for this analysis. Therefore, table 5.13 demonstrates how the survey data was analysed to see whether there was a significant bivariate relationship between the community's independent and dependent variables using Pearson's chi-square and analysis of variance (ANOVA).

Table 5.13: Variables in statistical analyses of vulnerabilities and or resilience

Socio-demographic variables	Variables used to analyse of vulnerability and/or resilience.
Gender	Social capital, adaptation, Importance of community response involvement, awareness level
Age	
Education	
Income	

Based on the exploratory analysis, it can be concluded that some of data were not normally distributed. Therefore, parametric and non-parametric tests were conducted for the relevant variables in this analysis.

Table 5.13: Correlations between socio demographic and social capital

Social capital	Gender ^a	Age	Education ^b	Income ^b
Willing to help neighbours during flood event	0.055 ^{**}	0.041 [*]	0.023 [*]	0.005 ^{ns}
Ready to respond to the community's needs	-0.040 [*]	0.027 ^{n.s.}	0.013 [*]	0.017 ^{n.s.}
Supporting those in greatest need after a disaster would be a priority for my community	0.069 ^{***}	0.038 [*]	0.043 [*]	0.016 ^{n.s.}

^{n.s} = None significant

^a = Dichotomy variables

^b = Ordinal data (Spearman's RHO)

* = Significant $p < 0.05$ (2-tailed)

** = Significant $p < 0.01$ (2-tailed)

*** = Significant $p < 0.001$ (2-tailed)

Confidence Interval = 80%

Bivariate correlations in Table 5.13 reveal that gender differences, being older, and more educated are significantly correlated to community social capital variables. According to the findings of the exploratory analysis, higher income levels and being married were shown to be substantially correlated with all resilience components.

Gender had a substantial negative correlation with readiness to respond to community needs (-0.040). This means gender categories doesn't influenced on household preventive measures and either male or female is more being realistic cope with flood events. In general, women are taught to participate in roles that affect life in the household, such as housekeeping, childcare and some decisions on coping strategies. Other than that, the same domain was found to be correlated as well with education

level (0.013). In all five villages, the majority of interviewees expressed a stronger sense of togetherness and friendship. Social relationships and integration were found to strengthen social bonds among community members. Participants argued that because they gather often in mosques to pray together and also on important social occasions such as weddings (kenduri) and gotong-royong, they feel more connected to one another and develop bilateral relationships.

5.5.5 Association between socio-demographic factors and awareness level

This sub-section examines the correlations among the socio-demographic characteristics and level of community awareness (Table 5.14). All socio-demographic factors have a significant positive correlation with each other, except for “Government should invest more on educational programmes” and “People rely on government to protect community”.

The study shows that age, and length of experience has the strongest correlation to risk awareness. Individuals of the Teluk Kumbar with a higher level of education significantly correlated with social capital (willing to help other community during flood, ready to respond to community’s need and supporting those in greatest need). Concerning education and disaster resilience, Chester et al. (2010) claimed that individuals may utilise their educational credentials and sophisticated interpretations of science to rationalise disasters or other traumatic situations.

Table 5.14: Bivariate correlations: between socio-demographic variables and awareness level

Socio-demographic characteristics (n=100)	Aware that live in a flood risk zone	Government should invest more on educational programmes	Understand the flood warnings	People rely on government to protect community
	p-value	p-value	p-value	p-value
Age	0.371**	0.070	0.259**	0.056
Education	0.107**	0.297**	0.155**	0.322
Length of experiences	0.493**	0.250**	0.127**	0.243**
Living period				

*significant $p < 0.05$; **significant $p < 0.01$

As several key informants noted, residence length positively correlates with a community's resilience capacity because the longer people live in a particular location, the more likely they are to become aware of local problems and challenges and to develop a comprehensive understanding of the diverse needs and demands of their local community through their daily social interactions with others. Longer-term residents have a specific affinity with their home, which makes it easier for them to get to know their neighbours and form social bonds with them. These relationships give backup support that is always available in the event that they require assistance at a time of emergency. As evidenced by their duration of residence in the neighbourhood, the majority of participants had resided in the same house for more than twenty years. Owning a home signifies a valued asset that residents are eager to protect at all costs. They are therefore eager to return home following a tragedy, particularly those who grew up in that region and have accumulated memories and long-lasting social bonds there as they have matured in their adulthood.

5.6 Summary

This chapter presented the analysis of the questionnaire survey responses received based on the 2016-2017 floods. It is noteworthy that a number of people had been evacuated and provided temporary accommodation by the government. Most of those who responded knew they had lived in flood-prone locations for more than 5 years, most of them owned their houses and had prior flood experience. The respondents were agreed that the sources of flooding were primarily high river water levels due to tides; improper drainage system; blocked drains due to trash, rapid or uncontrolled development and lack of water catchment. The majority of respondents considered they were facing losses associated with house damage that also resulted in damage to furnishings and home appliances.

Further, based on the findings, households indicated that they received support in terms of financial (compensation) and non-financial assistances for their recovery. Majority of the respondents stated that they were well adapted and had taken various actions to limit the impact of flooding. However, they relied on the government to protect the community and feel left out from government support. It was further found that they hadn't receive government advice and were unaware about the flood management policy.

The findings also identified the actions taken to minimise the impact of flooding related with unpreparedness among the communities. Some respondents voiced that when the flash flood happens, they cannot do much preparation because they only just have time to evacuate the family. Financial constraint is also one of the reasons why protective actions to limit the impact of floods on their families were relatively low. Government

intervention on flood mitigation and awareness programs is also limited. The community were also concerned about the condition and convenience of the temporary relief center.

An analysis of flood emergency information revealed that people were poorly informed about possible flooding and there was a lack of reliable flood risk information as well as flood warnings. The respondents indicated that relied most on information from word of mouth among family members, friends and close relatives. From the responses, communication of flood warnings through TV, radio and newspaper are the most preferred communication and access to information.

Detailed exploratory findings of the survey responses examining the effect of demographic factors such as gender, age, education, flood experience, and income were interrelated with different domain variables such as preferred media usage, coping mechanism, insurance, compensation and financial assistance and awareness level. Flood losses or impact can be reduced markedly by empowering community responses and awareness.

The following chapter will examine the community response in terms of its vulnerability features using qualitative research techniques such as one-on-one interviews and focus group discussions.

CHAPTER SIX

Chapter 6: Vulnerabilities Associated With Flooding In Penang, Malaysia

“The major issue in managing disaster risk reduction is the 'access to information' that is accurate, complete and speedy when dealing with flood disaster”

– Resident Council, 16 June 2018

In Chapter 6, characteristics of vulnerabilities of the communities during the 2017 flood are discussed. This chapter brings the local respondents' knowledge and response to flooding in Teluk Kumbar together with the involvement of respective stakeholders that had been directly affected by flooding in 2017. This to explore people's vulnerabilities to flood events and the data is used to demonstrate the range of views of participants in various levels of disaster response and recovery. This chapter serves to promote adaptive capacity as window of opportunity to support a more comprehensive disaster risk reduction approach. It also worth to understand in this chapter, the different levels of impact between social groups depending on variety of factors such levels of readiness to prepare, ability to cope and recover according to disaster event in which understand the ways vulnerability are shaped.

Practically, this chapter presents and analyses results of questionnaire surveys, semi-structured interviews and focus group discussion which explore a comprehensive triangulate analysis that lead to its own framework, namely Community Response Capacity. Within this section, I integrate the theoretical foundation and establishes a set of hypotheses that have been tested throughout this thesis. I captured factors such as

people knowledge, institutional volatility, economic capital, risk communication, on ground politics and governance contributes to type of coping and response mechanism being employed. Relevant analysis of the data from the in depth interview and focus group interviews are discussed in the context of barriers to communication and collaboration between governments and at-risk communities in decision-making regarding flood risk management, particularly making use of a crisis as a window of opportunity for change.

Each interview with participants in the stage of the fieldwork was recorded in full, and subsequently transcribed both in full and in summary. The participants authorised the use of the full and summarised transcripts in the data analysis. These transcripts were analysed using NVivo software identifying and collating key words and phrases nodes were coded and assigned to a particular type of community resilience themed around institutional, economic capital, infrastructural destruction and societal responses, with additional analysis on the risk of communication and politics of disaster.

6.1 Institutional Volatility

This research measured the function of institutional volatility that influences the flood risk reduction, which considers institutional bureaucracy, relief intervention, enforcement and constraint capacity of operations for disaster preparedness and response. Initially, this demonstrates the resistance of government organisations to implement disaster reduction policy at the cross coordination of local, and national scales. In the paper entitled “Emergency and Disaster: Pervasive Risk and Public Bureaucracy in Developing Nations”, Henderson (2004) stated that there are more challenges that refer to the problem of implementation, and institutional governability

to deal with ex-ante disaster risk management. Yet in term of institutional volatility, as Lassa (2011) noted in her PhD thesis, the constraining attributes can be caused by poor urban governance, lack of good governance, decentralization and power inequality.

In addition, institutions may lose their reactive responses after disasters, struggle to be effective in providing public services which indicates emerging disaster management bureaucracy. The institutional dimension of vulnerability can have an impact on the priorities of the emergency services, the handling of the vulnerable groups, reconstruction phase, the mobilisation and prioritisation of resources, availability of government compensation and standard operational procedures for emergency planning that affect the societal resilience. This will be thoroughly discussed in the subsection below.

6.1.1 Complexity of flood management

Malaysia's disaster management strategy has evolved from a narrow concentration on fire and landslide response to encompass all aspects of flood disaster management. It is clear that there are two aspects to institutional flood management, firstly in terms of managing decisions around the actions and activities that occur within affected communities, and secondly, dimensions of disaster preparedness before the disaster event, response during events such as evacuation arrangement, and post event recovery which needs of decision-makers involvement related to aids, compensation, and budgeting. As a result, an evaluation of the various types of household responses and associated problems was done.

- i. Management during emergencies

This subsection expands the importance of the findings and discussion on vulnerabilities found during flood disaster emergencies response and recovery. One of the key institutions involved with supporting communities during serious flooding is the health sector which supports people suffering from flood related illness and injury. Such support is provided through the local community medical centre under the Ministry of Public Health.

Hospitals are an example of an institution available to support people irrespective of causative event. Based on observations and conversations with key informants during the field case study, not all of the nurses have practical experience or knowledge about flood related disaster management during such chaotic situations. There are two aspects to this, looking after people impacted by the floods, but the buildings and services themselves may also be at risk of flooding (Figure 6.1). Empirical data in Kruahongs (2008), highlights that there were issues with ineffective emergency operation for impending disaster. In our hour and half interview, a nurse (anonymous) spoke excitedly of the tough experiences during flooding at *Teluk Kumbar* Medical Centre:

“During the latest flood event, areas surrounding the general hospital were flooded and it became like an island. There were difficulties in transporting the victims and patients from one place to another. We had to rely on the Fire Department, Public Defence Department (JPAM) and Police in order to rescue the patients. We need training on medical disaster response procedure and water ambulance assets”.



Figure 6.1: General hospital in Georgetown, Penang (Island) was flooded in 2017

(Source: Bayan Lepas medical officer)

As she described, a deficiency of strong engagement among the agencies were to be blamed. Sound and proper coordination among diverse agencies must not be taken lightly in view of its utmost importance in disaster recovery management planning. Yet a range of regulations and guidance exist. For instance, the state government has a set of legal frameworks about how to operate under emergency conditions, whilst the forestry department, the waterworks department, the PlanMalaysia agency and the federal government are governed by a number of policies that have been established to guide operations during emergencies.

Meanwhile, through my interviews and secondary research at the local council governance level, there is another set of rules to abide by as well. The wealth of policies and guidance at different scales of management and for different organisations means that there is confusion about how to act in flood related emergencies. As a nurse from Teluk Kumbar Medical Centre mentioned, there is too much organisation politics involved in operational flood management. Agencies experienced particular dilemmas in decision making about emergency actions such as evacuation during emergency times. To evaluate on this matter, I used several situations that emerged during my interviews.

ii. Pre –event management

Pre-event planning is as complicated as management during an emergency. As an officer of the National Disaster Management Agency (NADMA) explained:

“The conflict of interest could be attributed to many bureaucratic woes especially in enforcement related matters. For instance, according to the local council authority, any river mitigation works are forbidden in their books as it does not fall under their ambit and the buck shall be passed to the waterworks department. Subsequently, the waterworks department remarked that such purview falls under the jurisdiction of the federal government in entirety. As such, this is a bottleneck which shall be redressed immediately”.

Further, some participants agreed that flooding is inconvenient because not everybody can cope with the situation. For example, one of the NGO members from *Briged Bakti* highlighted that households often did not agree to be relocated elsewhere by the government. According to this quote,

“As we know majority of households not being willing to leave their personal belongings, historical factors and to live away from their community. This will

have psychological effects on the victims, especially those who are not prepared and cannot against hazard risk situation”.

In addition, according to what has been explained by the JKKK Suluk Village member, there is also an issue with coordination between agencies, NGO and community representatives in regards to flood preparation and operation. His description below shows there is no formal connection among stakeholders in dealing with flooding matters.

“However, we don’t have formal connection with NGOs. The NGOs will come when the flood is occurs. We have their phone number. Every time when the floods happen, they will call us and ask about the hot spots area affected. – Male, JKKK for Suluk Village”.

iii. Post –event management

Fieldwork results also highlighted that certain district administration officials do not offer adequate logistical support to the NGOs for the distribution of relief materials, which led to the unfair distribution of these relief materials to the elderly and infirmed victims, in particular. There were loss of appliances, utensils, and power cuts that lasted for a few days. The victims were in urgent need of at least three days supply of food that did not require refrigeration, preparation or cooking. This is of utmost importance for the older victims who may lack the ability to cook. Similar relief food and materials were brought in which led to wastage and failure to meet dietary needs. One of the representatives from the Gertak Sanggul village member that I interviewed stated simply that:

“The elders and infirmed relied on past life experiences in preparing for disaster and a considerable number of them do not possess any contingency plans in mind; as they had never participated in any disaster preparedness educational

program, and additionally, we were not aware of the availability of relevant resources which are tailored to their requirements” – Male, Villager, Gertak Sanggul

My interviews revealed the difficulty of social service organisations operations. An NGO member from the Penang Forum Steering Committee highlighted the lack of flood preparation and local council weaknesses in operationalising services following unexpected flooding. Additionally, the participants described numerous instances of an insufficient supply of emergency kits and assistance following the receding flood waters, including the following:

“What I mean is contingency plan if the flood goes unexpected. It always based on ad-hoc practice, which is not practical” – Male, NGO Committee Member, Penang Forum Steering

While, another member supported this view

“Can you imagine elderly peoples fighting to get any assistance such as to register their family for flood aid? We think that is one of the measures that need to be put into place” – Female, Committee Member, Penang Forum Steering

Speaking about community needs, organisational capacity and the distribution of disaster preparedness information, uncertainty remains as to what external organisations could provide in terms of emergency management and reliance on government agencies.

6.1.2 Institutional aid and support delivery

Local governments is defined as the 'key agencies' that play a vital role in identification and evaluation of the potential risks of flood disaster and initiatives for preparedness and response. However, common across all contexts, institutional delivery capacity can

become dysfunctional when there is lack of communication and participation at the government and community level.

A major focus of this study is on analysing to what extent these different perspectives affect the ability of the government to respond effectively. More than half of the respondents feel moderately (n=56) left out from the government support, while 25 respondents disagreed with the statement that the government failed to provide adequate support for the communities (Table 6.1). A total of 56 respondents moderately agreed that the government allows participation in environmental decision-making. The analysis below again demonstrates that there is grievance from the residents regarding dissatisfaction with the management of flood aids to flood victims.

Table 6.1: Satisfaction of institutional delivery

People's perception	Less preferred	Moderate	Most preferred
Community has a feeling of being left out from government support	25	56	17
Government allows us to participate in environmental decision making	12	56	31
Did not participate	60	14	12

According to the discussion session with the representative of JKKK *Teluk Nelayan* committee members, there were residents who did not move to the evacuation centre during flooding because it was reported to be almost full with victims. However, there were consequences for not being located in the evacuation centre since the communities' member claimed that to be eligible for any financial or non-financial

assistance residents needed to be registered at the temporary evacuation centre. One of the JKKK members from *Paya Village* reported regarding the disturbances to evacuate during the flooding:

“Some people reported the route to the evacuation center was closed and there were families who did not receive the necessary assistance. There was no suitable transport to evacuate. Only large lorries can across the flooded areas to the evacuation centre. The elderly and the sick people preferred did not move to the relief centre and some have tried to register but have no place. What happened was they didn’t get any assistance such as food, and cash compensation” – Male, Committee, JKKK Paya Village

This example raises a range of issues. Firstly, there were victims that were totally unable to move due to certain circumstances such as disabilities and how should people register if they are unable to get to the transit centre. Secondly, it is difficult for the related authority to channel assistance if there is no information on the victim, which in this case was collected at the transit centre. There are issues when the victims think the authorities should come or search to see the victims, rather than expecting people to register in person at a specified location. Thirdly, according to one comment from the *Teluk Nelayan* villager there were complaints that some of communities received the same goods item repeatedly. As noted,

“Those parents with toddlers and infants gave feedbacks over the limited provision of baby food. There so plenty of food wasted but actually no one from the agencies or NGOs bring other basic needs such as diaper for kids and woman, wet tissue, clothes, pillow and others” – Male, Villager, Teluk Nelayan.

The same applies to the situation on the period after the flood related to resident’s complaints about flood management and mitigation. Another villager representative

echoed this view, by stating that flooding in *Teluk Kumbar* is related with flood management issues and public amenities problem:

“We (the people) tried to file a complaint through the meetings with government representatives. It used to not be a flooding problem before the construction of phase 1 of the pump house at the mouth of the river. After the construction of the drainage, river became narrows. Water is not flowing smoothly and eventually turn flooding to easily occur. Now this second phase of construction will start. We worry because it will only worsen the problems. Now the development at the hillside will disturb watersheds. When it rains the water is going to swiftly flow down to the river and this will cause the river can’t cope with large quantities of water at one time. This is the matter that we are complaining” – Male, Respondent 2, Villager, Gertak Sanggul Village.

This interviewee also wondered about the lack of follow up of complaints that have been made to the stakeholders. For example,

“Just look at the pump house and flood mitigation projects that were delayed. We [residents] repeatedly complaint about this matter to them but still no results and action had been taken” – Male, Respondent 3, Villager, Gertak Sanggul Village

Based on one interview with JKKK from *Suluk* Village committee, he explained that he had reported cases several times to the police, local council, and state assembly office but had seen no action. The village committee could not see any solutions from the government. Other participants also explained that the fishermen groups disagreed with the project. They protested and were partaking in a demonstration, and concurred that their voice was frequently ignored. They claimed the issue of the pump house and riverbank enlargement project contributes to the flooding in their neighbourhood. The applied engineering works may, to some degree, disrupted the flow of any nearby river, as well as difficulties in the flow of river water and the protective embankments limit

the possibility of the temporary accumulation of water. The consequence of this situation is increasing the level of the flood (Wilk, 2018). To that extent, boats that parked near to river estuary were reported drifted away, during storm-raining season.

The people in *Teluk Kumbar* are active and diligently filing complaints and suggestions, but no one is interested to resolve them effectively. Land erosion near rivers results in the river becoming narrower, increasing the risk of flooding. According to what I've observed in Penang, citizens are hoping for the Penang government to adopt its flood mitigation strategy in accordance with popular suggestions. For example, another respondent from *Gertak Sanggul* fisherman commented about the flood mitigation systems not being properly-maintained; complaints were sent to the local council but no action had been taken.

We have made a complaint regarding one river embankment project by companies or developers that we do not know their origin and background. Contractors came with lorries carrying cargo filled with land. The problem is when it is sow around the area make the riverside silt. We noticed the river becomes eroded. The authorities just come for the monitoring and maybe some even file report, but the problem had still not seeing any improvement.

Another participant representative underlined the importance of project-policy review, land erosion difficulties, and development near rivers, all of which contributed to flooding. But policies adopted now apparently do not solve the problem,

“We are being told that this expansion project will cost about RM6-7 million. However, we are enquiring and wanting to know is how the extension is and enlargement project is going to solve the flooding issue. We do not want them to inform us regarding this million Ringgit worth of project and how expensive this mega project is but eventually it will only profit the contractors and our still is still not solved” – Male, Villager, Gertak Sanggul Village

One representative voiced criticism towards government officer work,

“JPS and JKR officials came just to take some pictures of the area that had been filed with complaints. We do not know what they are doing but still no further action had ever been taken, all of this complaint filing seems to be worthless” – Female, Village Development and Security Committee Member, Gertak Sanggul Village.

This distinction demonstrates the critical nature of the Penang government's flood control strategies. It must ensure that its existing flood-mitigation systems are maintained effectively and must be considered by all state-level authorities, updated based on local participation in collective activities, often measured by tenure within communities.

6.1.3 Challenges for flood insurance

Buying flood cover with motor or property policy offers protection for personal and family impacts that might protect (insure) and may save thousands of *Ringgits*. In Malaysia, the most basic home insurance policies cover damages caused to the insured properties due to accident, fire, lightning, and explosion. But, are people interested in dealing with the bureaucratic processes involved to purchasing or renewing motor policy? This sub-section examines the difficulties people face when seeking insurance for their property and examines whether insurance may be a helpful instrument in assisting with property restoration.

The interview data suggest that 72 people did not have home disaster (flood) insurance coverage, whilst 40 people were willing to have insurance and the rest of respondents

(59 people) felt there was no significant interest for them to have disaster related insurance. In fact they also not being interested in getting any claim due to the event of a flood disaster from the insurance provider (Table 6.2). Notwithstanding, only around 10% of interviewees had flood insurance, meaning that most of the locals are severely at risk from natural disasters. Numerous vehicles have been completely buried in floodwaters, while others have sustained significant damage due to fallen trees and heavy debris (Figure 6.2).



Figure 6.2: Submerged vehicles in floodwaters at Teluk Kumbar and Tanjung Bungah

(Source: Interview respondent)

Table 6.2: Insurance

Insurance	Yes	No	No Response
Having home insurance	11	72	17
Willing to have insurance	33	40	26
Apply for insurance claim	11	30	59
Receive insurance claim	4	37	59

However, insurance for flood risk is not straightforward. Most of the policy covers damages caused by fire and lightning only. Therefore, the government has plans to offer an insurance scheme to insure policyholders, but unfortunately there are no insurance companies willing to underwrite the insurance as it does not yield huge profitability gains. As the following quotes indicate, a NADMA officer expressed that the majority of insurance companies claim it is a high-risk business when it involves not only costs to cover the value of the properties, vehicles and belongings, but also costs which may be incurred for the reconstruction, repair and purchasing of new items.

“Insurance companies would like the government to bear 100% of the risks rather than reinsuring it to them which entails risk sharing for both parties; as flooding occurrences is a commonplace in Malaysia and thus, the insurance companies does not want to cover such related risks in the wake of such disastrous occurrences” – Male, Officer, NADMA.

This statement was supported by an interviewee working for an insurance agent company in Penang:

“I don’t think it’s working effectively in our country. No company will offer because we often get flooded and this is not profitable for them. I believe, many people do not take insurance for flood or extend their coverage to cover flood for their properties, vehicles or belongings due to high price premium they need to pay”.

Another respondent, this time from the community perspective, emphasised that people might be reluctant to pay the premium commitment payments and hence solely rely on governmental assistance or subsidies. This is echoed with my previous explanation in Chapter 3. Such a position was argued by JKKK Teluk Kumbar.

I don't think people want to contribute paying monthly or annually commitment to the insurance company. Well I don't think any company interested to offer that product too. Flooding is not only once in 2-3 years, it is happening 2-3 times in a year.

This is a similar view to those held by JKKK from Masjid and Paya Village that commented on factors of reluctance to subscribe to the insurance among community members:

"Insurance is good. I would like to have one if government provide it with subsidy. But, I think most of the homeowners feel reluctant to insure their property due to premium and budget constraints. They don't even want to pay RM50 monthly" – Male, JKKK for Masjid.

His friend that was also present at the interview session added,

"People in this area especially in my village are mostly low income level. I feel that they could not afford to purchase flood insurance policy unless the premium will be given free. It is hard for the government too" – Male, JKKK for Paya Village.

The issues with availability of insurance were also commented on by another interviewee from an NGO group. He is a member of *Briged Bakti* and indicated:

I don't think there are any companies would like to offer this product as it is not profitable. Flood happens 3 to 4 times a year. It is a risk business to them.

Another respondent voiced about his worries regarding the insurance compensation and reliability. One JKKK from Teluk Kumbar Village expressed:

Maybe people want to have the insurance if they experience a flood many times compared to those who less experienced a flood. My concern is about reliability

of insurance firms to pay insurance claims. We are facing more than 10 floods in a year. Are they willing to pay us every time?

It should not be surprising that when there are people insured against the idea of government flood insurance incentive by elaborating as mentioned:

“I would prefer government focus on structural flood control measures, such as dykes, floodwalls, reservoirs, and bypass channels to reduce flood susceptibility. We don’t want floods to happen so many times. There is no point in having insurance if flooding caused by improper drainage system still couldn’t be solved until now” – JKKK for Suluk Village.

It is basically cost-consciousness, flood cover is expensive. As expected, the majority of the residents are not willing to have home insurance because they will have to fund another financial commitment. Therefore, when their homes are damaged during a flood, they will be more willing to seek assistance and compensation by the government. Other dimensions of why residents were not interested with insurance policies is because this home insurance is not really popular in Malaysia. Malaysians tend to neglect the importance of getting an insurance policy for their properties and belongings. Most individuals in Malaysia only understand the value and importance of general and life insurance compared to home related with disaster insurance. Therefore, overcoming the destructive effects of a natural disaster can be very disheartening; perhaps the government and private sector should joint venture and came up with a more specific coverage for flood damage.

6.2 Economic Capital

The destructive nature of floods can impact property, asset belongings, income and lives. From the respondents' perceptions, it can be observed that the majority of the respondents perceived those floods can have a high impact on their physical assets and belongings (n=75), but also their income (n=71). Respondents thought that floods could affect their property, resulting in the loss or damage of furnishings and interior appliances/equipment. Those who were running business also felt that the floods affected their daily business and damaged their shop appliances. Only five respondents from Teluk Kumbar mentioned that they have low severity and did not have problem/experience any disruption to their income and financial assets (Table 6.3).

Table 6.3: Flood impact

Exposure	Low severity	Medium severity	High severity	No experience	Majority
Asset Belonging	4	19	75	1	High
Income	5	18	71	5	High

It is worth noting that some respondents had low severity or no experience of health, family and friendship and psychology. These exposures were likely not to be affected directly by the respondents. Even though floods can damage non-replaceable assets and make victims suffer physical or mental stress, the respondents were still able to find out how to calm themselves and manage their stress or shock very well.

In the early days after the flood, the residents faced terrible losses. Poor individuals needed to ask for financial assistance. There are those who have to fix the structure of their houses, and repair damage to their cars, and replacement of house furniture and electrical appliances was also needed. Low-income people tended to face a slow recovery process due to financial factors, for example the need to reconstruct the damages to their private property.

Table 6.4: Correlation between socio-demographic and domains of flood impacts

Characteristics	Flood impacts			
	Asset Belonging (High severity)		Income (High severity)	
Employment (Full time employed)	-0.104*	0.011	0.194*	.000
Income (High income)	0.127**	.002	N/A	N/A
Living status (owned property)	0.194**	.000	N/A	N/A
Living status (rented)	1.952	.050	N/A	N/A

*significant $p < 0.05$; **significant $p < 0.01$

N/A = Not applicable

To discuss the flood impacts, domains of socio-demographic factors have been analysed by using correlation measures in order to check the significant levels of asset

belonging and income of respondents. Table 6.4 presents the results of bivariate analysis and shows that there were significant correlations between variables in the study except between living status (rented) with domains of flood impacts. The findings showed a significant negative relationship between employment (full time employed) and flood impact on asset belonging ($r = 0.104$, $p = 0.011$). Meaning that, those who do not work full-time are not likely to be exposed to the risks and hazard effects of floods that cause asset damage.

Table 6.4 also shows that full time employed people had significant positive correlation with income respondents. Thus, those who can afford (full time employment) will have more assets and in the event of flooding, these groups will be at higher risk. The next domain analysed was living status. Results demonstrated that those who own their own home will be more affected by the floods that impacted the property assets. Based on this analysis, the significance of flood impacts factors varies for each socio demographic domain.

The analysis of average loss per household (Figure 6.4) also showed that based on the survey data, out of the recorded responses, the majority of respondents (43) financial loss during the flood incident is between RM501-RM1000. Further, 31 of the respondents indicated losses below than RM500. As illustrated in Figure 6.4, less than 10 respondents lost more than RM4001.

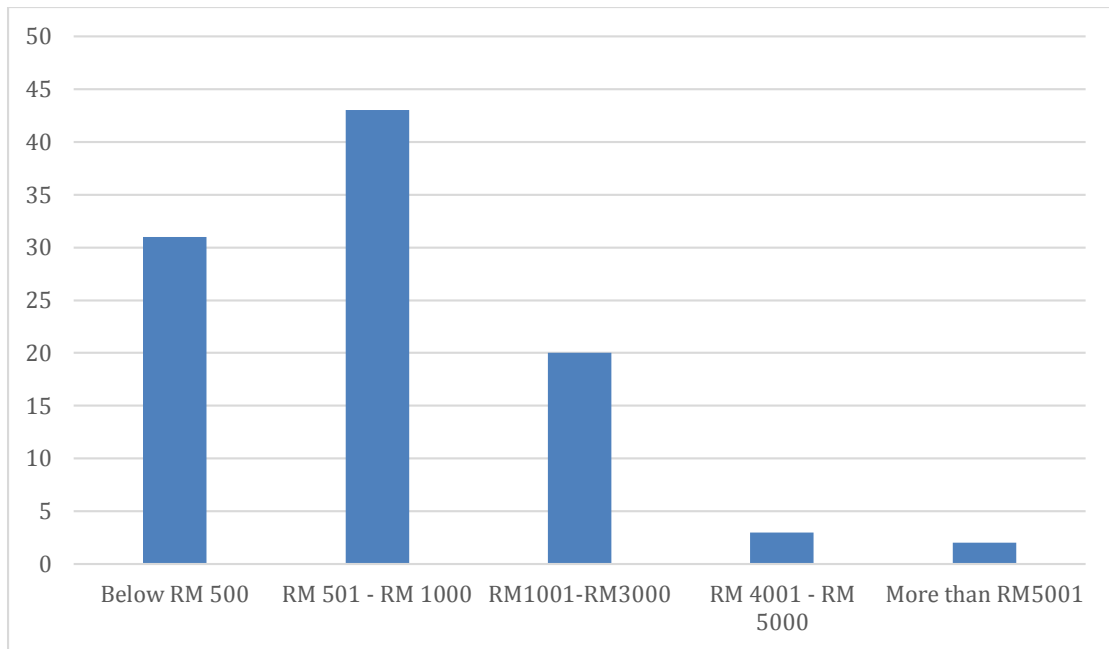


Figure 6.3: Average total loss per household impacted by flooding

This indicates that flood victims had taken some preventive or protective action plan to limit the losses since they perceived their area to be at medium to high risk of flooding. The major concern among interviewees was that during a flood disaster they need to buy new equipment, furniture, and to repair or reconstruct their house building.

In fact, data in Figure 6.5 shows that the majority of respondents absorbed the effects of a hazard event and return to normal, or near-normal within weeks (n=61). Based on the interviews, the community received recovery assistance in the form of food, household appliances, or cash. Furthermore, participants in this study spoke about feeling disempowered by the bureaucratic response that is applied immediately after the flood crisis event. The most generous community members expressed they relied upon availability of nearby relatives, close friends and NGO volunteers to support the building restoration and rebuilding stage, also the house cleaning work.

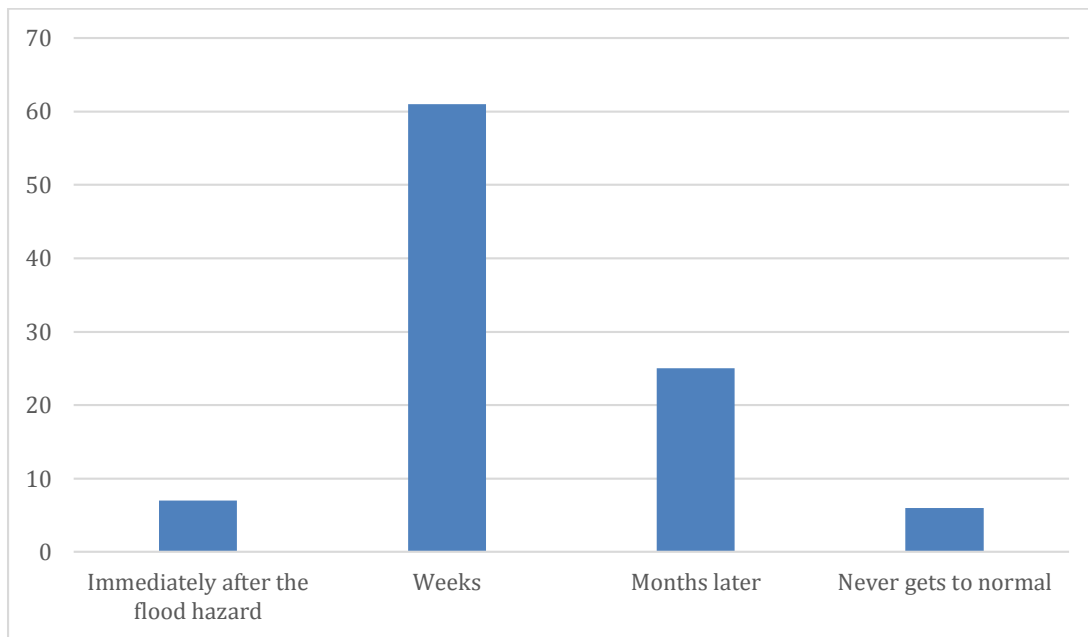


Figure 6.4: Time taken for household to get back to normal

However, it would be worth finding out why six respondents felt that their house never return to normal. Once the floodwater receded, the area was left with dirt, waste and damage to non-replaceable items or furnishings. This might be described by how their available disaster recovery assistance to individuals could not meet the needs of the locals and the most recent disaster that affected the community was nearly every 5-6 months before these interviews occurred.

The greatest concern for many individuals, community leaders, and community-based groups was the amount of damage that determined the speed of the post flood disaster recovery and the restoration of a community. An important factor in household recovery is that the interviewees felt that insufficient subsidies and allocation seem to affect victims' recovery processes. Many residents were financially unprepared for

such a sudden disaster and lacked emergency financial assistance. Likewise the PlanMalaysia Director, commented:

“The compensation received will not be on par with the losses incurred. Well many of the people in this area living in village and generally poor even before the flood. This has made their quality of life even worst”.

There were accessibility cost issues, as well as a lack of logistical coordination, which hampered the distribution of this assistance. For example, victims faced the risk of not getting enough food at the evacuation center, or not being able to get the medical check by duty doctor due to crowded victims at once time. An emergency medical management representative explained this concern,

“Mobile ambulance is really limited. Our 4x4 WD ambulance need to be equipped with the battery, power bank and generator and some of these items were costly at present, our medical centre cannot afford to buy them. Funding from the federal government also constraint and limited to the medication. Costs incurred were very high, amounting to hundred thousand of ringgit. I found out that, the program on the families’ preparedness, responsibilities, interest to learn and the readiness for self-first aid need to hold for a while due to lack of provisions.” – Male, Engineer, Teluk Kumbar Community Medical Centre

In this respect, lack of relief and emergency facilities has been the big factor that delayed the speed of rescue. The recent large flood in 2017 focused the attention on disaster concerns across the whole community in ways that small events do not, as one interviewee explained this led to tension and a lot of ad hoc response between victims and first responder, which are turned out to make people more vulnerable. As mentioned by JKKK Suluk Village Committee;

“When the flood level getting too high, the evacuate team require boats to move all the victims. Unfortunately, boats are limited. This is why the evacuation

process sometime takes longer time especially at the rural areas and inaccessible places with normal transport”.

Another NGO representative explained that it was unfortunate that the community had had limited practice. Truthfully, in organising an event by an NGO it would need certain funding. For example, as what Sahabat Alam Malaysia (SAM) representative explained, to run a course or workshop on flood emergency response practice, it would certainly require a high amount of funding due since it has become a norm for an event to prepare food, souvenirs, and other miscellaneous costs. The main constraint discussed by many Teluk Kumbar, Penang interviewees is specifically related to concerns about the lack of funding, which in turn would limit the number of awareness programmes that could be organised. This lack of support needs to include costs for technical preparedness needs such as the purchase of assets such as boats, safety jackets and water pumps.

An NGO representative from Briged Bakti mentioned about situation they were faced:

“The estimated value of the assistance we will provide is about RM10,000. It still very little compared to the urgent needs of those in need. We are facing a lack of funds. The allocation currently applied is from the party's contribution. Donations that our NGOs can provide can only accommodate no more than 500 flood victims, while the flood victims involved are usually around 3000 to 5000 people here. We cannot afford to send help to every home or every victim”.

Another interviewee, JKKK Masjid Village, who represented the community group described the budget constraint. He had experience in dealing with disaster operation situations and elaborated that,

“Well it is simple. No need to talk about renovation, repairs work and other reconstruction things yet. Organisations might lack stockpiles of food, flashlights, emergency kit, drinking water and other important basic needs in the event of disaster. Response and rescue team requires financial allocation or subsidy for their operation budget of example to have generators to operate if the power goes out at the relief centre. One generator cost about RM5000. As I know, each Mukim has a limited budget of 5,000 Ringgit annually. This is not enough. Can you think how we could get extra money to fund disaster awareness program, such as educating community people on disaster risk reduction activities and student preparedness. All of this needs some budget”.

Tighter budgets made it a challenge to engage the local community. According to the one of the *Gertak Sanggul* villager in a focus group discussion,

“I have heard that the YB (member of state assemblymen) of this area would like to organize programmes on surviving during the natural disaster. But due to the insufficient budget there was no program held so far”.

Budget constraints were also faced by the school administrator for schools that were used as an evacuation centre. Facilities were reported damaged and were vandalized and some of the amenities were stolen. Complaints of damages to the school due to conversion to evacuation center were related to the disruption of regular classes and conditions were not conducive to learning and functioning as temporary accommodation for the victims. However, limited actions could be taken. As noted by the school representative interviewee,

“The school did receive complaints and reports from the flood victims but the school could not take any actions because we only provide the premise for the flood centre. However, information that we received could be channeled through informing the office agencies working here. Usually, we will inform the head of the community and representatives of JKKK that working together with us. The

funding from the school too is very limited”. – Female, Head Teacher, Teluk Kumbar Primary School.

Another school representative added,

‘The affected students by the flood were mostly from poor families. The schools could not help with many things. It’s really costly to support numbers of those require basic needs item.’ - Female, Teacher, Teluk Kumbar Primary School.

6.3 Physical And Environmental Destruction

When considering the vulnerability of local communities, it is very important to consider the different sources of flooding. The 2017 big flood in Penang attracted unprecedented local and international coverage which highlighted the risk of flooding. The questionnaires were systematically structured to gather information about sources of flooding in the Teluk Kumbar. Since this was a closed ended multiple-choice questionnaire, some of the respondents identified more than one source of flooding. As it can be observed all of the Teluk Kumbar communities affected are dramatically vulnerable to flooding.

Results demonstrate that all options were perceived as likely sources of flooding by the majority of the respondents, with the high river water levels is the slightly highest among others in Table 6.5. It should be noted that the community members felt that all the sources option were expressed through the familiarity to the locality. Areas that developed without careful planning, improper urban planning, poor sanitary infrastructure and a completely blocked system, including the absence of bylaw enforcement as well as heavy and continuous rainfall amount of more than 90 mm had contributed and considerable sources of flood in the study area (Figure 6.5).

Table 6.5: Sources of flooding

Flooding factors	Numbers of respondent choose
Heavy rainfall	16
High river water level due to tide	17
Improper drainage system	16
Blocked drains due to trash	16
Rapid / uncontrolled development	16
Lack of water catchment	16
Missing/No answer	2



Figure 6.5: Existing and new property and infrastructure destruction caused by flood

(Source: State Council Officer)

The inundation concerns in this area have never been resolved as it is situated in a low-lying area and so a viable drainage system must be in place to mitigate the occurrences of heavy floods. This is supported by the following statement from JKKK *Teluk Kumbar* Village Committee:

“The problem of flooding arises due to heavy rainfall. Suitable drains not been built, and density of urban development is very high. They built high-rise buildings and cut the trees at the hilly areas. People those living close to the river and hill areas are risky and their areas remains flooded easily because the water catchment is getting over.”



Figure 6.6: Heavy rainfall blocked the drainage system in Penang

(Source: Fieldwork observation)

JKKK from Masjid Village also stressed about the role of legislation and enforcement,

“I could say that majority of local communities indicate physical environment plays a role in mitigating floods. We all agreed that low absorption of rainwater in forested areas attribute to flooding. We against what is happening at the hills around this area. Loggings of forests are everywhere. In the 10 years past, there was less development on the hillside. We rarely face floods during the last time”.

The confusion in making decisions to permit the approval of planning that are postulated on sound technical regulations among the agencies are discussed when it

comes to disaster management. This is noted from the following quotation from a government officer,

“There is a matter of conflict of interest from the perspective of JKR, PBT and JPS. Simply put, this is one palpable move to complicate the decision-making process in ensuring any developmental projects in the pipeline would not be executed swimmingly as planned” – Male, Director, PlanMalaysia.

He added,

“Such cases of sustainable river management and environmental management related projects has to put to a halt or postponed to a certain period of time which shall be agreed in consensus by the parties involved as the aforementioned has not received sound financial backing. A meagre sum of RM 20000 has been allocated for a particular project of such nature and on the contrary, the estimated cost of the project value is circa RM 1 million. Thus, it is of utmost impossibility for the said environmental management project to commence smoothly”.

Other interviewees’ highlighted frustration related to issues of dumping rubbish that affect the river flow and contribute to the rapid rise of water levels.

“Yes, there may be some people who are less conscious and have a less-caring attitude such as dumping garbage. However, this group is a minority and could be from regardless of the level of education nor income and location. – Male, JKKK for Paya Village”.

Accordingly, a lack of empowerment to influence government decision-making processes on development indicates continued vulnerability. Accountability of government institutions remains elusive. An NGO noted:

“Well we all know over-development, illegal logging and the lack of enforcement to monitor the excessive development had contributed to the devastating effect of flooding. Just compare the floods on the island and the mainland. Here (on the

island) it is muddier, like Teh Tarik (milk tea) (Figure 6.6). It is clear that soil erosion has occurred and the drainage system is not good enough to contain the water – Male, Coordinator, Penang Forum Steering Committee”.



Figure 6.6: Photo of “milk tea” or *Teh Tarik* flood-muddier water in Teluk Kumbar
(Source: Fieldwork observation)

Other participants of the Penang Forum Steering Committee argued that the government must react. The community and other societies have had enough. Allocation for hillslope protection is nothing if the authority ignoring people warnings by close the eyes upon the removal of the hill forests, silting of the rivers, which have replaced the green areas with, concrete. The comment was:

“The government can no longer be in a state of denial. These problems have to be tackled head on. The state has to examine the inadequacies and loopholes in the laws and guidelines for environmental quality, hill-side development, adequate drainage and to take action to redress these inadequacies and loopholes”.

The flood mitigation projects being carried out at present require an astronomical amount of financial investment to ensure its efficacy in minimizing chances of future flood risk. The cost has to be borne by the federal and state governments concurrently. For instance, one of the representatives of JKKK *Teluk Kumbar* explained that,

“Not every flood mitigation project would be executed according to the promised value of the project sum of RM 1 billion, nevertheless, it could only be carried out at a cost of RM 400 million since a decade ago or so (Figure 6.7). Moreover, not every aforesaid project could be performed as planned and the flood or inundation woes could not be resolved overnight in a blink of an eye sans rigorous set of planning”.



Figure 6.7: One of the mitigation projects in Nelayan Village, Teluk Kumbar

6.4 Societal Responses To Flooding And Their Difficulties

6.4.1 Unprecedented situation

According to the focus group participants among *Gertak Sanggul* Village Community, they do not expect that major flooding will occur, although low level flooding is expected. For example,

“Before this, we can predict if it raining for two days continuously flooding is imminent. Nowadays the rain just need 5-6 hours to flooding. Most people can’t prepare for the flood within a short time” – Male, Respondents 1, Gertak Sanggul Village Community

“We do not anticipate the extent of the flood waters rose up to the chest level. Often the highest level of the flood would only reach the waist level” – Male, Respondent 2, Gertak Sanggul Village Community

“During the recent floods, I’m still at work. I merely rely on onto my children in moving the stuffs. My neighbours would also come to help. As I arrived, I did not manage to lift much stuffs as the water rose too fast” – Male, Respondent 3, Gertak Sanggul Village Community



Figure 6.8: Teluk Kumbar Community Hall: Impact of flooding

(Source: Village resident interviewee)

This viewpoint was consistent among other mosque committee members who had experienced the flooding and recovery period. In our hour and half interview, they explained:

“Often the water level is very predictable by the resident. So most of the people know what to do and whether they will need to move their goods and valuables. But this time the water just rose too fast and way too high than it normally occurred costing the people a lot of goods were damaged” – Male, Chairman, Teluk Kumbar Mosque

“Floodwater usually rises up to the knees or hips. The recent flood had really surprise the peoples. We do not expect it to happen so badly. Indeed, it causes panic. Usually flood had never submerged the vehicles, but this time the car was submerged, many do not realize the water rose too fast. Casualties were reported as the death of a senior citizen. The incident happened this time never or have not taken place since 10 years ago. The water level was read as high as 12 foot and the receding of the water level is so slow taking up to 4-5 days” – Male, Committee Member, Teluk Kumbar Mosque.

“The speed at which the floodwaters rise during the biggest flood happened recently was unpredictable and unmanageable. We have never experienced floods like this where the water raised up to 1 meter. Thousands of victims been evacuated at one time. We received complaints as delivery of government relief items such as food was delayed for 6 hours” – JKKK for Paya Village Committee.

A similar view was held by one of the NGO representatives interviewed;

“For me, the second group is seen as not ready because the flood happens very fast and sudden” – Male, Chairperson, Sahabat Alam Malaysia (SAM)

A comment from *Suluk* Village representative (JKKK) similarly related to the lack of preparedness among community and volunteers. As can be seen, there appeared to be concerns about how the flood was managed on a local level. For example,

“It’s not we are not prepared. What can we do much? Perhaps we are lacking of people that came to help. We are short on manpower. Well council workers need to clean up their homes too”.

Further, as discussion about readiness with JKKK *Suluk* Village, he explained that most of the victims had no emergency plan, nor had ever participated in any disaster preparedness educational program. He described that,

“There are victims still living in evacuation halls for one week or more because their homes are not completely clean and repaired yet. Some of them waited for the government funding but encountered many difficulties related with financial costs such as vehicle repairs, shop restoration and property reconstruct. I believed just a few might know basic emergency preparedness such as keep all the valuable items to the second floor of house include securing of important documentations, packing emergency kit immediately to evacuation center and prepared a three-day supply of clean water”.

Likewise, other interviewees from *Masjid* Village asserted a similar view that the low level of flood education would affect the individual preparedness. For instance, he said that,

“I don’t think there are any preparedness educational programs. People especially elderly, disabled and children were not aware of the availability of relevant resources. People just act based on their experiences and waiting for the assistance. I could say people don’t listen to the evacuation call. They just ignore and just wanted to stay at their house even though have to stay in dangerous, and uncomfortable area”.

There is a question whether they are prepared to lose their belongings, clean up and have to search for a temporary living arrangement? Based on the conversation with Global Peace Mission Malaysia (GPM), the community preparedness was really based on history. The Chairman of this NGO cited,

“I think as it happened recently in Penang, we have been so much overwhelmed with an unusual downpour. One of the victims explained to me his families’ members surprised by the speed of the floodwater surge and had to evacuate at 3 am in the morning. At first they thought it just a normal flash flood but then it kept on going up higher and they went out the front door and saw their neighbours shouted, ‘Need to go now’. Obviously they were panicked and doesn’t know what to bring and how to transport themselves because of flooded roads”.

Numerous community members felt that they should rely on the government to resolve flood-related issues. However, community people would rather wait for authorities to handle each worry than cooperate in resolving numerous issues.

6.4.2 Social vulnerabilities affecting awareness

Data analysis confirms that there is still a lack in society’s preparedness to face floods. More worryingly, community members lack the awareness about the consequences of flooding on communities. They are not aware what is happening in their surroundings, which means there are unable to take action to reduce and limit impacts when flooding occurs.

Table 6.6: Socio-psychological wellbeing

Exposure	Low severity	Medium severity	High severity	No experience	Majority
Health	36	12	13	35	Low severity/no experience
Family and friendship	22	13	8	54	No experience
Psychology	20	5	16	55	No experience

This includes the impact that flood risk can have on wider health risk. This is supported by the findings identified from one medical representative described as people in *Teluk Kumbar* lack awareness of health and safety hazard effects.

“Those of seventy years old and below than 10 years old more likely to be adversely affected by the cold, due to damp conditions caused by flooding. During that time, children’s were less controlled by their parents. Parents are busy to move all the belonging and rescue things. While the children takes the opportunities to play with the water (Figure 6.9). Flooding time is a celebration for the children. Actually, they are facing with the risk of drowning – Female, Medical Assistant, Teluk Kumbar Community Medical Centre”.



Figure 6.9: Kids playing with flood water without parent monitor

(Source: Fieldwork observation)

Another local medical officer also mentioned that victims were unaware about the consequences of flooding on cleanliness and hygiene during and following flood events.

“They eat exposed food and drink from unsanitary and treated water sources which contaminated sewage and other contaminants which are a threat to the health. We received some cases of diarrhoea, skin diseases, fever, and food poisoning. During the flood, household goods such as cooking utensils become dirty flooded by the toxic rainwater and mud. You know the tap water from sink also polluted and breeds lots of bacteria during that time. But nothing can do if the victims inadequate drinking water supply. They just drink.” – Female, Nurse, Teluk Kumbar Medical Centre.

These findings contribute to our understanding of flood-affected populations' susceptibility to poor health impacts associated with waste mismanagement during post-disaster recovery efforts. Health effects of flood associates with the living subsequently for long periods in damp and dirty conditions, which contaminated with sewage, animal waste and other contaminants. For example, one community representative, JKKK Teluk Kumbar Village described:

“Scores of indestructible or unperishable used items could not be destroyed in totality in view of their material nature. As a matter of fact, the aforementioned items became abodes of vectors such as rats and mosquitoes – hence it led to the spread of many life threatening disease such as dengue, leptospirosis, diarrhea, and the likes”.

In this respect, people's ongoing concerns about their physical health were largely associated with the degree to which coping and support capacity are insufficient. Floodwater waste might leave a muddy deposit as it recedes and this may contain some

harmful bacteria. Poor flood solid waste management particularly in rural area is an issue, which is a complex issue to address.

Besides, the effects on psychological health impacts which the flood victims faced because of a lack of psychological preparedness and awareness on do's and don'ts during floods. Most of them reported that they were stressful. The nurse from *Teluk Kumbar Community Medical Centre* perceived that:

“It's not easy to adapt with the crowded relief center condition. Victims surely tired and restless move out their belongings. I also suffered from high blood pressure and psychologically stressed by the flood event”.

In another example, school institutions I interviewed had experienced managing the school as a temporary evacuation center and the interviewee believed that the residents understood the risk, but there was a lack of awareness among the flood victims in the matters of hygiene and safety. The following quote illustrates the situation:

“The situation at the flood center is not well managed especially dirty bathrooms, rubbish is not thrown properly, overcrowded center, and all are inevitable because of the number of victims. I can give the score of three out of five if I am asked to summarise the level of awareness in terms of hygiene and the risk of danger of flood. They are aware but would often ignore the advice and rules outlined. Given that this school is within their community area, they feel like the school belongs to them. They are not shy from doing things according to whatever they want – Female, School Teacher, Teluk Kumbar Primary School”.

Unfortunately only a few disaster preparedness initiatives have been organised for those with low flood awareness in the community. For example, one interviewee noted that the response capacity and needs of those vulnerable people are perceived as fundamental to effective disaster response.

“I feel that not all awareness programs are known to the public. There is still many victims who have never been involved. My experience when I joined a flood hazard awareness program, what was lecture is too general and does not reflect what the victims are facing in the local area. Understanding local norms, values, belief systems and language are found to be imperative in the communication strategy and skills. There is a need to come back and make follow-up at least after six months to look back at the awareness progress of the victims. If only one time (referring to debriefing intervention) after a few weeks of disaster, I do not think it could help”. – Male, Engineer, Teluk Kumbar Medical Centre.

There are still a limited number of disaster awareness initiatives and training programs for the local people even though this has been suggested many times. This argument relates to the discussion on how awareness can be enhanced while the recommendations from the community are not taken into account. Lack of understanding on flood risk and awareness may even lead people to deliberately ignore danger. For example,

“Many people in this area who do not want to move out for temporary period at the mosque and wait until the critical level as the water level rose up to chest level. This is very inconvenient for us to carry out the rescue mission. This is very dangerous for them. We had been patrolling while using the speaker making the announcement but not all the people who want to take action. It is difficult to change their mind-set” – Male, Chairman, Teluk Kumbar Mosque Committee.

6.5 Confusion And Clarity Around Flood Risk Communication

Additionally, empirical data suggested that the community established around the flood experience is viewed as a vulnerability, which is especially crucial for risk communication between agencies and the general public. In the recent flood situation, the warning alarm system did not function effectively; this is seen as disappointing by residents and a situation which could be addressed by the area’s officials relatively

easily. Another concern is fake news, which can spread quickly via social media, creating panic and distrust in official warnings. For example, one disaster management agency representative from NADMA described that the authorities must immediately stop such behaviour during troubling times in disaster-hit areas.

Local inhabitants, according to flood volunteers, disregarded authorities' early flood warnings. Communities do not respond to the early warning system for evacuation:

“When the water inundated too high, then they started to evacuate themselves. The problem is communication from first responders getting chaos. Many people need an immediate response to help them evacuate. Therefore, the process of transferring victims from house to evacuation center will be slow” – Male, JKKK for Masjid Village.

Local residents were not expecting such a large flood to attack them when the sea and river waters abruptly retreated. As we talked about disaster response, there was disagreement amongst the communities that appears to have led to a lack of trust with the relevant agencies. People were aware of how the emergency siren operates, but they were not connected to emergency management and lacked knowledge of the council or authority's emergency plans. From the interviews in Teluk Kumbar, it seems that it is a big challenge to raise people's awareness and get them to respond quickly. One of the community representative members in charged during flood operation stated:

“A lack of cooperation rendered by the flood victims upon the idea of deploying alarm/ siren system in strategic. It's all about communication. I could see they had limited thought about disaster procedures” – Male, JKKK for Teluk Kumbar.

Specifically, an NGO representative believed that most of the community members do not understand the warnings issued and they were not given a clear explanation on how the warning system works. This is most obvious among the special needs group such as the elderly, those with disabilities, and those with special medical needs.

“There are many who are confused and they do not know what to do when early warning is given. We can observe people unaware about the early warning given when flood were to occur through sirens. Like I say, they those require special needs not really to show up and respond the siren”– Sahabat Alam Malaysia (SAM)

Table 6.7: Flood risk perception

Flood risk	Disagree	Moderate	Agree
Flood warning information is easy to understand and readily available	21	30	47
People cannot rely on government to protect community	32	26	37
Local infrastructure in my neighbourhood is satisfactory right now to handle the flood and effective	22	41	35
Authorities have done the best (acting fast) to reconstruct	15	46	37
Government should invest more on educational programmes	4	22	72

According to the survey data (Table 6.7) from local households, most respondents agreed (n=47) that they understood the information about flood warning provided by the authorities, but 21 respondents did not understand and felt the information provided was incomplete or unclear. Yet, 37 respondents stated they do not need to rely solely on the government in managing floods. However, 32 respondents felt the community

should hope for assistance and support from the authorities. In addition, the facilities and infrastructure of flood mitigation provided by the government were seen to be in a less than moderately satisfactory condition (n=41); 35 respondents were satisfied, but a further 22 respondents were dissatisfied because the emergency support provided was not very effective. The community was similarly disappointed in the speed of the authorities to support recovery and did not feel they managed themselves efficiently in disaster mitigation actions.

Thus, the acute response of early warning and monitoring systems is not very effective or easy to understand by many locals. Among the findings from interviews and discussions with stakeholders, it appears that the technical warning system problems has led to miscommunication and confusing warning signals that contribute to ignorance of community to take any action to face floods. The confusion between normal and warning siren amongst the public has been called into question for many times. As one interviewee, in Teluk Kumbar, pointed out the difficulties,

“When the flood water reached at some specified level, a warning siren will sound. Siren station at our village placed at the river mouth near the location of the pump house. People understand that warning siren will sound as a sign of rising water levels. The only problem when high tide happen, the siren will alert. But, most of us not sure is it a normal siren or a warning for flood” – Male, Villager, Gertak Sanggul Village.

This view was supported by a representative from Masjid Village who stated that sharing of information from local government to the at-risk community is problematic. The local community was confused and found it hard to differentiate between the normal siren signals for releasing water from the pump house or during sea high tides with the emergency siren signal of the flood early warning system.

“We only have been informed to evacuate to the nearest school within a few hours. People just ignore and did not get ready for flooding. People only get ready to evacuate when the authorities such as Malaysia Civil Defense Force (APM) and Police (PDRM) give instruction to evacuate. Nothing much we can prepare. That is why people refuse to evacuate. Although others started to head north due to a false flood warning”.

Other participants from the community group also argued that there was low awareness due to limited flood education about exposure and that people do not get a clear approach to emergency procedures. This is evidenced by the communities not responding appropriately to the warning system until the situation getting really urgent and risky.

“Government can install high-tech early warning system but there is no point if at-risk communities still have low awareness. I would suggest to local authority that they should conduct activities to empower and educate people to react positively to an emergency flash flood early warning system when it switched on”. – Male, Chairman, JKKK Paya Village.

“Some of the villagers do not want to hear the instructions or information we deliver. But, if there are patrolling authorities and giving examples for preparing to move to a temporary evacuation center, then they will follow the instructions. I think for the rural area, it is good if there are Special Forces patrolling by using the loudspeaker to inform the emergency situation” – Male, Chairman, JKKK Teluk Kumbar Village.

Nowadays, government and environmental agencies are using a wide range of media as standard operating procedures for flood relief efforts. There are several flood precautions notes through social media such as WhatsApp, radio and TV. However according to the interview with one of the medical officers in *Teluk Kumbar Medical*

Centre, it can be difficult in delivering flood risk information to certain targeted communities especially those who are considered as vulnerable groups:

“Yes it is quite hard to deliver flood information to these groups. It is hard to get them for training events. To communicate with them, we need extra effort and budget. It is difficult in this area because of the lack of volunteer team to disseminate the information”.

Dissemination of emergency notice to the public could be a challenge and the effectiveness was continually being questioned. One local community representative’s perspective offered insight into both levels of analysis, in which respondents discussed the constraint of delivering messages to target community groups, especially those who are vulnerable. The following quote from him explained that:

“Yeah, not all people using smartphone or aware with the emergency notice from the media. Why there is no alternative plan or a few options for effectively delivering the messages to the target communities in specific areas.” – Male, JKKK for Suluk Village.

He also asserted that,

“In one of the meeting I attended, local councils expressed frustration about public participation. Self-response and recovery strategy related to flood information was not well communicated to the public. Without strong participation from the public any flood action plan which contains information on the community level plan of action in case of flooding, information on whom to contact, local community emergency centre and other information such as what people can carry with them will only be a disorder in the disaster response operation”.

The issues also related to the way in which flood warning information is issued, whether it is a passive system or a top-down communication. Review of standard operating

procedures for flood relief efforts must be undertaken in view of the changing weather patterns and availability of new communication technology. Reliability of the flood warning system has been critiqued by local community members as it needs to be improved. The respondents perceived a strong need for improvements to the flood warning system so that they could understand the warnings and respond effectively.

“The weather forecast also not so reliable and not up to date. We will only know about flooding or river water level 1 hour before flooding. Most of us will observe by ourselves by looking at the sky and predict the rainfall. Local council website for flood information or news not really update and people not likely to access it. Most of victims only get clear information from the council and authorities when the people are require to be evacuated.” – Male, Secretary, Suluk Village JKKK Committee.

At the other end of the spectrum, a villager identified contingency plan of early warning and effective information delivery within community:

“Honestly speaking, locals were not informed sufficiently early about the possibility of facing flash flooding or even during monsoon season. If we have strong budget allocation for early warning system, it is good to adding siren system at every hotspot area especially those rural villages that really difficult to reach with communication. Another thing is the sound of the normal siren and emergency should be different which capable of providing accurate and timely information on potential floods. Otherwise, the siren will not effectively to convey messages about the emergency situation which owing to a dysfunctional system.”

To ensure that the warning system is properly known, the trustworthiness and accuracy of news, whether via formal channels or social media, are dubious during disasters, producing uncertainty among victims. On their own, people are confused with orders from various authorities. Also, the authorities do not provide much timely information

about the real situation of the flood. This has been commented on by on JKKK Majid Village member who said that,

“Maybe they (government) want to prevent panic and chaos situation. Nevertheless, they were keeping it silent and we were shocked when the order of evacuation given at a very short notice. I think it is better to be transparent.”



Figure 6.8: The only emergency warning siren installed in Teluk Kumbar.

Based on the present situation, dissatisfaction would be the word to describe how people feel the information has been relayed to the flood victims. A number of

governmental websites which should feature the latest and updated flood information were not updated and cannot be relied upon significantly by the masses. This is something to ponder about. In this area, there are many elderly people (pensioner) living with their partner or alone. Most of their kids live remotely because of work location. Some of them just rely on their neighbour's assistance to give them emergency information. The JKKK Masjid Village member also cited the flood-warning system was in its infancy and was poorly understood:

“They (elderly) don't have smart phone. Yes, they watch TV and listen to radio. However, I am sure we would getting difficulty to get their response back because they are not connected much with us unless they are in our register list.”

It is worth mentioning that trust and reliability on flood warning was an issue the participants felt was important and relevant, especially if such information relevant to flooding emergencies was available, but it needs to be improved because it is not effective. An NGO member from *Briged Bakti* emphasized that information related to disaster risk reduction and warning to the public via official websites as:

“I think if you could check the Infobanjir webpage, you may see the system is not really enables effective early flood warning dissemination to the public. Sometimes the website reported crush and not updated. The operational flood warning system supposedly provides early warnings several days ahead. So people could determine when flooding might occur and have accurate time to prepare and ability to save their property. The government also should invest in flood awareness events in schools, youth clubs, and community centers. I could say that this effort quite being left out now. People are aware of the risks but they need to be more prepared. Some of them seem not trust the system of warnings.”

In this regard, dissemination and timely responses to flood warning systems are important issues that should be addressed in Teluk Kumbar, Penang Island. These

changes require institutional support in applying science and technology to improve the warning system and communications. Household respondents reported that they are exposed to river overflow, which carries dirt, sewage, and other pollutants into their properties. By the time they become aware of a flood warning, water has already surged into their property. It is obvious that communities often lack the time or resources to take measures.

6.6 Ground Truthing The Local Politics And Governance Of Flood Disaster

There are a number of other challenges, such as politics, involved in disaster recovery that could impact disaster management and these are discussed below. Political concerns, in general, have a crucial role in the planning for, response to, recovery from, and mitigation of Malaysia flood disaster occurrences. Referring to one of the earliest studies by Geipel in 1982 that systematically analysed the recovery model, he discovered that the crisis has worsened previously existing inequities, and the original hierarchy of tasks, persons, and power connections has asserted itself more forcefully than ever, making even relief policies difficult to change. Class, cultural, and, in the case of Friuli, regional issues all contribute to divergent perspectives of needs, reconstruction plans, and the role of government and external assistance in the recovery process.

My results indicate that local authorities (state government) insist that managing large-scale flooding is the responsibility of the national government, rather than theirs. Hence, it is not unusual that disaster financial networks management is also closely linked to politics. There was a lack of coordination among the political leaders involved in the post-disaster recovery programs. This is all the more apparent when the continual

overlapping of responsibilities, which are to be deputized among the agencies at the state and federal level, are considered. This overlap contributed to the confusion as to whom takes full responsibility of the entire financial assistance process. From the interview with one of government agency, the following politicisation of flooding issues was identified:

“A number of incentives or goodies has been proffered to voters during the campaigning period of the general elections by the federal government; and this is palpable in alleviating the flood woes faced by the victims. Millions of ringgit has been promised to be channelled to the rightful beneficiaries. Nonetheless, there is what we commonly called the “blame game”. – Male, Director, PlanMalaysia.

He added that the compensation payment woes between developer and the federal government have yet to reach an amicable situation as both parties could not agree to an impasse smoothly. Similarity was identified based on the response from the Bayan Lepas State Assembly Office where a series of plans have been in place, nevertheless the inevitable nature of political pressures from certain quarters has obstructed the smooth flow of flood-mitigation processes. He stated:

“It is publicly known whereby during the general elections, every financial allocations are being froze by the relevant ministries until the end of the general election period. As a consequence, poor drainage system, failure of implementing disaster mitigation projects are plaguing the affected areas”.

One particularly vexing issue affecting people at all levels is the delay in allocating funds for any mitigation measures that have been put on hold for several years. It is a common sight, and likely a consequence of greed among certain politicians. Instead, there were conflicts between the political players and adversaries and they do not

appear inclined to cooperate or share a common political agenda. In particular, based on the interview with JKKK *Suluk* village member, he expresses this concern as:

“Let me give you one example, Tanjung Bungah assembly member is barred from approving a RM700 aid for those in his constituency who were affected by unprecedented floods because he is representing different political party with the state government”.

Nonetheless, the political schism between the federal and state administrations persists. One concern by JKKK Masjid Village member was that during the flood events, he described that there were difficulties synchronizing and managing political decisions if the state government is not of the same political party as the federal. For example, Penang state is governed by the opposition Pakatan Harapan Party, while the federal government is led by Barisan Nasional Party. Confusion has occurred at the beginning of the registration process for entitled victims applying for emergency financial assistance such as loans, and compensation. As noted by one resident in Teluk Kumbar:

“There is always confusing regarding registration process for new flood damages compensation application. This is usually because the list of names for registration that compiled by Federal Village Headman (JKKKP) was different to that of the list of names recorded by State’s Village Headman (JKKKN). The federal and state governments managed separately the flood compensation depending to their political considerations and bureaucratic rules”.

There was much contention over reaction and recovery concerns as a result of this political reality. As an example, in the event of severe floods, the federal government from the *Barisan Nasional Party* intentionally funded river maintenance or flood mitigation projects with a budget of millions of Ringgit. In this case this funding had a positive impact and this will give advantage to a specific political party.

Furthermore, according to the JKKK Masjid Village member, the state government claimed that the federal government had not done enough to assist with flood mitigation costs, planning efforts, nor the actions taken to implement flood preventive projects. The problem is that the allocation for infrastructure repairs, which is distributed through grants, were delayed. Naturally, even when the necessity of developing policy in advance of disasters is accepted and understood, the process of developing and maintaining such policy is difficult. The respondent described his disappointment around the politics of disaster:

“I am saddened to see that, some politician leaders have begun to adopt the attitude of fighting each other. They keep on pointing fingers that who supposedly organize the community awareness campaign such as flood preparedness training but the question is whether there is a solution to this. How long should we wait until this blame game over. We hardly see promotion campaign (poster, buntings etc.) at the community level”.

Generally, communities are tired with politicians that always point fingers at each other as they often use flood disasters as an opportunity to blame each other. Barisan Nasional Party (BN) has blamed the Penang State’s ruling Pakatan Harapan’s (PH) poor flood mitigation works for the recent spate of flash floods in the state. While PH Penang State alleged that BN-Federal Government had failed to set aside sufficient financial allocations to improve drainage and reduce the risk of flooding for the state. This was agreed by all representatives of Teluk Nelayan Village in a focus group discussion,

“All of us agreed that all parties should concentrate on the real task of dealing with the floods. Stop all the politicking. We want solutions!”

Communities received rice, sugar, biscuits, and other basic items, but some politicians seemed to provide better offers because they also provided money. This can also be

seen as an upcoming election goody, although some people did not get the same benefits, which could have serious consequences, for example:

“I’m not sure not that is just a strategy to gain the votes from them on the Election Day or due to their responsibility. Some flood victims also mentioned that the relief from both political parties was still not enough because they experienced the flood disaster every year without solutions from the government.” – Male, Masjid Village Committee Member.

The other important finding from the analysis related to connectedness of Teluk Kumbar communities and the quality of relationships with community leaders and government stakeholders. The Village Development and Security Committee (JKKK) should listen to the problems and ideas of the local people and then communicate this message to the district and state assembly member who has the budget. These repercussions can, in rare occasions, result in illegal or immoral behaviour (e.g. use of disaster powers for personal gain or influence). As stated by one of the Teluk Kumbar Community representatives during their interview:

“Well, we can’t run away from unequal distribution of support especially on financial based on social political backgrounds. The JKKK coordinate the movement and welfare of victims. I see the problem is from ineffective of flood aid distribution due to the attitude of JKKK. They have authority to distribute the flood aid and endorse the application of damage compensation. My neighbour told me that if we do not support their (JKKK) political party then our application might be pending or delayed to be process”.

It is also interesting to look into a statement made by one of the interviewees from *Gertak Sanggul* Village community. There is one village, which had been reportedly left behind in terms of governmental assistance, as the villagers are known to publicly pledge their political allegiance to the opposing political party.

“There are those who are complaining that the aid is not provided fairly and there are those who claim they don’t receive any help at all. Perhaps because there were those among the resident representative practicing favoritism due to political differences. There is also late aid receiving cases as there are irresponsible representative which are advancing their family and closest friends first before they start to distribute the aid to the people” – Male, Villager, Gertak Sanggul Village.

The finding through the academic lenses of politics of disaster also found the same issue as stated above:

“Based on my experience and observation, one of the village committee members did not distribute the aid evenly and solely distributed to the known supporters of a particular political party. Hence, this is a breach of duty and it has resulted in the villagers’ dissatisfaction towards the village committee members” – Female, Professor, University of Malaya.

In another example from an NGO perspective, the dissemination of information would be an issue because all the information related to warnings, funding assistance and other support would be forward to the level of Village Development and Security Committee (JKKK). However based on his explanation:

“JKKK are involved mainly in politics, which then led to difference of opinion, and they did not want to follow orders and commands from JKKK. Eventually, the information’s and explanations to the public could not be executed effectively as the community and resident representatives mainly JKKK are not able to work together”.

The implementation of sound policies which are stipulated on well planned flood mitigation activities by certain states in Malaysia are a laudatory move and sadly, some frequently flooding hit or prone areas did not carry out effectual flood mitigation plans.

For example, based on the federal state level, there are a number of policies which call for good flood-management plans, nevertheless this is the opposite for certain districts in certain states which do not adhere to the set of prescribed guidelines as manifested by the policies on the federal state level. Hence, it resulted in unnecessary conflict among the agencies involved. One representative from Gertak Sanggul Village in a focus group discussion responded:

“The villagers at my family's home have protested a dam construction near to the village upstream river. However, due to the intervention of various political parties, the project continues. Unfortunately, the project was half way due to lack of allocation” – Male, Gertak Sanggul Local Villager.

Nonetheless, some flood-affected localities have a substantially higher level of political engagement. The community representatives perceived politicians as giving shelter and relief supplies in an attempt to sway voters' perceptions of incumbent lawmakers and the government. One common observation is politicians do not care about the core problem:

“When floods occurred everyone especially politicians busy to help us. But actually they didn't care about the core problem. Everyone knows flooding occurs as a result of improper drainage system. But you can see how small our drainage. Many suggestions have been given, but until now we can only wait and wait the flood proofed or modified structure to be built” – JKKK Nelayan Village Committee Member.

Conflict between politicians, emergency managers and residents would often occur. Usually, the engineers who would come to observe the area before conducting flood mitigation projects refused to listen to the advice and suggestions from the community. They would thus work from their personal expertise and understandings. Even though the community may not have high qualifications in engineering, their experiences are

useful because they know the context and detail of the local area a hence the origin of the problem. The government, technical agencies and authorities should respect and value the knowledge of local people and should have taken the suggestions of the community more seriously. As Sahabat Alam Malaysia noted,

“When the local communities disagreed and protested on the pump house in Sungai Bayan Lepas as it will only cause the water to not flow through successfully and the water would overflow during the rainy season. However, the project kept on going which have caused the area nearby to cause flood. The opinions of the local communities are not well taken as we received complaints from it in many places”.

Politics is defined as the process of defining and enforcing public policy. Failures in policy formulation or implementation are frequently at the centre of political disputes and campaigns. A development project or flood mitigation project would only be approved when there is political intervention. For instance, many people continue to argue that hillside development regulations and standards have shortcomings and loopholes. An interviewee from JKKK Suluk Village community group described that the state government seemed to promote and approve the high-rise development on the hill areas. On the other perspective, state government was defensive about having to build more houses and commercial buildings with limited land space, which has led to replacing the green areas with concrete. Add to this complexity the fact that demands evolve constantly and that public expectations in the aftermath of a disaster are inevitably (and frequently irrationally) high.

6.7 Summary

This chapter has explored the vulnerabilities of flooding through the lens of the communities and respective stakeholders. Through a combination of data information collected during in-depth interviews and focus group discussions, it was possible to assess community vulnerabilities around 2017 flooding in Teluk Kumbar, Penang Island. It is unsurprising therefore, that the majority of those involved with this study faced a range of vulnerabilities as they were involved with surviving and dealing with the aftermath of the flood, recently and over the last decade.

Key results underline the impact of poor environmental management which increases the likelihood of flood events and the vulnerability of communities to flooding. Flooding arises due to heavy rainfall. In addition, suitable drains have not been built and the density of urban development is very high, exacerbating runoff. It appears that the physical environment, including the nature of hazard events such as; deforestation, increased concrete areas, improper development planning, heavy-storm rainfall contribute to the hazard. Climate change, environmental issues, and development planning and policy-making processes have resulted in land erosion, which in turn causes reduction of flow capacity of channels, increasing the likelihood of flooding or even worse, flood with mud. People affected felt that the authorities were ignoring people's critiques and warnings. Volatility and difficulties in institutional governance have been presented.

These factors have led to achieving the research objectives on the factors of local communities that form the response and recovery. The analysis of findings indicated that a lack of timing exists in preparing for likely disaster events influences responses

to flooding. In addition data from the present study has shown that lack of knowledge in flood preparedness among residents to deal with flooding in Penang was surprising. The results from the field case studies have shown that actions taken by the authorities did not appear to reduce uncertainty. Complaints about the support available included delayed emergency operations that created 'panic' or 'worry' amongst those affected by the floods. This chapter also has presented the investigation of evacuation decision. Results demonstrate some residents chose to stay at home during flood events and refused to leave since they did not want to leave their houses unattended.

The other challenge is the unwillingness of insurance companies to offer home insurance packages for disasters, especially flooding. The insurance companies are profit-based and seek to establish sensible profit margins from the insurance premiums payment. However, Penang Island has been known to have a high number of flood events. Thus, insurance companies are likely to have to compensate more, compared to high returns from the customer premiums. Therefore, many respondents suggested that the government should be involved with insurance companies through joint ventures to subsidise people's involvement, particularly for low to middle income families. The relationship between insurance and vulnerability is complex and it was noted that there were issues with insurance mechanisms as one form of economic adaptation. A lack of understanding about the benefits of insurance is a major challenge, especially for community members reluctant to subscribe to an insurance policy.

Since flooding issues in Teluk Kumbar disrupt community livelihoods, insufficient subsidies and resource allocation affect the victims' recovery process. Limited disaster awareness programs due to financial constraints by the relevant agencies have impacted

the community's self-preparedness and awareness. For example, using the school as an evacuation centre with a limited budget produces consequences, which include damages to the school, disruption of regular classes and poor conditions of school facilities. These impacts undermine the ability of the school to provide an effective education and support to pupils. Despite significant community experiences and knowledge of flooding, locals did not expect such a severe flood. Hence, the biggest flood that occurred was unpredictable and unmanageable. It was difficult to predict and understand past and future rains. This finding demonstrates that flood preparedness and disaster risk reduction awareness activities are not working effectively among the locals.

Vulnerability of communities was increased by indirect impacts of flooding associated with mess, chaos and unclean evacuation centres which in turn leads to health and hygiene issues. Many community members did not see floodwater risk, cleanliness and hygiene as a priority during floods. This research clearly identifies that the community faced difficulties adapting to crowded relief center condition and sharing facilities with unsatisfactory hygiene conditions caused by the attitude of the flood victims. Apart from that, children are vulnerable during flood events because they are controlled by their parents. It was noticed that the deciding element is a lack of information among family members about what to do in the event of a calamity.

This chapter has also highlighted that effective communication was significantly important and a key aspect that should be exercised in the interpretation of these results. Evidence and reflections from the community highlight that they do not respond to the early warning system for evacuation. Communities lacked trust in the relevant agencies.

The lack of trust is compounded by unreliable and inaccurate news, either through formal channels or through social media, which often exacerbates flood information. Incorporating disaster risk information with accurate information about danger and behavioural options for vulnerable communities with special needs is a big challenge, which means that current flood warning systems are not strong enough to support people's preparation and readiness.

A disaster then, by definition, involves people, and any event and is managed by complex organisational politics, for instance those involved in operationalising flood-risk management. Despite the current integration of government disaster policies and any decision-making of emergency management including flood aid distribution, flood-risk management remains political because it involves party political patronage and power. How effectively or ineffectively we mitigate, prepare for, respond to, and recover from disasters is strongly tied to the quality of emergency management/disaster policy development, maintenance, and implementation.

Building on this discussion, the next chapter re-evaluates the above findings along with a discussion of community responses to flooding in Chapter 5 as the key research findings and how the empirical evidence supports the conceptualisation of resilient disaster recovery.

CHAPTER SEVEN

Chapter 7: Discussion

“A flash flood with landslide killed 11 workers at a construction site for a high-rise apartment tower, burying them in mud. Flooding is endemic.”

– Penang State Media Release, 29 June 2017

The community worst hit by the floods on November 5, 2017 were the communities of Teluk Kumbar, Jelutong, and Tanjong in Georgetown, in Penang Island. While bringing sorrow and destruction, the flood disaster also left the people with many valuable experiences and lessons. It also triggered public participation and involvement of affected communities in flood-risk management. The sorrow and grief were apparent, but the suffering did not mean they lost the ability to take control of their lives.

7.1 Understanding Variations In Vulnerability And Community Response

In the previous empirical chapters, the challenges faced by impacted community groups in reducing vulnerability and building resilience were investigated in the perspective of better understanding local risk and social, economic and political forces in the Teluk Kumbar, Penang floodplain environment. Presently, the state has physically recovered from the flood disaster, however, there are still particular aspects such as forms of community knowledge and preparedness, adaptation, coping, public flood risk communication and politics of disaster, that need to be addressed. This chapter revisits the key results that discuss various levels of disaster response and stakeholders' experiences in the context of the existing literature, indicating the flood response, coping and adaptation. In order to satisfy the study objectives, the findings from Chapters 5 and 6, as well as associated hypotheses, are combined into this chapter.

It's also important to remember that this study is based on the observations and experiences of persons from the affected community who helped in some manner with the rehabilitation process. Community members' participation was important in three ways: first, it allowed participants to observe and gain a better understanding of community leadership, action, and activities; second, it provided participants with a hands-on experience of community resilience and recovery; and third, it allowed participants to participate in the research. The study concentrates on the community's strength, capacity, and acts while neglecting the community's vulnerability, distress, and actions. The research focuses particularly on the strength, capability and actions of the community without ignoring the experiences of vulnerability, distress or inaction. This study makes no attempt to minimise or distort the terrible experiences that communities and individuals face in the aftermath of a natural disaster. Table 7.1 summaries a number of the main themes of resilience and vulnerabilities that were uncovered during the course of the thesis. It can be used as a guideline while answering research questions.

Table 7.1: Key factors of vulnerabilities and responses

Category	Vulnerabilities identified	Responses identified
Environmental	Unpredictable flood pattern and levels. Extreme weather. River debris. Amplified risk perceptions. Inability to adapt to new hazards. Unsafe water. Hazardous sites (near to river and hills).	Improved flood solid waste management (cleaning and dispose actions).
Socio-economic	Wages/employment interrupted. Inability to compensate business loss. Damage to home. Property loss.	Restoration of damaged houses under the Rural and Regional Development Ministry.

	Crop loss. Infrastructure facilities damages.	Establishment of National Disaster Management Agency in 2017.
Institutional	Land-use not unified with risk management. Infrastructure priorities do not include mitigation (project delay). Pending decision making. Uncoordinated preparation and response between inter agencies. None flood standard limited zone and relocate plan. Lack of structural mitigation policy. Lack of public trust. Bureaucratic rules in dealing with the local council.	Satisfied compensation policy. Efficient mobilization of assets and people to implement rescue and relief activities under National Disaster Management Agency (NADMA). Well supported by contributions of the Non-Governmental Organisations (NGOs). Updated database information to flood manager staff. Ongoing training to encounter flood disaster, ensuring equipment needed for disaster to be in a ready-to-use condition.
Flood warning (technology, information)	Unpredictable flood pattern and levels. Local warning and information unreachable issues. The flood prediction data is not always reliable.	Multi-response local warning system.
Politics	Difficulty to enhance coordination, understandings and agreements among two political parties. Insufficient resources due to political differences. Media sensationalism. Unfair assistance and aids distribution by head of the village (JKKK).	Fast distribution of aid during their early stage of stays in the evacuation center and when the victims return to their home by political groups. Active political volunteer groups.
Community (awareness, attitude)	Lack of campaign and flood preparedness/education programs. Forced evacuation.	Increased local responsibility. Adequate public involvement. Learning from recent experience. Capacity to cope with uncertainty.

Health and psychology	Emergency evacuation kit is still not yet common. Destruction causing emotional distress to the victims. Inconvenience condition of evacuation centre. Intense or unpredictable feelings such as anxious, fear, overwhelmed. Poor socially isolated.	Assistances received were in line with their needs during flood events. Low risk of injury and death. Mobile medic team. Active medical NGO. Strong spiritual and religious beliefs (Belief in His will). Special needs victims were facilitating with appropriate emergency equipment. Evacuation centre with special medical support. Supported and engaged by social community and leaders.
Causes of flooding	Monsoon. Drainage system issues. Poor maintenance. Drainage blockages.	

7.1.1 Urbanisation and environmental

The main cause of flash flooding in Penang Island is a product of increasing urbanisation, including development in floodplain areas. Penang is a highly developed state in which it is difficult to stop development because people need houses to live, industries need factories, and roads need to be built, while at the same time the number of available catchments were insufficient and there is a lack of available land for development purposes. As a result, hills have been turned into housing areas (Figure 7.1) and used for other development projects, without replacement rainwater reservoirs being built. The land is therefore losing its ability to act like a sponge to absorb rainfall and resulting runoff. Hence there is a conflict of priority between development and environmental needs.

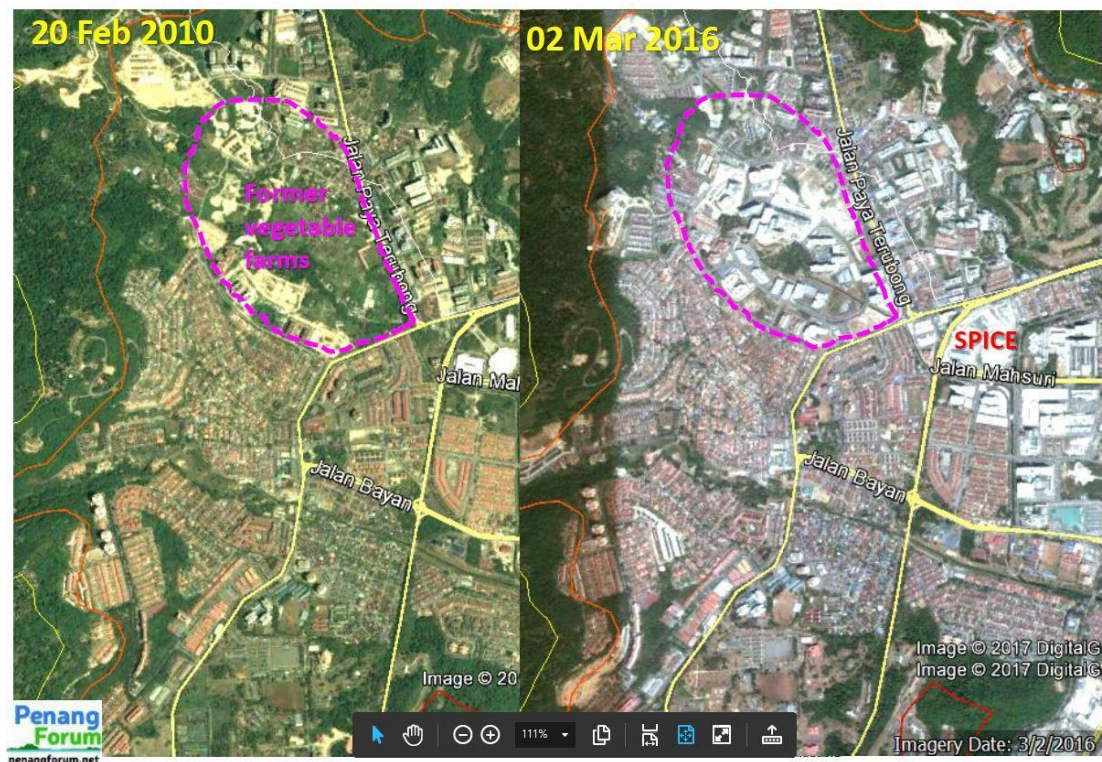


Figure 7.1: Land use change in Bayan Lepas district, Penang Island

(Source: Penang.Forum.net)

Floods in Penang Island are therefore caused by mismanagement and poor maintenance such as the lack of maintenance of the river channel, insufficient and poorly maintained drainage systems, and changes in the upper catchments. There is no doubt that participants of this study has revealed freely and accurately what they observed in their community. The participants described their observations of these events and actions, as well as the beneficial impact they had on the community's resilience, as well as the main concerns they believed influenced the recovery process. As a result of their experiences, the participants created their own viewpoint on what coping, social capital, and preparedness require, as well as what permits or hinders the adaptation and mitigation process. This study reveals that communities are undergoing complicated and variable recovery processes, many of which defy their own expectations.

7.1.2 Social capital

The current study looked at the several types of assistance that people could get in an emergency, such as financial aid, loans, home repairs, and material aid, such as water, food, shelter, and daycare (Twigg, 2007). The government provided the citizens with a few basic necessities as well as a little amount of financial compensation. In terms of social capital, it is normal practice in Penang's coastal villages to help one another during and after a crisis. Almost every person interviewed said that their family, relatives, and neighbours instantly stepped in to support them in their rehabilitation after the disaster. Furthermore, the overwhelming majority of interviewees (more than 90%) believed that community volunteers aided in the recovery process.

The same disasters are wreaking havoc on the neighbours, who are straining to keep up with their own house repairs. If a community has a financial support system, it will be better able to cope with and respond to disruptive events since it will assist to improve their resilience and lower their susceptibility. This system might be a way to coordinate all activities in order to prevent disaster-related losses. Community leadership and action, which are not necessarily widely recognised or officially organised, are a substantial contributor to community resilience and recovery, according to this study.

The emergence of such community leaders and acts, both inside the community and beyond, occurs on a regular basis. Following a tragedy, it is clear that community-led activities and initiatives play a critical role in a community's rehabilitation. Furthermore, it is clear that the acts of other people (individuals, groups, and organisations) in other places are also important. This study adds to the growing body of evidence suggesting governments and organisations should invest in projects that

foster social connections and bring disparate groups within communities together. (Aldrich and Meyer 2015). Developing these shared assets and qualities, however, necessitates a large role for the community in selecting and managing the process. A community is capable of selecting its own community leaders, and its members are already aware of those who are engaged and regarded as potential leaders in their community. In light of the research discussed, I attempt to defend the argument by Pelling (2003) in that it is possible for households with greater social status to sustain a lower impact of hazard because they have the ability to adopt adequate mitigation measures, and their recovery period is shorter than those who lack the requisite social capital resources.

7.2 Community Knowledge, Understanding And Preparedness

It was revealed that there was some amount of innate resilience existing by researching historical flood occurrences through local experiences and knowledge. Integrating local data and information about flood experience, as well as 'professional knowledge,' has the potential to improve knowledge and comprehension of the challenges at hand (Norris et al., 2008). There are voluntary team roles in villages that promote campaigns on how to deal with floods, to improve understanding the risk of heavy rainfall, suggestions about what response should look like and that provide information about government assistance available. Disaster resilience was shown to be significantly and positively connected with the number of previous disasters that the community has experienced, according to the current study. Several studies show that a family's prior catastrophe experience has a significant impact on the three stages of disaster (pre, onset, and aftermath), that is, before, during, and after the disaster (UNISDR, 2007).

Nonetheless, this study also found that some household members don't expect or anticipate large scale floods. The results demonstrated that rescue teams had difficulty in persuading victims to move to evacuation centres. Victims lacked knowledge that would have enabled them to take proper action. During the study it also emerged that individuals are emotionally affected by their previous experiences and draw on these in any future emergency situation.

This study intended to uncover a feeling of community self-reliance that was then turned into a collective reaction by individuals from three separate neighbourhoods taking the lead to address flooding concerns in order to better understand the source of resiliency for these communities. In survey, residents of the neighbourhoods demonstrated resiliency, demonstrating that they could withstand adversity, especially with outside assistance. In contrast to this situation, people's trust in the resilience of those who live with a deep connection to a site leads them to grow better at coping with flood threats, and they are more likely to help themselves rather than rely on outside assistance (Steinführer et al., 2009; Jonathan, 2012).

Members of these communities are managing their own shelters and taking care of themselves using various methods, providing mass assistance to one another by devising their own distribution schemes and resource management systems in their emergency response, evacuating one another on their own, and making their own decisions. As stated by several respondents: "*We managed our own flooded house*". Residents in their local neighbourhood were frequently in charge of evacuation. People's desire to work together was crucial in maintaining these communities resilient during floods. Cooperation has been recognised as one of the sources of resilience in

previous studies. As stated by Rhinard and Sundelius (2010), cooperation successfully improves coordination, more equally distributes resources, and promotes trust and social capital.

The study found that collaboration between these neighbourhoods boosted their resiliency in a variety of ways, based on observations from focus group interviews. For starters, it allowed for greater organisational success since they collaborated to carry out area protection duties (e.g. taking preventative measures to stop flooding of the neighbourhoods with water from the floods). Furthermore, collaboration aided them in mobilising labour, providing electricity, and deploying different resources and equipment that were already available inside each neighbourhood. Several participants stated that collaborating and using community resources and experience from each neighbourhood improved response operations while also establishing a larger pool of resources from which everyone could benefit. They went on to remark that working together rather than going it alone helped them deal with floods better (Folke et al., 2010).

The five local neighbourhoods in this case study collaborated to battle floods, and external support was shown to have bolstered their emergency response efforts. The assistance or aid offered by other organisations is referred to as external support in this case study. Local government agencies, for-profit and nonprofit organisations, as well as citizen groups from other locations, district, and *mukim*, all played important roles. Supplies, food, labor/manpower, equipment/materials, and even financial support were supplied by these sources. The information gained from the focus group interviews

demonstrates how important various sources of support are in helping these resilient communities enhance their response capabilities.

Local wisdom, or a community's acquired knowledge, may also be a source of resilience at the neighbourhood level. The idea of resilience is discussed in detail in the article where, Manyena (2006:445) stated that “*local adaptation strategies, culture, heritage, knowledge and experiences are building blocks for boosting disaster resilience*”. This study uncovered tangible data that supports the idea that local knowledge affects a community's or neighborhood's emergency response capabilities. Local knowledge, as defined in this study, is the knowledge of human adaptation to a specific local environment that has been accumulated over a long period of time. Knowledge on the flood hazard, suitable preventative measures, and successful response methods were acquired from a range of local sources, according to the findings of this study.

Having to encounter or endure regular flooding provided knowledge about flood threats and flood response tactics. Participants who have dealt with flooding before reported that their previous flood experiences helped them to persevere in their lives. Flood prevention and response measures have been devised or altered as a result of previous flooding incidents. Members of the community are more prepared to deal with floods if they arise since they have dealt with floods previously. Penang residents are familiar with floods because they occur every year, and their previous experiences have prepared them to respond appropriately when one strikes.

When communities are cut off from outside aid and their access to normal society resources and functions is limited as a result of natural catastrophes, planning is vital in assisting people in dealing with the consequences and adjusting to changing or unforeseen conditions (Jang and Wang, 2009; Paton et al., 2006; Birkland, 2010). The phrase "preparation" refers to the processes that were carried out prior to the floodwaters inundating the affected areas. As a result, anticipation may be considered as the source of preparedness. As previously noted, flooding affects people in the Teluk Kumbar and Penang neighbourhoods almost every year.

As a result, flooding has grown widespread in the area, and it is predicted to increase in the coming years. Preparatory activities take many forms in these communities. It could be used to collect data on requirements, vulnerabilities, and generating capacity, as well as inventories of resident volunteers. A resident representative who participated in a focus group offered the following information on the information gathering procedure that took place prior to flooding:

“Before flash flooding occurred, we gathered information about the number of possible evacuees, recorded the number of the elderly, children, people with disability, and other vulnerable population. Once we got all this information, we submitted the request with this information attached to the district office and other organisations such as Welfare Department (JKM). We collected all the information and made a request to the district office”.

Additionally, inside these communities, preparatory efforts include storing dry food and emergency supplies, as well as preparing and evaluating disaster response materials and equipment.

7.3 Community adaptation and coping response

a. Engagement with local knowledge

The study discovered that residents in the area employed a range of social coping techniques, such as cleaning the house and its surroundings, continue patrolling the neighbourhood (*ronda*), helping other community members clean (*gotong royong*) (Figure 7.2), guarding temporary evacuation centre and the surrounding neighbourhood (*rukun tetangga*), and evacuating the family, especially children and elderly to a safer place.



Figure 7.2: Encouragement of local level participation through *gotong royong*

Residents voiced their views, opinions, and lodged reports of flooding issues through their resident's representatives. People have formal and informal ties and meetings and town-hall sessions were conducted. Some community members voluntarily helped the

rescue team with flood contingency plans, searched for missing victims and had direct contact with the operation room. In addition, the community was concerned about the lack of river upkeep, which was addressed in the replies in a group discussion (Figure 7.3).



Figure 7.3: Locals meeting to discuss their experiences in *Teluk Kumbar*

b. Living with floods

Simultaneously, issues with traditional flood-prevention engineering technologies have been addressed, and rather of preventing floods, the administration has embraced the need of having to live with and cope with them (Chan, 2012). One of the most difficult problems, however, is creating an environment in which disputes are openly expressed and constructively resolved.

An important outcome of this study was that mosques serve as a window of opportunity for disaster risk reduction improvement. For example, from a humanitarian standpoint, the use of religious organisations, such as mosques, as shelters without regard for their religious views. Mosques can have a very important role in natural disaster risk reduction (Alshadadi, 2017) and have the potential to play a significant part in reducing the destructive impact of natural disasters. Teluk Kumbar mosque has shown its proactive role in educating people about flood disasters, providing training and functioning as a place of shelter. Volunteers and agents, especially the youth, have been recruited as part of the local volunteerism disaster aid team.

This has been suggested by Harun-ur-Rashid (2004), Cheema (2012), and Intan et al. (2015) that the mosque should act as a local center with different functions such as health centre, education, fund distribution centre (waqaf and donation), disaster relief centre, information and communication centre, and psychological and spiritual consultation. Education and training helped improve the preparedness of residents in these communities. Several respondents (especially neighbourhood leaders) said they took disaster management courses offered by government agencies and then passed on their knowledge or experience about flood impacts and how to best prepare for and respond to floods to the rest of their communities. neighbourhoods (Figure 7.4).



Figure 7.4: Flood simulation training in Teluk Kumbar Mosque

(Source: *Teluk Kumbar Penghulu*)

Importantly, those local people, especially Muslims, who were involved with the flooding have their own self-recovery mindset. This occurs by accepting that the fatality of natural hazards (flooding) it is a test from God and this cannot be changed. Therefore, people need to take protective procedures to face it as this is clearly stated in the Holy Quran:

“...and do not throw yourselves into destruction.” (2:195)

In this case, local communities, especially Muslims, in the study area have integrated faith into disaster risk reduction, as pointed out by McGeehan and Baker, (2016) and Alshadadi (2017); there should be a natural outcome to reducing the eternal and unchangeable will of God. In such a scenario, the community becomes resilient to the disaster and allows them to live in an area vulnerable to a natural disaster, such as floods. The mosque, based on the observation during the fieldwork, occupies a central

position in the community that can be a very practical alternative option, not only as temporary shelter for affected flood victims, which was also proposed by Wisner (2010), but as a first respondent institution in the time of disasters. It has been activating the efforts of response and relief through the recruitment of volunteers among the locals. Faith leaders, known as civic leaders, are agents to implement the disaster risk reduction across these communities by spreading awareness and knowledge of disaster response.

The imams have their own circle of followers and are seen as people with good morals and trust, which can encourage people to attend training sessions in the mosque on how to prepare for the floods. Similarly, to the village leader such as JKKK who can easily reach the local people, especially the youth, the imams usually occupy their special status to spread the importance of disaster risk reduction. In reality and practically, government authorities do not find it easy to reach the locals, especially in rural areas (Alshadadi, 2017) as they do not have a strong connection compared to the Imam and JKKK. Therefore, if these local leaders were reluctant to work on disaster preparation plans and did not play an active cooperation in disaster risk reduction, the establishment of resilient and better-prepared communities would not happen.

c. Coping with health conditions

Some of respondents said the sickness (health problem) was mainly because of cholera due to untreated waste water. During the flooding time, there is limited availability of safe drinking water. Elderly persons were more vulnerable to serious physical harm and required special care in specific conditions, particularly during evacuation processes,

which involve great teamwork and coordination among families and community members (Figure 7.5).



Figure 7.5: Elderly residents suffer the adverse impact of flood in 2017 flood

(Source: Interviewee personal photo)

In the context of the Penang coastal villages, hygienic lifestyle is only possible in the Penang coastal villages if the community has appropriate facilities for effective solid waste disposal and wastewater treatment, including storm drains. The majority of the dwellings were found to have insufficient drainage systems, according to the survey's findings. The physical infrastructure in these research communities is so poor that it produces an unsanitary environment. Sanitation levels that are deemed inadequate have a greater influence on overall health.

As an instance, people don't really care about hygiene in the temporary shelter centers where cleanliness of the toilets is really bad and they are damaged by irresponsible people. Furthermore, residents are exposed to untreated water supplies, which is a critical issue in terms of having access to safe drinking water during flooding. My

findings indicate that clean water is in short supply in majority of the study communities, posing a serious threat to human health. As a result, health problems such diarrhoea, fever, skin problems, and typhoid were reported in the research villages. Furthermore, Dasgupta et al. (2015) stated the aforementioned health issues might cause neonatal mortality, maternal hypertension, postpartum morbidity, and mortality.

7.3 Flood Risk Communication And Management

Common findings indicated that both JKKK and NGOs would present their views and concerns about information they had received, as well as the effectiveness and reliability of warning information. Participants expressed their belief that in order to better prepare for future floods, they should be given advance notice, allowing them to prepare and protect themselves. Because trustworthy and relevant information is required, the messages should include critical information such as the potential magnitude, projected rainfall, and tidal timings so that the value of the information can be understood and appropriate judgments can be made. A phone number should also be included in the message to make it easy to get more information or make a request for help. Some inventive approaches for communicating the word were also explored, such as posting emergency contact information at their community centre, mosque, and local sign boards near rivers.

People are more likely to have higher resilience, according to Norris's (2008) model, when they have precise, timely information at their fingertips, when they can connect and tell stories, and when they have the ability to share their experience and understandings of an event. In addition, individuals should have '*access to reliable information sources and a more resilient communications infrastructure*', according to

the author. They also emphasised the necessity of responsible media in the aftermath of a disaster, which publishes on a variety of themes accurately and ethically. Norris et al. (2008) hypothesised that when these factors are met, a community's resiliency is more likely to improve. One may argue that emergent online groups, such as those functioning on social media, have been credited with contributing to a number of the aforementioned aspects. Upgrades to the flood warning system, as well as access to alerts, were deemed critical by respondents in this survey, so that they could plan and react rapidly in the event of a flood. Some of the village representatives I interviewed also highlighted that they use the WhatsApp application to facilitate info and updates on floods to the residents.

During the period of this study, for flash floods or other types of downpour flooding, there was no warning mechanism in place. The MET's ability to offer flood warnings with a lead time has been questioned due to a request for technology developments and research into new approaches to improve flood forecasting. It is thought that leveraging social media to establish warning systems like this might have a significant impact, such as bringing the disaster closer to people and making them emotionally invested, as well as creating a sense of community following the incident. Rather than relying on established organisations for advice, community members should better organise themselves to meet the needs of those who are impacted by social media use. This suggests that they are capable and empowered, two essential components of Norris's community-resilience paradigm. Using social media, volunteers and needs can be promptly found and matched. Emergent online communities can provide valuable information to community members, allowing them to contribute in a more educated manner to the response and recovery efforts.

It is critical that the media become an integral part of a country's disaster management team not just during and after a disaster, but also before one occurs, in order to aid in the preparation of a country's organisations and people before a disaster strikes (Coppola, 2007). Furthermore, as some interviewees have stated, social networking systems such as Facebook can be used as one of the primary communication platforms, particularly amid disasters, due to their widespread appeal. It's vital to figure out the most popular communication strategies in order to contact as many people as possible. As a result, it is vital that communication methods become more innovative. Communication lines must be maintained on a regular basis to ensure their efficiency in the case of an emergency or disaster (WCDRR, 2015).

7.4 Governance And Politics Of Disaster Management

a. Conflict of interest between state and federal government as these governments are not from the same political party.

Political and institutional responses are important elements in determining the adaptation towards flood disasters. From the research undertaken it can be seen that flooding severely affects societies and their socio-political structures in Penang. The federal government (Barisan Nasional Party) gave rapid financial support and planned a visit to Penang by the Pakatan Harapan Party state administration, who wore rubber boots as they walked through flooded communities has become a symbol for the federal government's dependability. As disasters affected all of the people and because they will continue to be frequent occurrences, this issue will be triggered by a specific

political issue. For examples, disaster management success or political scandals on flood aid distribution, flood relief promises correlate with political trust.

The interview questions used to measure the success of governmental performance is evaluated following disasters from different perspectives. The findings of this review found that a well-respected government pays less attention to the mitigation measures compared to political support during the next elections. The current political context of the crisis, which is a result of public criticism of disaster management and federal government preparedness, is thought to explain the study's findings. The 2017 floods were found to have negatively impacted political attitudes, such as views on political leadership, as well as the Penang state government, particularly the perception of failed governmental performance as a result of environmental issues and a lack of flood-mitigation policy, according to research.

I am interested in comparing how local political adaptation toolkits and governance arrangements have influenced operations on the ground. As highlighted throughout the different chapters, the city governments' work on building climate resilience and adaptive capacity is often constrained by the inability to pass laws that facilitate adaptation (McDonald 2011). The Penang government has hit back at parties that claimed it had failed to solve flood problems in the state. Those villagers with good connections with the head of villagers, the political party, and government officers received “special treatment”. The current situation can be characterised by the result of bureaucracy, lobbying, personal influence, and often extra-legal means where those with greater political influence decide for others.

Collaboration with community groups and non-governmental organisations (NGOs) to provide critical inputs is critical in recognising and evaluating community trust in disaster risk management programmes (Jha et al., 2012). The governance mechanisms for disaster risk reduction are well implemented at the national and state levels; however, such policies are not implemented adequately at the local and community levels. The lack of actual participation of vulnerable groups in decision-making processes discourages power-sharing and, as a result, may develop distrust among stakeholders. Members of the community have described the government's response to the disasters as disempowering and overwhelming.

Concerns were raised about the manner in which members voted for their representatives and how they were chosen. The recuperation process was discovered to be hampered rather than aided by these methods. The community leaders chosen to represent their group were widely criticised for being unrepresentative. People were not consulted before initiatives start and most of the projects bypassed the residents. Locals felt they were not being respected by the government and their role in the community was not valued or respected. The respondents stated that they believe there is no unified framework in place for flood-mitigation projects, and that scheme execution on the ground has numerous flaws. Several members of the community claim the government failed to inform residents about the type of work being done on the relocation of the pump house in Teluk Kumbar (Figure 7.6).

The elder residents thought that authorities and political appointments for community representation did not heed local expertise.



Figure 7.6: Controversial pump-house project in Teluk Kumbar

Other variables previously recognised as predictors of political trust, in addition to the aforementioned aspects on political performance. Locals expect both the federal and state governments to compete with one another to aid and provide the greatest possible service to the people as part of a shared political culture. There are several aspects to this political trust. As a result, situations associated to floods that are properly addressed may result in a steady or growing level of political trust. People may ignore proposals and information provided by public institutions due to a lack of faith in the institutions.

b. Differences between institutional and local viewpoints


Flooding was not seen in the same manner on a local level as it was at the institutional level; there were significant variances. Climate change was emphasised by most

government agencies as a key cause of flash floods and a significant element in the development of severe rainfall. However, whilst most residents were interested in stressing concerns linked to land use change, new developments on floodplains, and increasing surface runoff as causes of floods, a central component of this was high-rise building project on hill areas, partly because of changing patterns of drainage and river management.

Villagers commented that the implementation of the proposed projects must include local participation as their community is not simply a beneficiary, but also bears the consequences if the projects fail, such as was the case with the unusable system of flood mitigation project in Teluk Kumbar, Bayan Lepas. Local participation might be time-consuming, however the experiences from Penang Reclamation Project and previous research have shown that local participation could also offer enormous benefits. For example, local participation is a useful tool to incorporate knowledge and preferences of communities into decision-making processes, to reduce corruption, and to deliver services more effectively (Mansuri and Rao, 2012).

In contrast, projects can fail if local communities are excluded. The exclusion of Teluk Kumbar villagers from designing and implementing the dyke construction and the subsequent loss of greenbelts is one example of how the limited participation of the local community has undermined efforts to improve community resilience (Figure 7.6).

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NEWS

'Don't cause us more misery,' Penang fisherfolk protest

mk **Susan Loone**
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The fishing community in Tanjung Tokong has lashed out against the proposed Penang South Reclamation (PSR) project as they do want their fisherfolks in the area to suffer similar losses in livelihood.

They vented their anger at the state government for not learning from the

Figure 7.7: Penang community protest (*Source: Malaysiakini.com*)

Discussions also showed that local participation is essential but it is not sufficient. Villagers and staff from governmental agencies explained that most projects in the proposed plan are highly complex and needed the expertise from diverse sectors in the process of designing and implementing the projects. Secondly, discussions revealed that effective participation relies on decentralisation and democracy as they provide actors with opportunities to raise their concerns in the decision-making processes.



Figure 7.8: NGOs stage a protest against Penang's hill slopes mega-projects in 2018
(Source: *Malaysiakini.com*)

Some NGO officials claimed that decentralisation and democracy in Penang have been significantly improved over the last five years, but they remained concerned about the disparity of political powers, which often impedes public participation and induces inequality in making decisions and implementing projects. This claim is compatible with previous research findings by the Penang Forum and Consumers Association Penang in 2019 where governmental agencies ignored comments and limited the powers of local organisations in making decisions on coastal resources co-management. The NGO staff suggested that substantial decentralisation and improvements in state's development policy across multiple levels of competency, accountability and transparency that essential to promote the effectiveness of project formation and implementation over the next five years (Figure 7.7 & 7.8).

7.5 Evolved Frameworks For Understanding Community Response Mechanisms

The concept of community reaction is diverse, complicated, and subtle, as this study demonstrates. According to the conclusions of the study, effective planning for a disaster event before it occurs enhances community resilience, coping recovery, and adaptive capacity, as well as community response capacity. Building a strong and connected community, that is, a community with large social and community capital that connects the many organisations and individuals within the community prior to a crisis, contributes in the creation of community resilience and recovery, according to the results. Reflecting on the conceptual and theoretical community response capacity discussed in Chapter 1 I've integrated the theoretical foundations for each of these causal links and established a set of hypotheses that have been empirically tested throughout the dissertation. (Figure 7.9).

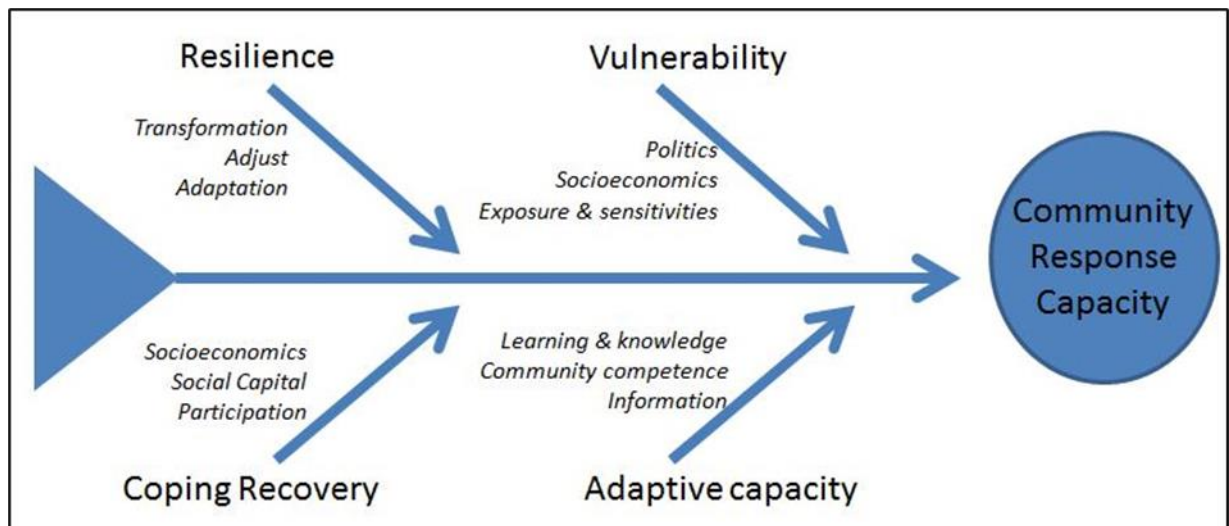


Figure 7.9: Community response framework

It has been established that the traits and activities of community leaders who emerge before to, during, and after a crisis and who engage to help themselves and others boost the success of community coping recovery. Ordinary men, women, and children, acting

alone or in groups, are the most potent advocates of community coping, particularly when their efforts create community and social capital while simultaneously exhibiting concern and kindness toward one another. Compassion and thoughtfulness have been demonstrated to be incredibly beneficial, especially when persons are already known. Community reaction at the local level remains the most essential aspect in reducing catastrophe risks or coping with disasters (UNDP, 2004; Aldrich, 2012).

Further research reveals that people's adaptability does not entail going back to "normal" or the way things were before. Community members, on the other hand, discussed how the events that occurred before or after the crisis influenced their own recollections and lives. They realise how drastically their lives have changed as a result of the calamity. Acceptance and understanding of the loss and sadness that occurred as a result of the disaster, knowing that things will be different moving forward, finding ways to re-create and adapt on their own and together, and creating new ways to celebrate who they are into their lives were terms used by those who recovered after a tragedy to describe community recovery.

Although numerous assumptions said that political trust was surrounded by expectations, the shift was less likely owing to how it was represented as a basic disposition towards the political system, hence it can be claimed that flood impacts had a big impact on political trust. They've also been known to have a negative impact on government support. As a result, local communities develop techniques for self-regeneration and vulnerability reduction. The communities in this study showed little variation; community members highlighted variances in their conceptualisations of

community resilience, activities and actions taken after a disaster, and other effects on the community recovery process.

Each community's character, identity, and context are reflections of how they were represented differently across the groups. Because of the regularity of these incidents and residents' shared awareness of the impending dangers posed by decaying plant matter, members of the community in Teluk Kumbar Village owned personal or shared small boats so that the community rescue team can provide active help to one another soon after flooding has occurred. Although the disaster-affected populations have been shaped by their experiences, they refuse to let those events restrict or define them. Instead, they are characterised by their reactions to what has happened, as well as the bravery and compassion that their reactions imply.

7.6 Summary

Penang has developed very rapidly in the last 30-40 years and continues to do so. This development has introduced various environmental hazards into the island. The majority of past research has concentrated on the scientific perspective on catastrophes and the role of structural science in disaster risk reduction. This study bridges the gap in the literature and demonstrates the value of social science understanding of flood disasters, which includes non-structural measures.

Based on the data presented, these strong communities in Teluk Kumbar could be considered successful in their flood response because: (1) they demonstrated an uncompromising commitment to self-reliance, which resulted in a self-reliant reaction

in the event of an emergency; (2) during the flood response effort, they provided complete collaboration (high social capability) with neighbouring villages; (3) they gathered wisdom through decades of locally accumulated information (traditional coping strategies and local wisdom). Equally interesting is that people are aware of the impacts of flood disaster, but still at the moment lack formal ways of resource mobilisation and information dissemination (e.g., flood warning) which communities were unable to prepare for the flood by anticipating it and making necessary preparations ahead of time. Also, they lack training and awareness in responding to flooding.

It is argued in this dissertation that the government and those political parties involved in DRR in the state should pay special attention to environmental issues, educate and train communities, be proactive more than reactive in mitigating the risks of natural disasters, especially flooding by reducing the vulnerability of people to and preparing how to act in advance to face the risks of flooding. Mosques can play a very important role in DRR, not only when floods happen, but also before and after they take place. Religious institutions and its organisations are vital to support flood risk reduction and to prepare people to mitigate the risks of flooding.

The final chapter summarises the research's most crucial results, elaborates critically how Penang communities are living in highly vulnerable flood prone areas, and highlights how communities understand their own vulnerability and resilience. The chapter also discusses the research limitations and identifies areas for future research.

CHAPTER EIGHT

Chapter 8: Conclusion And Recommendations

“Hazards and stresses can push households or communities into crisis, cause loss of life, injury, social and economic disruption or environmental damage”

– Bayan Lepas State Assemblymen, 15 August 2018

Between April 2017 and September 2018, the research was conducted during four visits to Penang Island, Malaysia. The physical and social landscapes of Teluk Kumbar, Penang Island, were explored using various qualitative, quantitative, and participatory methodologies. A complete ethnographic account of the community setting in which the research was conducted was developed using community profiles and baseline surveys. The risk perception and response of 100 households were examined using household surveys and semi-structured interviews. The fieldwork ended with a series of ten semi-structured interviews with various stakeholders. This informed the final dissemination of research focus group discussions with technical specialists, local residents, and policymakers.

In Malaysia, the government has implemented various flood prevention and mitigation strategies, including structural and non-structural measures to safeguard areas identified as flood-prone. The processes of using engineering in controlling flood issues and protecting human settlements, such as developing dams, river gatehouses, seawalls, revetments, levees, and embankments, are referred to as structural flood prevention measures. Despite all of the government's flood-control efforts, which have cost billions of Ringgit, including mitigation and disaster management, several concerns have been made about the effectiveness of flood-related policies' execution. There is a lack of coordination between the numerous agencies involved at the federal, state, district,

locality (*mukim*), and village levels, as evidenced by the lack of data. Also, there is an imbalance in disaster management planning methodologies between top-down and bottom-up expertise (which was heavily skewed to the former). The findings indicate that rapid urbanisation, unplanned urbanisation, deforestation for development, a deficient drainage system, and environmental degradation are all likely to be important environmental issues.

The essential component of this research has been the contributions provided by community members during fieldwork participation, which are frequently based on their own personal experiences with a frightening and upsetting occurrence in their lives or the lives of their community. Participants have described this experience in a variety of ways: as terrifying and difficult, initially beyond their or their community's capacity to handle, as one filled with loss and grief, as complex and exhausting overtime, as something that remains overwhelming in some cases and at times, or as liberating, rewarding, and renewing. The experience differs within and between communities due to the variety of crises, participants' personal situations, and the characteristics of affected groups and individuals.

Nevertheless, the experiences of diverse communities and community members share specific characteristics: phases that may apply to the experience of disaster; factors that aid or hinder community recovery; characteristics of the most successful and supportive actions for community resilience and recovery; and, most importantly, the human spirit's strength and endurance.

These are not based on the coordination of the distribution of goods to support the relief efforts since these appear influenced by their leaders, which may depend on favouritism and political patronage. The findings of the study show that there are areas and activities in flood disaster management in Malaysia that may involve favouritism and political patronage, resulting in a lack of transparency, accountability, and corruption in the sector related to the core work of the organisation, which frequently negatively impacts the beneficiaries' vulnerability to flooding hazard.

Additionally, it is revealed that there is a lack of communication and participation at the community level due to the state or relevant authorities managing flood disasters. The Penang River Basin's official Flood Warning and Relief System is ineffective because it does not actively engage all essential stakeholders in an integrated manner. Thus, the best course of action is to incorporate the existing community-based flood response system into the official processes, with input from multiple stakeholders (administration, policymakers, NGOs, commercial and public sectors). A more comprehensive approach to flood risk management, primarily in Penang, will result from improved or more effective flood risk management and governance that incorporates input from public stakeholders, particularly multi-stakeholders at all crisis stages.

Notably, this study confirmed that officials' and others' activities could either aid or hinder the process of community rehabilitation. Thus, this research has significant implications for future action by governments (federal, state, and local), non-governmental organisations, other community organisations and groups, and

individuals and community members themselves if they are to assist communities in recovering and strengthening their resilience.

8.1 Theoretical Contributions And Response To Research Objectives

The 2016-2017 floods in Penang demonstrate that the flood disaster has become an enormous threat, and it is difficult to prepare for future emergency or disaster situations. This research addresses the overarching objectives of this dissertation.

Initially, this research explored the factors of local communities that form the response and recovery. This research established that while government officials retain the formal and official leadership role in decision-making regarding the recovery process (even when they believe they are enabling and supporting a community-led recovery), communities do lead their recovery in terms of actions and activities that occur on the ground in the community. My analysis give understanding the context in which how people in case study area live with the flood. Theory alone, cannot explain how resilience functions, so we need to apply what we have learned by improving how governments (at all levels) and communities prepare and respond to flood and how community recovery can be planned. I think this something relevant to practitioner from this study. There are findings that valuable for further discussion such as government and private entities joint venture on flood coverage package, related to premium insurance subsidy which this is something that new and very limited discussion or debate among practitioner or at higher level.

Participating in government-led reference groups or community action groups is not the only way to participate in the community-led recovery. What the community does on the ground in their (or another) community to improve community resilience and support is community-led recovery. They seek methods to assist one another and take action. They help one another in various ways, and they have a firm grasp on the complexities of their experience and the capacity to rebuild and renew their community (socially, economically and physically). Regular meetings attended by all community members to discuss all issues and concerns affecting the community increase community awareness of their rights and ability to identify any mischief that may occur in the community. Through dialogue, participation should also empower and strengthen the voice of vulnerable groups.

All participants emphasised the critical nature of disaster planning and preparation. When disasters struck unexpectedly, as in Teluk Kumbar, people involved recognised that without time to prepare and plan, losses were more significant and community recovery more difficult. Additionally, this research highlights the importance of social and communal capital in establishing resilience and subsequent community recovery. While participants emphasised the importance of practical preparations and planning steps (at the individual, family, and community levels), the stories shared about what happens after a crisis has passed, as well as the factors identified as critical to the effectiveness and trajectory of the community's recovery, are all stories about the value of relationships, networks, and social groups.

Additionally, the use of technology to manage flood disasters has also been examined. The involvement of flood-affected communities is no less critical. Their preparedness

and knowledge in the face of a flood disaster are critical for mitigating the disaster's harmful consequences. As a result, the community should be taught on flood management, particularly on how and what to prepare for a flood and how to react during a flood.

These are the critical elements of social and community capital as indicated in Chapter two by the literature. Additionally, these are stories of the human spirit and examples of human caring and compassion. This research solidifies the notion that the disaster recovery, government, and non-government sectors should prioritise social cohesion and connections and build community trust (Aldrich and Meyer, 2015). Additionally, it emphasises the critical role of family, friends, and neighbours in the recovery process (Camilleri et al, 2010). Indeed, communities welcome assistance and support from outside the community and desire that assistance and support engage with them in ways that acknowledge their potential and capacity. This is a critical reason why Briged Bakti NGO is a successful externally supported intervention or activity frequently referenced as an example of successful activity in all communities studied in this research.

The most significant distinction between the elements of these frameworks and the study findings was the study findings' emphasis on religiousness. According to survivors' views, religiousness and religious coping, particularly in the qualitative phase, emerged as a significant facilitating factor for psychological resilience. The findings suggested that religious beliefs and practices may benefit survivors' psychological health and adaption following disasters, hence building resilience. These beliefs and practices and may contribute to an increased acceptance of negative experiences.

8.2 Areas For Future Research

The research findings apply to various fields and circumstances, illustrating the breadth of people involved and the increasing complexity of flood and disaster management. Without diminishing the significance of this research, it is important to briefly discuss the ramifications of several of the findings and the research in general.

Numerous research areas have been identified for future study. There are numerous approaches to strengthen disaster management policies. This research confirms that community members believe that disaster preparation and planning (before the crisis) are critical components of successful community recovery. This suggests that a comprehensive approach to community preparation and planning could be a crucial investment in community recovery. Additionally, this research indicates that community members support the community-led preparation and planning phase. The challenge is in cultivating communities that are driven to plan and prepare effectively. Members of the community in this study acknowledge that their direct experience with a disaster has pushed them to plan and prepare more efficiently for the future. Numerous participants stated that they did not plan or prepare as thoroughly as they could have, despite encouragement from all levels of government and non-governmental organisations.

Perhaps the most difficult challenge facing policymakers is providing incentives and opportunities for communities to lead disaster planning and preparation. A collaborative or community-led method to developing this policy change is more likely to work than a policy developed by governments or major non-governmental organisations and then distributed or imposed.

Further research is therefore needed to develop the communication systems in disaster management such as early warning systems and ensure they are practically applicable in local communities. There are several key findings in this research that would enhance disaster management policy and practice in Malaysia if adopted or incorporated. For such systems to be effective, developing the three critical pre-crisis protective factors identified in this research (i.e. planning and preparation, community identity and connection, and community and social capital) prior to a crisis is highly desirable. It is likely to be a compelling investment that supports community recovery if a crisis occurs in the future.

Apart from that, there are other ways in which future research could build on this study findings. It would be essential to perform additional research into the impact of a community's social capital in terms of disaster resilience and recovery: both the trajectory and recovery process. A comparative study that identifies and quantifies the social capital present in several communities prior to a disaster and then follows up on those communities following the experience of a natural disaster to assess the impact of the experience on post-disaster levels of social capital; or the impact of pre-crisis levels of social capital on the process of community building would be significant.

The communities that have been considered in this study are rural communities. Additionally, it would be interesting to examine community recovery following natural disasters in predominantly urban environments. Natural disasters have occurred in urban areas, and it would be highly beneficial to learn whether the elements that lead to recovery are comparable or dissimilar in regional, rural, and urban groups. Comparing the characteristics and responses of urban and rural or regional communities

could allow us to understand community recovery, potential policy responses, and community preparations and actions in each environment.

The topic of the perception and preparedness to mitigate the risks of flood disasters should be further researched in more rural areas to reach more comprehensive conclusion and dis/confirm the findings of this study. The difference between hazards and disasters should also be further researched in the socioeconomics, and culture context to know the difference in the conceptual meaning between these two terms and whether they are same or not.

Also, it is necessary to examine the role of religious organisations, which has gone chiefly undocumented and unrecognised in development and disaster studies. While the masjid's function in disaster situations is well documented in Malaysia, relatively little study has been conducted to document its role as a development agent. This could be done through more research on religious worship places and how they can play more significant roles in disaster management domains. This would help to document its role related to the HFA and Sendai frameworks.

Further research could be directed at political attitudes and their relationship to natural disasters, as this area has received scant attention. It is interesting to explore how emergency response agencies are engaged with political trust is essential how the community members experience this engagement, mainly whether it is respectful of their local knowledge. Further research focused on exploring the specific effect of political trust on disaster preparedness and management may further assist in

understanding what role these parties take and how they can improve their ability to support vital community recovery.

Despite the contributions mentioned above, the present study has several limitations that should be considered in interpreting results. These include practical, methodological and ethical considerations that impact the quality of the study. Relatively small sample sizes in the questionnaire (n=100) had implications for the analysis and interpretation of results. Improvements to the evidence-based data will enable myself to monitor and track variations in the community's adaptive capacity and ensure that this population receives the support necessary from the government, civil society, and the research community. While these limitations may appear contradictory, the mixed-methods methodology of this study enables a comprehensive understanding of the relationship between these two variables that would not have been detected in a single-method study.

8.3 The Final Word

The objectives of this research have been achieved successfully: the evidence gained illustrates the critical nature of community recovery, given the clear evidence that flood disasters would continue to occur and affect communities throughout Malaysia, particularly Penang Island. We must also apply what we have learned by improving how governments (at all levels) and communities prepare for and respond to disasters and how community recovery can be planned and led by any affected community to reach an adaptive and sustainable future. This thesis has attempted to dissect the

concepts of resilience, community resilience, vulnerability and social capital to fill in this crucial gap in the literature.

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APPENDIX 1: CONSENT LETTER

**Durham University**

INFORMED CONSENT TO PARTICIPATE IN THE STUDY

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.


The purpose of my research is to assess how communities respond to flooding in which communities adapting to living with flood risk in Bayan Lepas, Penang Island, Malaysia. I want to explore these issues through interviews with community/stakeholder/ members. The objectives of the study are: 1) to explore different kind of key factors in community response (as adaptive capacity, resilience, coping mechanism) to flooding in Malaysia, and 2) to critically analyse the factors (exposure and sensitivities) that create different causes of flood vulnerability in Malaysia. The research is funded by Malaysian Higher Education Ministry and School of Geography, Durham University through a 3-year grant.


The research will require an initial approximately 45 minutes – 1 hour interview and questionnaires survey, each requiring approximately 10-15 minutes for completion. The research will explore issues relating to your experience, perception, knowledge and decision-making involvement with past floods and associated flood response. The content will cover a wide range of topics including public policy implications, emergency management, and future flood preparation and response (adaptation, resilience, coping). You are under no obligation to participate in the interviews. If you choose to participate please feel free to discuss your opinions open and freely. You can, at any time, end the interview or refuse to answer individual questions. In the event that you do not wish to answer a specific question, simply respond 'no comment'. To ensure accurate representation of your responses a tape recording device will be utilized during the interview. You are under no obligation to be recorded and may refuse. Your responses will be held in strict confidence and the results of the study will be aggregated (grouped) with no reference made to specific participants. It is our desire that you, the participant of the study, be informed of our findings. If you would like a summary of the survey findings please inform me and I will record your name and mailing address so I can mail the summary to you.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your

continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

If you have any questions, please leave a message for me at +60175430641 or +447392983327 (whatsapp), or Professor Harriet Bulkeley at (h.a.bulkeley@durham.ac.uk).

Signature of the Respondent  Date: 2-11-2017

Signature of the Interviewer  Date: _____

APPENDIX 2: INTERVIEW FORMATS QUESTIONNAIRE FORM

(ENGLISH)



ID :

Date:

Location:

Community Response to Flood Disaster: A Case Study of Flooding in Penang, Malaysia

Dear Sir/Madam,

I am PhD researcher from Department of Geography, Durham University, United Kingdom. I am carrying out a research on **Community Response to Flood Disaster: A Case Study of Flooding in Malaysia** funded by Malaysian Government to improve community resilience to flood in Malaysia. This research is conducted **to assess how communities respond to flooding in which communities adapting to living with flood risk in Bayan Lepas, Penang Island, Malaysia**. This research will help to improve flood resilience at community level. **ALL INFORMATION PROVIDED BY YOU ARE STRICTLY CONFIDENTIAL AND FOR RESEARCH PURPOSE ONLY**. Your efforts in completing the questionnaire are much appreciated. Thank you.

THIS QUESTIONNAIRE WILL ONLY TAKE 10 MINUTES TO COMPLETE

SECTION A: DEMOGRAPHICS

Gender: Male Female

Age: _____

Marital Status: Single Married Widowed

Ethnicity: Malay Chinese Indian Others: _____

Education Level: Non-formal education Primary education
 Secondary education Tertiary education
 Others: _____

Occupation: Government servant Private sector employee
 Student Retiree
 Unemployed Self-employed: _____
 Others: _____

Employment status: Full time (FT) employed Part time (PT) employed
 FT self-employed PT self-employed
 Not in paid employment Retired

Household's financial available resources?
 Less than RM2000 Between RM2001-RM3999 Between RM4000-RM7009
 More than RM10,000

How many persons currently live in your household (including yourself)? _____
 Of these, how many are children, age 18 or under? _____
 Of these, how many are age 65 or over? _____

Is your present housing rented or owned by a member(s) of the household?
 Rented Owned Living with other family members Other: _____

How many years have you lived in this place?

What are your reasons living in this place?

Ancestral	Own properties	Access to education	
Good neighborhood	Access to business centers	Cheap living	
Access to work place	Safety	Others:	

SECTION B: EXPERIENCE OF FLOODING

Flood experience	Yes	No
Have you ever had a flood here before?		
I have experienced flood in this area in the last 3 years		
I am expecting floods to occur during each flood		

How many times have you and household evacuated due to flooding?

No experience	4-10 times	
1-3 times	More than 10 times	

Where does you and household evacuate? (Tick)

Public evacuation center		Hotel / motel	
Family or friends house		Religious place	
Others:			

Who would you turn to first for **financial** help during or following flooding in your area? (check one)

Family within community		Neighbors		Organization (religion, NGOs, etc)	
Friends within community		Family outside community		Government	
Financial or corporate bodies		Would not need help		Others:	

Who would you turn to first for **non-financial** help during or following flooding in your area? (check one)

Family within community		Neighbors		Organization (religion, NGOs, etc)	
Friends within community		Family outside community		Government	
Financial or corporate bodies		Would not need help		Others:	

Seeking for assistance	Yes	No
Did you report the flood to the local authority bodies?		
Did you report the flood to the rescue bodies?		
Did you report the flood to the community leaders?		
Did you report the flood to the politician in your area?		
Did you report the flood to other bodies (list):		

What are the preferred adaptation strategies during flood at household level?

Adaptation strategies	Value
Climb tree and roof of houses	
Take care of people with first aid	
Take valuable properties	
Shout and escaping	
Use of plywood or timber to divert flood water	
Controlling flood level & food storage	

SECTION C: IMPACT OF FLOODING

What potential sources of flooding exist in your area?
(Rank it)

Heavy rainfall		High river water level due to tide		Improper drainage system	
Blocked drains due to trash		Rapid / uncontrolled development		Reducing water catchment	
Others:					

Exposure to flood shocks and risks (please tick)

Aspect that affected by flood	Scale			
	Low severity	Medium severity	High severity	Not experience
Asset belonging (House, vehicle)				

Income				
Health				
Family and friendship relationship (social)				
Psychology				

Recovery period from shocks and risks

Variables	Scale						
	Not recovered	Partially recovered	1-2 weeks	3-4 weeks	1-2 months	3-6 months	6-12 months
Property							
Health							
Psychology							
Economic							
Others:							

Average total loss

Range	Tick
Below RM500	
RM501-RM1000	
RM1001-RM3000	
RM3001-RM5000	
More than RM5001	

SECTION D: RECOVERY AND ASSISTANCE

		Tick
I get my house back to normal	After a few hours after the flood hazard	
	Weeks	
	Months later	
	Never gets to normal	

Have you received recovery programs, if Yes please tick the list below:

Programs	Tick
Health care	
Disaster preparation and management	
Flood aids	
Financial aids (financial grants, soft loans)	
Employment or economic development	
Others:	

If you didn't received any programs listed above, please tick the reason why:

Reasons	Tick
Do not know	
Don't want to participate	
Household members don't want to participate	
No program available in my area or nearby	
Distribution of aids bias due to political bias	
Distribution of aids bias due to ethnic bias	
Others:	

Insurance, compensation and financial assistance	Yes	No
Do you have home /property insurance?		
If you don't have insurance, would you be willing to have it?		
Did you make an insurance claim?		
Did receive home insurance claim payout?		
Did you receive government compensation?		

Do you think assistance provided by the government was enough?		
Have you receive any advice from the city authorities about how to prevent flood damage to your home?		
Are you aware of any city policies or plans that directly address flood hazards		

SECTION E: COPING MECHANISM

What are the preferred flood adaptation strategies at individual, household and community level?
(Most preferred: 5, very preferred: 4, moderately preferred: 3, less preferred: 2 & least preferred:1)

Adaptation Mechanism	1	2	3	4	5
Remove possessions from ground floor to second floor					
Evacuate to safer grounds					
Place flood guard (plywood/timber) to divert flood water					
Make furrows at the backyard or front space to divert flood water					
Avoid keeping sentimental possessions, animals, on ground floor					
Listen and alert to media					
Move to temporary shelter					
Consider permanently moving to another flood-free area					
Move to neighbor, friend, relative's place					
Stockpile food and necessary items					
Make permanent changes to the ground floor interior e.g. raising electrical sockets, raise the bottom of house floor					
Develop flood management plan					
Keep emergency materials					
Didn't do any preparation at all					
Others:					

Social capital (participation) aspects

1	People around here are willing to help their neighbors during flood event	1	2	3	4	5
2	Organization and individuals are ready to respond to the community's needs following a disaster	1	2	3	4	5
3	People in this neighborhood doesn't get along with each other during disaster recovery	1	2	3	4	5
4	Local community groups provide effective support and communication between other organisations	1	2	3	4	5
5	Supporting those in greatest need after a disaster would be a priority for my community	1	2	3	4	5
6	If public officials asked everyone to follow flood emergency procedure, people in my community would not cooperate	1	2	3	4	5
7	Our community has a feeling of being left out from government support	1	2	3	4	5
8	Government allows us to participate in environmental decision making about how to manage flood risk	1	2	3	4	5
9	Did not participate	1	2	3	4	5

Is there anything restricting from taking action to minimise the impact of flooding incidents on you and others within your community?

APPENDIX 3: INTERVIEW QUESTION SET (BAHASA LANGUAGE)



Membentuk Komuniti Berdaya Tahan untuk Bencana Banjir: Satu Kajian Kes di Penang, Malaysia

(Soalan untuk Ketua Penduduk dan NGO Persatuan)

a) Kesiediaan dan ketidaksiediaan

1. Apa yang anda lakukan semasa dan selepas kejadian banjir? (cth: penyelamatan, bantuan kewangan, logistik, bekalan makanan, sokongan moral)
2. Apa yang membuat individu, isi rumah atau masyarakat terdedah kepada banjir berkaitan dengan kesiediaan dan ketidaksiediaan?
3. Adakah anda fikir penduduk mampu pulih dari bencana banjir? Adakah penduduk bersedia?

b) Penglibatan dan penyertaan sosial (*Coping*)

1. Adakah organisasi anda terlibat dengan proses membuat polisi berkaitan banjir? (cth. perundingan, menghadiri mesyuarat, melobi dan memberi maklum balas)
2. Adakah efektif kerjasama antara kerajaan dengan NGO dan pihak berkuasa lain untuk mengambil bahagian dalam proses membuat keputusan pengurusan banjir? - Formal atau tidak formal?
3. Bagaimanakah keberkesanan / efektif kolaborasi?
4. Pentingkah penyertaan masyarakat tempatan dalam pengurusan banjir?
5. Adakah anda fikir pihak berkuasa melakukan sesuatu untuk menggalakkan penyertaan masyarakat tempatan? (kempen sukarela, kesedaran)

c) Sokongan kewangan (Pemulihan)

1. Bagaimana kekangan kewangan menjejaskan tahap kesiediaan menghadapi kecemasan? (Ketersediaan peralatan / sumber)
2. Apa pendapat anda mengenai idea pelan insuran perlindungan rumah?
3. Apakah bantuan kewangan yang disediakan untuk membantu pemulihan komuniti atau berdaya tahan untuk berhadapan kejadian banjir masa depan?

d) Komunikasi risiko

1. Adakah anda berpendapat penduduk tahu dan mempunyai pengetahuan tentang sistem amaran banjir? (Dalam apa cara)
2. Adakah anda berpuas hati tentang penyampaian maklumat yang berjaya berkaitan dengan amaran banjir oleh pihak berkuasa?
3. Adakah anda merasakan cara pihak berkuasa berkesan dalam menyampaikan maklumat banjir kepada kumpulan yang terdedah risiko? (Orang kurang upaya, orang tua, anak-anak, dan wanita)

e) Politik dan bencana

1. Adakah terdapat ketegangan antara kumpulan profesional atau ahli politik atau komuniti setempat dalam perancangan langkah-langkah pertahanan banjir struktur?
2. Bagaimanakah ahli politik terlibat dalam membuat dasar pertahanan banjir?
3. Apakah keputusan dan perubahan politik yang anda fikirkan berkait dengan banjir yang berlaku baru-baru ini?
4. Adakah komuniti terpinggir daripada sokongan kewangan kerajaan? (Pampasan kerosakan, pembayaran tuntutan insurans, bantuan banjir)

d) Kesimpulan

1. Apa yang anda fikir, secara ringkas adalah penyebab utama peningkatan banjir di Bayan Lepas?

APPENDIX 4: INTERVIEW QUESTION SET (ENGLISH)



Community Response to Flood Disaster: A Case Study of Flooding in Penang, Malaysia

(Questions for Community leader, NGO)

a) Preparedness and non-preparedness

1. What do you do during and after flood events? (eg: rescue, financial assistance, logistics, food supply, moral support)
2. What makes an individual, household or community vulnerable to flooding with regards to preparedness and non-preparedness?
3. Do you think people are able to recover from flood disasters? People are prepared?

b) Social involvement and participation (Coping)

1. Is your organisation involve with community-based flood related policy-making process? (e.g. responding to consultation, attending meeting, lobbying and give feedback)
2. How do you liaise with other stakeholders such as NGOs and authorities to participate in the decision making process of flood management? - Formal or informal? How often?
3. How effective is the partnership?
4. How important do you think local community participation is to flood management?
5. Do you think the authorities are doing anything to encourage local community participation? (volunteering campaign, awareness)

c) Financial support (Recovery)

1. How financial constraints affect the emergency response? (Equipment / resources availability)
2. What do you think about the idea of home insurance?
3. What financial assistance has been provided or is currently underway to help community recovery or resilient for the future flood event?

d) Risk communication

1. Do you think people are aware of and have knowledge about flood warning? (In what ways)
2. How satisfied are you about the successful information delivery related to flood warning by the authorities?
3. Do you think the authorities are effective in delivery flood information to vulnerable groups of people? (Disabled people, old people, kids, and women)

e) Politics of disaster

1. Are there any tensions between professionals or political members or the local community over the form and planning of structural flood defence measures?
2. How are politician involved in making flood-defence policy?
3. What political decisions and political changes do you think the recent flood event brought about?
4. Community left out of government financial support? (Damage compensation, insurance claim payout, flood assistance or distribution)

f) Summary

1. What do you think, in summary are the root causes of increasing flood in Bayan Lepas?

APPENDIX 5: FOCUS GROUP DISCUSSION QUESTION SET

FOCUS GROUP DISCUSSION (Village Development & Security Committee GROUP)

[For these questions, please try to think about you and your community's experiences with the 2017 flood events]

a) Preparedness and non-preparedness

1. What do you see as the current issues and concerns about governmental policy for preparedness and mitigation? (Lack of flood education, managing public attitudes, interagency management)
2. Do you think people are able to recover from flood disasters? Do you think people are easily prepare to facing the flood but don't have enough flood knowledge?

b) Social involvement and participation

1. How do you see authority organisation react to the local community participation?
2. Do you see community are less awareness and lack of attitude towards environment? (Rubbish dump, irresponsible damaging school facility)

c) Flood management (Government capacity)

What do you understand about Flood Disaster Management Standard Operation Procedure (MKN 20)?

How and to what extend delays during the emergency response?

d) Financial support (Recovery)

1. Did you receive government compensation? Is it enough? If NO, why?
2. How your organisation views the idea of home insurance?

e) Risk communication

1. Is there room for improvement in flood warning coverage? (Areal coverage, warning accuracy, lead times)

f) Politics of disaster

1. How your organisation sees the effectiveness of financial support on the ground when there are conflicts between state and federal government?

2. Does the community left out of government support (damage compensation, insurance claim pay-out, flood assistance or distribution) due to political decisions or religion or ethnic factors?

g) Summary

What do you think, in summary, are the root causes of community vulnerability towards flood?

Climate/ environment (Heavy rainfall, High river water level due to tide)	Social capital (individualistic, community ties)	Structural measures (Improper drainage system)	
People attitude (Blocked drains due to trash dump)	Rapid / uncontrolled development	Politics of disaster (policy, governance)	
Communication risk	Financial constraint	Lack of coordination between agencies	
Others:			

APPENDIX 6: INTERVIEW TRANSCRIPT RAW DATA DURING CODING AND CATEGORISATION PROCESS.

Focus Group Discussion (Question for Community Group)

Agencies/Organisation: Representatives of JKKK from Kampung Teluk Kumbang, Kampung Saluk, Kampung Nelayan, Kampung Masjid dan Kampung Paya

Preparedness and non-preparedness

Question 1:

JKKK from Kampung Teluk Kumbang: The problem of flooding arises due to heavy rainfall. Suitable drains have not been built, and density of urban development is very high. They build high rise buildings and cut the trees at the hilly areas. People those living close to the river and hill areas are risky and their areas remains flooded easily because the water catchment is getting over. (Risk Location) - *Public trust and complaints*

JKKK from Kampung Saluk: The authorities have been contacted so that they can address the situation. Unfortunately, we could not see much solution from the government. (Lack of Solution) - *Public trust and complaints*

JKKK from Kampung Masjid dan Kampung Paya: Many community members felt that they should rely on the government in overcoming the problems caused by flood events. The problem is they prefer to wait for the authorities to attend to every concern rather than cooperate in addressing many problems. (Solely rely on the government) - *Preparedness, awareness and knowledge*

JKKK Kampung Nelayan: When floods occurred everyone especially politicians try to help us. But usually they didn't care about the core problem. Everyone knows flooding occurs as a result of improper drainage system. But you can see how small our drainage. Many suggestions have been given, but until now we can only wait and wait the flood proofed or modified structure to be built. (Politicians didn't care about the core problem, and slow action response) - *Politics*

Question 2:

JKKK from Kampung Saluk: I could say that we are living under one roof. We are like family. Kinships and family bonds are instrumental in helping victims cope with and recover from flood disasters. Everyone could call upon their own family members and relatives that living in next or adjacent houses to help each other cope with the floods. We (among JKKKs) all know each other and we are coordinating on flood aids as well as logistics arrangements of the assistance within the flood affected areas. (Kinships and family bonds helping each others) - *Relief and emergency*

JKKK from Kampung Teluk Kumbang: Flood victims often to experience psychological stress and anxiety stems from the damage of properties need to be repaired. But we learn from the past. If the previous times, people keep their furniture and valuable items at the living room, nowadays we are no longer store the valuable items at lower ground area which easily to get flooded. Most of the houses in my village are double storey. During the flooding, we could see everyone helping each other lifting the items to the safest place. We as a representative of villagers are responsible to each others. (Learn from the past. No longer store the valuable items at lower ground) - *Learn from the past*

JKKK from Kampung Masjid: We have been facing extensive floods not only during monsoon period. It's happen almost every heavy rain because of overspill of river banks. For this year only, I think about 10 times our house been flooded and twice time the evacuation centre was opened for

be from regardless of the level of education nor income and location. (Rubbish) - *Legislation and enforcement*

Flood management (government capacity)

Question 1:

JKKK from Kampung Masjid: My village committees know about National Security Council. NADMA is the organisation that presence of disaster management team. There was one time we had training program. During that time, we selected 10 representatives from our village for that training. They talked about evacuation centre management, relief and recovery process. (Training with NADMA) - *Relief and emergency; Preparedness, awareness and knowledge*

JKKK from Kampung Saluk: I am not sure everything about the policy documents. But I think we all know about MKN (National Security Council). Our village committee council members are well-prepared before floods occur, such as keep people updated with flood warnings, and distribute relief supplies. All of these are the emergency management standard of procedures we are practicing so far. (Well practice emergency management standard of procedures) - *Relief and emergency*

JKKK from Kampung Paya: All the instruction related to evacuation center operation, evacuation process, emergency relief, and flood aid distribution are given by the authorities before we could take any action. We just follow the instructions. Normally, if the water gets too high, then everyone will be informed to evacuate. We will wait and see if there are any required tasks should take as responsibility to act. (Follow instruction by authorities) - *Relief and emergency; Preparedness, awareness and knowledge*

Question 2:

JKKK from Kampung Masjid: Communities do not respond to the early warning system for evacuation. When the water inundated too high, then they started to evacuate themselves. The problem is communication from first responders getting chaos. Many people need an immediate response to help them evacuate. So the process of transferring victims from house to evacuation center will be slow. (Not responding to early warning system, chaos and slow evacuation process) - *Communication; Relief and emergency*

JKKK from Kampung Saluk: When the flood level getting too high, the evacuate team require boats to move all the victims. Unfortunately, boats are limited. So this is why the evacuation process sometime takes longer time especially at the rural areas and inaccessible places with normal transport. (Limited rescue transportation) - *Relief and emergency*

JKKK from Kampung Paya: The speed at which the floodwaters rise during the biggest flood happened recently was unpredictable and unmanageable. We have never experienced floods like this where the water raised up to 1 meter. Thousands of victims been evacuated at one time. We received complaints as delivery of government relief items such as food, water, blankets, etc. (Unpredictable and unmanageable disaster, slow government relief process) - *Preparedness, awareness and knowledge; Public trust and complaints*

Example page of interview transcript raw data during coding and categorisation process.

APPENDIX 7: NEWSPAPER ARTICLE CONCERNING FLOODING IN PENANG

8:29 AM

The Star Malaysia | 7 Nov 2017 | 1 of 48

TUESDAY 7 NOVEMBER 2017 PP1641/03/2013 (031549) (No. 21252) RM1.30

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2



Trial on exam day
It was an extra test they did not anticipate, but with a little ingenuity, about 160 students managed to reach their school hall without getting too wet. The sequence of photos was taken at SMK Datuk Haji Ahmad Said in Sungai Dua, Butterworth, on the first day of this year's SPM exam. > See Page 4

1



3



In troubled waters

Penangites, especially those on the mainland, are still struggling in hip-deep floodwaters and facing an uncertain number of days till normalcy returns. Many areas in north and central Seberang Prai are still submerged despite having fair weather since Sunday morning because of overflowing rivers. The plight of Penangites is also made worse by conflicting flood warnings from two state executive councillors. > See reports on Pages 2-9

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NEWS ► PAGE 11

GUNMAN WHO KILLED 26 IN U.S. CHURCH HAD MENTAL ILLNESS

WORLD ► PAGE 26



PHOTO BY DANIAL SAAD

EVACUEES EXCEED 10,000

FLOODWATERS may have receded in many parts of Penang, but the number of people seeking shelter at relief centres there, and in Kedah, has risen considerably. More may be displaced in the coming weeks and months, with the DPM warning about a second and third wave of flooding.

■ **DEATH TOLL IN PENANG FLOODS RISES TO SEVEN**

■ **BILAL OPENS UP SURAU TO NON-MUSLIM FLOOD VICTIMS**

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Army personnel help to distribute household items to flood victims at Taman Free School in Penang. Picture by Farhan Najib

Hisham: Soldiers prepared to help at any time

GEORGE TOWN — The Defence Ministry will focus on flood relief work in Penang so that all victims of the floods receive the necessary aid.

Defence Minister Datuk Seri Hishammuddin Hussein said the focus will be on post-flood work such as clearing blocked roads and helping to clean up areas.

"I have urged the army chief, General Tan Sri Zulkifli Kassim, and the Royal Engineer's Army Regiment to repair damaged houses and infrastructure," he said after visiting flood victims at Taman Free School with Malaysian Armed Forces Chief General Tan Sri Raja Mohamed Affandi Raja Mohamed Noor here yesterday.

Hishammuddin said observation from the air showed the flood situation in the state

had improved and the flood waters receded.

He said the armed forces were prepared to mobilise their personnel and assets at any time for flood relief operations.

"The floods should serve as a lesson to the Penang government. We should look for the real cause so that we can prevent a repeat of the disaster," he said.

Hishammuddin said the present Standard Operating Procedure (SOP) of rendering assistance to those affected by calamity will continue.

"As long as the people need the army's help, they will render their assistance without waiting for a general's instruction," he said.

"It does not matter what time, whether it is 2am or 3am, we will be there. Like

Taman Free School, our soldiers came at 3am on Sunday. They cannot be waiting for my instruction as I do not know where the floods are.

"The present SOP is fine."

Hishammuddin was responding to Penang Chief Minister Lim Guan Eng's statement that coordination of disaster management between state and Federal agencies needed to be improved.

Lim said the state government should have better coordination with all agencies, especially federal agencies and the Meteorological Department, to be prepared for disasters such as the unexpected strong winds and downpour during the weekend.

About 200 armed forces officers and personnel with the Second Infantry Division

are involved in the post-flood operations in Penang.

In Kulim, Kedah, a flood victim was grateful for the aid from government and agencies such as the Civil Defence Force, Royal Malaysian Police, the Social Welfare Department and the Fire and Rescue Department.

"I am satisfied with the services and aid given. When the flood waters rose, the police asked us to move out to the relief centres where we received various types of aid," Saibiah Arifin told Bernama at the relief centre at Sekolah Kebangsaan Pematang Tok Dik.

Saibiah, 56, from Kampung Manggis, was among the 450 flood victims who received various forms of aid.

3,500 more cops available if situation worsens

KUALA LUMPUR — A total of 3,500 policemen will be deployed to join flood relief efforts in the northern states if the situation worsens.

Federal Internal Security and Public Order Department director Datuk Seri Zulkifli Abdullah said the reserve force consisted of General Operations Forces, Police Air Unit and Marine Police.

"As of now we have 187 personnel assisting other enforcement agencies in flood relief operation," he said yesterday.

Thousands of people in the three northern states of Penang, Perak and

Kedah were forced to evacuate with waters rising to roofline in some areas.

Zulkifli advised those with elderly people at home to immediately evacuate their families to safety as the flooding was unpredictable.

"Although the situation has stabilised, the hazard of rising tide and heavy rain could worsen any situation," he said.

"Please act now. The public must not take chances and wait for the water to recede."

He said police personnel have been instructed to resume their patrol duties at affected areas to deter looters from

flooded houses.

The Malaysia Control Centre situated at Bukit Aman has been tasked with monitoring the situation 24 hours daily and was prepared to render immediate reinforcement when requested.

Each state police chief has been given commander responsibilities to oversee the flood relief operations in their respective states.

Zulkifli said the force also suffered asset losses and damage caused by the floods amounting to at least RM 600,000. "We are still assessing the situation to determine the exact figure from the three

states," he said.

"Some of our communication equipment, patrol vehicles and motorcycles have been damaged by water."

He said no police stations were affected and remained operational.

"The public can still lodge reports as usual and should our computerised system malfunction, the process could be done manually," he said.

On the circulation of unverified news on social media, Zulkifli urged the public to remain vigilant. He said the authorities would make official announcements as and when necessary.



Death toll rises to 7

GEORGE TOWN: Two more people have died in Penang's floods, bringing the death toll to seven.

The figure rose after two bodies were found at a house in Jalan Mata Kucing, Air Itam and in front of Stadium Bandaraya here.

"The sixth victim has been identified as Tan Ah Peow, 45. He was found by his neighbour at 2pm yesterday.

"The seventh victim, also a man, was found at 2:40pm," said Timur Laut district police chief ACP Anuar Omar.

He said no identification documents were found on the body of the shirtless man who was covered in mud. The two bodies were sent to Penang Hospital for post-mortems.

Earlier, four bodies of senior citizens were discovered in their homes; while the body of a Bangladeshi man was found in a house destroyed by a falling tree. **Bernama**

IN BRIEF

No disruption to medical services

GEORGE TOWN: The Health Ministry has assured people of continued services at five medical facilities affected by floods in Penang. Health director-general Datuk Dr Noor Hisham Abdullah said they were Penang Hospital, Mak Mandin Health Clinic, Lahar Yool Rural Clinic, Prai Health Clinic and Taman Seri Delima Malaysia Clinic. "Penang Hospital and Prai Health Clinic are operational while the other three other facilities are flooded." No health facilities in Kedah and Perak were affected by floods.

Met Dept had issued severe weather alerts

KUALA LUMPUR: The Meteorological Department had, on Nov 1 and Nov 4, issued early warnings of heavy and continuous rain in the northern states. It had first issued a Yellow Alert, which anticipated increasingly severe weather conditions in northern states, via a television broadcast, followed by the Orange Alert to warn that rainfall would continue at the maximum level and remain persistent, the deputy science, technology and innovation minister told the Dewan Rakyat.

RM1b spent on Penang flood projects

KUALA LUMPUR: The Federal Government has spent RM1.04 billion on flood mitigation projects in Penang from 2000 to last year. The Natural Resources and Environment Ministry, in a written reply to Lim Guan Eng (DAP Bugang) at the Dewan Rakyat yesterday, said the amount was from the Ninth Malaysia Plan between 2006 and 2010, up to the 11th Malaysia Plan, which would end in 2020. A 17-hour storm on Saturday caused major flooding in Penang, paralyzing almost the entire state, displacing thousands and killing at least seven. **Agencies**

Landslides put Tg Bungah residents on high alert

GEORGE TOWN: Residents in Tanjung Bungah here are on high alert following the landslide and sinkhole incident, where parts of newly-built luxury houses had collapsed on Sunday.

Coastal Tower resident Reuben J. Israel, 53, said he had learnt about the incident when his friend shared the pictures of the houses in a WhatsApp group chat.

"I was shocked by the images as my condominium is about 500m from the area.

"There were lots of blasting and construction going on in the area. I believed the project was not suitable as it is really near the hillside," said the father of two.

Reuben, who has lived in the area for six years, claimed many residents were unhappy with the project as it had destroyed a water-catchment area and natural habitat of animals.

A representative from The Straits Regency (TSR) Apartment, who declined to be named, said they had taken precautionary measures to ensure the safety of its 120 residents.

"The incident happened right in front of our premises and I told the security guard to ring the fire alarm if any emergency occurs.

"We, the (TSR) committee management, also demanded future



Houses damaged by the landslide in Tanjung Bungah, Penang. PIC BY MUHAMMAD MIKAIL ONG

diversion of water from the Penang Island Municipal Council (MIPPP)," he said at the site yesterday.

State and federal agencies were also assessing the damage and inspecting soil movements near the area.

MBPP engineering department officers were entering the construction site, which was cordoned off to the public.

A source from Geoscience Department said there was no soil movement at the site, but the department would monitor it hourly to avoid any mishap.

Bukit Bendera member of parliament Zairil Khir Johari said MIPPP would initiate the mitigation work as soon as possible to avoid further damage.

On Sunday, three newly-built luxury houses on the hillside of

Tanjung Bungah were damaged after downpour triggered a landslide and sinkhole, causing the two-lane road in front of the premises to collapse.

In the 2.30am incident, the centre of the retaining wall in front of the houses collapsed before the road caved in.

The units were going for between RM1.6 million and RM2.3 million each.