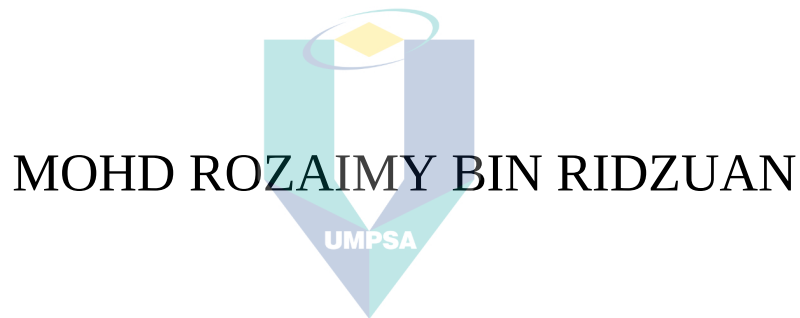


PREDICTORS OF FLOOD PREPAREDNESS
AMONG YOUTH IN THE EAST COAST
REGION, MALAYSIA



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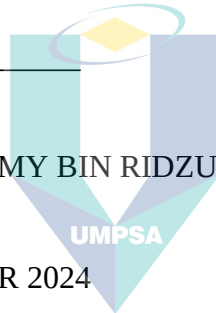
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PREDICTORS OF FLOOD PREPAREDNESS AMONG YOUTH IN THE EAST
COAST REGION, MALAYSIA

MOHD ROZAIMY BIN RIDZUAN



Thesis submitted in fulfillment of the requirements
for the award of the degree of
Doctor of Philosophy

اونيفرسيتي مليسيا قهغ السلطان عبدالله
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ABSTRAK

Perubahan iklim telah menyebabkan masyarakat global terdedah kepada peningkatan risiko bencana alam, termasuk bencana banjir. Golongan belia merupakan salah satu kumpulan yang paling rentan terutamanya dalam situasi bencana. Berbanding dengan belia Malaysia secara keseluruhannya, belia yang tinggal di negeri Pantai Timur (Terengganu, Kelantan dan Pahang) lebih terkesan kepada impak alam sekitar dan perubahan iklim. Secara puratanya, belia di Pantai Timur lebih terdedah kepada bencana banjir berbanding belia di negeri-negeri lain. Terdapat banyak kes kematian yang melibatkan banjir dalam kalangan belia dilaporkan di negeri-negeri Pantai Timur di Semenanjung Malaysia. Dengan menggabungkan dua teori—iaitu Teori Tingkah Laku Terancang dan Model Kepercayaan Kesihatan—kajian ini mengkaji faktor-faktor yang berkaitan dengan tingkah-laku kesiapsiagaan banjir dalam kalangan belia di kawasan Pantai Timur. Dengan menggunakan teknik persampelan bertujuan, seramai 350 responden telah mengambil bahagian dalam kajian ini. Pemodelan Persamaan Struktur (SEM) menerusi perisian Smart-PLS versi 4.0 digunakan untuk menguji hubungan antara konstruk dalam kajian ini. Kajian ini mendapati bahawa sikap, norma subjektif, kerentanan dan keparahan yang dirasakan menunjukkan hubungan positif dengan niat kesiapsiagaan menghadapi banjir, sementara pengalaman menghadapi banjir menunjukkan hubungan yang signifikan, dan kawalan tingkah-laku tidak menunjukkan hubungan yang signifikan dengan niat kesiapsiagaan menghadapi banjir. Kajian ini juga mendapati bahawa tanggapan terhadap kawalan tingkah-laku dan niat kesiapsiagaan menghadapi banjir mempunyai hubungan positif dengan tingkah-laku kesiapsiagaan menghadapi banjir. Selain pemboleh ubah tanggapan terhadap kawalan tingkah laku, pemboleh ubah penyertaan komuniti secara positifnya memberi kesan penyederhanaan terhadap hubungan positif antara sikap, norma subjektif, kerentanan yang dirasakan, keparahan yang dirasakan dan niat kesiapsiagaan menghadapi banjir. Penyertaan komuniti pula didapati memberi kesan penyederhanaan terhadap hubungan antara pengalaman menghadapi banjir dan niat kesiapsiagaan menghadapi banjir. Walau bagaimanapun, kepercayaan kepada perlindungan awam tidak mempunyai kesan penyederhanaan terhadap hubungan positif antara niat kesiapsiagaan menghadapi banjir dan tingkah-laku kesiapsiagaan menghadapi banjir. Kajian ini menyumbang kepada ilmu pengetahuan berkaitan tingkah-laku kesiapsiagaan menghadapi bencana banjir di Malaysia. Selain itu, ia berfungsi sebagai titik permulaan bagi para penyelidik pada masa hadapan untuk mengkaji niat dan tingkah-laku kesiapsiagaan menghadapi banjir. Kajian ini juga mengumpulkan maklumat yang berharga kepada penggubal dasar dan agensi kerajaan, terutamanya NADMA dan pertubuhan belia, bagi membangunkan intervensi secara bersasar dan memperkukuhkan tahap kesiapsiagaan menghadapi banjir dalam kalangan belia di kawasan Pantai Timur. Matlamat akhirnya adalah untuk memperkukuhkan daya tahan dan mengurangkan impak banjir terutamanya dalam kalangan belia pada masa hadapan.

Kata kunci: Banjir, Tingkah Laku Kesiapsiagaan Banjir, Niat Kesiapsiagaan Banjir, Belia

ABSTRACT

Climate change has increased the vulnerability of the global community to natural hazards, including flooding. Youth are considered one of the most vulnerable groups of people, especially in the event of a disaster. Compared to the average Malaysian youth, youth in the East Coast states (Terengganu, Kelantan and Pahang) are disproportionately affected by environmental and climatic hazards. Youth in these states are more likely to have experienced flooding than the average Malaysian youth. Many deaths related to Malaysian youth have been reported from the east coast states of Peninsular Malaysia. Integrating two theories— the Theory of Planned Behaviour and the Health Belief Model — this study examines the predictors associated with flood-related behaviours among youth in the East Coast region. Using purposive sampling, a total of 350 respondents participated in this study. Structural equation modelling (SEM) using Smart-PLS version 4.0 was used to test the relationships between the constructs in this study. The study found that attitude, subjective norms, perceived susceptibility, and perceived severity showed a positive relationship with flood preparedness intention, whereas past flood experience showed a significant relationship and perceived behavioural control did not show a significant relationship with flood preparedness intention. This study also found that perceived behavioural control and flood preparedness intention were positively related to flood preparedness behaviour. Interestingly, except for perceived behavioural control, community participation positively moderated the relationship between attitude, subjective norms, perceived susceptibility, perceived severity and flood preparedness intention. Community participation was also found to have a moderating effect on the relationship between past experience and flood preparedness intention. However, trust in public protection did not moderate the relationship between flood preparedness intention and flood preparedness behaviour. This study contributes to the body of knowledge on flood disaster preparedness behaviour in Malaysia. It can also serve as a starting point for future researchers to determine flood preparedness intention and behaviour and stimulate new research that involves modifying and improving the model through continuous testing. The study also provides valuable insights for policy makers and government agencies, particularly NADMA and youth organisations, to develop targeted interventions and strengthen flood preparedness among youth in the East Coast region to ultimately promote resilience and mitigate the impact of future flood events.

Keywords: Flood, Flood Preparedness Behaviour, Flood Preparedness Intention, Youth

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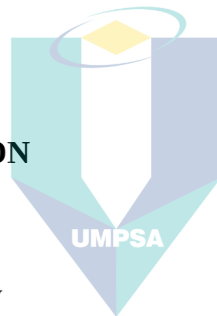
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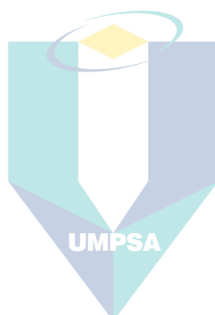
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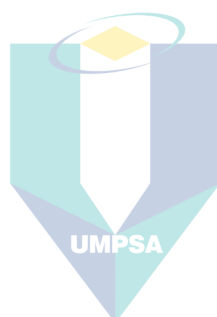


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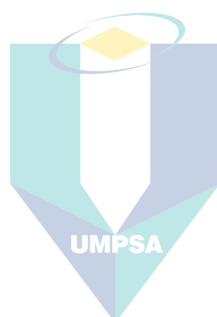
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APM	Malaysia Civil Defense Force
ASEAN	Association of Southeast Asian Nation
ATT	Attitude
AVE	Average Variance Explained
AVE-SV	Average Variance Extracted to Shared Variance Method
BOMBA	Fire and Rescue Department of Malaysia
CA	Cronbach's Alpha
CB-SEM	Covariance base Structural Equation Modelling
CFA	Confirmatory Factor Analysis
CI	Confidence Intervals
CMB	Common Method Bias
CMV	Common Method Variance
CR	Composite Reliability
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EFA	Exploratory Factor Analysis
FDM	Flood Disaster Management
FPB	Flood Preparedness Behaviour
HBM	Health Belief Model
HTMT	Heterotrait-Monotrait Ratio
INT	Flood Preparedness Intention
IPCC	Intergovernmental Panel on Climate Change
LLCI	Lower Bound Confidence Intervals
MGA	Multi-Group Analysis
MLMV	Measured Latent Marker Variable
MV	Marker Variable
MVA	Missing Values Analysis
MVN	Multivariate Normality
MYC	Malaysia Youth Council
NADIM	National Disaster Management Association
NADMA	National Disaster Management Agency

NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
OLS	Ordinary Least Squares
PBC	Perceived Behavioural Control
PBM	Parlimen Belia Malaysia
PE	Past Experience
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares – Structural Equation Modelling
RMSE	Root Mean Squared Error
SDB	Social Desirability Bias
SDGs	Sustainable Development Goals
SEM	Structural Equation Modelling
SEV	Perceived Severity
SFDRR	Sendai Framework for Disaster Risk Reduction
SN	Subjective Norms
SPSS	Statistical Package for Social Science
SRB	Self-Report Bias
SUC	Perceived Susceptibility
Teen CERT	Teen Community Emergency Response Team
TPB	Theory of Planned Behaviour
TPP	Trust in Public Protection
UiTM	Universiti Teknologi MARA
ULCI	Upper Bound Confidence Intervals
ULMC	Unmeasured Latent Method Construct
UMPSA	Universiti Malaysia Pahang Al-Sultan Abdullah
UNISDR	United Nations International Strategy for Disaster Reduction
VB-SEM	Variance base Structural Equation Modelling
VIF	Variance Inflation Factors
YPC	Youth Preparedness Council

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Climate change is one of the most pressing challenges facing humanity today. Masson-Delmotte et al. (2021) defined climate change as long-term changes or shifts in average global or regional climate patterns. Changes in climate patterns include permanent changes in temperature, precipitation, air pressure, and humidity (Raihan, 2023). Greenhouse gas emissions are the most influential man-made component of climate change. The emission of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) is caused by a variety of human activities, including the burning of fossil fuels such as coal, oil and natural gas, deforestation and industrial processes (Mitra et al., 2023; Raihan, 2023). These gases can retain heat in the Earth's atmosphere and thus, contribute to the phenomenon known as the greenhouse effect.

The frequency of climate-related disasters has caused growing concern worldwide over the last ten years. Natural disasters such as heatwaves, floods, landslides and droughts have become more frequent as a result of climate change (Agache et al., 2024; Itoh and Zhang, 2023; Malau et al., 2021; Ali et al., 2020; Seddon et al., 2020; Aven, 2020; Yang et al., 2017), leading to their increased frequency and severity (Shala and Schumacher, 2024; Liu et al., 2024; Agache et al., 2024; Barnett et al., 2023). More frequent and more severe flooding, higher sea levels and more rainfall are all symptoms of climate change. These consequences of climate change pose a major challenge in terms of their predictability (Azmi et al., 2021; Intergovernmental Panel on Climate Change [IPCC], 2007).

Climate change poses a double challenge, as it not only affects the environment but also represents a significant obstacle in the pursuit of the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction (SFDRR) (Wang, 2024; Börner, 2023; UNDRR, 2021). Hughes and Zhang (2023) pointed out that the lack

of action to combat climate change can have significant socio-economic consequences. Every year, around one billion youths worldwide face stressful events such as natural disasters (Orengo-Aguayo et al., 2022; Hillis et al., 2016). This persistent phenomenon not only exacerbates youths' vulnerability but also increases their susceptibility to traumatic events (Augustinavicius et al., 2021). The difficulties faced by youth in flood-prone regions have been a major subject of study and policy attention in recent decades, particularly in light of the growing threats to human well-being and survival posed by climate change, both present and future (Zaremohzzabieh and Samah, 2013).

Past studies found that natural disasters disproportionately impact youth (Lai et al., 2021; Peek et al., 2018; Kousky, 2016). They encounter both immediate and lasting consequences of disaster events, including a variety of adverse cognitive, emotional, psychological and physical consequences (Peek et al., 2018; Masten and Narayan, 2012). Felix et al. (2020) found that youths who experienced a flooding disaster had, on average, the highest level of life stressors. They also experienced trauma, severe stress (Cox et al., 2019), anxiety disorders, depression (Taylor and Weems, 2011), and social isolation (Peek et al., 2018; Muzenda-Mudavanhu, 2016). The main reason why many youths are affected by natural disasters is a lack of preparation for disasters (Safiah Yusmah et al., 2020; Nugraheni and Suyatna, 2019).

A study by the United Nations Development Programme (UNDP) et al. (2020) found that almost 90% of Malaysian youth experienced first-hand the effects of environmental and climate phenomena such as flooding. The search for long-term solutions to strengthen disaster risk reduction (DRR) is therefore of crucial importance. The ninth Prime Minister of Malaysia urged the youth to engage in DRR initiatives, particularly for floods, as part of the 12th Malaysian Plan (Rafidah, 2021). However, Haliza (2020) argued that the youth's limited knowledge, attitude, and behaviours hinder their ability to effectively manage and respond to flood disasters. Hence, it is crucial to find out what motivates youth to take precautions against flooding.

Lim et al. (2018) found that the factors influencing individual preparedness for disasters are complex and multifaceted. Therefore, this study aims to investigate the factors associated with flood preparedness intention and behaviour among youth in the East Coast region of Peninsular Malaysia. In Pahang (Aira Abdul, 2021; Roselan, 2021), Terengganu (Sinar Harian, 2022, Bernama, 2017) and Kelantan (Bernama, 2017), many

youth deaths related to flooding were reported, thus the inclusion of youth in this study was necessary (Muhafandi Muhamad and Nur Fazlizai, 2022; Hazelen Liana, 2022). According to Bentz and O'Brien (2019), it was emphasised that youth have significant potential to drive social change and play a crucial role in addressing climate-related issues. Cox et al. (2019) highlighted that understanding youths' views on their DRR intentions and behaviours can reveal areas for improvement and opportunities to create new DRR solutions.

1.2 Background of the Study

Natural disasters pose a major challenge to people, property and the development of countries. Natural disasters are ubiquitous and affect both developed and developing countries alike. Common natural disasters include earthquakes, hurricanes, floods, forest fires, tsunamis and droughts. Several scholars (e.g., Adhikari et al., 2023; Fijko et al., 2019; McGrath et al., 2019; Jevrejeva et al., 2018) agreed that flooding has become a pervasive global problem and is one of the most severe natural disasters on a global scale. From 1980 to 2018, floods have led to a total of 223,482 reported deaths worldwide and caused economic losses of over USD 1 trillion (Munich, 2020). It is well known that floods have the potential to cause significant devastation and hinder a nation's progress. In recent times, the frequency and severity of flooding have increased due to the increase in rainfall caused by climate change (Singha et al., 2022; Nur Zainul et al., 2021).

A flood is one of the types of natural disasters usually characterised by excessive masses of water that can inundate a large area or property (Mohd Tariq et al., 2021). Floods are categorised into different types, including pluvial floods, fluvial floods, coastal floods and flash floods. A pluvial flood is a flood caused by the accumulation of rainwater on the ground surface, often due to overwhelmed drainage systems (Singh et al., 2023; Rosenzweig et al., 2018; Falconer et al., 2009). Pluvial flooding is often associated with urban and densely populated regions. In urban areas, many impermeable surfaces such as roads and car parks impede the infiltration of precipitation into the ground, leading to rapid surface runoff.

Figure 1.1 shows that mountainous regions with low runoff capacity and high flash flood risk are more likely to be affected by pluvial flooding. Areas such as Andorra and Nepal are good examples of this. Furthermore, in climatic zones with intense rainy

seasons that exceed the runoff and absorption capacity of the soil, there is also a risk of rainfall flooding. Examples of such regions are Guyana, Suriname, Bangladesh and Myanmar.

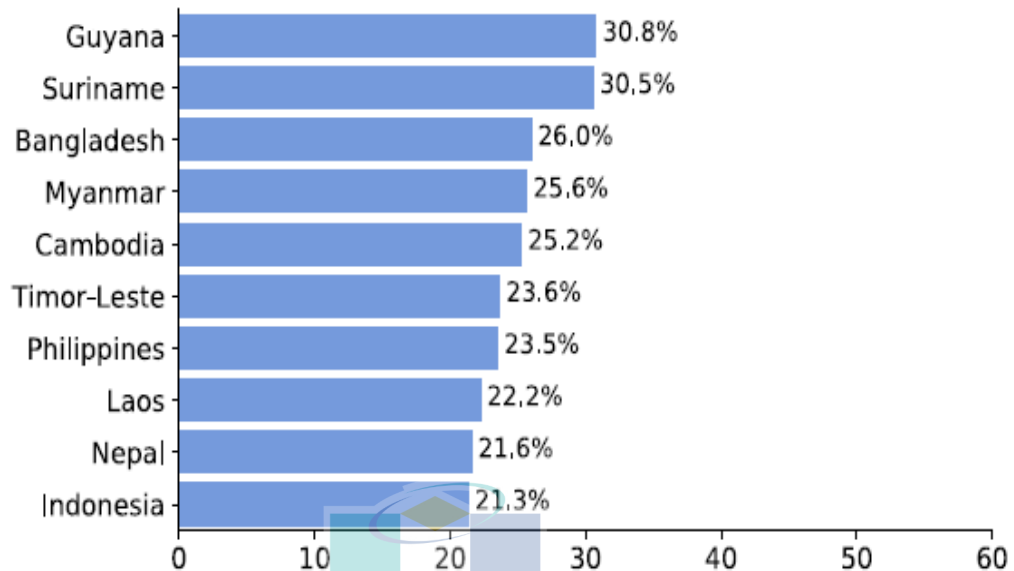


Figure 1.1 Percentage of people exposed to high pluvial flood risk.

Source: Rentschler et al. (2022)

A fluvial flood is also known as a river flood and is characterised by flooding due to an increased water level in watercourses. It is a special category of flood events characterised by the overflowing of a river or stream, resulting in the flooding of surrounding land areas. The occurrence of these floods is generally attributed to heavy rainfall, snowmelt or a combination of both factors that lead to an increased discharge of water in the river courses. Fluvial flooding occurs when the amount of water in a river or stream exceeds the threshold of its banks, which includes both the river banks and the dams. As a result, the water overflows into neighbouring floodplains and low-lying areas. Figure 1.2 shows that Bangladesh, Egypt and Iraq are among the three countries most affected by river flooding.

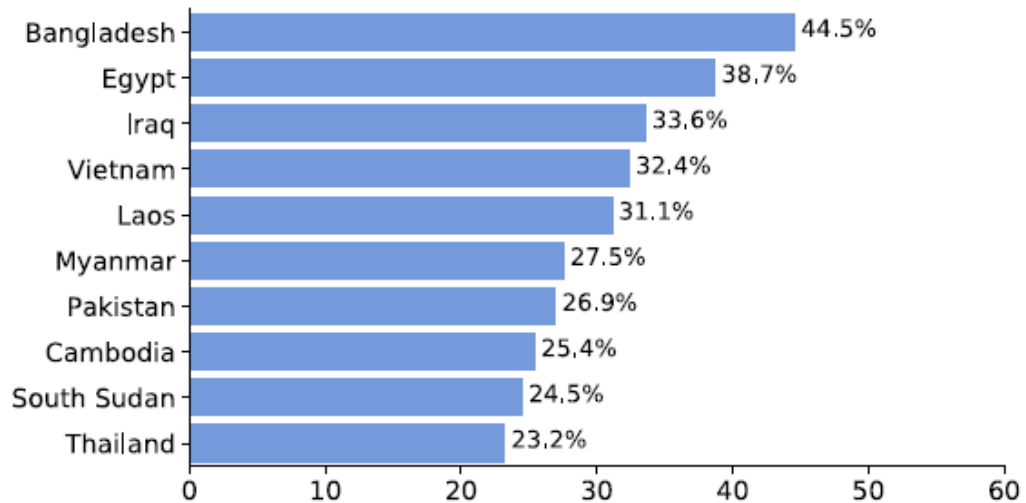


Figure 1.2 Percentage of people exposed to high fluvial flood risk.

Source: Rentschler et al. (2022)

Coastal flooding, also known as tidal flooding or coastal inundation, occurs when water from the sea or ocean floods coastal regions. Coastal flooding and erosion not only exacerbate poverty and destroy infrastructure and personal property but also have a devastating impact on human ecosystems, reduce biodiversity and increase human mortality (IPCC, 2023). Coastal flooding and erosion disproportionately affect people's lives and financial resources, even if only small geographical areas are affected (Munich, 2021). Figure 1.3 shows that the Netherlands, Vietnam and Japan are most affected by coastal flooding.

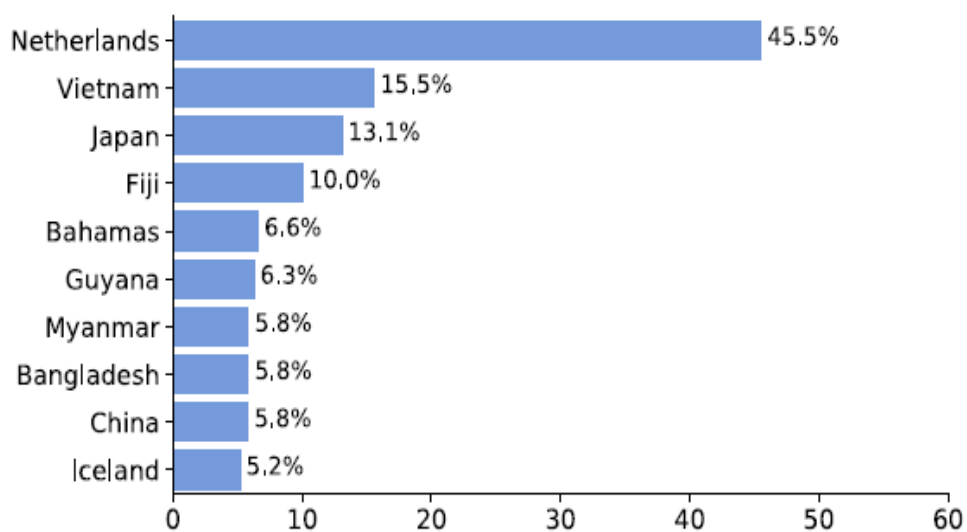


Figure 1.3 Percentage of population exposed to high coastal flood risk.

Source: Rentschler et al. (2022)

Flash floods are usually triggered by rainstorms of high intensity and short duration and by the rapid reaction of catchment areas (Mishra et al., 2022; Falconer et al., 2009; Merz and Blöschl, 2003). A flash flood is an abrupt, accelerated and highly concentrated flood event characterised by a rapid rise in water levels within a relatively short time, usually lasting no longer than six hours. The characteristic that distinguishes a flash flood is its sudden onset. Rapid onset flooding can manifest shortly after the triggering event, typically within a span of minutes to hours, and often lacks significant advance notice before the flood escalates.

According to the Centre for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM) (2019), most of Malaysia's population is vulnerable to floods. Floods account for 74.5% of all-natural disasters in Malaysia, exceeding the global average of 43% (Haliza, 2020). The occurrence of floods in Malaysia has become a national concern as they endanger lives and property and disrupt social and economic activities (Azmawati et al., 2021; Nuriah et al., 2021; Jonkman et al., 2004). Noorhashirin et al. (2016) contended that Malaysia has suffered cumulative losses of over USD 100 million from floods and landslides over the last forty years. The destruction of property, loss of life, financial impact and extensive damage to agricultural land and livestock are just some of the reasons why floods cause major national losses (Khan et al., 2014a; Tang, 2019). Due to the time and energy required to recover from floods, the negative impact on the economic development of Malaysian society is significant (Nurul Ashikin et al., 2021).

The occurrence of floods is a major obstacle to the realization of sustainable development, as both governments and individuals suffer great losses due to flood-related disasters. Nuriah et al. (2021) argued that floods can have negative impacts on individuals' health, both in the short term, such as through injuries or deaths, and in the long term, by leading to problems such as infectious diseases, mental stress or malnutrition. If left untreated, these effects can increase morbidity and mortality rates among Malaysian youth. Nur Zainul et al. (2021) claimed that without precautionary measures against the threat of flooding, more money will be spent on covering damages, which could significantly hinder the country's economic development.

In most developing countries, flood disaster management is reactive, with a focus on responding to and recovering from emergencies (Rabiul Islam et al., 2016). It is critical

to shift from a reactive to a proactive response strategy to enhance management's efficacy and reduce casualties and property damage. Public engagement and greater involvement of a wide range of government agencies, non-governmental organisations and businesses are essential for better proactive disaster management. To promote sustainable development within a nation, it is imperative to prioritise flood disaster preparedness as a means to effectively implement measures (Yin et al., 2021).

The global policy agenda places great emphasis on mitigating risks associated with natural disasters, with a particular focus on developing countries, which bear the brunt of economic and human losses due to their vulnerability to such events (AlQahtany and Abubakar, 2020). The disaster management cycle consists of four distinct phases: Mitigation, Preparedness, Response and Recovery. In disaster management, the preparation phase is the most important element (Ayenew et al., 2022; Rostami-Moez et al., 2020). Nuriah et al. (2021) argued that it is crucial to take a precautionary measure before a flood occurs.

Disaster preparedness is an endeavour aimed at improving the preparedness and awareness of various stakeholders regarding hazards, relevant organisations, mitigation strategies, and other disaster information. Disaster preparedness is proactive planning before an actual disaster occurs, rather than merely reacting to the disaster after it happens (Horn et al., 2024). In this phase, people are working on early warning systems and putting them into practise. People are also building public capacity to respond effectively in the event of an early warning. Noorhashirin et al. (2016) identified the importance of public preparedness as critical to mitigation. The United Nations and many other international organisations have stressed DRR as an essential part of disaster management and a way to build resilience (UNIDSR, 2015; FEMA, 2016; Xinhua, 2018).

The successful implementation of DRR requires the active participation of multiple stakeholders, including not only government agencies and communities but also individuals (Paton et al., 2006a). A variety of actions can be taken as part of disaster preparedness to lessen the likelihood of harm coming to people and their possessions in the case of a dangerous occurrence (Phillips et al., 2016). The concept of individual preparedness is seen as a crucial component in the process of adapting to natural hazards (Monteil et al., 2021). Disaster preparedness is a way of life that seeks to safeguard health (Najafi et al., 2017). The occurrence of floods is an unavoidable disaster for people. The

rise of rivers during the monsoon season is a natural occurrence (Nuriah et al., 2021). Considering the inevitability of floods (Nur Zainul et al., 2021), it is crucial for individuals to always prepare for the negative consequences of such events.

The development of disaster management can be observed in a series of international conferences and frameworks. The catalyst for this change was the 1994 Yokohama World Conference on Natural Disasters. In 2005, the Hyogo Framework for Action (HFA) was introduced, which had a further impact on the field of disaster management. The most recent milestone in this development is the Sendai Framework, which was adopted in 2015. These developments have led to a shift in focus from emergency management to a more comprehensive approach known as disaster risk management (Salajegheh and Pirmoradi, 2013). Daellenbach et al. (2018) stated that the SFDRR, which succeeded the HFA, stresses the significance of people and communities acting to mitigate the effects of future catastrophes. The three global disaster risk management (DRM) frameworks mentioned above consistently emphasise the importance of preparedness.

The active participation of individuals, especially youth, is of utmost importance to minimise the harmful effects of flooding (Puteh et al., 2018). The importance of youth as a stakeholder group has been recognised due to their vulnerability to disasters and their consequences, as well as their ability to drive change and act as leaders (Cox et al., 2017). Previous studies have shown that youths are particularly sensitive to environmental challenges (McDonald-Harker et al., 2021a; Vergunst and Berry, 2021; Ribeiro and Silva, 2021; Hayes et al., 2018). According to Fothergill and Peek (2015), there is a growing number of youths who are exposed to various climatic extremes such as floods, heatwaves, droughts and storms. Although they make up a significant proportion of those affected by disasters, their involvement in disaster relief is usually limited to the role of passive individuals who suffer the consequences (Akeyo, 2010).

Reducing disaster risk in Southeast Asia is crucial to accomplish the SFDRR by 2030. This is especially true considering that ASEAN is one of the most disaster-prone areas in the world. As a whole, ASEAN members acknowledge that natural disasters, especially floods, disproportionately affect youths. Disasters exacerbate existing inequalities and prejudices. As recognised both globally and by ASEAN, disasters affect people differently, and youth are among the group of people who are vulnerable and

severely affected (The ASEAN Secretariat, 2021). According to a study by the United Nations Development Programme et al. (2020), Malaysian youth face obstacles in their efforts to tackle climate change because they have limited access to resources, including funding, information and expertise necessary to effectively address these environmental issues. A group of people feel that their actions cannot make a difference, which can lead to despair and demotivation. Studies have shown that when youths experience loss or disruption, it can greatly affect their emotional health, making them more prone to stress, sadness, isolation, and worry (Mort et al., 2018a; Mort et al., 2018b).

Prior research has established that being adequately prepared for floods is essential for reducing the impacts of disasters (Murray and Watson, 2019; Shah et al., 2019; Titko and Ristvej, 2020) and thus leads to a reduction in the negative consequences of flood-related disasters (Siti Nurul Annisa and Azahan, 2017; Sarina and Rahimah, 2017). Ubaidillah et al. (2022) found that youths are especially susceptible to the devastating impacts of disasters, making it all the more important to implement measures to reduce disaster risk early on in development. In the context of disaster events, youth can face various challenges and obstacles. These include the experience of separation from family, limited skills to effectively cope with and respond to emergencies, and the inability to drive motor vehicles due to age restrictions set by the minimum driving age in Malaysia of 15 years (Ubaidillah et al., 2022).

Youths are also disproportionately affected by environmental problems (Verlie et al., 2021; Børner et al., 2020; Pihkala, 2018). Displaced workers suffer losses due to natural catastrophes like floods (Chang-Richards et al., 2019). These impacts included displacement of jobs and workers, loss of income, disruption to workers' livelihoods and the creation of additional barriers to labour market participation, particularly for youth, women and those with lower skill levels. The interwoven global problems have evoked complex emotional responses, including feelings of doom, fear, sadness and anxiety (Grandisoli et al., 2021). However, the emotions, knowledge and experiences of youths are often disregarded, even though they are the population group most affected by climate change (Verlie et al., 2021; Trajber et al., 2019). By engaging in the education process and preparing their families and friends (FEMA, 2015), they can contribute significantly to building resilience and recovery in their own lives and their immediate communities (Peek, 2008).

The cognitive, emotional, psychological, and physical effects of disasters on youths are complex and multi-faceted (Peek et al., 2018). Previous studies (e.g., Crandon et al., 2022; Scribberas and Fernando, 2022) have shown that youths are highly affected by climate anxiety, leading to various consequences such as depression, self-harm and suicide. The increased vulnerability of individuals stems in part from the possibility that trauma and severe stress may interfere with and negatively impact developmental trajectories and tasks. According to Ho (2013), communities that invest in their young also reap long-term benefits, such as better problem-solving, stronger leadership and communication abilities, and more developed critical thinking capacities.

Research suggests that youth may be more vulnerable to the psychological effects of climate change (Charlson et al., 2021; Clemens et al., 2020). Youth mental illness has far-reaching consequences that can influence an individual's psychological health, happiness, and capacity to function in daily life (Vergunst and Berry, 2022). The psychosocial and mental health consequences of flooding are particularly pronounced in marginalised communities, including youth (Berry and Schnitter, 2022). Youth are disproportionately affected by disasters such as flooding (Kousky, 2016). Youth who were most affected by flooding also had the highest average post-disaster life stress (Felix et al., 2020). Youth and their families are facing unforeseen difficulties as a result of the floods, including job loss, loss of income, destruction of homes and communities or displacement and social isolation. The mental health of youth was already declining as these factors compounded each other (Kwan et al., 2023).

Therefore, involving youth in disaster management activities can not only improve their disaster preparedness skills but also help their families and communities prepare for floods. Youth can provide knowledge and awareness to communities and various groups on how to reduce risks and minimise the consequences associated with disasters (Haliza, 2020; Haq, 2015). In the event of a disaster, individuals can protect both themselves and others. This endeavour has the potential to mitigate, to some degree, the level of panic and disorder seen during disasters. Therefore, it is incumbent upon the nation to effectively utilise these vast national resources by providing comprehensive disaster training, raising awareness of social services, and taking a leadership role in post-disaster rehabilitation and reconstruction (Haliza, 2020).

Building resilience to climate change and calamities was a major focus of Datuk Seri Ismail Sabri Yaakob's 12th Malaysian Plan. Engaging young in disaster risk reduction activities is crucial for promoting behavioural changes that help communities become more resilient to disasters (Rafidah, 2021). The significance of youths as change agents is acknowledged by the SFDRR. It stresses the importance of national policies, educational initiatives, and legislative mandates that empower youth to help mitigate disaster risks (Muzenda-Mudavanhu et al., 2016). Including youth in DRR programmes is crucial (Al-Baldawi et al., 2021). As messengers of risk and organisers of their communities, youths are vital to flood preparation efforts (Lopez et al., 2012). According to Al-Baldawi et al. (2021), it is imperative to prioritise and facilitate meaningful youth engagement in DRR. Knowledge of DRR should be explicitly emphasised as a strategic approach to strengthen youth resilience and facilitate the dissemination of information to mitigate the impact of natural hazards (Khorram-Manesh, 2017; Mitchell et al., 2008; Sawada, 2007).

While the amount of literature dealing with DRR in developed countries has increased, there is still a significant lack of empirical studies documenting DRR in developing countries (Chen et al., 2019). According to Ubaidillah et al. (2022), there are few studies on flood preparedness in the Asian region, although this region is known to be more frequently affected by annual disaster events and has a higher number of victims compared to other regions. Besides that, inadequate disaster risk preparedness is observed in developing nations (Gammoh et al., 2023). Inadequate disaster preparedness leaves developing countries particularly susceptible to the effects of natural catastrophes (Gammoh et al., 2023). Further research is needed in this area, particularly in the context of Malaysia, notwithstanding the previous data on flood intentions and behaviour. In addition, not many studies have looked at the behavioural factors affecting youth disaster preparedness in developed or developing nations (Ubaidillah et al., 2022).

The studies on youths concerning disasters have received limited attention in previous studies (Ubaidillah et al., 2022). According to Khorram-Manesh (2017), a predominant feature of research on youths is its descriptive nature, which often results in their inclusion as case studies in manuals, recommendations and papers. There is a global push to get young people involved in DRR programmes. Recognising the significant role of youth in driving change and advocating collective action, the first campaign of the

United Nations International Strategy for Disaster Reduction (UNISDR) following its establishment in 2000 was themed "Disaster Risk Reduction, Education and Youth" (Fernandez and Shaw, 2013). Youth are particularly vulnerable to the damaging effects of disasters due to the physiological, cognitive and sociological variables associated with their developmental stage. Yet, there is a dearth of research on the particular elements that lead to resilience in youths (McDonald-Harker et al., 2021b). The topic of studying youth involvement in DRR is a relatively new area of research (Pickering et al., 2021). The feelings, knowledge and experiences of youths are often ignored, even though they are the generation most affected by climate change (Verlie et al., 2021; Trajber et al., 2019).

The Malaysian Youth Council or Majlis Belia Malaysia calls on youths to prepare for floods by equipping themselves with basic emergency and psychosocial support skills to face disasters (Mat Isa, 2023). However, Haliza (2020) contended that while many youths are aware of the potential dangers of disasters, they lack the necessary knowledge, attitude and behaviour to deal with them effectively, and even fewer admit to having taken preparedness measures. Youths experienced a heightened sense of incapacity, such as not being able to effect change (Puteh et al., 2018). Cong et al. (2021) found that youths lack experience, clear guidance and time to prepare for floods compared to older generations. Therefore, it is critical to examine the factors related to youth flood preparedness intentions and behaviours to ensure that youths are empowered to take proactive measures to mitigate the effects of flooding and promote community resilience.

The current study intends to evaluate the factors associated with flood preparedness practices among youths in the East Coast region, specifically in Pahang, Kelantan, and Terengganu. Muhammad et al. (2020) discovered that rainfall patterns in Peninsular Malaysia's east coast region differ from those in the central and southern regions, particularly with increasing annual rainfall volumes and greater variability in rainfall. Youths in this region are particularly vulnerable to the effects of climate change, especially flood disasters, compared to their peers in other regions of Malaysia.

Youths in the East Coast region of Malaysia were selected as the subject of the study because many flood-related deaths involving youths aged between 15 and 40 years have been reported in the East Coast region and lack of preparedness for floods is the main reason for these problems. In addition, the Sendai Framework for Disaster Risk

Reduction (SFDRR), the Ninth Prime Minister of Malaysia and the Youth Council of Malaysia have called on the youth to participate in disaster risk reduction. If this problem is not addressed immediately, it will have far-reaching consequences for the country's future leaders, skilled workers, human capital and productivity. The loss of youths to preventable flood disasters not only robs the nation of potential leaders and skilled workers but also reduces human capital and overall productivity. Failure to address this issue promptly can lead to further loss of life, displacement and economic hardship, exacerbating the already devastating effects of flooding in the region. In addition, the psychological and emotional impact on survivors and affected communities may further impair their ability to contribute effectively to the world of work and society. Therefore, preparing youths for the flood disaster is important not only to protect lives but also to ensure the future prosperity and development of the nation.

In this quantitative study, correlational and cross-sectional studies were used to investigate youth behaviour in preparation for the flood. Purposive sampling was utilised, with 350 youths who met the criteria set by the researcher becoming the respondents of the study. A hypothesis-testing approach was used in this study, whereby 15 hypotheses were developed based on theories and previous empirical studies. These hypotheses served as guiding hypotheses that the researcher wanted to investigate and test through empirical research. All of these hypotheses were tested using SmartPLS 4.0 to determine whether each hypothesis was supported. By understanding the predictors of youth flood preparedness intentions and behaviours, interventions and educational programmes can be developed to address specific barriers and improve youth flood preparedness efforts. The study's findings will add to the body of knowledge on youth behaviours in Malaysia's East Coast region regarding flood preparedness. In addition, this research is expected to bring benefits to various stakeholders including the National Disaster Management Agency (NADMA), the Malaysia Civil Defense Force (APM), the Fire and Rescue Department of Malaysia (BOMBA), the Public Health Department, local authorities, district office and non-governmental organisations (NGOs) as well as youth organisations.

1.3 Problem Statement

Despite the regular occurrence and severe impact of floods in Malaysia, there remains a notable deficit in terms of people's preparedness to respond effectively to such disasters (Jani et al., 2015; Azmawati et al., 2021), even in areas that are prone to disasters (Mohd Tariq et al., 2021; Appleby-Arnold et al., 2018; Hoffmann and Muttarak, 2017; Becker et al., 2017; Paton and Johnston, 2001; Geoscience Australia, 2015). People show a worrying lack of understanding of flood disasters, leading to inadequate flood preparedness (Rosmadi et al., 2023). Bessaha et al. (2022) stated that youths are seen as an important asset in international initiatives to lessen the effects of disasters. Besides that, the SFDRR also recognises the importance of youth contribution to DRR (Muzenda-Mudavanhu et al., 2016).

However, Haliza (2020) argued that many youths lack the knowledge, attitude and behaviour to deal with disasters. Although they acknowledge the existence of disasters and the damage they can cause, fewer of them admit to having taken preventive measures (Haliza, 2020). Despite being the group most affected by climate change, youths' emotions, knowledge and experiences are often disregarded (Verlie et al., 2021; Trajber, 2019). In Malaysia, it was reported that over 90% of youth in Malaysia have been confronted with environmental and climate-related impacts (United Nations Development Programme, 2020). The findings of the National Youth Climate Change Survey in Malaysia revealed that youth in the East Coast states (Terengganu, Kelantan, Pahang) are disproportionately affected by flooding compared to the average Malaysian youth (United Nations Development Programme et al., 2020).

The main consequences of floods, especially deaths, result from inadequate or no flood preparedness (Ahmadi et al., 2022; Yari et al., 2019). Inadequate flood preparedness is the fatal factor leading to flood-related deaths (Guo et al., 2023). In the states of Pahang (Aira Abdul, 2021; Roselan, 2021), Terengganu (Sinar Harian, 2022; Astro Awani, 2022; Bernama, 2017) and Kelantan (Muhafandi Muhammad and Nur Fazlizai, 2022; Hazelen Liana, 2022), many cases of flood-related deaths among Malaysian youths have been reported. The wide range of stressors associated with the disaster causes severe trauma for youths, including the experience of death, grief and prolonged distress (McDonald-Harker et al., 2021a). According to the Director-General of the Malaysian Ministry of Health, the devastating floods that ravaged Kelantan,

Terengganu and Pahang caused physical illness, depression and trauma among the victims (MOH, 2015). Preparatory measures taken before a crisis occurs can effectively reduce the number of victims of disasters (Wang and Tsai, 2022).

Youths are considered one of the most vulnerable groups in disasters and often suffer the most severe consequences. Particular challenges faced by youth in disaster situations include separation from their families and the lack of experience and training needed to deal with emergencies (Ubaidillah et al., 2022). The lack of preparedness for floods has increased people's vulnerability to such events (Safiah Yusmah et al., 2020). Empirical evidence suggests that youth are more vulnerable to flood-related deaths because they tend to engage in risky behaviour and participate in rescue operations (Isia et al., 2023) and lack knowledge and preparation (Tascón-González et al., 2020). Youths are particularly vulnerable to the negative consequences of the flood, mainly due to their different physical, cognitive and psychological developmental stages (McDonald-Harker et al., 2021b).

Research into the factors that influence people's actions concerning flood preparedness is crucial (Kerstholt et al., 2017). Unfortunately, there are few empirical studies on youth participation in disaster risk reduction (Pfefferbaum et al., 2018; Fletcher et al., 2016; Kuran et al. 2020), especially in developing countries (Muttarak and Pothisiri, 2013; Hoffman and Muttarak, 2017), including in Malaysia (Noorhashirin et al., 2016). Most of the previous studies have relied on policies, laws, reports and direct ministerial orders to assess disaster risk reduction in Malaysia.

Future researchers are encouraged to explore DRR in developing countries, as previous studies have applied behavioural theories in developed countries (Ejeta, 2015). The Asian region has a higher level of annual disaster events and casualties compared to other continents, but very few studies have been conducted there (Ubaidillah et al., 2022). Therefore, this empirical study is conducted to enhance the knowledge of flood disaster preparedness in the context of Malaysian youth. Ubaidillah et al. (2022) used the TPB in their study and suggested integrating the TPB with other theories to gain a more comprehensive understanding of the behavioural factors that influence disaster preparedness. Therefore, this study has integrated the TPB and the HBM to achieve its research objectives.

Yastica et al. (2020) found that TPB and HBM remain the most prominent theories in preventive behaviour research. However, previous studies have used either TPB (Jacob et al., 2023; Vinnell et al., 2023; Ubaidillah et al., 2022; Wang and Tsai, 2022; Zaremohzzabieh et al., 2021) or HBM (Ullah et al., 2024; Sonmez and Gokmenoglu; 2023; Mohd Tariq et al., 2021; Rostami-Moez et al., 2020) separately. None of them integrated these two theories into one research model. Tiantian et al. (2022) emphasised that using a single theory is often incomplete because many variables are excluded, making it difficult to predict certain behaviours. Therefore, the integration of theories is crucial for the study of flood-related behaviours (Tiantian et al., 2022). In addition, previous studies (e.g., Zaremohzzabieh et al., 2021; Wei et al., 2019) used community participation and trust in public protection as exogenous variables for their studies. However, in the present study, community participation and trust in public protection were used as moderating variables of the study. Based on these considerations, the present study integrated TPB and HBM and used community participation and trust in public protection as moderating variables to examine factors associated with flood preparedness intentions and flood preparedness behaviours.

1.4 Research Questions

This study sought to examine how various factors, including attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, past experience, community participation, and trust in public protection, are associated with flood preparedness intention and behaviour. The specific research questions are outlined below.

1. Is attitude positively associated with flood preparedness intention?
2. Is subjective norm positively associated with flood preparedness intention?
3. Is perceived behavioural control positively associated with flood preparedness intention?
4. Does perceived susceptibility positively associate with flood preparedness intention?
5. Does perceived severity positively associate with flood preparedness intention?

6. What is the relationship between past experience and flood preparedness intention?
7. Does perceived behavioural control positively associate with flood preparedness behaviour?
8. Does flood preparedness intention positively associate with flood preparedness behaviour?
9. Does community participation moderate the relationships between attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, and past experience, and flood preparedness intention?
10. Does trust in public protection moderate the relationship between flood preparedness intention and flood preparedness behaviour?

1.5 Research Objectives

This study examines the predictors of flood preparedness intention and behaviour among youth in the Malaysian East Coast region. It also examines how community participation and trust in public protection moderate the relationship between the variables in the study. Therefore, the study is designed to achieve the following specific objectives:

1. To examine the predictors associated with flood preparedness intention.
2. To investigate the predictors associated with flood preparedness behaviour.
3. To analyse the moderating effects of community participation on the relationships between the predictors and flood preparedness intention.
4. To analyse the moderating effect of trust in public protection on the relationship between flood preparedness intention and flood preparedness behaviour.

1.6 Scope of The Study

The disaster management cycle comprises four different phases: Mitigation, Preparation, Response and Recovery. According to Rostami-Moez et al. (2020), the

preparation phase is the most important phase within the disaster management cycle. A high level of preparedness reduces the likelihood of negative consequences, improves an individual's ability to cope, adapt and recover in the event of a disaster, and mitigates the escalating costs associated with hazardous incidents (Paton, 2018). However, as discussed in the problem statement section of this thesis, many flood-related deaths have been reported in the East Coast region of Malaysia, primarily due to inadequate preparation for floods. In addition, youths living in the East Coast region of Malaysia are more affected by flooding compared to those in other regions, as this region has higher annual rainfall and greater variability compared to other parts of Malaysia. Therefore, this study focuses on youths residing in the east coast region of Malaysia (Kelantan, Pahang and Terengganu).

As already mentioned, youths are the subject of this study. The age range for youths varies from country to country. In Southeast Asia, the age range of adolescents ranges from 12 years in Timor Leste to 40 years in Malaysia and Brunei (Fernandez, 2012; Fernandez and Shaw, 2015). This study is limited to youths between the ages of 15 and 40. In Malaysia, the Youth Societies and Youth Development Act 2007 defines youth as a person who is not younger than 15 and not older than 40 (Ubaidillah et al., 2022; Sharif and Naghavi, 2020; Mohd Zin et al., 2020). Several institutions, for example, the Institute of Youth Research Malaysia (Fei et al., 2020) and the Society for Adolescent Health and Medicine (Walker-Harding et al., 2017) as well as the Malaysian Institute of Youth Development Research (IYRES), have also recognised the range of youths between 15 and 40 years old. By 2020, youths aged 15 to 40 are expected to make up 44.7% of Malaysia's total population (Economic Planning Unit, 2015).

In addition, numerous previous research papers published in the Web of Science (WOS) and Scopus-indexed journals have studied Malaysian youth and set the upper age limit for their subjects at 40 years (Mohamad et al., 2024; Al Mamun et al., 2023; Ismail et al., 2023; Ibrahim et al., 2023; Ting, 2022; Nungsari et al., 2021; Munikrishnan et al., 2022; Yaakub et al. al., 2023; Chong et al., 2021; Mohd Hed and Grasso, 2020; Che Rose et al., 2020; Mahbob and Nordin Ahmad, 2020; Ismail et al., 2022; Juanis et al., 2022; Fei et al., 2020; Ahmad Ghazali et al., 2020; Ahmad Ghazali et al., 2019; Abu Samah et al., 2019; Abu Bakar et al., 2022; Dollah et al., 2022; Ting and Wan Ahmad, 2021; Mohammad Amizi et al., 2020; Shaharudin et al., 2020; Meng et al., 2020; Mahat et al.,

2021; Sidek et al., 2021). In their study, Mohd et al. (2024) set the maximum age for youth at 40 years instead of 30 years under the new legislation because the Youth Societies and Youth Development (Amendment) Act 2019 was not fully implemented until January 1, 2026.

Ubaidillah et al. (2022) stated that youth are particularly vulnerable to the negative effects of disasters. Particular challenges faced by youth in disaster situations include separation from their families and the lack of experience and training needed to deal with emergencies (Ubaidillah et al., 2022). Cong et al. (2021) found that people in this age group face difficulties in preparing for disasters as they take on caregiving responsibilities for their families, friends and relatives. They have limited experience, clear instructions and guidance, and too little time to prepare for floods compared to the older generation (Cong et al., 2021). It could be that they pay more attention to the care itself while they are not able to prepare for disasters (Wakui et al., 2017).

As for the location of the study, this study is limited to the geographical area of the East Coast region in Malaysia, particularly the states of Pahang, Kelantan and Terengganu. Previous studies by Md Nasir et al. (2021), Mahat et al. (2022), Abdul Shakur et al. (2020), Fazidah et al. (2021) and Alam et al. (2018) have examined the East Coast region, which comprises three states: Pahang, Kelantan and Terengganu. In recent years, the country has grown rapidly and expanded, which has had a negative impact on several states, especially the eastern coastal regions (Noorhashirin et al., 2016). Mohd Said et al. (2019) stated that flooding has been identified as the predominant natural disaster in Malaysia, with particular focus on the east coast region which includes Kelantan, Terengganu and Pahang. Flooding along the east coast of Malaysia is significantly influenced by the northeast monsoon winds, which cause significant rainfall between November and March (Khan et al., 2014b; Elfithri et al., 2017).

Abid et al. (2021) found that a significant number of households living in flood-prone areas, particularly in the eastern part of the peninsula, have low incomes. Furthermore, these households have suffered significant damage from flooding. It is also worth noting that rainfall patterns in the east coast region of Peninsular Malaysia differ from those in the central and southern parts. Annual rainfall amounts in the east coast region are higher and rainfall is more variable (Muhammad et al., 2020).

1.7 Significance of the Study

This study makes a valuable contribution to the expanding field of flood preparedness research by integrating two prominent theories, namely the Theory of Planned Behaviour (TPB) and the Health Belief Model (HBM). It is therefore expected that these findings will be useful from both a theoretical and practical perspective.

1.7.1 Theoretical Significance

Unlike most previous studies, which focused on preparing for disasters such as earthquakes or even general disasters, this research aims to provide a more solid theoretical knowledge of flood behaviour. Some theories explain factors that influence certain behaviours, such as the HBM, the ecology system theory and others (Mohd Tariq et al., 2021). These theories provide scholars with a framework for studying people's behaviour and provide stakeholders with clues for developing an effective approach to solving specific problems.

The HBM is one of the most well-established and oldest conceptual frameworks for behaviour. The HBM is used in the field of DRR and focuses mainly on human behaviour (Ejeta et al., 2015). The theory is flexible and suitable to explain DRR behaviours (Azhar et al., 2022). In addition, previous studies have found that the TPB is a robust theory that can credibly predict certain behaviours, including preparing for a natural disaster such as a flood. Humans' disaster preparedness behaviour is most often discussed through TPB (Wang and Tsai, 2022). Nevertheless, relying on just one theory is frequently inadequate. Theoretical omissions or exclusions may account for a large portion of the variance in observed behaviour. Consequently, studying people's behaviour on flood prevention methods requires the construction of a thorough and integrated psychosocial model (Tiantian et al., 2022).

Besides that, the factors that influence emerging nations' level of disaster preparedness have been the subject of scant empirical research (Muttarak and Pothisiri, 2013; Hoffman and Muttarak, 2017). Several studies have examined flood preparedness behaviour using TPB and HBM theories (Ejeta et al, 2016; Paton, 2003; Samah et al, 2019; Najafi et al, 2017; McIvor and Paton, 2007; McLennan et al, 2014). However, these studies primarily only used either TPB or HBM theories separately. As this is a research gap, this study intends to integrate the TPB and HBM to determine the relationship

between the variables. Finally, it can evaluate the factors associated with flood preparedness intention and flood preparedness behaviour.

To the best of the author's knowledge, this is the first study to contextualise and incorporate the HBM and TPB into a predictive model that provides a comprehensive theoretical foundation that illuminates how individuals' behavioural intentions toward flood preparedness are formed. This study also proposes that community participation moderates the relationship between predictors (attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, past experience) and flood preparedness intention. Therefore, this study provides a platform for increasing knowledge and promoting proper skills and preparedness for flood disasters.

This study will contribute to the body of knowledge on flood preparedness behaviour. This study can also serve as a starting point for future researchers to determine flood preparedness intention and behaviour, which may stimulate new research that involves modifying and improving the model through continuous testing. In addition, this is the first study to look at flood preparedness behaviour among youth in the East Coast region. It is hoped that the results of the study will provide new insight into the flood preparedness behaviours of youth in the East Coast region. Finally, the study's model construct could be used to assess other types of natural disasters worldwide.

1.7.2 Practical Significance

This study is of practical importance to various stakeholders such as the youth, the Malaysian Youth Council (MYC), government agencies such as the National Disaster Management Authority (NADMA), the Malaysian Civil Defense Authority (APM), the Malaysian Fire and Rescue Department (BOMBA), the Health Department, local authorities, district offices and non-governmental organisations (NGOs) such as the Malaysian Red Crescent Society and youth organisations. The results of this study will help the youth to develop ideas on how to prepare for flood hazards in the future by providing knowledge on what factors can lead to flooding behaviour. According to Kurniawan et al. (2021), there has been little research on youth participation in flood management.

According to Singh and Subramaniam (2009), public education, awareness and training programs are among the activities that are part of disaster risk reduction. This study is crucial as it can facilitate the health department to take necessary steps to prevent the severe effects of floods. Based on the results of this study, the health department can organise training courses, workshops and educational programs for at-risk groups, disaster responders and volunteers to increase capacity and promote ownership. Knowledge about risks and appropriate responses can also be disseminated through public information and education systems.

According to Shariff and Hamidi (2016), training is important because it familiarises the community with various topics such as climate change, natural forces, disasters, early warnings of disasters, what to do, emergency bags for individuals and families, and health and hygiene. The above topics seem very commonplace, but people tend to overlook them during an emergency. Government agencies such as the Health Department, NADMA, APM and BOMBA can use the findings of the study to formulate sound public policies to encourage youth to prepare for floods. In addition, the local authorities and the district office can utilise the findings of the study to improve youth participation in the community, especially in the decision-making process.

NGOs and youth organisations will also benefit from this study. They can use the results of the study to develop a unique flood preparedness training program for young people. This is because youth are becoming increasingly important as they can help other population groups mitigate the negative effects of flooding. Janicke-Bowles (2018) contended that youth active participation can solve flood-related issues by disseminating information related to flood preparedness and recovery. Moreover, youth are very creative, confident and bold when it comes to expressing new ideas, so their benefits in disaster risk reduction will be very high (Garg and Sam, 2020; Cox et al., 2018; Vicerra et al., 2018; Fothergill, 2017). Fakhru'l-Razi et al. (2018) believed that appropriate disaster education could be developed using the findings to improve DRR in the community.

1.8 Definitions of Terms

For a clear comprehension of the ideas and variables utilized in this study, the following definitions of key terms are provided. The results of the tested hypotheses are discussed in light of these definitions.

1.8.1 Attitude towards Flood Preparedness

Attitude refers to a favourable or unfavourable stance toward flood preparedness (Kurata et al., 2023).

1.8.2 Community Participation

Community participation reflects people's participation in activities within the wider community people's active involvement in their community (Ejeta et al., 2016).

1.8.3 Disaster Preparedness

Disaster preparedness refers to activities and measures taken in advance to ensure an effective response to the impact of hazards (Paton 2019; Dasgupta et al., 2020).

1.8.4 Flood

A flood can be defined as an excessive volume of water that can inundate a wide area or property, and it is recognised as a natural disaster (Mohd Tariq et al., 2021).

1.8.5 Flood Preparedness Intention

Flood preparedness intention refers to the extent to which individuals intend to take precautionary measures for future floods (Papagiannaki et al., 2019).

1.8.6 Flood Preparedness Behaviour

Flood preparedness behaviour is the actions, practices, and measures that individuals, undertake in anticipation of a flood event (Frieman et al., 2011).

1.8.7 Predictors of Flood Preparedness

Predictors of flood preparedness refer to factors that influence preparedness activities (Hajar Mariah et al., 2021).

1.8.8 Perceived Behaviour Control

Perceived behaviour control refers to an individual's subjective assessment of the ease or difficulty in preparing for a flood (Kurata et al., 2023).

1.8.9 Perceived Susceptibility

Perceived susceptibility refers to the person's expectation of being exposed to a threat, such as a flood reaching his or her house (Grothmann and Reusswig, 2006).

1.8.10 Perceived Severity

Perceived severity of flood refers to an individual's belief about the potential extent of harm or damage that could occur as a result of a major flood event (Ejeta et al., 2016).

1.8.11 Past Experience

Flood experience can be defined as being exposed to a flood disaster at least once in a lifetime (Atreya et al., 2017). In the present study, past experience is defined as being exposed directly or indirectly to a flood disaster at least once in a lifetime (Mondino et al., 2020; Santoro et al., 2019).

1.8.12 Subjective Norm

It refers to the individual's perception of social pressure to engage in flood preparedness activity (Najafi et al., 2017).

1.8.13 Trust in Public Flood Protection

Trust in public protection refers to confidence in the government in protecting flood hazards (Han et al., 2016).

1.8.14 Youth

Youth Societies and Youth Development Act 2007 defines youth as a person not less than 15 years and not more than 40 years old (Ubaidillah et al., 2022). In a Malaysian context, the term “youth” is equally as wide-ranging, covering an age range between 15 and 40 (Sharif and Naghavi, 2020).

1.9 Organisation of the Study

This thesis consists of five chapters, including this introduction. Chapter 1 provides an overview of the background of the study on youth and flood preparedness, the research problem, the research objectives and questions, the significance of the study, the scope of the study and the definitions of terms. Chapter 2 provides an overview of relevant theories and previous research and outlines the research framework and hypotheses. Chapter 3 describes the research paradigm and research methodology, including the research design, data collection and sampling methods. Chapter 4 presents the research findings. Chapter 5 discusses the findings and contributions of the study. It also identifies the limitations of the study, suggestions for future research and conclusions.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter begins with a general discussion of issues related to flooding. It begins with an examination of flood disasters, provides an overview of such events in both developed and developing countries, addresses the specifics of the flood disaster in Malaysia, and examines national policies related to flood management in Malaysia. The theories on which the study is based, namely the TPB and the HBM, are then explained. It then reviews the relevant literature on the selected constructs, including exogenous variables such as attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, and past experiences. The study also examines the moderating variables of community participation and trust in public protection as well as the endogenous variable of the study, i.e., flood preparedness intention and flood preparedness behaviour. Throughout this chapter, various hypotheses are derived from the corresponding subsections, and a conceptual framework is presented at the end of the chapter. Finally, this chapter concludes with a summary.

2.2 Flood Disasters

Floods are a widespread form of natural disaster that have brought tremendous effects on both people and the environment throughout history. While water is an essential requirement for human survival, excessive amounts of water exceeding normal levels and flooding the surrounding land can cause significant difficulties for any population. Rainfall, storms and the physiographic characteristics— of the catchment area - size, shape, geology, hydrography and land use — are all possible causes of flooding (Rehman et al., 2019; Osman et al., 2016; Boateng, 2012). Osman et al. (2016) and Mensah and Ahadzie (2020) list several human activities that can cause flooding, including the construction of structures in floodplains, clogging of drains with solid waste, deforestation of catchments and land reclamation.

Flood events can have a variety of causes. These include coastal and estuarine flooding originating from the sea, inundation of river courses, flooding resulting from the overflow of water that has not yet reached a natural drainage channel, the rise of groundwater and the malfunction of artificial water systems (Lancaster et al., 2004). Floods are common in Malaysia. Weather conditions during these months are typically harsh and characterised by high rainfall in the eastern coastal areas, including Pahang, Terengganu and Kelantan. Nurul Ashikin Alias et al. (2018) found that a significant proportion of the impoverished population suffered considerable damage to their livelihoods due to climate-related disasters.

Extreme flooding is a common and devastating natural disaster that may wipe out entire communities, displacing residents for an extended period and destroying homes and businesses. From 1980 to 2018, floods resulted in a total of 223,482 documented deaths worldwide and caused economic losses of over USD 1 trillion (Munich, 2020). According to CRED (2020), floods were the most prevalent and deadliest type of natural disaster. They accounted for 49% of total disaster events and caused 44% of fatalities in 2019. In 2019, the consequences of natural disasters were most severe in Asia, with a notable 40% share of the number of disaster events, 45% of the number of fatalities and 74% of the population affected (CRED, 2020). Furthermore, James (2008) emphasised that certain countries, namely China, India, Bangladesh and Pakistan, have gained a reputation for being significant sources of disasters, particularly devastating floods.

2.2.1 Flood Disasters in Developed Countries

Floods in developed countries can have a significant impact despite advanced infrastructure and disaster management systems. Although developed countries often have better resources to mitigate flood risks than developing countries, they are not immune to the consequences. Japan has always been prone to flooding, which poses a significant threat to the country. Currently, almost half of the country's population lives in flood-prone areas (Fan and Huang, 2020). According to Ashizawa et al. (2022), natural disasters related to flooding account for over 70% of all natural disasters in Japan. The frequency of flooding, particularly in cities, has been exacerbated by changing climate patterns and various socio-economic factors. Among the many devastating events that occurred in Japan during this period, the worst was the flooding of Nagasaki in 1982. The

entire country was severely affected by the heavy rains, especially Nagasaki Prefecture (Nakamura and Llasat, 2017).

Effective flood risk management requires a mix of structural and non-structural solutions (Hao and Lun, 2024), which Japan has known since the 1980s (Fan and Huang, 2020). When it comes to long-term strategies, the Japanese government invests 7% of its budget in the research and development of new technologies and other structural remedies (Schwarz et al., 2023; Greer, 2012). The Japanese government has also concentrated on non-structural measures. Flood insurance is one of the non-structural measures (Fan and Huang, 2020). In Japan, 66% of the households have flood insurance (Konami et al., 2021). The Japanese community is well-prepared and responds effectively to disasters through high levels of public participation and cooperation (Paton et al., 2010).

The United States is among the countries that has experienced a significant number of floods (Hu et al., 2018). In light of the global research, the United States was found to be among the countries with high vulnerability in terms of population affected by floods. According to Tellman et al. (2020), the cumulative death toll from pluvial and fluvial flooding in the country amounted to 350 people in the period from 2008 to 2012. Furthermore, American businesses suffer far greater financial losses from floods than their international counterparts (Hu et al., 2018). According to Ashley and Ashley (2008), a significant portion of flood-related deaths in the contiguous United States are attributed to flash flooding. Comprehensive evaluations at the national level have also shown that the Eastern region of the United States has been repeatedly affected by flooding, resulting in a significant number of deaths.

According to Meyer et al. (2014), a significant portion of the United States population now resides in coastal regions where there is a high concentration of assets near water. Experts predict that coastal population expansion and near-coastal development will continue, meaning that a greater number of people will live in flood-prone regions in the coming decades (National Oceanic and Atmospheric Administration [NOAA], 2013). According to Wing et al. (2018), an estimated 40 million people live in regions within the United States that have an annual probability of flooding of 1% or more. This figure could rise to over 70 million by 2050. The high population density in many cities in the Northeastern United States makes this geographic area particularly

vulnerable to coastal flooding (Mayo and Lin, 2022). There has been a notable trend among governments to allocate more financial resources to flood protection. Additionally, research institutions and related authorities have intensified their efforts to lessen the impact of flooding (World Health Organisation, 2017).

The Coastal region of Singapore is confronted with erosion and flooding risks due to progressive land reclamation and simultaneous sea level rise. In recent decades, the intensity and frequency of storms in Singapore have increased noticeably, leading to a corresponding increase in flash floods (Chow et al., 2016). In 2019, Singapore made an official statement to incorporate nature-based solutions as a strategy to address the issue of rising sea levels. This approach is being considered along with the potential implementation of engineered solutions, such as empoldering (Mohan, 2021). Mangroves are increasingly recognised as a viable nature-based approach to mitigate coastal flooding hazards and prevent erosion (Ramírez-Agudelo, 2020). As of now, mangrove forests cover around 8.1 square kilometres of Singapore, or around 1.1% of the country's overall land area (Gaw et al., 2019). According to Gijssman et al. (2021), implementing a combination of hard and soft engineering solutions has the potential to successfully control coastal erosion and provide protection against the effects of sea level rise.

The Netherlands is widely known as a country where flooding events occur very frequently on a global scale (Bosker et al., 2018; Engel et al., 2014). Without flood defence systems on rivers and in the sea, around 67% of the Netherlands would be permanently underwater (Terpstra, 2011). Because of its stringent flood protection regulations, the Netherlands is generally considered to have one of the world's best-protected deltas (Bannink and ten Brinke, 2006). In the Netherlands, the proportion of the population exposed to flood risk is the highest in the world, with approximately 58.7% of the population living in regions that would experience a flood depth of more than 15 cm in a 1-in-100-year flood, without flood protection systems in place. The country has some of the most extensive flood protection systems in the world. These systems are designed to protect against very rare disasters with a return period of up to 1:10,000 years. Consequently, they can effectively reduce the risks described in the study by Rentschler et al. (2022). The Netherlands has a rich historical experience in dealing with the potential threat of flooding from both the sea and the rivers that surround the country (Bosker et al., 2018).

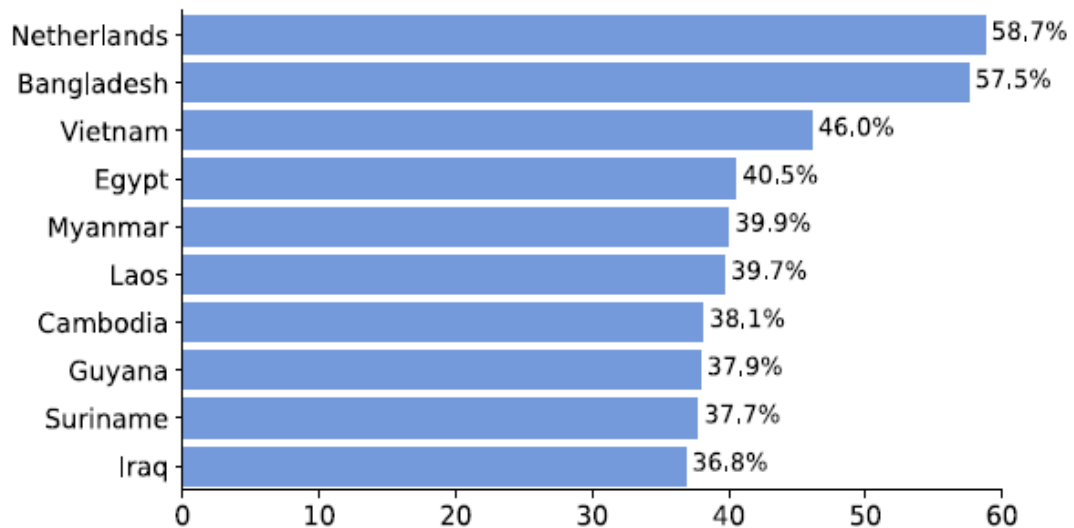


Figure 2.1 Percentage of population exposed to high flood risk

Source: Rentschler et al. (2022)

The Netherlands is geographically located in a delta region, which is characterised by the fact that it is partly below sea level. It is surrounded by the North Sea and is crossed by numerous important rivers. In terms of scale of impact, flooding can be considered the greatest natural hazard in the country. It is crucial to acknowledge that future flooding events cannot be definitively predicted owing to potential changes in climate, even though many effective preventive measures have been put in place to lessen the likelihood of flooding (Ministry of Transport, Public Works and Water Management, 2006). In regions characterised by low-lying delta topography, the incidence of flooding is particularly high due to several factors. These include the presence of rivers, the combination of low elevation and slope, an elevated groundwater table and the influence of marine processes.

One of the places in question is the Netherlands and western Belgium, which lie in north-western Europe. This area is characterised by the convergence of the Rhine, Meuse and Scheldt rivers, which eventually flow into the North Sea (Jansma et al., 2020). The storm surge that occurred on February 1, 1953, resulted in a significant loss of life with over 1800 fatalities and the displacement of hundreds of thousands of people in the southwest of the Netherlands (Warnera et al., 2018). In the Netherlands, it has been

observed that the population is inadequately prepared for the consequences of flood hazards (Kievik and Gutteling, 2011; Terpstra and Gutteling, 2008).

In Iceland, it has been observed that at least three flood events can be categorised as megafloods, as they are capable of creating substantial rock canyons and moving massive boulders through fluvial processes (Carrivick and Tweed, 2019). According to Carling (2013), floods that have a peak discharge of $106 \text{ m}^3\text{s}^{-1}$ or 1 Sverdrup or more are classified as megafloods. According to Baker (2002), it is argued that the occurrence of the largest and most extensive floods ever recorded on Earth is closely associated with regions where glaciers and significant ice formations play a central role. Essentially, the occurrence of these floods can be attributed primarily to variables associated with glaciers and the phenomena occurring in glacial habitats. Glacial ecosystems can contribute to flooding through many mechanisms, including the melting of glaciers, the draining of water from glacial lakes, and the rapid displacement of ice and water during glacial floods. People in Iceland have been documenting glacial floods for thousands of years and there is extensive scientific literature on the subject of Icelandic glacial floods (Björnsson, 2010).

This means that the occurrence of glacial floods in Iceland is not a recent event, but has been documented and observed over a long period. Subglacial volcanism serves as a prominent catalyst for a significant portion of the flooding in Iceland. This phenomenon means that volcanic activity under glaciers or ice sheets can trigger the thawing of ice and the subsequent discharge of considerable amounts of water. The occurrence of subglacial volcanism has the potential to trigger rapid melting of the overlying ice, leading to a subsequent release of water under the glacier and thus a flood event. In addition, many floods in Iceland are due to drainage or runoff of water from subglacial lakes. These lakes are formed under the ice by geothermal processes originating from the earth's subsurface and volcanic activity. The increase in water volume in subglacial lakes has the potential to destabilise the overlying ice mass, leading to either the breaking of the ice or the creation of a channel for water to reach the surface, eventually resulting in a flood event (Carrivick and Tweed, 2019).

Glacial eruptions are frequently observed in Iceland, which has led to the term 'Jökulhlaup', which originates from this region. Jökulhlaups in Iceland pose a significant

risk to human communities, individuals and hydroelectric infrastructure along glacier-fed river systems. They have also caused significant damage to large areas of land, negatively impacting agricultural practices and livestock farming. The transportation sector has been affected by the floods, particularly through the destruction of roads, bridges and related infrastructure. In addition, the occurrence of larger jökulhlaups has led to the formation of tidal waves in coastal seas (Carrivick and Tweed, 2016). Over a considerable time, jökulhlaups in Iceland have been responsible for significant and recognizable changes to the landscape, as evidenced by the presence of erosional and depositional landforms. According to Carrivick and Tweed (2019), considerable erosion of the extensive rocky canyons occurred, accompanied by significant material transport through the outwash plains.

2.2.2 Flood Disaster in Developing Countries

Indonesia is a growing nation in the Southeast Asian region that is repeatedly struck by disasters. One of the biggest urban problems in Indonesia in the last ten years has been flooding. Extreme weather events, including flash floods, torrential rains and 5-year floods, are the result of heavy rainfall. In addition, the low-lying coastal region has experienced strong tidal refluxes leading to flooding. Uncontrolled urban population growth, poor land use planning, lack of knowledge about floods and their hazards among urban stakeholders and communities, and lack of understanding of disaster preparedness and prevention programmes are the main causes of floods turning into disasters (Rabiul Islam et al., 2016).

According to the Climate Risk Profile for Indonesia (2021), the World Bank expects the country's population at risk of severe flooding to increase by more than one million people between 2035 and 2044. The floods that occurred in the South Sumatra region in 2018 not only damaged homes, but also destroyed three health facilities, three places of worship and seven educational institutions (Hidayat et al., 2019). Pramantha et al. (2021) contended that the severity of flooding in Palembang is increasing year on year. According to Rendana et al. (2023), the Indonesian National Disaster Mitigation Agency has documented a remarkable increase in flooding in the South Sumatra region since 1972. Fitritinitia and Matsuyuki (2022) found that a significant proportion of the

Indonesian population, or around 76 million people, are particularly vulnerable to flooding.

Indonesia's inadequate protection programmes for impoverished and vulnerable households are of great concern, especially given the country's increased vulnerability to natural disasters (Perdana and Maxwell, 2004). As the world's largest island nation, Indonesia is highly susceptible to flooding due to various factors such as tidal flooding, sea level rise, river overflow due to heavy rainfall and land subsidence. These phenomena are primarily attributed to natural processes such as the deposition of young alluvial sediments, excessive extraction of groundwater and rapid urbanization (Harwitasari and van Ast, 2011).

India is considered to be one of the nations significantly affected by climate change, with severe flooding being a major consequence of this phenomenon (Eckstein et al., 2021). Floods are a significant disaster in India, having far-reaching impacts on people's lives, economic livelihoods and physical infrastructure. Rentschler et al. (2022) reported that 196 million people reside in flood-prone regions in the Ganges-bordering Indian states of Bihar, Uttar Pradesh, and West Bengal. This population group makes up around 33-53% of the respective populations of these states. In addition, the state of Assam, which is characterised by abundant rainfall and a robust river network, is one of the states in India where flooding is particularly frequent.

Floods have various dimensions, including inundation due to overflow of river banks, runoff accumulation due to inadequate drainage features, and erosion due to alteration of watercourses (Rabiul Islam et al., 2016). In regions without adequate drainage infrastructure, flooding occurs because rainfall accumulates during periods of heavy rainfall. Flooding is a recurring event in the city of Mumbai every year. According to Gupta (2007), the enormous rainfall led to an immediate and complete collapse of the transportation and communication infrastructure. According to Samaddar et al. (2009), at least 415 people died as a result of the disaster. This figure includes 65 deaths as a result of the numerous landslides and a further 216 deaths due to various flood-related illnesses.

The Eastern and Western Ghats regions of South India are particularly prone to flooding caused by the southwest and northwest monsoons. According to Flood Damage

Statistics (2018), India suffered significant consequences from floods and heavy rainfall between 1953 and 2016. A total of 105,472 lives were lost and 347,581 cores of crops, buildings, and public infrastructure were severely damaged; the impacted area was around 460 million hectares. In August 2018, a severe flood occurred in the state of Kerala, which unfortunately claimed 474 lives.

The population in question was the most affected during the 2005 flood event and also during the subsequent annual floods (Bhagat et al., 2006; Stacey and Nicole, 2007). According to many sources (Government of Maharashtra, 2006; Bhagat et al., 2006; Parthasarathy, 2009), the city's increasing vulnerability to flooding can be attributed to several causes, including building collapses, disorganised and improvised evacuation procedures, inadequate health infrastructure, and a lack of information about potential risks. It is evident that the implementation of simple preventive measures at the household level, such as evacuation planning, preparation of food safety kits, proper storage of food and drinking water, and elevation of the basement floor, can significantly reduce the loss and damage caused by the 2005 flood (Samaddar et al., 2009; Bhagat et al., 2006). The floods that occurred in Chennai, India, in 2015 can also be described as anthropogenic rather than natural. Likely factors contributing to the problem include unauthorised encroachment on pre-existing water bodies, excessive disposal of solid waste in river channels, and construction of buildings and roads over artificial drainage systems that impede the natural flow of water (Lakshmi and Yarrakula, 2016).

Bangladesh has experienced a series of severe disasters, including floods, famines, earthquakes and cyclones, which have caused extensive damage in the coastal regions of the country. The Coastal region of Bangladesh was severely devastated by a cyclone and subsequent storm surges in 1953. The rivers in Bangladesh are heavily silted and therefore pose a constant threat of blockage. The 1988 floods had a major political impact on the capital Dhaka. Mrs. Danielle Mitterrand, the First Lady of France, visited Bangladesh and drew attention to the flooding in the country, which prompted her husband to put the flooding in Bangladesh on the international agenda as a priority. The French then proposed an investment of USD 5 billion for river training on the Brahmaputra-Jamuna. Nevertheless, the aforementioned idea was not implemented (Warner et al., 2018).

One of the nations hit worst by floods globally is Bangladesh. Its 230 rivers, 57 of which flow across international boundaries, are a major reason for this (Kundzewicz et al., 2014). The country's river flooding is distinct from other countries because of its geography, topography, number of river systems, and monsoon climate. River floods are a result of the overflowing of river banks, which leads to flooding of adjacent areas, mostly inhabited by residents. In major floods such as in 1987, 1988, 1998, 2004, 2007, 2014 and 2016, more than two-thirds of the country was flooded, with significant consequences for millions of people and their belongings (Mondal et al., 2021).

In August 2017, the nation faced its most severe flooding in recent history. The water levels of prominent rivers in the northern region of Bangladesh exceeded their dangerous thresholds, resulting in the flooding of river basins. According to the daily disaster situation report published by the National Disaster Response Coordination Centre (NDRCC) in 2017, an estimated 6.9 million people were affected by the event. Of this population, around 297,250 people were displaced from their homes, while 593,250 homes were destroyed. The disaster also caused severe damage to around 650,000 hectares of farmland. As flooding is a frequent occurrence in Bangladesh, it is common for people living along the rivers to adopt several mitigation strategies after a flood event. These efforts aim to minimise the potential consequences of future flooding, using the knowledge and experience gained from the last flooding episode (Ali et al., 2018b).

A study by the United Nations Office for Disaster Risk Reduction found that China experienced the most disasters between 2005 and 2014, with 286. It was followed by the United States, which recorded 212 disasters, and the Philippines, which reported 181 incidents (United Nations, 2015). According to Rentschler et al. (2022), the provinces near the coast and the Yellow River Valley in China have the highest concentration of vulnerable residents. Based on statistics from the Ministry of Water Resources (2018), it can be seen that floods and typhoons are the most prevalent natural disasters in China. According to Zaiton Hamin et al. (2013), China experienced significant devastation in the twentieth century, particularly during the Yangtze River floods in July and August 1931, which reportedly claimed 400,000 lives.

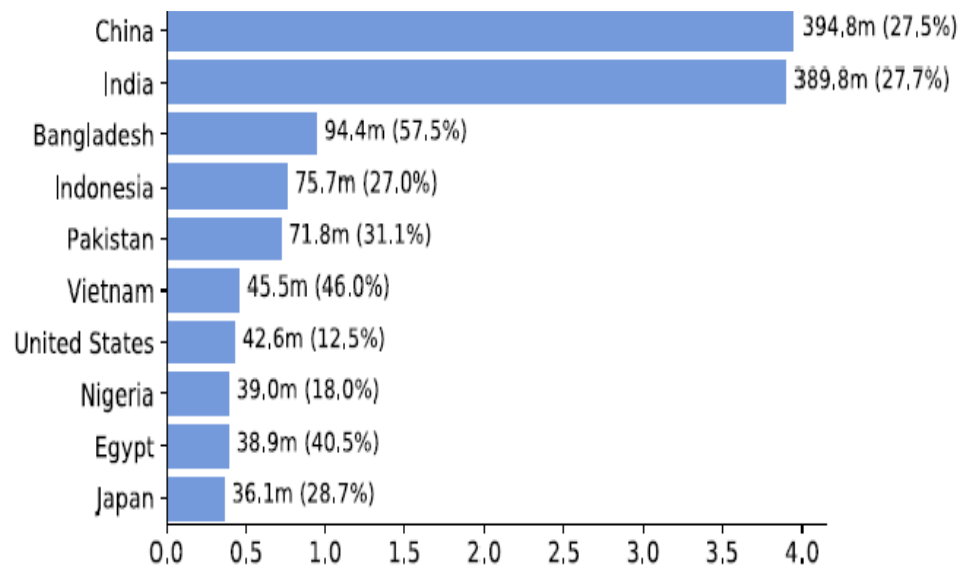


Figure 2.2 Number of people exposed to high flood risk

Source: Rentschler et al. (2022)

In the second half of the 1990s, China suffered significant financial losses from flooding, with the largest documented losses amounting to USD 26.5 billion in 1996 and USD 30 billion in 1998. In 2018, the total monetary losses caused by a series of natural disasters amounted to CNY 264.46 billion. An example of the consequences of severe weather phenomena in urban areas was evident on July 20, 2021, when flooding occurred in Zhengzhou, China, triggered by heavy rainfall. According to Dong et al. (2022), the event claimed at least 380 lives or people who have not yet been identified. The intensity of the rainfall was of such a magnitude that it was described as a "millennial" event, surpassing previously documented climatic extremes at numerous meteorological stations. The severe event had several characteristics, such as a considerable amount of accumulated rainfall, long duration, intense short-term rainfall, and significant precipitation (Xu et al., 2023).

China and India are countries in Asia that are prone to flooding, as shown by the findings of Shen and Hwang (2019) and Hu et al. (2018). These studies also show that the frequency of flooding is particularly high in Asia, with China and India being the most affected regions. Countries with higher population densities are more likely to have a significant proportion of their population living in areas directly exposed to the risk of flooding. India and China, the two most populous countries, have the highest absolute number of people affected, with 390 million and 395 million people respectively.

Consequently, these two countries together represent almost a third of the world's population exposed to flood risk. However, the presence of geographical characteristics and urbanization patterns can significantly increase the extent of the population vulnerable to exposure (Rentschler et al., 2022).

Between 2008 and 2010, a significant proportion of urban areas in China, over 60%, were affected by flooding of varying degrees. In addition, nearly 140 cities in the country experienced at least three floods during this period (Xiaoyong and Wenhui, 2020; Zhang et al., 2016). In the period from 2014 to 2018, floods in China caused an average annual economic loss of RMB 161 billion and claimed 747 lives. According to Zhang et al. (2021), these numbers were responsible for 61.2% of the fatalities caused by natural catastrophes and 48% of the total economic costs.

According to Wang et al. (2021), a higher GDP per capita and a higher urbanization rate have been identified as factors contributing to a higher incidence of flooding and subsequent damage. There may be a correlation between the extent of flood disasters and various factors such as income, population and land area. More widespread flood protection infrastructure and a more refined institutional framework are two outcomes that are anticipated to result from enhanced socioeconomic development. Socioeconomically developed nations are thus more likely to be able to safeguard their citizens from floods and other disasters (Li et al., 2016; Hu et al., 2018).

Vietnam ranks eighth among the ten nations hit most by severe weather events between 1996 and 2015, indicating its vulnerability to the destructive power of floods and storms (Kreft et al., 2016). The increased susceptibility to flooding in Vietnam can be attributed to the tropical monsoon climate, the extensive river networks, the extensive coastline and the densely populated regions along the rivers and coastal areas (Chau et al., 2014; Razafindrabe et al., 2014).

Furthermore, it should be mentioned that a considerable number of Vietnamese people live in areas prone to flooding, making them more susceptible to natural calamities (Davis, 2014; Tukker and Ngo, 2014; Shaw, 2006). Vietnam's vulnerability to flooding has been exacerbated by rapid population growth, industrial development and the expansion of agriculture, particularly in the riverine and coastal regions (Tran et al., 2008). According to Yaseen et al. (2023) and Tran et al. (2009), low-income populations

are disproportionately affected by flooding, particularly those living in rural and coastal areas whose livelihoods are highly dependent on the natural environment.

Vietnam is located in the tropical monsoon zone and has a 3440 km long coastline and a complicated topography. Thus, the nation is often confronted with a range of natural disasters, including hydrometeorological occurrences like storms, floods, droughts, and high rains, as well as geophysical catastrophes (Thomas et al., 2013). According to Chau et al. (2014), a significant proportion of Vietnam's population (approximately 71%) and a significant proportion of the country's total land area (over 59%) is potentially vulnerable to the adverse effects of severe storms and floods.

Recently, the occurrence and severity of flooding have increased in many cities in Vietnam due to the accelerated urbanization process and increased rainfall (Luo et al., 2018). The dyke system in question stretches over a considerable distance of 2600 km, surpassing the defence infrastructure of many other nations. However, it should be noted that the current system has been designed to safety standards specifically aimed at mitigating the risks associated with coastal flooding, which occurs at a frequency of 1 in 30 years. It is important to recognise that in more extreme and catastrophic flooding events, the existing system would likely be inadequate and unable to effectively address the increased challenges posed by such events (Rentschler et al., 2022).

2.2.3 Flood Disaster in Malaysia

Floods are the predominant natural disaster in Malaysia, causing widespread disorder and disruption in the social and economic spheres. They cause damage to transportation infrastructure, including roads and railroad tracks, as well as cars. In addition, they affect the level of property, cause loss of life and exacerbate the vulnerability of affected regions. Natural occurrences like heavy and persistent rainfall and human activities like fast urbanisation, unplanned urbanisation, insufficient drainage systems, and environmental degradation are the main causes of floods (Abid et al., 2021).

Severe monsoon floods occur frequently in several countries, including Malaysia (Chan, 2012a). Approximately 5 million people call flood-prone regions home (Maznieda et al., 2022). Every year, floods in Malaysia inflict more destruction than any other natural calamity. The periodic monsoon causes flooding in Malaysia every year, causing major

damage and affecting the country's economy (Safiah Yusmah et al., 2020). In their study on flooding in Sarawak, Abid et al. (2021) identified the main causes contributing to these events as related to nature, human activities and governance. This study shows that the implementation of vulnerability reduction measures and emergency preparedness strategies can effectively mitigate the negative impacts of floods, including damage and mortality.

Chia (1971) identified several factors contributing to flooding disasters in Malaysia, with limited flood storage capacity emerging as a major factor leading to frequent flooding. Prolonged and intense rainfall eventually leads to the phenomenon of flooding, where the water level in a river reaches a critical threshold and results in significant inundation. Malaysia has experienced the worst floods in the last three decades. The above-mentioned incidents occurred in 2006, 2007, 2010, 2014 and 2017. In 2000, a similar incident caused 15 deaths and displaced about 10,000 residents in the states of Kelantan and Terengganu as a result of heavy rainfall.

In 2008, a similar incident also occurred in the above-mentioned state, killing 28 people and causing an estimated RM 65 million in damage. In 2010, Kelantan and Pahang experienced major disruptions that led to the suspension of many activities, including transportation. These disruptions led to the suspension of rail services and the closure of roads along the North-South highway. Consequently, these disruptions harmed agriculture and other commercial activities. The year 2014/2015 is widely recognised as a significant period in history, commonly referred to as the "tsunami" due to its profound impact on various aspects of society, including human life, agricultural practices and the economy. This designation stems mainly from the severe consequences in the East Coast states of Pahang, Terengganu and Kelantan, as documented by Umar (2018).

According to the report published by EM-DAT CRED in 2020, a comprehensive analysis revealed that a total of 51 cases of natural disasters were documented over two decades, from 1998 to 2018 to be precise. Among these events, a significant majority of 38 events were classified as floods. Between the years 1998 and 2018, a total of over three million people were affected by the negative impacts, including 281 fatalities. Malaysia has the highest proportion (67%) of people susceptible to and affected by flooding among ASEAN member states. One of the most prevalent natural disasters in

Malaysia is flooding, which affects a large number of people. Nearly 4.8 million people call the flood-prone 9 per cent of Malaysian land area home (NADMA, 2018).

The first notable flooding event documented in Malaysia was the Great Malayan Flood of 1926, which had far-reaching effects throughout the peninsula (Williamson, 2016). The fast expansion of agriculture and industry under British colonial control intensified these floods (Williamson, 2016). Almost all of Kuala Lumpur, the capital city, and several locations in adjacent states were inundated during the Great Flood of 1971, a major flood event that occurred in the twentieth century. An estimated RM 177 million in economic damage was caused by this event (Chan, 2012b). All of Johor was hit hard by the consecutive floods that occurred in 2006 and 2007 due to unusually heavy rainfall. Several significant regional towns and cities were submerged by these floods (JPS, 2009; Tangang et al., 2012). Tangang et al. (2012) and JPS (2009) estimate a total loss of about RM 1.5 billion due to the floods. Kelantan, Terengganu, and Pahang suffered substantial financial damages of almost RM 2.9 billion as a result of additional devastating floods that hit the eastern coast of Malaysia between 2014 and 2015.

Over the last century, Malaysia has experienced more than twelve major floods. Notable examples include the Bah Merah Flood in 1926, which led to the flooding of the entire Peninsular Malaysia, and the Bah Kuning Flood in 2014, which led to the displacement of over 200,000 homes in West Malaysia. The flood event known as Bah Kuning, which occurred between mid-December 2014 and early January 2015, caused significant damage in five states in Malaysia, namely Kelantan, Terengganu, Pahang, Johor and Perak. The devastation of buildings and infrastructure, crop failure, and interruption of economic operations were all consequences of this damage (Mohd Muhaimin et al., 2020).

The northeast monsoon is responsible for the greatest annual floods in the states of Terengganu and Kelantan. Many towns and cities in Kelantan and Terengganu have been built on floodplains or along riverbanks, making flooding a big problem locally and nationally (JPS, 2009; Mohamad et al., 2005), even though these areas are naturally prone to flooding. Extreme flooding has become a national emergency due to a confluence of factors, including climate change, which has forced the government to devote substantial funds to disaster relief and recovery (Nur Zainul et al., 2021).

The 2014/2015 floods caused RM200 million in economic damage in Kelantan and more than RM12 million in flood-related damage in Terengganu. Kelantan experienced severe destruction, with the capital Kota Bharu being inundated by floodwaters. In contrast, certain regions, namely Kuala Krai and Tanah Merah, were severely devastated, resulting in the displacement of many people. Ismail and Haghroosta (2018) claimed that Kuala Krai experienced the most severe flooding in 2014, exceeding the extent of any flood event since 1967. The effects of the floods in Terengganu were comparatively milder than those in Kelantan. However, the occurrence of floods has also resulted in the inundation of numerous residential areas, towns and culturally significant villages that were previously considered immune to flood-related risks. Assuming a lack of additional precautionary measures and strategic preparation for the imminent possibility of flooding. According to Nur Zainul et al. (2021), in such a scenario, more financial resources need to be allocated to mitigate the losses incurred. This could be a significant obstacle to economic progress in both countries.

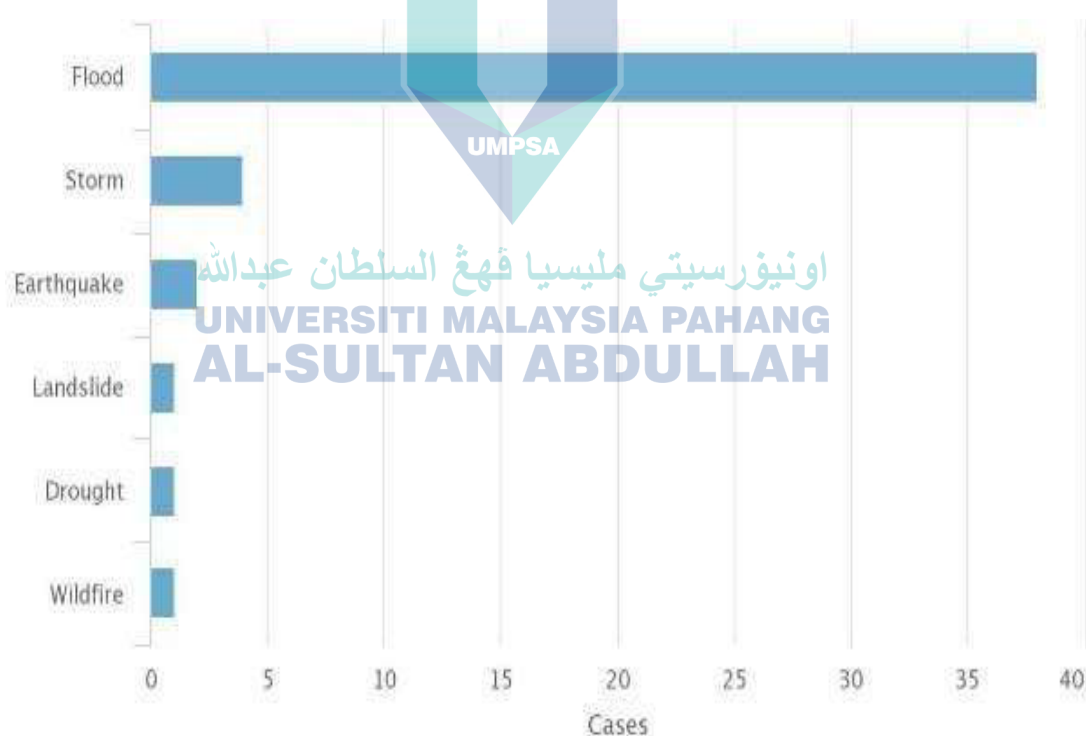


Figure 2.3 Natural Disaster Events, By Type (1998-2018)

Source: EM-DAT CRED (2020)

2.3 Global Policy on Disaster Management

International conventions have repeatedly moved to create a framework that promotes the incorporation of thorough DRR strategies into development plans to reinforce resistance to climate-related risks (Desouza and Flanery, 2013; Saavedraa and Budd, 2009). To raise overall resilience to disasters, this encompasses both preventative and curative actions in the shape of structural interventions, as well as inclusive and adaptable non-structural strategies for lowering disaster risk (Wenger, 2017).

2.3.1 The Hyogo Framework

The dynamic changes in demography, technology, socio-economic factors and modernization processes have made the world's population, especially people in impoverished communities, increasingly vulnerable and susceptible to disasters, especially floods. The 'Hyogo Framework for Action (HFA) was adopted by the World Conference on Disaster Risk Reduction in January 2005 to reduce catastrophe risk in all areas of society (Zaitom Hamina et al., 2013). The HFA is the first worldwide plan to address catastrophe risk reduction from every angle (Zhoua et al., 2014).

More than 162 nations have ratified the 2005 HFA, which lays out a thorough plan to reduce catastrophe risk. The HFA was developed to reduce the societal, financial, and ecological toll that natural catastrophes take on countries and their citizens (UNISDR, 2005). In 2005, the HFA was adopted by numerous nations to create national or local plans for disaster risk reduction (Zhoua et al., 2014). The HFA lays out five primary objectives to reach the previously established general objective. Among the highlighted areas of importance are: Disaster risk reduction should be a top priority. This can be achieved by learning about potential dangers and taking steps to mitigate them. Another important step is creating an environment where people are willing to adapt and thrive in the face of adversity. Reducing exposure to danger by using sound risk management practices; Being ready for anything and acting swiftly when necessary. Important entities recognised by the HFA include state governments, regional groups, and international organisations including the UN system and international financial institutions.

United Nations International Strategy for Disaster Reduction (UNISDR, 2007) stated that the Hyogo Framework protects human lives and social, economic, and environmental assets in communities and countries while guiding nations to reduce

disaster losses. Enhancing institutional capacity and placing a premium on risk reduction are two outcomes of planning and policy integration. Reducing social and physical susceptibility to catastrophes while building adaptive capability and resilience is the core objective of the framework, with a particular emphasis on DRR. According to McGean and Rodgers (2010), the primary goal of the HFA is to lessen vulnerability to hazards, fortify resilience to and recovery from catastrophes, and enhance disaster preparedness and effectiveness. According to Prabhakar et al. (2009), the primary goal of the framework is to help poor nations strengthen their ability to deal with climate-related catastrophes on a local level. The government is consulting the Hyogo Framework for guidance on how to deal with climate change and natural disasters, as well as how to better coordinate and execute national and local government programmes, because of its inadequate domestic policy and research funding (Sternberg and Batbuyan, 2013).

2.3.2 Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030

One hundred seventy-seven nations ratified the SFDRR in 2015, the UN Sendai Framework for Disaster Risk Reduction. By 2030, it hopes to have prevented natural and man-made disasters that could have destroyed ecosystems, and endangered people's way of life, and critical infrastructure (UN 2015; UNISDR 2015; Wahlström 2015). To reach the SFDRR objective, the worldwide community has established seven worldwide objectives, thirteen principles for action, and four priorities. According to UNSDR (2015), Walz et al. 2020, p. 1, and Zaidi and Fordham (2021), there has been a notable change in emphasis from disaster management to disaster risk management, which entails gaining a better understanding of risks, mitigating current risks, avoiding new risks, and enhancing societal and environmental resilience.

The SFDRR was established to monitor the seven global targets. In March 2018, the UNDRR unveiled the Sendai Framework Monitor¹, a web-based tool that states are obligated to use to evaluate the indicators on a national level and submit yearly reports (UNDRR, 2021). To help with the SFDRR implementation, this procedure will statistically evaluate how far down the path to reaching the global goals they are. The UNISDR (2015) stated that the framework was accepted by the UN Member States as a more ambitious successor to the HFA. The framework stresses that structural vulnerability elements do not fully capture a society's capacity to endure or adapt and change in the face of disastrous events. In addition, four critical areas are highlighted in

the document as areas of concentration for catastrophe prevention and risk reduction. The adoption of this framework represents a fundamental shift from a reactive approach to mitigating the consequences of disasters to a proactive approach that focuses on controlling and mitigating the underlying risks that lead to disasters to effectively prevent their occurrence.

The idea of shared responsibility is heavily emphasised in the Sendai Framework, which comprises four action priorities (UNISDR, 2015). The importance of better understanding disaster risk and risk management in reducing disaster incidence and consequences is acknowledged by the Framework (Monteil et al., 2022). In addition, the SFDRR has outlined the necessary steps to include disaster resilience in local development plans by including disaster risk reduction in such plans. According to Poterie and Baudoin (2015) and UNISDR (2015), local initiatives can enhance the feasibility and dependability of disaster resilience promotion. When it comes to catastrophe management, everyone in society has a role to play. To accomplish a certain goal, all parties involved will need to collaborate on formulating a plan of action and carrying it out in a coordinated fashion. Nollkaemper (2018) argued that the idea of shared obligations is more than just a collection of people's duties. Instead, it is a multi-stage process in which different people's actions impact one another and the final result.

The establishment of planning goals and the selection of procedures are two of the many comprehensive endeavours involved in the division of labour between public and private actors in the context of reducing the risk of flood disasters (Sayers, 2013; Mees et al., 2014). The need for effective coordination of joint tasks has been emphasised by scholars as they have pointed to the potential for adverse outcomes or unintended consequences (Nollkaemper, 2018). In recent years, some countries, such as Canada, have undergone a significant shift in their approach to flood protection, where responsibility has been partially transferred from government agencies to individual property owners (Monteil et al., 2022). However, Henstra et al. (2019) expressed doubts about the extent to which the public is willing to accept this higher level of responsibility.

Among the most significant takeaways from the Sendai discussions is the need for women and girls to have a voice in DRR decisions and to comprehend the effects of disasters (Zaidi and Fordham, 2021). The primary policy instruments for addressing disaster risk are the SFDRR and related publications. After reflecting on the shortcomings

of the HFA in terms of gender equality and considering the suggestions put forth by the Women's Major Group, the introductory statement of the SFDRR acknowledges the importance of including underrepresented groups, such as women, people with disabilities, and other marginalised communities, in the process of disaster risk reduction and management (Zaidi and Fordham, 2021).

The SFDRR also highlights the importance of youth engagement and their contributions to DRR. Youth, women, children, individuals with disabilities, the elderly, indigenous communities, migrants, academia, and the media are all identified as significant stakeholders in the DRR process in another part of stakeholder engagement. Making sure they are included in the framework's implementation is crucial (Zaidi and Fordham, 2021). According to Cox et al. (2019), UNISDR actively sought to involve children and youth in decision-making before the Sendai Framework's adoption to encourage more involvement of this demographic in developing the worldwide agenda for disaster risk reduction.

2.4 National Policy on Disaster Management

National Safety Council Directive No. 20 governs the operational and regulatory structure of Malaysia's disaster management system (Said and Ahmadun, 2017). Adherence to the complete disaster management process—which comprises prevention, mitigation, preparation, response, and recovery—is mandated and outlined in the document for all responsible entities, whether they are government or non-government organisations. The federal, state and local levels of government will all work together more efficiently and effectively in disaster management with the implementation of Directive No. 20. The National Policy on Climate Change, also put into place by Malaysia, seeks to lessen the negative impacts of global warming and enhance mitigation efforts (Jamaludin and Sulaiman, 2018).

The Prime Minister issued National Security Council Directive No. 20 to formally support the cooperation of numerous federal, provincial, and district agencies. To ensure that land-based disaster management efforts in Malaysia are well-coordinated and integrated, a thorough policy framework was necessary, which is why this directive came into being. Building collapses, toxic gas releases into the public, transportation of dangerous items, and reservoir or dam failures are all included in the directive's scope.

Train accidents, air crashes in heavily populated areas, pollution-related environmental disasters, industrial accidents, fires, explosions, releases of hazardous substances, transporting and handling dangerous goods, nuclear and radiation accidents are among the other kinds of disasters. Forest fires, open fires, floods, storms, droughts, beach erosion, landslides, and storm-related disasters are all included in the category of major events (Zaiton Hamin et al., 2013).

The effectiveness of flood relief and recovery efforts is highly dependent on the activation of National Security Council Directive No. 20, which can only be initiated by the National Security Council under the auspices of the Ministry of the Prime Minister. Several laws, including but not limited to the Land Conservation Act of 1960, the Town and Country Planning Act of 1976, the Environment Quality Act of 1974, the Local Government Act of 1976, the Irrigation Areas Act of 1953, the Drainage Works Act of 1954, the National Forestry Act of 1984 and the Uniform Building By-Laws of 1984, would need to be applied. In addition, Malaysia has introduced the National Climate Change Policy, which aims to strengthen efforts to mitigate the harmful effects of climate change (Jamaludin and Sulaiman, 2018).

Effective flood risk management involves more than just responding to emergencies (Elias et al., 2013). Findings from the study by Zaharah Elias et al. (2013) indicated that the legislative framework in Malaysia is inadequate to integrate flood management policies and procedures. While the National Security Council Directive No. 20 provides comprehensive instructions, it is limited by the reliance on numerous laws that are not specifically enacted for flood management. The policy in question is primarily overseen by the Prime Minister's Department to effectively and comprehensively manage disasters. This regulation does not serve as a comprehensive tool to implement flood management measures. It serves as a mechanism to activate government infrastructure under various laws that are not specifically designed for flood management.

In the absence of a comprehensive legal framework for flood risk management, Malaysia may face challenges in formulating solutions tailored to the specific needs of the local population. To effectively manage flooding, policies and priorities must remain consistent. Delineating the individual tasks of the different actors involved in flood risk management can be challenging due to potential overlaps in their respective roles and

responsibilities. Nevertheless, rights or duties cannot be definitively included or excluded by these separate legal measures. It has been suggested that there may be provisions in different laws that complement each other. However, in times of crisis, the limited timeframe available may hinder the ability to effectively find and utilise such provisions (Zaiton Hamin et al., 2013).

Rebuilding and rehabilitating flood risk management as part of the post-disaster recovery process is crucial. Access to welfare, housing, education, and other public facility laws is essential for a good rehabilitation and rebuilding process. There will be a little function that the Directive must perform. Consequently, modern nations must establish a legal framework that can be modified to accommodate the ever-changing socio-economic and technical landscape. According to Zaiton Hamin et al. (2013), comprehensive legislation is needed to make flood risk management regulations effective when policies change and new risks develop.

To make Malaysia more resilient to climate change and natural disasters, the Eleventh Malaysia Plan (2011-2020) seeks to strengthen the country's infrastructure (Jamaludin and Sulaiman, 2018). Malaysia has made a strong effort to develop new strategies, policies, and programmes to show its support for worldwide initiatives that aim to reduce catastrophe risk and increase resilience. By promoting ideas and tactics that increase general resilience, these projects hope to address and respond to different disaster risks more effectively.

The recently adopted Sendai Framework serves as the latest benchmark for these efforts. Nevertheless, the above-mentioned policies and initiatives often have a sectoral approach, focusing on the physical, spatial and administrative aspects. Furthermore, it should be noted that these guidelines are for reference only and are not binding as they lack legal enforceability (Nur Zainul et al., 2021). The flood relief plans developed by Malaysian officials in the past have been criticised in previous studies. Regrettably, it is observed that the implementation of food aid plans by levels of government in Malaysia is reactive rather than proactive, as they are typically initiated only in response to a crisis rather than being set up preventively (Aldrich et al., 2015).

The idea of resilience has been increasingly included in Malaysia's objectives for national development in the past few years. A safer, more resilient, and livable nation is

developed when the nation strengthens its efforts to reduce catastrophe risk, susceptibility, and the related costs of disaster losses (Jamaludin and Sulaiman, 2018; Khailani and Perera, 2013). According to Jamaludin and Sulaiman (2018), Malaysia has previously pledged its support to the HFA 2005–2015 and, later, the SFDRR. More and more, people in Malaysia are urging that development planning procedures incorporate comprehensive DRR approaches (Amin and Hashim, 2014). In keeping with its goal of promoting national resilience, the present Third National Spatial Development Plan (RFN-3) has already investigated and proposed solutions to reduce the impact of national flood catastrophes.

In Malaysia, the implementation of DRM follows a top-down model characterised by a government-centric approach (Chan, 2012b). According to Shariff and Hamidi (2016), the preparedness strategy in Malaysia is characterised by a reactive rather than a proactive approach. In the context of significant disasters, individuals' coping methods often prove ineffective, leading to an increased reliance on centralised emergency management assistance (Maznieda et al., 2022). The research has shown that local plans place limited emphasis on the factors that contribute to promoting preparedness concerning flood risk. Unfortunately, not all of the evaluated municipal plans sufficiently address the need for an early warning system. However, to lessen the impact and casualties and to enhance the capacities of rescue workers, it is crucial to establish an early warning system (Nur Zainul et al., 2021). The analysis also revealed a significant deficiency in the disaster preparedness dimension, as some local plans did not fulfil any of the requirements associated with this dimension.

It is critical to prioritise catastrophe risk reduction efforts to foster a more resilient environment, considering the significance of protective measures (Restemeyer et al., 2015; Wamsler, 2014). A more important goal than just avoiding hazards is to implement adaptation methods, particularly those that make use of local knowledge (Folke et al., 2010; Restemeyer et al., 2015; Wenger, 2017). There is widespread agreement that adaptation is crucial, especially when it comes to disaster preparedness and response. The participatory planning process failed to incorporate indigenous coping mechanisms into local plans, which is a failure on the part of stakeholders and civil society (Nur Zainul et al., 2021).

Many people believe that the local plan is the best way to put disaster-reduction strategies into action. This is a legally enforceable document that was made to lay out plans for the future. To facilitate and control growth, it is complemented with policy statements and a thorough land use map. Local efforts to build a resilient nation were already underway as part of the HFA before Malaysia embraced the Melaka Declaration in 2011. Therefore, neither the aforementioned framework nor any other global resilience agenda is explicitly referenced in the local plans about catastrophe resilience.

However, one may argue that municipal plans should have shown a greater understanding of the persistent flood issues in their areas by incorporating thorough strategies to reduce flood risks into their land use plans. This assertion is supported by the fact that the preparation of these plans involved meticulous technical analysis covering a range of factors including local environmental conditions and relevant local concerns. According to Nur Zainul et al. (2021), all local plans explicitly prohibit the construction of complicated and permanent structures such as residential buildings, high-rise buildings, utilities and transportation infrastructure in river protection areas.

The research has shown that local plans place less emphasis on features that facilitate flood risk preparedness. Nonetheless, the introduction of an early warning system is an important measure to mitigate loss of life and injury whilst improving the capabilities of the emergency services. It is unfortunate that not all of the municipal plans that were reviewed sufficiently address the need for an early warning system. Community facilities that can serve as evacuation centres and emergency shelters have been acknowledged, though with little emphasis, in the Kota Bharu District Local Plan (LP1), the Kuala Krai District Local Plan (LP3), and the Marang District Local Plan (LP6). Nur Zainul et al. (2021) pointed out that stakeholders and civil society should have been involved in the participatory planning process, but instead, they were left out, leading to local plans that do not incorporate Indigenous coping mechanisms.

As mentioned earlier, it is essential for local plans to effectively address local concerns to mitigate disaster risk and enable growth. One way to accomplish this is to implement a system for controlling development that considers the current state of environmental risk and vulnerability. Planners should have a heightened awareness of the specific needs of the local community and have the expertise to effectively address and implement measures to mitigate the risks associated with flooding. These measures

should not focus solely on preventing flooding, but rather on reducing vulnerability and promoting adaptive capacity to improve overall resilience to flooding.

It would have been prudent for the local planning authorities in both states to have prioritised flood risk mitigation, considering Malaysia's planning-led growth model. Their local plans may have included flood risk reduction measures, which would have made this possible. Thorough environmental and hazard assessments for each area are necessary for the development of effective local strategies. Also, to boost local resilience, planners should set up good lines of contact with the public. This will allow for the free flow of information and ideas. To better understand how to mitigate the effects of climate change, disaster risk reduction (DRR) plans must be developed in tandem with different branches of government and non-profits (Nur Zainul et al., 2021).

2.5 Agencies Involved In Malaysian Disaster Management

Government agencies and local communities must work together to ensure equitable implementation of flood management strategies (Elias et al., 2013; Khalid and Shafiai, 2015). Many organisations in Malaysia are actively involved in dealing with floods (Billa et al, 2004; Katuk et al, 2009; Ismail et al, 2012; Elias et al, 2013; Khalid and Shafiai, 2015) such as the National Security Council (NSC), the police, the fire service, the civil defence, the Ministry of Public Works, the Ministry of Social Welfare, the Meteorological Department and the Ministry of Irrigation and Drainage. Each authority has its own responsibilities and response options. According to Billa et al. (2004) and Ismail et al. (2012), the Ministry of Irrigation and Drainage is primarily responsible for implementing a comprehensive flood prevention and response programme and is therefore a key player in the prevention and response phase.

According to Othman et al. (2014), many authorities focus primarily on measures related to warning, emergency relief and post-disaster reconstruction. In recent decades, Malaysia has been hit by several disasters. This has led to the immediate need to reassess disaster response issues and ensure the effective and efficient implementation of disaster recovery mechanisms (Leman et al., 2016; Mohit and Sellu, 2013). The aim was to alleviate the emotional distress of the people of the nation and prevent them. Therefore, the responsibility of coordinating all disaster-related activities lies with the Prime Minister's Department, namely the National Security Department (NSD). National

Security Council (NSC) Directive 20 was intended to establish guidelines for the coordination and oversight of the administration and management of disasters, encompassing the responsibilities and roles of multiple agencies involved (Badrudin, 2012; Chan, 2012).

The efficacy of emergency response depends on how well responders understand their jobs and duties as outlined in their various organisational mandates. In addition, the inherent volatility of disasters requires cooperation between multiple agencies and various stakeholders, whether they are assisting or affected themselves. This collective effort is critical to mitigating harmful consequences and stemming the escalation of damage and loss resulting from the disaster. The Directive has two primary goals: first, to establish a comprehensive policy framework for disaster and emergency management that considers the varying complexity of different types of disasters, and second, to define the specific roles and responsibilities of the various agencies involved in developing effective management mechanisms. These institutions include the Ministry of Public Works, the Ministry of Social Welfare, the Department of Statistics, the Ministry of Drainage and Irrigation, the Malaysian Medical Relief Society, and several non-governmental organisations, among others.

In 2015, the National Disaster Management Agency was established to replace the NSD under the Sendai Framework and is now responsible for disaster management. It is worth noting that many committees have been formed at various levels, such as federal, state, district and village levels. Management at the village level was overseen by the district committees. Obeta (2014) noted several shortcomings in the top-down strategy, including inadequate implementation of sustainable flood management techniques and limited allocation of resources to vulnerable populations, to name a few. Numerous shortcomings have been revealed by empirical studies following previous flood disasters.

Some of the key challenges identified in the literature related to disaster response and management include inadequate information sharing between the various agencies involved, difficulties in managing the dynamics between organisations, overlapping roles and responsibilities, limited availability of trained rescuers and necessary equipment, misallocation and mismanagement of resources, and an ineffective flood warning system (Karki, 2016; Comfort and Kapucu, 2006). When considering these shortcomings, certain

factors are significant in the effectiveness of emergency response. Cooperation, predisposition, information sharing and coordination between authorities have been identified as important factors in many studies (Comfort, 2007; Hocevar et al., 2011; Haddow et al., 2014).

The heavy reliance on government machinery is a major problem when it comes to managing flood disasters in Malaysia (Salleh and Shahrar, 2016). The NSD, which reports to the Prime Minister, is responsible for managing emergency preparedness. In response to natural and man-made disasters, the NSD was established on 11 May 1997 through a decree issued by the Prime Minister. This decree, commonly known as the Policy and Mechanism for National Disaster and Relief Management," is National Security Council Directive No. 20.

Two main objectives of the Directive are: (1) to clearly define the roles and responsibilities of the various governmental and non-governmental agencies in developing effective management systems and (2) to establish a comprehensive policy framework for disaster and relief management that recognises the multifaceted complexity of disasters. According to the MERCY Disaster Risk Reduction Workshop (2016), it is worth noting that these institutions include a variety of functions such as public works, social welfare, statistics, drainage and irrigation, and medical assistance in Malaysia.

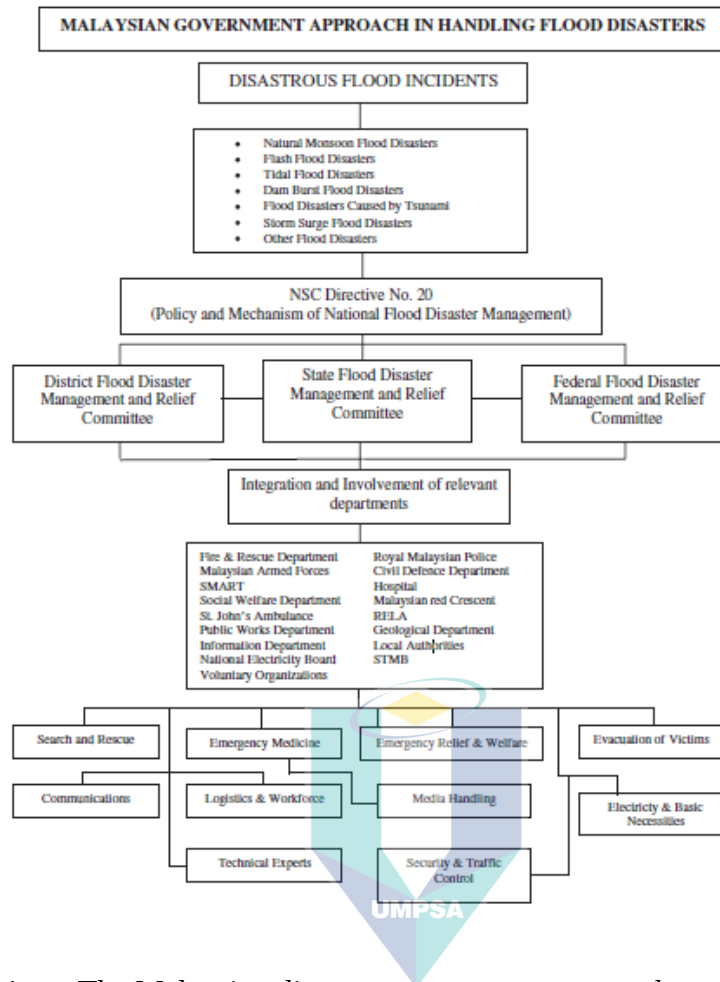


Figure 2.4 The Malaysian disaster management approach

2.6 The Roles of Youth in Flood Preparedness Endeavours

In recent years, it has been increasingly recognised what an important role young leaders play in shaping the future of our world. Young leaders such as Greta Thunberg, Autumn Peltier, Malala Yousafzai and Mari Copeny have become prominent figures on the global stage. Their remarkable activism, commitment and advocacy have captured the world's attention and inspired countless others to join the fight for a more sustainable and just future (Pickering et al., 2022). Henry and Gireesan (2011) believed that the involvement of youth, regardless of their specific role, is crucial in the field of disaster management. Youth participation in risk management and risk reduction programmes increases their knowledge and understanding of safety issues and how to deal with them. Finnis et al. (2010) also actively advocated for better preparedness in their immediate surroundings and home environment. Individuals are in a position to educate their respective communities about risk reduction efforts and the consequences of disasters,

thereby exerting a significant influence on the behaviour and outlook of society. It is therefore important to recognise the significant impact they can have in times of disaster (IFRC, 2011).

Disaster preparedness and response are two areas where youth can have a major impact. They can help parents and communities prepare for disasters, identify which variables put them at risk and which protect them, and much more. According to Ronan et al. (2015), individuals in this role can also assume leadership positions within disaster preparedness programs, where they can disseminate valuable knowledge about disaster preparedness. Due to their increased physical vitality, they can immediately engage in emergencies, making it easier for them to help others prepare for and manage such crises (Haliza, 2020). The resilience of young people enables them to overcome various challenges, including those caused by natural disasters. According to Bartlett (2008), people with creative skills can develop imaginative and inventive approaches to disaster preparedness initiatives.

Community-Based Disaster Preparedness (CBDR) is widely recognised as the best method of disaster preparedness as it promotes a bottom-up approach to disaster management and emphasises active youth engagement. It is known that aid usually takes about 24 to 48 hours to reach a normally prepared city, regardless of the level of preparedness at the highest level. However, this time frame can change in the event of catastrophic disasters. Therefore, to promote the independence of youth, it is recommended that they receive training in rescue, physical and psychological first aid (Haliza, 2020).

According to Vicerra et al. (2018), greater participation of young people in community activities is expected to strengthen their resilience. According to Janicke-Bowles et al. (2018), the active involvement of young people in addressing flooding issues is expected to lead to positive outcomes. Disseminating good information to boost community confidence and speed up the recovery process after a tragedy is one way this commitment could manifest itself. Better disaster management is not possible without the involvement of young people, who have a wealth of information, and expertise in business, science and technology (Cox et al., 2018).

The younger generation possesses remarkable qualities such as creativity, self-confidence and courage, which enable them to express new ideas. Vicerra et al. (2018), Fothergill (2017), Garg and Sam (2020) and Cox et al. (2018) all predict that disaster risk reduction could have significant positive impacts. Community resilience can be increased when youth are actively involved in disaster management (Cox et al., 2019). In general, youth may encounter challenges when trying to process the information and expertise they receive from many outlets, including educational institutions, media platforms, and government agencies (Vicerra et al., 2018; Fernandez and Shaw, 2015).

Youth have a particular opportunity to influence the level of preparedness in their households and communities as they take responsibility for risk communication and community mobilization (Lopez et al., 2012). Ronan et al. (2008) and Mitchell et al. (2008) noted that young people in El Salvador efficiently disseminated information about disaster risk reduction to their families and communities, which was a significant contribution to disaster preparedness in the Australian setting. In Sri Lanka, India, Indonesia and Thailand, the importance of youth participation in DRR was emphasised (Penrose and Takaki, 2006). In the Philippines, the young generation actively participated in the disaster response process by engaging in consultations and critiquing prevailing disaster policies (Fernandez and Shaw, 2015).

It is well-known on a global scale that youth can be an invaluable asset in the fight against and recovery from natural catastrophes. To further our understanding of social justice, civic involvement, and youth empowerment, it is crucial to investigate how young people are involved in disaster research. Natural disasters can make young people feel helpless and hopeless, but this study aims to find ways to empower them (Bessaha et al., 2022). There is an opportunity to strengthen the resilience and health of youth through community-based DRR activities, especially in times when climate change is making natural disasters more frequent and severe. According to Cox et al. (2019), it is evident that youth express a desire to actively participate in these efforts. Furthermore, Amri et al. (2018) and Pfefferbaum et al. (2017) argued that youth should be recognised as an important resource in the community mobilization process.

According to Delgado and Staples (2008), youth participation and active organisation in disaster planning and response have the potential to improve their resilience and overall well-being. In addition, such participation can provide valuable

assistance to local communities. The role of young people in mitigating and responding to natural disasters is recognised both in the United States and internationally (Cox et al., 2017). Furthermore, they are considered crucial elements in disaster risk reduction (DRR) initiatives on a global scale (Cumiskey et al., 2015; Fernandez and Shaw, 2015).

2.7 Demographic Characteristics and Flood Preparedness

Most studies indicate that the degree of preparedness for a natural disaster is related to many socio-demographic variables. The specific role of these parameters may vary depending on the social and environmental setting studied. A study conducted by Okayo (2015) found a clear correlation between preparedness for flooding and various parameters, including distance from home, household composition and membership in a social network. On the other hand, flood readiness was unaffected by educational attainment. Reynaud et al. (2013) found that the influence of socioeconomic variables on households on flood preparedness practices was rather insignificant. Furthermore, there was no correlation between education level and wealth in flood preparedness behaviour.

A synthesis study conducted by Kim and Kang (2010) found that factors such as education, wealth and age play a significant role in predicting a person's level of disaster preparedness. Subsequent research, however, has yielded different results regarding the correlations between demographic characteristics and the degree of disaster preparedness. Al-Rousan et al. (2014) discovered that there was no significant correlation between gender, race or ethnicity, marital status, living alone and respondents' level of disaster preparedness.

A lack of participation in preventative interventions was observed among low-income groups and individuals experiencing gender-specific hurdles, such as single moms, due to the competing demands placed on them (Eisenman et al., 2009; Martins et al., 2019). The prevalence of flood preparation measures is, on the other hand, known to be significantly impacted by family income (Haque, 2021; Mohammad-pajoooh and Ab. Aziz, 2014; Okayo et al., 2015). Factors such as age, housing tenure, household size, and kind of dwelling all have a role in determining whether or not a home takes precautions. Cases from Japan and Hong Kong have shown this association (Chan et al., 2016; Onuma et al., 2017).

Age, flood awareness, and the length of time since the previous flood are three elements that affect citizens' readiness for floods (Ashenefe et al., 2017). However, the study found no correlation between gender, home ownership and flood preparedness of the population. In their study, Sufian et al. (2022) found that gender, number of household members and type of housing had no direct influence on people's decision-making process in adopting protection measures.

Previous studies (e.g., Cvetković et al, 2016; Dooley et al, 1992; Miceli et al, 2008; Mishra and Suar, 2005; Mishra et al, 2009; Kim and Kang) have found that age is significantly associated with disaster preparedness. Some studies have confirmed that older people are better prepared to respond to natural disasters (Melick and Logue, 1985; Murphy et al., 2009). An individual's readiness to react to natural catastrophes increases with age (Sattler et al., 2000). Baker (2011) confirmed the correlation between age and the degree of preparedness to respond at a significance level of 5%. Citizens between the ages of 40 and 70 have a higher level of preparedness compared to younger and older populations. Respondents in the United States who were 45–54 years old were more prepared than those who were 55–64 and 35–44 years old, according to a 2009 study by (FEMA, 2009). In addition, Al-Rousan et al. (2014) discovered that age is a significant predictor of catastrophe readiness. The findings indicated that individuals in their younger years are more prone to having sufficient emergency preparations.

2.8 Theoretical Underpinnings of the Study

Several theories have been proposed by scholars to explain human behaviour and suggest strategies to effectively influence this behaviour. These include the Health Belief Model, Ecological Theory and Social Cognitive Theory (Mohd Tariq et al., 2021). Mohd Tariq et al. (2021) contended that these theories provide researchers with a framework to understand human behaviour and identify the necessary information to devise a successful strategy. Paton (2018) asserted that various psychological theories, including the Health Belief Model, Protection Motivation Theory, Theory of Planned Behaviour, Social Marketing Theory, Protective Action Decision Model and Social Capital Theory, can contribute to the understanding of preparedness for both anticipated and actual dangerous incidents.

Although these theories do have some similarities and strengths that can be useful in some contexts, none of them are completely in line with the goals of this study. A thorough understanding of the factors that encourage the adoption of disaster preparedness behaviours is crucial for promoting individual readiness within a society (Najafi et al., 2017). Nevertheless, a significant amount of research on disaster risk reduction behaviour to date is deficient in terms of theoretical foundations (Ng, 2022).

Thus, this study employs the Health Belief Model and the Theory of Planned Behaviour since these theories are most appropriate for addressing the study's aims and concerns. Aboelmaged (2021) emphasised that using two theories in one study provides a comprehensive knowledge of the phenomenon being assessed. Nevertheless, the majority of the research on disaster and emergency preparedness based on behavioural theories and models comes from industrialised nations (Ejeta et al., 2015). Since the theories were developed and tested in Western nations, this makes one wonder how well they will work in other regions, especially in Asia and the Middle East, where cultural norms are different. Ejeta et al. (2015) emphasised the importance of targeting future research efforts in developing countries to investigate behavioural theories and models of readiness.

2.8.1 Health Belief Model

The HBM is a well-known model of social cognition that is widely used in the field of health psychology (Abraham and Sheeran, 2015; Sheeran and Abraham, 1995; Rostami-Moez et al., 2020). Green and Murphy (2014) asserted that the HBM originally proposed by Rosenstock (1974) is a widely used conceptual framework for understanding people's health behaviours. The model was formulated as a systematic approach aimed at identifying, explaining, and predicting preventive health behaviours (Janz and Becker, 1984; Rosenstock, 1974; Becker and Rosenstock, 1984; Janz and Becker, 1984). Andrade et al. (2019) mentioned that the HBM has been used extensively in assessing individuals' risk beliefs about environmental health. According to Ejeta et al. (2015) and Wang and Tsai (2022), the HBM is a popular behavioural theory that has been utilised in several studies concerning catastrophic events like earthquakes, floods, and epidemic diseases.

According to Rosenstock (1966), the main objective of the HBM's creators was to direct research towards finding out why people do not take preventative actions to

improve public health. In the 1950s, social psychologists in the United States sought to explain why people were not taking part in public health preventative programmes, and this is where the concept first emerged (Carpenter, 2010). An examination of various belief patterns is the means via which the HBM seeks to forecast behaviour. Two types of variables are included in these patterns: the psychological state of willingness to do something and the perceived advantage of doing something to lessen the perceived danger (Rosenstock, 1974).

For more than thirty years, the HBM has been a key theoretical basis for studying the cognitive factors that influence a range of behaviours. It served as the basis for numerous practical interventions relating to a variety of behaviours (Jones et al., 1987). The theoretical framework of the concept is based on an individual's intrinsic drive to engage in a particular behaviour. The theory emphasises the role of a person's perceptions in generating motivation, facilitating action, and ultimately influencing behaviour. The HBM is a theoretical framework that examines the relationship between changes in beliefs and subsequent changes in behaviour (Glanz et al., 2008; Namdar et al., 2012). It assumes that the HBM can be used to maintain or terminate certain behaviours as well as to change attitudes (Sadeghi Sedeh et al., 2015).

The HBM, developed by Rosenstock (1966), originally consisted of five elements: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. However, due to its effectiveness in predicting behaviour, self-efficacy was included in subsequent versions of the HBM in 1988 (Rosenstock et al., 1988; Champion and Skinner, 2008; Bk et al., 2005). In the present study, the latter HBM version was used, which consists of six elements: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy, as suggested by Inal et al. (2018). Inal et al. (2018) contended that in the HBM, disaster preparedness will depend on the stated six variables. The six elements of HBM also were utilised by several past studies (Ataei et al., 2021; Inal et al., 2018; Teitler-Regev et al., 2011; and Glanz et al., 2008).

Previous researchers have used the HBM to predict various behaviours, such as travellers' willingness to vaccinate (Suess et al., 2022); COVID-19 vaccine uptake in South Asia (Hawladar et al., 2022); preventive health behaviours against the COVID-19 outbreak in Turkey (Cam et al., 2022); prevention of osteoporosis and promotion of health literacy (Panahi et al., 2021); acceptance of COVID-19 vaccination among

Chinese citizens (Zhou et al., 2021); attitudes towards safe eavesdropping measures in entertainment venues (Diviani et al., 2021); willingness to be vaccinated against COVID-19 (An et al., 2021); adherence to Anti-Tuberculosis treatment among adults in Gondar, Ethiopia (Gebremariam et al., 2021); COVID-19 Preventive health behaviours in Khuzestan, Iran (Karimy et al., 2021); risk information and counselling influence intention to get vaccinated (Yasuhara et al., 2021); and the effect of a smartphone application on women's performance (Shakery et al., 2021). The present analysis suggests that the HBM can also be useful in other behavioural areas, not only in the area of vaccination behaviour.

There is no denying that the HBM is a robust framework that can be used effectively in the study of disaster preparedness behaviour. As the study by Reams et al. (2013) showed, the HBM has been used in assessing emergency preparedness for environmental threats. Inal et al. (2018) argued that the HBM is a long-standing and widely recognised conceptual framework that is broadly applicable. The HBM is a theoretical framework used to assess the different actions and reactions of individuals to potential hazards (Rosenstock, 1974). Rostami-Moez et al. (2020) claimed that the HBM has the potential to raise people's awareness, strengthen their motivation and influence their beliefs and attitudes towards general disaster preparedness.

The above model has been proposed to assess individuals' willingness to engage (Mohd Tariq et al., 2021). Due to its effectiveness in predicting certain behaviours, numerous researchers have used the HBM to predict behaviours related to disaster preparedness. However, Ejeta et al. (2015) discovered a paucity of studies utilizing behaviour change models in the field of disaster research. The HBM is a successful method to improve understanding of individuals' attitudes towards disasters (Inal et al., 2018; Inal and Dogan 2018). Numerous studies have shown that interventions that focus on health education and the use of the HBM are effective in improving community knowledge, skills and preparedness (Mhd Noor et al., 2023).

Researchers have developed and adopted many theoretical frameworks, such as the HBM and the TPB, to understand the factors that contribute to individuals' precautionary behaviour in the face of potential risks (Wu et al., 2018; Paton, 2019). According to the HBM, people are motivated to protect themselves to avoid or mitigate unfavourable outcomes. The rationale for this preference arises from the perceived probability of the risk occurring and the perceived severity of its consequences if it does

occur (Jansen et al., 2021). Muhammad Mehedi et al. (2018) used the HBM to investigate the impact of flood risk perception on people's behaviour when implementing flood preparedness measures. The researchers hypothesised that the perception of risk associated with flooding is likely to influence human behaviour and lead people to take concrete actions to prepare for potential flooding events.

According to Rosenstock (1974), the HBM is used as a framework to describe the particular actions an individual takes in response to a perceived threat or danger. Women's earthquake preparedness was studied by Amini et al. (2021) using the HBM. Factors hypothesised to influence women's earthquake preparedness included their perception and assessment of the likelihood of an earthquake (perceived susceptibility), their perception of the severity of an earthquake and the resulting damage (perceived severity), their belief in and understanding of the effectiveness of earthquake hazard mitigation measures (perceived benefits); their identification of obstacles that hinder their earthquake preparedness efforts (perceived barriers); their recognition of factors that promote earthquake preparedness, such as the support of family, friends, and family members (perceived benefits); and their recognition of factors that promote earthquake preparedness, such as the support of family, friends, and family members (perceived barriers). Their recognition of factors that encourage earthquake preparedness, such as support from family, friends and medical professionals (incentives to act); and their confidence in their ability to effectively address earthquake hazards (perceived self-efficacy). The concept of "perceived risk" can be broken down into two distinct dimensions, namely the "perceived likelihood" (or probability) and the "perceived consequences" (or severity) associated with a particular event or activity (Bubeck et al., 2012).

The HBM can serve as a valuable framework for promoting awareness, motivation, and the development of beliefs and attitudes related to general disaster preparedness (Rostami-Moez et al., 2020). Ejeta et al. (2015) performed a systematic review that looked at how well different models and theories worked for emergency and catastrophe preparation. According to the analysis, researchers have employed an extensive range of behavioural theories to examine topics like disease outbreak preparedness and natural disasters like floods and earthquakes. In addition, the HBM was found to be one of the most commonly used theories to study disaster preparedness (Ejeta et al., 2016).

It is assumed that people who want to prepare for flood hazards must have certain perceptions as described in the HBM and its adapted version. These perceptions encompass: acknowledging vulnerability to flood risks, understanding the severe repercussions of flood hazards, recognizing the threat posed by flood hazards to daily life, comprehending the potential advantages of preparedness measures in averting and lessening flood hazard consequences, and having confidence in the capacity and resources to execute these measures. Furthermore, individuals' assessment of flood vulnerability and severity significantly influences their participation in community-driven efforts to prevent and alleviate the effects of flood hazards. Furthermore, it is essential to consider the presence of motivating factors that can serve as triggers for people's engagement in preparedness activities in response to flood hazards (so-called cues to actions) (Ejeta et al., 2016).

Researchers Dooley et al (1992) used the HBM to investigate how people's perceptions of danger, how serious the threat appeared and how much it would cost them to prepare for an earthquake influenced their decisions. A survey instrument was developed to assess people's level of earthquake preparedness using the HBM as a theoretical framework (Haraoka et al., 2012; Inal et al., 2018). Ejeta et al. (2016) also found that the HBM is used to assess flood preparedness. However, community members often disregarded the need to be prepared for flooding. Mohd Tariq et al (2021) asserted that the problem requires immediate and drastic action. This research aims to identify the elements that influence people's intentions and actions when it comes to being prepared for floods at home. The HBM achieves this by utilising numerous structures.

According to Costich and Scutchfield (2004), protecting public health from any type of emergency requires the public health sector to focus on reducing risks and mitigating their immediate and long-term effects. According to Semenza et al. (2011) and Akompab et al. (2013), HBM is widely used in the design of interventions and assessment studies, especially when it comes to environmental responses to natural disasters. As flood preparedness behaviour is inextricably linked to risk reduction, the HBM is an appropriate tool to include in this study.

The occurrence of floods can cause significant disruption to sanitation and health infrastructure, leading to an increase in disease and negatively impacting the health of vulnerable people. The persistence of these disease outcomes can be observed even after the flood season has ended (Sajid and Bevis, 2021). Floods have been shown to contribute

to a higher prevalence of gastrointestinal illnesses characterised by the predominant clinical manifestation of diarrhoea. Other infections that can be transmitted via contaminated water after flooding include cholera, leptospirosis (a disease that occurs mainly in areas with a high rodent population), poliomyelitis, rotavirus, typhoid fever and hepatitis E. It is worth noting that hepatitis E poses a significant risk to pregnant women as it can increase the likelihood of infant mortality (Ahern et al., 2005; Alderman et al., 2012).

Reams et al. (2013) highlighted the use of the HBM in assessing emergency preparedness for environmental threats. According to Andrade et al. (2019), the HBM primarily emphasises individuals' subjective perceptions of obstacles, benefits, severity, and vulnerability in response to environmental stimuli. Semenza et al. (2011) used the HBM to assess individuals' propensity to participate in voluntary mitigation and adaptation actions, considering their attitudes and beliefs. The study aimed to investigate the suitability of health as a framework for promoting behaviour change in response to climate change. In addition, Semenza et al. (2011) found that the willingness to engage in voluntary climate change action is primarily influenced by individuals' perceptions of vulnerability to and severity of climate change. In this research, Ejeta et al. (2016) used the HBM as it was recognised by Glanz et al. (2008) as a framework that incorporates risk and threat perceptions as fundamental constructs. These assessment tools are suitable for evaluating the perceptions and preparedness levels of individuals in a hazard-prone region.

According to Azmi et al. (2021), individuals need to consider their perceived vulnerability and severity as these factors can significantly influence their preparedness and response to adverse circumstances. According to Khan et al. (2018), the occurrence of emergencies and disasters has a significant impact on public health as individuals are exposed to a range of hazards influenced by the complicated nature of the environment. Flooding is a recurring threat that leads to the displacement of indigenous groups, the destruction of urban infrastructure and negative health outcomes (MNP LLP, 2016; Moghal and Peddle, 2016). One of the most significant consequences that flooding can have is the disruption to a family's daily routine and functioning, as well as the associated stress that occurs during the flood. This can lead to subsequent health problems and the loss of valuable personal possessions and mementoes. In addition, it is worth noting that

the presence of tension and worry about the potential dangers and effects of future flooding can potentially harm an individual's well-being (Chan, 2012b).

Table 2.1 Past Studies That Utilised HBM in Disaster Preparedness Behaviour

No.	Authors	Scope of the Study	Findings
1	Mohd Tariq et al. (2021).	Flood disaster preparedness among the community in Selangor.	The likelihood of a person implementing a recommended health behaviour was influenced by their belief in the effectiveness of the behaviour and their assessment of their risk of disease.
2	Azmi et al. (2021)	Elementary school children in Malaysia.	The learners' knowledge was positively influenced by the inclusion of HBM in the knowledge transfer.
3	Rostami-Moez et al. (2020).	Households in Hamadan province, located in the west of Iran.	Perceived benefits, cues to action, and self-efficacy were significant predictors of earthquake preparedness
4	Inal et al. (2018).	The city of Yalova, Turkey.	The 45-item GDPB scale, developed using HBM, demonstrates satisfactory reliability and validity
5	Ejeta et al. (2016).	Disaster preparedness for flood hazards at household levels in Dire Dawa town, Ethiopia	The relationships among perceived threats, perceived benefits, perceived barriers, and cues to actions on flood preparedness were significant.
6	Amini et al. (2021).	Earthquake preparedness in women living in Hamadan City, Iran	Perceived susceptibility, perceived severity, perceived benefits, perceived self-efficacy constructs (except for cues to action), and earthquake preparedness increased in the intervention group compared to the control group.

2.8.2 Theory of Planned Behaviour

The TPB was initially developed by Ajzen (1985) and originated from the earlier theory known as the Theory of Reasoned Action (TRA). The TRA consists of two important constructs, namely attitude and subjective norms, which can influence the intention of certain behaviours. The inclusion of perceived behavioural control led to the TRA changing its name to TPB. TPB is normally employed by scholars in various fields of study to predict certain individual behaviours (Greaves et al., 2013; Martin et al., 2017; Ong et al., 2021; Tikir and Lehmann, 2011; Zaremohzzabieh et al., 2021).

It can also be used to examine the factors that influence people's disaster preparedness behaviour (Najafi et al., 2017), daily engagement in water conservation and other climate change adaptation behaviours (Deng et al., 2017), demonstration of pro-environmental behaviours in the workplace (Greaves et al., 2013), earthquake mitigation preparedness (Ong et al., 2021; Najafi et al., 2017) and household preparedness for earthquake (Zaremohzzabieh et al., 2021), typhoons (Dasgupta et al., 2020) and terrorist attacks (Tan et al., 2020). The TPB can also be used to investigate flood preparedness behaviour (Hirano et al., 2014). However, Ong et al. (2021) noted that few studies focus on people's behaviour during disasters.

Najafi et al. (2017) highlighted the significance of readiness for disasters as a behaviour that enhances health preservation. Hence, behavioural science approaches have gained prominence as a viable means of addressing this issue. Thus, the TPB, developed by social psychologists, has been widely utilised by researchers to understand various behaviours, including those concerning health (Ajzen, 1988, 1991; Conner and Sparks, 1995, 2005, 2015; McEachan et al., 2011). The TRA and the TPB are widely used models in the field of health behaviour. These models have shown significant explanatory power for both the intentions and actual behaviour of individuals (McEachan et al., 2011).

Attitude stands as a pivotal element within the TPB. It refers to individuals' positive or negative feelings regarding the potential outcomes of certain behaviours. According to the expectancy-value conceptualization (Peak, 1955), attitude is measured by the consequences of an activity. An individual will perform a certain behaviour if they believe it will bring positive consequences. Another salient element within the TPB is the subjective norm. It refers to the individual's perception of what important people around them think about the appropriateness or inappropriateness of a particular behaviour. The

individual will perform a particular behaviour if that behaviour is approved by the important people around them. An individual has an incentive to fulfil the expectations raised by these caregivers. The individual wants to fulfil the exact requirements or wishes of the referent in a particular matter (Norman and Conner, 2017).

As mentioned above, perceived behavioural control is the additional construct that was added to convert TRA into TPB. It refers to a person's ability to perform certain behaviours. Individuals will perform certain behaviours if they have the resources and skills to do so (Ajzen, 1988; 1991). Individuals who believe that they have the means to obtain the necessary resources and are free of any obstacles are usually more likely to perform the behaviour (Ajzen, 1991). Control beliefs, alternatively termed as perceptions of conditions that facilitate or impede the execution of specific behaviour, significantly impact individual behaviours. The components included in this analysis include internal control factors such as information, personal shortcomings, abilities, skills and emotions, as well as external control factors such as opportunities, dependence on others and obstacles. According to Ajzen (1991), it has been suggested that the perceived power of each control component plays a role in either facilitating or inhibiting the performance of the behaviour.

In general, it can be observed that individuals are more likely to engage in a certain behaviour if they have a positive attitude and a subjective norm towards that behaviour as well as a higher level of perceived behavioural control. As noted by Najafi et al. (2017), the concept of intention is considered the primary precursor to observable behaviour. According to Bamberg et al. (2003), the integration of attitude, subjective norm, and perceived behavioural control is thought to generate a behavioural intention, which then leads to the manifestation of the intended behaviour. The TPB explains the relationship between individuals' attitudes toward readiness, subjective norms regarding readiness, and perceptions of their ability to control their behaviour when using readiness measures, which in turn predicts their level of readiness.

The TPB has been supported in flood and bushfire preparedness studies (McIvor and Paton, 2007; McLennan et al., 2014). Zaremohzzabieh et al. (2021) found that attitude, subjective norms, community participation and community trust were identified as significant factors in predicting intention to engage households in earthquake preparedness. In the study by Zaremohzzabieh et al. (2021), a significant relationship was

found between natural disaster preparedness practices and intentions and perceptions of control among families assessed for their level of preparedness. The TPB begins by examining the different variables that motivate families to engage in preparedness activities. It then examines the emergence of intentions and subsequent changes in attitudes towards preparedness.

Ultimately, the TPB culminates in the decision-making process about precautionary measures (Ajzen, 1991). Using the TPB as a theoretical framework allows for the examination of emerging structures in the field of disaster research, as highlighted by Vinnell et al. (2021). Furthermore, the authors clarified that this approach provides the opportunity to identify new targets for intervention and campaign development while exploring established constructs to uncover insightful correlations within the TPB, independent of initial discoveries. Najafi et al. (2017) contended that applying the TPB to disaster risk reduction is feasible. The researchers postulated that attitudes and subjective norms can serve as predictors of individuals' intentions to engage in DRR as well as their perceived behavioural control over this behaviour. Najafi et al. (2017) in their study found that the factors of attitudes, subjective norms, and perceived behavioural control explained 32.0% of the variability in individuals' intentions to engage in DRR.

Despite the differences in the aspects studied, the methods used for data collection and the analytical approaches used, several studies have consistently demonstrated a positive correlation between attitudes, subjective norms and perceived behavioural control with farmers' intentions (Lalani et al, 2016; Moradhaseli et al, 2017; Daxini et al, 2018; Rezaei et al, 2018; Bagheri et al, 2019; Vaz et al, 2020; Aliabadi et al, 2020). These results provide empirical support for the application of TPB in the study of farmers' propensity to use environmentally friendly pesticides. Norman and Conner (2017) suggested that individuals are more likely to express an intention to engage in a particular health action when they believe that such behaviour will lead to desired outcomes when they perceive that individuals whose opinions they value approve of the behaviour, and when they perceive that they have the necessary resources and opportunities to carry out the behaviour.

Numerous theoretical frameworks have been created to elucidate the mechanisms through which motivational factors influence disaster risk reduction behaviour via the

mediating role of intentions (Paton, 2003). The TPB was developed by Ajzen (Ajzen, 1985; Gumasing et al., 2022). According to Paek et al. (2010), the TPB continues to be influential in the field of emergency and natural disaster preparedness. Previous studies have used the TPB to explain the concept of disaster preparedness (Paton, 2003; Samah et al., 2019). The TPB has been used extensively in analyzing people's risk adaptation behaviours because it can predict such behaviours well (Wang et al., 2020b; Xu et al., 2021).

Researchers have used the TPB to predict individuals' preparedness for disasters in various contexts that include events such as natural hazards (Beatson and McLennan, 2011), earthquakes (Najafi et al, 2017; 2018; Zaremohzzabieh et al., 2021), emergencies (Allen et al., 2015), bushfires (McLennan et al., 2015; Bates et al., 2009; Morrison et al., 2014) and floods (Muhammad Mehdi et al., 2018). According to Bichard and Thurairajah (2014), empirical evidence has shown the predictive ability of the TPB in understanding the behavioural responses of individuals to flooding. In addition, the TPB has been instrumental in the design and implementation of effective program interventions in England.

This study used behaviour change tactics based on the concept of planned behaviour. The results showed that a significant proportion of the local population was aware of the potential dangers and expected future flooding to occur. A significant proportion of people failed to take action to adequately protect their homes in anticipation of the impending storm. The results suggest that those who did not take preparatory measures felt they had no control over the potential consequences of a flooding event. In addition, these individuals showed less willingness to take proactive measures when their neighbours did not. The hurdles and expenses reported by residents indicate that the level of difficulty associated with preparations was perceived as too high, leading many people to question its justification.

The TPB has been used extensively in research on driving, particularly in the context of drunk driving (Moan and Rise, 2011) and drowsy driving (Jiang et al., 2017). Despite its frequent use in health research, there are few studies specifically examining individuals' behavioural responses in the context of catastrophic events (Ong et al., 2021). Nevertheless, Najafi et al. (2017) argued that TPB has not been used extensively in the context of natural disaster preparedness, despite being advocated by researchers in the

field of natural disasters, such as bushfires and earthquakes. According to Vinnell et al. (2021), TPB assumes that attitudes, social norms, and perceived behavioural control are important factors that influence intentions. However, the extent to which these cognitive factors explain intentions may vary depending on the specific behavioural intention, as suggested by Armitage and Conner (2001).

The TPB has been used as a predictive framework for human behaviour in numerous disciplines (Greaves et al, 2013; Ong et al, 2021; Tikir and Lehmann, 2011; Zaremohzzabieh et al, 2021). The factors influencing disaster risk reduction behaviour can be examined using various indicators. These indicators include the presence of a household disaster preparedness plan (Najafi et al., 2017), engagement in daily water conservation and other climate change adaptation behaviours (Deng et al., 2017), demonstration of pro-environmental behaviours in the workplace (Greaves et al., 2013), preparedness for earthquake preparedness at the individual level (Ong et al., 2021), and household preparedness for future earthquake risk (Zaremohzzabieh et al., 2021). The TPB can also be used to investigate the correlation between social networks and the desire to prepare for floods (Hirano et al., 2014).

According to Ejeta et al. (2015), the TPB is considered a highly influential theoretical framework that is often used in the context of disaster and emergency preparedness. Nevertheless, in line with previous research using other theoretical frameworks, there are limitations when it comes to providing empirical evidence of the relationship between variables or constructs in the TPB and preparedness. This finding is further evidence of the need for more comprehensive path analytic studies or structural equation modelling (SEM) of theory for many types of hazards.

2.8.3 Comparison between the HBM and TPB

This section explains the similarities and differences between the HBM and the TPB. The output of this section will provide preliminary insights to the researcher regarding the feasibility of integrating these two theories.

2.8.3.1 The Similarities Between HBM and TPB

As mentioned earlier, researchers have used the HBM and the TPB to predict different types of activity. These theories share some common characteristics. Both

theories use an individual-level perspective in predicting health behaviours, and both theories rely on an expectancy-value framework. Essentially, both theories assume the expectations and values or beliefs that influence subsequent individual behaviour. Furthermore, both theories assume a comprehensive deliberative and rational decision-making process. An individual is likely to engage in a particular behaviour if he or she has considered the potential outcomes of the behaviour or has made a logical evaluation of the trade-off between the obstacles and benefits. Given the construction of both theories, it is plausible that there is a potential overlap of constructs within this theoretical framework. The following section provides a comprehensive explanation of the common constructs of the HBM and the TPB. Table 2.2 provides a brief overview of the similarities.

Table 2.2 The Similarities Between HBM and TPB

No.	HBM	TPB	Sources
1.	It adopts an individual-level approach to predict health behaviour. This theory also is based on an expectancy-value framework.	It adopts an individual-level approach to predict health behaviour. This theory also is based on an expectancy-value framework.	Brewer and Rimer (2008)
2.	Health decision-making is an essentially deliberative and rational process.	Health decision-making is an essentially deliberative and rational process.	Abraham and Sheeran (2005); Conner and Sparks (2005); Brewer and Rimer (2008).
3.	Similarities in the specific constructs associated with the two theories.	Similarities in the specific constructs associated with the two theories.	Weinstein (1993); Gerend and Shepherd (2012).

2.8.3.2 The Differences Between HBM and TPB

Although there are similarities between the two ideas, they also have differences, as shown in Table 2.2. In their study, Gerend and Shepherd (2012) found that the Health Belief Model did not provide an antecedent of intention that could be used to predict behaviour. To clarify, most of the predictors in the HBM are directly related to the observed behaviours. The antecedent of intention is included in the TPB framework. To clarify, the TPB assumes that three basic constructs link to intention, which is then expected to affect specific behaviours. Furthermore, it is worth noting that the first

version of the HBM did not include the concept of self-efficacy. However, due to its effectiveness in predicting behaviour, self-efficacy was included in subsequent versions of the HBM (Rosenstock et al., 1988; Champion and Skinner, 2008).

The inclusion of self-efficacy or perceived behavioural control has been observed within the TPB. The construct is of great importance within the theory as it has been observed to directly predict certain behaviours without the need for intention as a precondition. The main difference between these two theories lies in the typical use of the HBM to predict health behaviours by researchers. According to Orji et al. (2012), the HBM primarily emphasises health determinants and is therefore particularly appropriate for addressing problematic behaviours that impact health. In the field of behaviour prediction, the TPB is highly valued due to its comprehensive nature and wide-ranging applicability. This theory encompasses a wide range of behaviours, including those related to health-related protective measures, such as flood preparedness.

Table 2.3 The Differences Between HBM and TPB

No.	HBM	TPB
1.	There is no antecedent of intention to predict the behaviour (Gerend and Shepherd, 2012).	This theory highlights intention's importance in predicting behaviour (Gerend and Shepherd, 2012).
2.	This theory traditionally did not include a component that directly captured perceptions of control or self-efficacy. However, due to its success in predicting behaviour, self-efficacy was added to later renditions of the HBM (Rosenstock et al., 1988; Champion and Skinner (2008).	This theory has included the perception of control or self-efficacy (Perceived Behaviour Control).
3.	This theory is more health-behaviour-focused (Orji et al., 2012).	This theory was designed to apply to more general behaviours. The TPB can be applied outside as well as inside the health discipline (Godin et al., 2008); Armitage and Conner, 2001; Taylor et al., 2006; Davis et al., 2015; Carpenter, 2010; Ajzen, 2002; Armitage and Christian, 2003; Orji et al., 2012; Rosenstock et al., 1988; Champion and Skinner, 2008; Milton and Mullan, 2012; de Leeuw et al., 2015).

2.8.4 Justification of the Theory Integration of HBM and TPB

According to Yastica et al. (2020), the HBM and TPB are widely recognised as the most prominent theories in the field of health behaviour research. Numerous researchers have relied on these theories in the past, which have played an important role in the development of numerous successful treatments for health-related behaviours (An et al., 2021). This study incorporates several ideas to provide a theoretical foundation and make predictions about flooding-related behaviours. One of the notable strengths of the HBM is its origin, as it was formulated by researchers working directly in the field of health behaviour. Consequently, many of the model's principles are highly relevant to professionals working in this field. Nevertheless, the HBM lacks crucial social-cognitive elements that have been shown to have high predictive power in other theoretical frameworks. For example, intention to engage in an activity and social pressure are essential components of TPB activity that are not present in the HBM (Norman and Conner, 2017).

Gerend and Shepherd (2012) contended that the TPB posits that behavioural intentions serve as a proximal precursor to behaviour and are thus, the most reliable predictor of behaviour. While the original formulation of the HBM did not explicitly include intentions, some scholars have suggested that it may be worthwhile to examine the antecedents of intentions as potential mediators between predictors and actual behaviour rather than as direct predictors of behaviour (Abraham and Sheeran, 2005). According to Gerand and Shepherd (2012), a notable divergence between the original conceptualizations of the HBM and the TPB lies in the explicit inclusion of behavioural intentions as a proximal predictor of behaviour in the TPB. The inclusion of intentions in the model allows the researcher to detect a significant increase in R^2 behaviour, improving the estimation of each theory. The results suggest that the inclusion of intentions, which serve as a closely related element to behaviour, may increase the effectiveness of the model (Gerand and Shepherd, 2012).

Along with the aforementioned elements, the six components of the HBM are believed to be the conduits via which a variety of demographic and psychological traits, including personality, peer pressure, and perceived behavioural control, impact health behaviours. If the HBM aims to gain acceptance as a comprehensive framework for understanding health behaviour, the present topic is of great importance. Nevertheless,

the topic has not received much attention in empirical research, and when it has, the results have been inconclusive (Norman and Conner, 2017).

In addition, it is worth noting that the HBM does not explicitly account for perceptions of personal control over behaviour, also known as self-efficacy beliefs, although these have significant predictive power in models based on Social Cognitive Theory (Bandura, 1982; Schwarzer and Fuchs, 1996). However, Rosenstock et al. (1988) suggested including self-efficacy in the model. The current model could benefit from improvements as this study includes TPB in the model to enhance the effect of the predictors on the dependent variable.

Perceived Behavioural Control, which falls within the TPB framework, refers to a person's belief about their ability to exert control over the performance of a particular behaviour. Gerend and Shepherd (2012) suggested that perceived behaviour control is a construct with multiple dimensions that include perceptions of control over the behaviour, perceptions of difficulty associated with performing the behaviour, and perceptions of self-efficacy. Because most health behaviour theories overlap at the individual level (Weinstein, 1993), it is useful to integrate these theories to identify the specific constructs that can explain different behaviours (Gerend and Shepherd, 2012). Findings suggest that the inclusion of intentions as a closely related element influencing behaviour may increase the effectiveness of the model (Gerend and Shepherd, 2012).

In addition to the above points, it is important to recognise a notable limitation of the HBM in terms of its predictive ability. The results derived from the quantitative analysis of the HBM indicate that the key variables, namely susceptibility, severity, benefits, and barriers, have significant predictive power for health-related behaviours in the majority of cases. Nevertheless, the effects of these studies are generally minimal (Harrison et al., 1992; Abraham and Sheeran, 2005). This means that there may be more influential factors that contribute to healthy behaviours that were not accounted for in the HBM (Orji et al., 2012). The addition of additional components proposed by Orji et al. (2021) has the potential to increase the modest influence size observed in the HBM.

Given the achievements of the TPB, several scholars such as Sommestad et al. (2015) have raised concerns about the ability of the three variables within the model, namely attitude, subjective norm, and perceived behavioural control, to accurately predict

intention. In response to this difficulty, Ajzen (1991) argued that the TPB allows for the inclusion of additional variables as long as they make a significant and recognisable contribution. In essence, he argued for the investigation of additional factors in the implementation of the TPB.

If researchers feel that current theories are inadequate, they have the option of extending an existing theory or developing an entirely new theory (Noar and Zimmerman, 2005). An integrated theoretical framework could potentially bring together the constructs that have received the most empirical support from the various theories, forming a unified and comprehensive theory. To develop an integrated theory, theorists need to establish consensus on common conceptualizations and terminologies for analogous constructs (Noar and Zimmerman, 2005). It is therefore expected that the inclusion of categories such as attitude, subjective norm, and perceived behavioural control will increase the predictive power of flood risk behaviour.

2.8.5 Justification of the Predictors Used in This Study

Previous studies (e.g., Weinstein, 1993; Nigg et al., 2002; Noar et al., 2003) have consistently found that many theories contain very similar (or identical) constructs but use different terminology, giving the impression that they are different. Noar (2005) asserted that constructs come from different theoretical and conceptual origins and may have different names, but are essentially the same when measured. Previous research (e.g., Weinstein, 1993; Nigg et al., 2002; Noar et al., 2003) has consistently found that numerous theories have considerable overlap in their constructs but use different names. This phenomenon leads to the impression that these theories differ from each other. According to Noar (2005), constructs may originate from different theoretical and conceptual frameworks and be referred to by different names but are fundamentally equivalent when assessed

In their study, Gerend and Shepherd (2012) concluded that while the TPB has certain advantages, there is also a significant degree of overlap between the TPB and the HBM. The researchers also emphasised the importance of proximal predictors as opposed to distal predictors in understanding health behaviours. As mentioned earlier, Weinstein (1993) and Gerend and Shepherd (2012) noted that there are similarities in the individual constructs associated with the HBM and the TPB. Therefore, the researcher must identify

the overlapping constructs in both theories before determining the specific constructs that will be used in this study. If researchers can justify that some constructs are similar and essentially measure the same thing, they can eliminate the redundant constructs. This has practical benefits for respondents as it reduces the number of questions or items they need to complete (Noar and Zimmerman, 2005).

In addition, the overlapping constructs need to be deleted to prevent the occurrence of discriminant validity issues. Discriminant validity refers to the extent to which a construct differs from other constructs in a model. For a construct to have good discriminant validity, it should measure something unique and not overlap significantly with other constructs. The use of overlapping constructs can lead to inaccurate findings about the relationships between constructs and undermine the validity of the research (Hair et al., 2021).

Avoiding overlapping constructs is also crucial to ensure that the research model fulfils the criteria of parsimony. One of the crucial characteristics of good scientific research is parsimony. Parsimony refers to the simplicity in explaining the phenomena or problems that occur, and in generating solutions for the problems. It is always preferable as compared to complex research frameworks that take into account an unmanageable number of factors (Bougie and Sekaran, 2019). Overlapping constructs lead to unnecessary complexity as they contain redundant variables that essentially measure the same underlying phenomenon. This can lead to a more complicated model with more parameters (constructs/predictors) than necessary.

Table 2.4 below illustrates the presence of overlapping constructs between the HBM and the TPB. Previous studies (e.g., Donyai, 2012; Armitage and Christian, 2003; Noar and Zimmerman, 2005; Harrison et al., 1992; Orji et al., 2012; Alhamad and Donyai, 2021; Gerend and Shepherd, 2012) have identified many common constructs that are present in both the HBM and the TPB. Based on the results of the literature review, it was determined that there are only two components in the HBM that differ from the constructs identified in the TPB. The constructs of perceived susceptibility and perceived severity within the HBM are distinct features that do not exist in the TPB (Forsyth et al., 2023; Donyai, 2012; Armitage and Christian, 2003; Noar and Zimmerman, 2005). The dimensions of the HBM, including perceived benefits, perceived barriers, and self-efficacy, overlap with the constructs of the TPB, as shown in Table 2.4.

Therefore, this study used attitude, subjective norm, perceived behavioural control, perceived susceptibility, and perceived severity as predictors of intentions and behaviours to prepare for flooding, as these domains are highly variable. Furthermore, previous research has shown a robust relationship between these components and behaviour. In addition, this study incorporates the antecedents of intention from the TPB to establish a relationship with flooding behaviour. The existing literature on flood behaviour focuses mainly on risk perception, specifically perceived susceptibility and perceived severity (Bubeck et al., 2012). Given the importance of these factors in the literature (Cauncil, 2007; Siegrist and Gutscher, 2006; Thieken et al., 2007; Miceli et al., 2008), it is crucial to gain a comprehensive understanding of how risk perception influences an individual's commitment to precautionary action (Bubeck et al., 2012). The decision as to which constructs must be omitted is shown in Table 2.4.



Table 2.4 Overlapping Constructs in HBM and TPB

No.	HBM Constructs	TPB Constructs	Explanation	Decision
1	Perceived Susceptibility	Nil.	The perceived susceptibility construct in HBM is unique to TPB (Forsyth et al., 2023; Donyai, 2012; Armitage and Christian, 2003; Noar and Zimmerman, 2005). Montanaro and Bryan (2014) highlighted that perceived susceptibility and perceived severity are two of the core components of the health belief model (HBM) that are not included in the TPB. Harrison et al. (1992) susceptibility and barrier were the strongest predictors of behaviour.	Maintain the perceived susceptibility construct since this construct is unique and does not overlap in both theories.
2	Perceived Severity	Nil.	The perceived severity construct in HBM is unique to TPB (Forsyth et al., 2023; Donyai, 2012; Armitage and Christian, 2003; Noar and Zimmerman, 2005). Montanaro and Bryan (2014) highlighted that perceived susceptibility and perceived severity are two of the core components of the health belief model (HBM) that are not included in the TPB. Harrison et al. (1992) susceptibility and barrier were the strongest predictors of behaviour.	Maintain the perceived severity construct since this construct is unique and does not overlap in both theories.
3	Perceived Benefits	Attitude	Perceived benefits described within the HBM could be seen as being very similar to control beliefs (attitude) and behavioural beliefs (perceived behaviour control) described in the TPB (Orji et al., 2012; Alhamad and Donyai, 2021). Noar and Zimmerman (2005) also mentioned that perceived benefits in HBM and attitudes in TPB are similar.	The perceived benefit construct in HBM is omitted in this study.

Table 2.4 Continued

No.	HBM Constructs	TPB Constructs	Explanation	Decision
4	Perceived Barriers	Attitude	Perceived barriers described within the HBM could be seen as being very similar to control beliefs (attitude) and behavioural beliefs (perceived behaviour control) described in the TPB (Orji et al., 2012; Alhamad and Donyai, 2021). Noar and Zimmerman (2005) also mentioned that perceived barriers in HBM and attitudes in TPB are similar.	The perceived barrier construct in HBM is omitted in this study
5	Cues of Action	Subjective Norm	Cues to action are not formally represented in the TPB, but they may be indirectly reflected in people's attitudes and subjective norms about a given health behaviour (Gerend and Shepherd, 2012). Noar and Zimmerman (2005) also mentioned that cues to action in HBM and subjective norms in TPB are similar.	The cues to action construct in the HBM is omitted in this study.
6	Self Efficacy	Perceived Behavioural Control	The self-efficacy component of perceived behavioural control (PBC) in the TPB overlaps with perceived barriers from the HBM (Gerend and Shepherd, 2012; Weinstein, 1993; Rogers, 1983). In other words, PBC and Perceived Barriers are similar. Noar and Zimmerman (2005) also mentioned that self-efficacy in HBM and PBC in TPB are similar.	The self-efficacy construct in the HBM is omitted in this study.
7	Intention	Nil	The antecedent of intention exists to predict behaviour.	Employ the intention construct.

2.9 Flood Preparedness Behaviour

The disaster management cycle comprises four distinct phases, including mitigation, preparedness, response and recovery. According to Rostami-Moez et al. (2020), the preparedness phase is the most important within the disaster management cycle. Preparedness includes several measures, such as storing essential supplies such as food and water, securing furniture and other necessities, securing electrical infrastructure, and developing an emergency and evacuation plan (Monteil et al., 2021). According to Hajar Mariah et al. (2021), preparedness-related activities include concrete and quantifiable actions necessary to achieve preparedness goals. Schipper and Pelling (2006) asserted that preparedness is an integral part of the systematic integration of DRM and includes both preventive and mitigating strategies. Preparedness can be described as a state of being fully equipped and ready. The state of preparedness requires the inclusion of three essential components, namely (1) preparation, (2) planning and (3) information.

According to Hajar Mariah et al. (2021), anticipatory action, hazard adaption, and mitigation are often linked with preparedness activities, which are also called preparedness measures and preparedness actions. In addition, it includes the implementation of tasks related to disaster preparedness and mitigation (Hajar Mariah et al., 2021). The overarching goal of preparedness programmes is to influence behavioural changes that make people less susceptible to danger and better able to deal with its aftermath (Mohd Tariq et al., 2021). The state of preparedness reduces the likelihood of negative consequences, improves individuals' ability to cope, adapt and recover in the event of a disaster, and mitigates the escalating costs associated with hazardous incidents (Paton, 2018).

Adopting disaster preparedness measures is a proactive practice that has the potential to mitigate the likelihood of harm and destruction and enhance the ability to effectively manage the temporary disruptions caused by hazardous events (Paton, 2003). Paton and Johnston (2017) asserted that preparedness includes several components, such as strategic planning, comprehensive information, immediate readiness, adequate stockpiling of emergency resources, and the competence of individuals and emergency responders. Together, these factors help to ensure efficient disaster response and subsequent recovery. It also includes measures aimed at protecting lives, property and critical infrastructure in times of disaster (Medina, 2016; Veenema, 2018). The

categorization of disaster risk reduction can be divided into different levels, including community, institutional, household and individual levels (Guo et al., 2021).

Flood preparedness is a proactive measure that enables individuals to deal efficiently with public disasters and mitigate their impact on themselves and society. According to Boonyaratkalin et al. (2021), the activity in question is considered proactive as it represents a successful response to potential disaster impacts. Preventive measures such as keeping a first aid kit at the place of residence, stocking food and water supplies, and preparing a family evacuation strategy can effectively protect individuals and promote a proactive approach to responding to natural disasters. According to Noorhashirin et al. (2016), the implementation of preventive measures by individuals before a disaster can effectively mitigate the potential damage to human lives and minimise the loss of agricultural yields and assets.

Given the limited effectiveness of alternative techniques, it has been emphasised that flood disaster preparedness—which is heavily impacted by individuals' perceptions of disaster risk—is an effective way to manage flood risk (Yin et al., 2021). Staupe-Delgado (2018), Bustillos Ardaya (2017), Dash and Galdwin (2005), and Lechowska (2018) are just a few of the many scholarly investigations that have sought to identify the elements that motivate people to take part in disaster preparedness to enhance the efficacy of disaster risk management. Even in disaster-prone regions, some research has shown that people are not disaster-prepared (Abdul Rahman, 2014; Eisenman et al, 2009; Mohammad-pajoooh and Ab. Aziz, 2014), highlighting the need for individual readiness. On the other hand, disaster preparedness in developing nations has received surprisingly little empirical attention (Hoffmann and Muttarak, 2017).

One of the most important aspects of adjusting to natural disasters is the idea of personal preparedness. Governments, response and recovery organisations, communities, and individuals are all part of the larger picture when it comes to disaster preparedness, which is defined by the UNISDR. This readiness is for the goal of being ready for, reacting to, and recovering from calamities that are either impending, already here or very likely to happen. Personal preparedness is crucial in dealing with extreme flash floods, according to previous studies (Kreibich et al., 2005; Poussin et al., 2014), particularly when the hazard's severity surpasses the capacities of official interventions. By raising awareness of potential dangers and disaster risks and enhancing people's capacity to react

appropriately, the Sendai Framework aims to make communities better prepared to deal with natural disasters.

The assessment of household preparedness should include a broader range of factors beyond the mere accumulation of goods. Kirschenbaum (2005) argued that a holistic strategy should incorporate learning how to deal with disasters, creating family emergency plans, and putting physical and structural safeguards in place. This is elaborated upon in the scholarly works of Kohn et al. (2012), Levac et al. (2012), and Wachinger et al. (2013), which examine several methods for evaluating disaster readiness. Levac et al. (2012) and Kohn et al. (2012) state that an all-encompassing framework for preparedness must include household catastrophe planning and stockpiling.

Individuals' risk perception and preparedness for floods are greatly influenced by personal experience with the disaster (Bradford et al., 2012). Gotham (2017) found that compared to those who either had no prior experience with flooding or lived in areas that were directly hit by Hurricane Katrina, New Orleanians who were either directly exposed to the water or whose neighbourhoods were flooded perceived a higher level of danger. Research by Takao et al. (2004) found that factors like property ownership, perceived fear of flooding, and damage from past floods affect people's level of flood readiness.

Personal experiences with flooding and localised risk communication are important factors that help promote preparedness, according to a thorough review of the current empirical evidence by Bubeck et al. (2012). The research examined by Bubeck et al. (2012) consistently showed a substantial association between bad flooding experiences and an increased degree of readiness, except for the studies by Takao et al. (2004) and Thielen et al. (2007). Damage severity was shown to be significantly correlated with flood protection systems' utilization (Grothmann and Reusswig, 2006). In addition, the authors pointed out that the general public, particularly those who have never been in a flood's shoes, may be more motivated to take precautions if they are informed about the risks involved. Thielen et al. (2006) stated that to promote the implementation of flood preventive measures, there should be better communication regarding flood dangers and mitigation strategies.

Thieken et al. (2007) conducted interviews with people who had been affected by flooding in Germany. Knowledge of self-protection, according to the researchers, can influence residents' ability to adopt protective measures, as well as the amount and kind of personal precautions performed. According to several studies (Terpstra and Lindell, 2013; Wachinger et al., 2013), demographic factors do not always have a significant impact on readiness. Evidence from Kellens et al. (2011) suggests that homeowners were more invested and open to acting. A person's intent to be disaster-ready is positively correlated with their employment status and income.

In addition, Scolobig et al. (2012) pointed out that people living in less urbanised regions tend to perceive a higher risk of flooding. Flood preparedness encompasses various aspects of a person's confidence in the competence of administrative authorities to effectively manage flood situations, as well as their ability to make informed decisions and effectively manage such events. Research has shown that when people trust those in charge, they are less likely to take precautions (Terpstra, 2011) and more likely to be passive (Poussin et al., 2014). A lower feeling of trust is likely to impact people who perceive a lack of choices (Wachinger et al., 2013).

2.10 Flood Preparedness Intention

Flood preparedness intention refers to the extent to which individuals intend to take precautionary measures for future floods (Papagiannaki et al., 2019). The presence of flood insurance can be of significant importance in some cases, especially in countries such as Norway or Iceland where flood insurance is mandatory (Surminski, 2014). As a result, the presence of reliance on public protection or private insurance schemes may make individuals less willing to take preventative measures against potential damage. Individuals who have confidence in the effectiveness of public flood protection measures underestimate their own risk and consequently have a lower intention to prepare for potential flooding. When people have faith in the government and the structural protections already in place, they do not feel the need to prepare for floods.

Individuals' perceptions of danger and their propensity to take preventative measures are correlated with the level of public confidence in public flood protection. This can be seen in the findings of Hanger et al. (2018) and Terpstra (2010), who investigated the relationship between social trust and the intention to protect oneself from

flooding. China's collectivist orientation has the potential to change the negative correlation found in Europe between trust in public protection and the propensity of individuals to engage in flood preparedness activities (Terpstra, 2011). From a personal perspective, this change is remarkable.

The observed processes provide a comprehensive explanation for the inverse relationship between the belief in authority and the propensity to engage in preparatory activities. Terpstra's (2011) findings suggested a negative correlation between higher levels of trust and concern and lower perceptions of flood risk. People may be hesitant to take precautions because, according to scientific research, trusting others makes them feel safe (Poussin et al., 2014). Papagiannaki et al. (2019) found that individuals are more likely to take precautions when they are well-informed about potential flood risks in their area and the steps they might take to mitigate those risks.

In a study conducted by Zaalberg et al. (2009) on flood behaviour, it was found that the perceived effectiveness of damage mitigation, referred to as outcome expectancy, showed a positive correlation with the adoption of flood preparedness measures. Conversely, perceived self-efficacy showed no significant relationship with adoption intention. In the study by Maddux et al. (1983), it was found that improvements in outcome expectancy were associated with a higher intention to engage in risk-preventive behaviour. However, the increase in self-efficacy did not lead to a significant increase in intentions. The intention to undertake flood prevention measures is positively correlated with self-efficacy and outcome expectancy (Grothmann and Reusswig, 2006).

The conventional cognitive theory of risk-reducing behaviour assumes that the intention to engage in personal protection follows a sequential process. This process involves a person first recognising that a hazard has the potential to affect them negatively. The person then begins to consider the potential benefits of certain actions (outcome expectancy) and assesses their ability to successfully carry out these actions (self-efficacy) (Martin et al., 2007; Neuwirth et al., 2000). Suppose a person affected by a disaster perceives a particular disaster preparedness measure as effective, leading to a strong positive expectation of positive outcomes. In this scenario, the person will assess their skills, expertise and available resources to carry out the plan. Based on this assessment, the intention to prepare for the disaster then emerges (Strecher et al., 1986).

The extent of willingness depends on how the individual assesses the outcome or effectiveness of the measure or technology and how competent they are to implement it. Neuwirth et al. (2000) cite a large body of empirical research showing a strong correlation between disaster preparedness intentions and reaction orientation components, specifically result expectancy and self-efficacy. Behavioural intention is the best predictor of actual conduct since it influences a person's actions. The motivation to protect is not directly observable, but rather a mental state that is derived and measured from the behavioural intention. This mental state is thought to be a reliable predictor of behaviour, as suggested by Ajzen (1991) and Kim and Hunter (1993).

Increased levels of cognitive risk perception and the experience of negative emotions are influential factors that promote the intention to take preventive measures to mitigate the associated risks. This phenomenon could explain people's tendency to avoid the often-unanticipated negative emotional states such as uncertainty, fear, anger and helplessness that occur in the context of a flood event. This view is consistent with the motivational hypothesis of Weinstein et al. (1998), which states that people take preventive action to mitigate perceived high risk. It is imperative to prioritise the dissemination of risk information to the general public, as this can effectively reduce perceived vulnerability by encouraging individual efforts to reduce and prepare for risk (Altarawneh et al., 2018).

Preparation intentions are likely to rise in response to increased risk perception and worry in a setting where individuals are more cognizant of flood-related problems and have less faith in the capacity of authorities to handle the issue. Evidence suggests that risk perceptions might impact readiness intentions, as demonstrated by studies conducted by Botzen et al. (2009) and Terpstra (2011). It should be mentioned that the two research analysed risk perception using distinct models. This second viewpoint is in line with what Wachinger et al. (2013) found. When people trust one another too much, it lowers their risk perception of floods and makes them less likely to take precautions.

Risk perception as a cognitive process has the potential to induce an individual's propensity to engage in flood preparedness (Papagiannaki et al., 2019). According to the study by Paton et al. (2005), an individual's propensity to take preventive action can be influenced by fluctuations in their level of fear of a hazard. According to the findings of Ong et al. (2021), several key factors have been identified as significant indicators that

influence the intention to prepare. These factors include concern about the potential consequences, experiencing increased stress levels, concern for the well-being of loved ones, feelings of anxiety, and feelings of personal responsibility for preparedness.

Abunyewah et al. (2019) investigated how people's intentions to prepare for the threat of disasters were influenced by their level of knowledge about disasters, the clarity of communication and the credibility of the source. Several aspects of intentions to prepare for disasters are influenced by how simply and concisely disaster information is communicated, the authors found. The intention to prepare (the dependent variable) is positively and causally related to the independent variable, sufficient information. The clarity of the message and the reliability of the source have a direct influence on the willingness to prepare.

According to the study by Papagiannaki et al. (2019), home ownership was found to have the most significant positive impact on both current preparedness and intention to be prepared. The study found a positive correlation between employment status and both current preparedness and intention to be prepared. Kellens et al (2011) found that homeowners are more worried and better prepared, with preparedness intention positively correlated with employment status and income. There is a positive correlation between having a larger family and a higher level of current preparedness and preparedness intention.

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2.11 Attitude

The overall positive or negative evaluation of a certain behaviour by the individual is reflected in his or her attitude toward this behaviour. According to Ajzen (1985), attitude can be defined as the positive or negative inclination towards a particular behaviour. Attitude refers to the evaluative response to a particular issue characterised by a favourable or unfavourable disposition (Aboelmaged, 2020; Kahlor et al., 2019). According to Armitage and Conner (2001), there is a positive correlation between the degree of approval of a particular behaviour and the strength of a person's intention to engage in that action. According to Rhodesa and Courneya (2005), an attitude refers to an individual's emotional and instrumental evaluation of a particular behaviour.

According to the research of Ataei et al. (2020), the concept of attitude towards a behaviour refers to a person's comprehensive evaluation of the behaviour. In the context of this study, the term "attitude" refers to the subjective evaluation of preparation for the inevitable occurrence of flooding, which is either positive or negative. As in the study by Gonzalez et al. (2012), the attitude scale comprised a total of five items. Each item was accompanied by a bipolar counterpart that included concepts such as positive-negative, sympathy-antipathy, pleasant-unpleasant, harmful-beneficial, and valuable-non-valuable.

According to Wang et al. (2020a), an attitude is a cognitive state that encompasses a person's subjective evaluation of people, places, objects, or events that subsequently shape their behaviour and cognitive processes. In a recent study conducted by De Coninck et al. (2020), it was found that there is a correlation between perceived vulnerability and a critical attitude that favours the implementation of stricter security measures. The correlation between attitude and perceived vulnerability is of great importance, as both serve as indicators of the perception of the potential risks to a person's well-being and health, especially in the case of geological hazards.

In the study conducted by Chou et al. (2015), a link was established between attitudes and beliefs, particularly concerning disaster avoidance. The theory of planned behaviour states that attitudes have robust predictive power for adolescent behaviour (Buckley et al., 2010; Kroshus et al., 2014). According to Asare and Heights (2015), a significant majority of participants, over 80%, showed that one person's positive attitude influences the behavioural intention of others. Of the three constructs studied, namely attitude, subjective norm and perceived behavioural control, it can be stated that attitude emerges as the most influential element. According to Arvola et al. (2008), attitude is a robust predictor of behavioural intention. According to Suprpto and Wijaya (2012), attitude plays an important role in influencing people's intention to purchase organic food.

According to Kirschenbaum et al. (2017), previous research has examined the role of the media in the dissemination of disaster-related communication and its potential impact on people's attitudes toward disaster preparedness. Similarly, Chou et al. (2015) found that effective communication of the benefits associated with participation and training in disaster preparedness is critical to promoting positive attitudes among college students. This finding is in line with several scientific studies (Ataei et al., 2021;

Aboelmaged, 2021; Savari and Gharechae, 2020) that have demonstrated a significant relationship between individuals' attitudes and behavioural intentions.

To cultivate a culture of preparedness and acceptance of the inevitability of earthquakes, households in Malaysia need to adopt a proactive stance and take preventive measures (Zaremohzzabieh et al., 2021). To understand the reasons for the lack of acceptance of certain behaviours, it is important to examine people's beliefs and attitudes (Zaremohzzabieh et al., 2021). Overall, individual willingness is influenced by three socio-psychological factors: attitude, knowledge and risk perception (Rohrmann, 2008). Najafi et al. (2017) provided a comprehensive compilation of more than 20 parameters that influence individual preparedness in the context of TPB. However, Najafi et al. (2017) found that a crucial aspect of individual preparedness is the conscious intention to engage in a particular behaviour, which is strongly influenced by one's attitude and perspective.

An attitude can be defined as a complex combination of cognitive, affective and conative elements that influence a person's understanding, emotional response and behavioural tendencies towards a particular object. The conclusion that can be drawn from this is that attitude refers to a person's tendency to understand, experience emotions, react and behave towards an object, which arises from the interplay of cognitive, affective and conative elements (Pfefferbaum and Shaw, 2013; Carley, 2005). An attitude can be understood as a cognitive judgment or an affective reaction. Attitude refers to an appropriate response to various stimuli encountered in daily life and includes emotional and social cues. Taufik et al. (2021) asserted that disaster preparedness attitudes encompass the behaviours and mindsets that enable individuals to cope promptly and effectively with a crisis scenario.

2.12 Subjective Norms

Subjective norms, as described by Fishbein and Ajzen (1975, p. 302), refer to the extent to which individuals perceive the opinions of significant others regarding their use or non-use of the system. Subjective norms refer to the influence of social factors on an individual's decision to engage or refrain from a particular behaviour, as defined by Rhodesa and Courneya (2005). Subjective norms refer to a person's perception of the extent to which others believe they should engage in a certain behaviour (Lajunen and

Rasanen, 2004; Simsekoglu and Lajunen, 2008; Moradhaseli et al., 2017). Dejm et al. (2015) defined the subjective norm as the perceived influence that important people in an individual's life exert on engagement or non-commitment to a particular behaviour. Subjective norm is a construct that refers to a social influence that compels a person to either approve or disapprove of another person's engagement in a particular behaviour, which is determined by the individual's beliefs (Asare and Heights, 2015; LaMorte, 2019).

The subjective norm refers to an individual's view of the opinions and expectations of influential individuals or social groups regarding the need to prepare for the occurrence of floods. Youth behaviour is influenced by the opinions and actions of peers, which serves as a basis for the adoption of personal views on shared social norms (Gibbons et al., 2012). Therefore, in situations where peer influence is particularly pronounced, subjective norms among youths may play a crucial role in shaping their behaviour. Cestac et al. (2011) claimed that the risk-taking behaviour of novice drivers on the road is influenced by subjective norms. According to the study by Park et al. (2009), subjective norms were found to have the highest predictive power for intention. According to Prasetyo et al. (2020) and Armitage and Conner (2017), it is argued that the subjective norm has limited predictive power in determining behavioural intentions, which is mainly due to the influence of individual preferences and social factors.

According to McIvor and Paton (2007), subjective norms show a remarkable correlation with disaster preparedness and promote people's tendency to take preparatory measures in the event of an earthquake. Subjective norms refer to an individual's perception of social pressure, while normative beliefs focus on the individual's assessment of how likely it is that certain individuals or groups (known as referents) to whom the individual wishes to conform will approve or disapprove of the behaviour (Armitage and Conner, 2001). According to Zaremohzzabieh et al. (2021), the results derived from the extended TPB model suggest that subjective preparedness norms can significantly improve earthquake preparedness among both individuals and communities. The results also suggest that subjective norms play an important role in influencing individual preparedness.

Palm (1999) argued that a person's risk assessment and engagement in disaster preparedness are influenced by their impression of the attitudes and behaviours of others.

The author argues that the importance of risk-reduction behaviour in a particular culture lies more in conformity to shared social norms and laws than in the individual perspective. In this cultural context, the individual is seen as connected to others rather than as a separate, independent entity. Furthermore, it has been observed that communities characterised by high subjective standards often have a history of overcoming challenges together, thus promoting a proactive attitude of families toward earthquakes (Zaremohzzabieh et al., 2021).

Appeals to peer influence include messages based on socially normative behaviour. Cialdini et al. (1990) suggested that behaviours can be predicted by both descriptive norms, which exemplify the actions of most individuals, and injunctive norms, which reflect individuals' perceptions of what others think they should do. Norms as a social phenomenon are disseminated through communication and have an impact on individuals' normative beliefs and subsequent behavioural changes (Lapinski and Rimal, 2005). Real and Rimal (2007) found in their study that peer communication plays a crucial role in college students' propensity to drink alcohol, even when their past drinking habits are considered.

2.13 Perceived Behavioural Control

Perceived behavioural control refers to a person's subjective assessment of how easy or difficult it is for them to exhibit a certain behaviour. According to Ajzen (1991), the theory considers a person's view of the necessary skills, resources, and opportunities required to perform a particular behaviour. In this study, the concept of perceived behavioural control is examined in terms of young people's ability to effectively manage their preparation for flooding events. Gonzalez et al. (2012) assumed that perceived behavioural control depends on how a person assesses their confidence, skills, knowledge and abilities concerning a particular behaviour and how easy or difficult it is for them to perform that behaviour. The approach involves assessing the influence of many circumstances that can either facilitate or hinder the performance of the behaviour.

Perceived behavioural control is a critical component of the concept of planned behaviour. The level of self-confidence an individual exhibits has a significant impact on how others view their ability to accomplish a given task, also known as perceived behavioural control. The concept of planned behaviour differs from that of reasoned

action by the inclusion of perceived behavioural control as proposed by Ajzen (1991). Nonetheless, the construct of perceived behavioural control is closely related to Bandura's (1977, 1982) notion of perceived self-efficacy, which refers to an individual's assessment of his or her ability to effectively perform the actions necessary to cope with anticipated circumstances (Bandura, 1982, p. 122).

Bandura (1982, 1991) has shown that self-efficacy beliefs have the potential to influence various aspects of behaviour, including activity selection, activity preparation, effort during a performance, and cognitive and emotional responses. The TPB integrates the concept of self-efficacy beliefs or perceived behavioural control into a broader framework that examines the relationships between beliefs, attitudes, intentions, and behaviour. The concept of planned behaviour assumes that the direct prediction of behavioural performance can be achieved through the use of perceived behavioural control and behavioural intention.

There are at least two justifications that can be given for this idea. Based on the premise of maintaining a consistent intention, it is likely that the effort required to successfully perform a particular action increases with the perceived degree of control over that behaviour. For example, when learning to ski, individuals with similar goals of acquiring this skill may have different levels of confidence. Consequently, the person who has a higher level of confidence in their ability to successfully master skiing is more likely to continue their efforts than the person who has concerns about their ability. The construct of perceived behavioural control may be limited in its realism under certain circumstances. These include situations in which the individual has little information about the behaviour in question, when demands or available resources have changed, or when new elements have been introduced into the situation (Ajzen, 1991).

Ajzen (1991) argued that control beliefs serve as an antecedent of perceived behavioural control (PBC) and focus on the perception of the influence that various factors have on the performance of a particular behaviour, either by enabling or inhibiting it. Similar to other belief systems, the equation considers the importance of a belief to an individual by quantifying the frequency with which the facilitating (or inhibiting) element occurs. The increase in PBC can be attributed to the presence of salient beliefs about sufficient resources and opportunities, as well as a lower expectation of obstacles or impairments.

2.14 Perceived Susceptibility

Perceived susceptibility refers to the probability with which a person assumes a personal susceptibility to developing a health problem. It essentially refers to the subjective perception of the likelihood that a person will develop an illness or unfavourable condition as a result of a particular behaviour. According to Rosenstock (1966), the concept of perceived susceptibility assumes that people are more motivated to engage in health-conscious behaviour if they believe that they are susceptible to a particular negative health outcome.

Perceived susceptibility refers to the cognitive assessment that individuals make regarding their risk and likelihood of developing a particular disease (Champion and Skinner, 2008). Susceptibility refers to the likelihood of developing a particular condition, and an individual's assessment of susceptibility is usually based on their existing knowledge of the associated risk, which may or may not be accurate (Akey et al., 2012; Greene and Brinn, 2003). Perceived susceptibility refers to the extent to which individuals have a belief that they are susceptible to a particular health problem (Zhang et al., 2017). According to Rosenstock (1974), individuals may have a subjective belief that engaging in certain behaviours may lead to the acquisition of a disease or condition with serious consequences. The importance of individual risk perception or sensitivity is critical in facilitating the adoption of healthier practices (Abraham and Sheeran, 2005).

There are considerable differences between people when it comes to assessing their susceptibility to various health conditions or diseases. There is a positive correlation between the perceived level of risk and the likelihood that a person will engage in risk-reducing behaviour. For example, the likelihood that a person will take preventative measures, such as exercising and eating a low-calorie diet to avoid weight gain, may depend on their perceived susceptibility to obesity. According to Abraham and Sheeran (2005), there is a predictive relationship between perceived susceptibility and various health-promoting behaviours such as smoking cessation, breast self-examination, healthy dental care, balanced diet and exercise. However, it is known that people often underestimate their disease susceptibility (Redding and Rossi, 2000).

Perceived susceptibility refers to a person's subjective assessment of how likely they are to get a particular disease. There are several views on individual susceptibility to disease. The spectrum of views ranges from outright denial of getting disease to

acknowledging the potential occurrence of the disease but not concerning oneself, to recognising the belief in a real threat (Rosenstock, 1974). The literature reviews and meta-analytic studies have supported the notion that subjective feelings of personal susceptibility are a necessary condition for bringing about behaviour change aimed at prevention (Janz and Becker, 1984; Van der Pligt, 1996; De Wit et al., 2008).

The perception of vulnerability, also known as risk perception, depends on various factors, including individual and cultural characteristics, how risk is communicated and the context in which risk information is conveyed. The perception of vulnerability varies from person to person, and this perception correlates only to a limited extent with statistical data and empirical research results (Van der Pligt, 1996). Individuals who have an increased perception of susceptibility are more likely to take appropriate action to reduce the likelihood of becoming ill. On the other hand, individuals who perceive themselves as having low disease susceptibility show a lower sense of susceptibility and possibly a lack of motivation to actively engage in essential health-related behaviours (Kim and Kim, 2020).

Various distortions have been observed in the perception of susceptibility. Two biases are frequently observed: the tendency to overestimate small probabilities and the tendency to underestimate large probabilities. Another bias concerns the tendency to overestimate dangers when people have greater cognitive availability. Greater cognitive availability can be achieved through extensive media coverage or personal experience, making it easier to recall or visualise the associated risks. The perception of susceptibility to risks such as breast cancer can be influenced by media exposure, namely through the cognitive availability of information. Underestimation of susceptibility can be influenced by risks with lower exposure, such as heart disease in women (Van der Pligt, 1996).

When studying human decision-making, it is crucial to consider the importance of the perception of vulnerability. Previous research has shown that individuals' cognitive abilities are limited, making them unable to process large amounts of elements and things effectively. The individual's cognitive limitations affect how they conceptualise the multidimensionality of vulnerability. The aforementioned limitation may affect an individual's perception of vulnerability, resulting in increased risk-taking, a higher likelihood of human error, and inadequate decision-making when faced with risk (Williams and Noyes, 2007).

In a study conducted by Zhang et al. (2017), an investigation was carried out into public announcements on the topic of healthy eating behaviour on YouTube. The aim was to assess the frequency of use of the four parts of the HBM, namely susceptibility, severity, benefits and barriers, in persuasive messages. According to the HBM, people are more likely to take preventive action against a particular health problem if they perceive themselves to be susceptible to it and if they recognise the potential severity of the consequences that may result from inaction (Carpenter, 2010). The lack of vulnerability information can be challenging, as the activation of protective motivation depends on the communication of both severity and vulnerability factors (Briones et al., 2012).

The importance of perceived susceptibility to threat in promoting positive health behaviours has been emphasised in many studies (Janz and Becker, 1984; Kohn and Rogers, 1991; Mermelstein and Riesenberg, 1992; Robinson et al., 1997). According to Greene and Brinn (2003), researchers continue to investigate strategies to encourage individuals to take preventive health measures, paying particular attention to characteristics such as perceived susceptibility. The concept of perceived susceptibility is important in numerous health studies and models of persuasion. The perception of the risk of developing skin cancer, for example, is a key factor influencing people's tanning practices. To take proactive measures to maintain good health, people need to have a comprehensive understanding and a high level of perceived susceptibility to developing skin cancer. In contrast, individuals who tan are aware of their susceptibility to skin cancer and sun-related damage and still maintain their tanning behaviour.

According to Greene and Brinn (2003), women who are aware of their susceptibility to skin cancer may maintain their tanning behaviour to avoid the concerns associated with it and may even choose to avoid it altogether. According to the study by Mermelstein and Riesenberg (1992), the variable of perceived susceptibility to skin cancer was found to be the most influential factor in predicting individuals' intentions to engage in preventive measures against skin cancer. Similarly, the study by Robinson et al. (1997) found a positive correlation between increased perceived risk and an increased tendency to use sunscreen and go to shaded areas. For therapies to be effective, it is therefore essential to improve the perception of susceptibility to skin cancer. Higher levels of perceived susceptibility are expected to lead to less positive attitudes and less

willingness to use tanning lamps. However, the question arises as to the most effective way to increase the perception of susceptibility.

The concept of perceived susceptibility is used to explain a person's beliefs about the likelihood of getting a disease (Brewer and Fazekas, 2007). According to Brewer et al. (2007), individuals who rate their susceptibility to a disease or condition higher are more likely to engage in preventive behaviours. Individuals who experience signs of illness are more likely to believe that preventive and avoidance measures can effectively reduce the likelihood of disease development (Gao et al., 2000). According to Jones et al. (2015), both perceived susceptibility and perceived benefit played an important role in predicting protective health behaviours. However, perceived susceptibility was found to have a greater influence on preventive health behaviours.

2.15 Perceived Severity

The concept of perceived severity refers to an individual's perception of the severity of the effects associated with the development of a health condition. The concept of perceived severity refers to an individual's subjective perception of the extent of harm caused by the acquisition of a disease or medical condition as a result of a particular behaviour. The concept of perceived severity refers to a person's subjective assessment of the extent of harm caused by acquiring a disease or harmful condition as a result of a particular behaviour (Surianti et al., 2020). The concept of perceived severity refers to an individual's subjective assessment of the severity of a condition, which includes both the clinical and social impact (Lee et al., 2020).

The concept of perceived severity refers to individuals' subjective assessments of the potential negative consequences of failing to take preventive action (Zhang et al., 2017). The term "severity" often refers to the degree of seriousness associated with an event or situation (Akey et al., 2012). People are more inclined to take preventative measures against weight gain if they believe that the potential negative physiological, psychological and social consequences associated with obesity are significant. These consequences may include mortality, physical limitations leading to the development of other health conditions, financial burdens, physical discomfort, and challenges with family and social interactions. The construct referred to as perceived threat is composed of the combination of perceived severity and perceived vulnerability, as discussed in

previous studies (Lachlan et al., 2020; Surianti et al., 2020; Champion and Skinner, 2008).

In cases where the potential negative health consequences do not significantly affect a person's general well-being, there is no motivation to take preventive action, even if there is a risk. The assessment of the severity of a health condition is influenced not only by medical information but also by the individual's view of the challenges posed by the condition and its impact on their general well-being (McCormick-Brown, 1999). Nevertheless, the assessment of severity depends largely on the individual's perspective. While some people may view a health problem as a significant risk to their lives and proactively take preventative measures, others may consider themselves immune and view preventative measures as useless. Simply possessing a solid knowledge base and maintaining a highly optimistic attitude is not enough to effectively implement positive behaviours (Latimaha et al., 2018).

Several studies have additionally clarified that individuals classified as clinically obese (with a body mass index [BMI] of over 35) have an increased susceptibility to COVID-19, with the severity of the disease being the most affected (Ryan et al., 2020; Simonnet et al., 2020). In a study conducted by Simonnet et al. (2020), it was shown that there is a positive correlation between the severity of the disease and a higher body mass index (BMI). Specifically, the researchers found a 47.6% increase in disease severity in people with a BMI over 30 and a 28.2% increase in people with a BMI over 35.

The concept of perceived severity refers to the extent to which a person fears the severity of a particular illness (Brewer and Fazekas, 2007). According to Hanson and Benedict (2002), people who have an increased perception of the severity of an illness are more likely to take preventive measures. This finding is consistent with theoretical perspectives that suggest that people tend to actively avoid aversive stimuli in a variety of situations. Not all studies have shown a favourable correlation between a high perception of the severity of an illness and the adoption of preventive measures.

A study conducted by Hounton et al. (2005) examined the use of condoms in Africa and found that participants' opinions about the severity of AIDS/HIV had no significant influence on the use of condoms during sexual intercourse. In the study by Nexoe et al. (1999), the perceived severity of the HBM components was found to play a

critical role in predicting influenza vaccine acceptability. Similarly, previous research by Champion and colleagues has shown that perceived severity is a significant predictor of participation in mammography (Champion, 1984; Champion, Ray, Heilman, and Springston, 2000; Champion and Menon, 1997; Champion, Skinner, and Menon, 2005; Champion et al., 2008).

The construct of perceived severity encompasses the individual's opinion of the illness itself and its potential impact on their occupational and social role (Rosenstock, 1974). The degree of concern a person has about a particular health problem, correlates directly with their efforts to reduce the likelihood of its development. In contrast, a person who underestimates the risk of disease will engage in behaviours that are less conducive to maintaining their health. In their recent study, Fathian-Dastgerdi et al. (2021) investigated adolescents' attitudes toward preventive measures aimed at reducing the risk of contracting COVID-19. The researchers used the HBM as the theoretical framework for their study. There was a clear positive correlation between the protective measures shown by the adolescents and their perception of the severity.

2.16 Past Experience

A study conducted in the Netherlands found a positive correlation between previous flooding events and an increased perception of risk and greater preparedness. According to a study by Zaalberg et al. (2009), those who had experienced flooding themselves had a stronger emotional response to potential future flooding and a greater willingness to take adaptation measures than those who had not been confronted with such situations. The study conducted by Zhang et al. (2021) aimed to investigate the factors that contribute to flood preparedness in China. Specifically, the researchers investigated the influence of previous flood experiences, trust in public flood protection and personal perception of flood risk on people's preparedness for flood events. The researchers discovered a positive correlation between residents' previous experiences of flooding, their perception of flood risk and their intention to prepare for future flooding. Conversely, there was a negative correlation between residents' previous flood experiences, their trust in public flood protection measures and their willingness to take financial risks associated with flooding.

Research has also found a notable positive direct effect of trust in public flood protection on people's intentions to engage in flood prevention activities. According to Zhang et al. (2021), a positive correlation was found in the Chinese samples between people's sense of responsibility for implementing protection measures and their belief in the effectiveness of public protection measures. The results of Bubeck et al. (2013) and Diakakis et al. (2018) have shown that previous experiences have a significant influence on individuals' intentions to participate in flood protection measures. Households' intentions to participate in protection measures are influenced by their previous experiences with flooding, as shown in the studies by Osberghaus (2015) and Diakakis et al. (2018).

The question of how to motivate people to take precautionary measures despite limited experience with disasters is a key issue among scholars working on risk analysis and risk communication (Harvatt et al., 2011). In many disaster-prone regions, government agencies at the local and national levels, as well as non-governmental organisations (NGOs), have implemented educational initiatives and emergency training programs. These efforts aim to raise public awareness, promote self-reliance and encourage households to take preparedness measures (Hoffmann and Muttarak, 2017).

Hoffmann and Muttarak (2017) assumed that there is a potential link between previous experience with disasters and the adoption of precautionary measures, which can be compared with the influence of education on this behaviour. The close relationship between hazard awareness and risk perception can be observed concerning previous experiences with disasters. Experiencing the effects of a disaster and successfully coping with its aftermath can help individuals understand the potential for devastation, emphasise the benefits of preparedness and evacuation measures, and promote knowledge of recovery and resilience in the face of future disaster risks (Sattler et al., 2000). Consequently, this leads to a corresponding increase in preparedness behaviour.

Although disaster experiences appear to have a significant impact on disaster preparedness behaviour, they may not be the most effective approach to encourage households or individuals to take preventive action. Therefore, the primary investigation revolves around strategies to increase risk awareness among individuals who have not yet experienced the effects of disasters. In this discourse, we assume that education has the potential to serve as a viable substitute for direct experience of disasters. This means

that people with a higher level of education can understand the hazards associated with disasters and anticipate their consequences, even if they have no personal experience (Hoffmann and Muttarak, 2017).

In a study conducted by Frandsen (2012), it was found that people who had previously been exposed to bushfires were more likely to prepare for such events than those without direct experience. In addition, people who lived in areas where their relatives and acquaintances had been exposed to bushfires were much more likely to be adequately prepared than those who had no such personal experience of bushfires. The assertion that bushfire preparedness is influenced by first-hand experience is supported by previous scientific research (e.g., Gow et al., 2008; Nicolopoulos and Hansen, 2009). Morrissey and Reser (2007), in their study examining the impact of natural disasters in rural Australia, suggested that the influence of prior experience on preparedness depends on the specific nature of the experience.

The proposition is that the potential benefit of this knowledge for future hazard events only applies to individuals who have had a pleasant experience and demonstrated adequate coping skills. The presence of a positive past experience serves to develop expectations that are grounded in reality and promotes a sense of self-efficacy and confidence in effectively coping with future disasters. In contrast, if a person has had poor experiences with hazards, their psychological and practical preparedness for future natural disasters is likely to be lower due to anticipated worries and fears (Frandsen, 2012).

2.17 The Moderating Effect of Community Participation

Community participation is a deliberate endeavour aimed at cultivating a sense of ownership and enthusiasm for various community development projects. This is achieved through active participation in the processes of planning, execution and evaluation of development initiatives (Syam, 2009). Community participation encompasses the active involvement of individuals in various initiatives aimed at addressing their challenges and improving their socio-economic conditions. According to Hossain (2013), people get involved in planning, implementing and evaluating initiatives and strategies. According to Allen (2006), citizen participation initiatives are more likely to achieve optimal results when they are viewed as integral components of a larger framework of disaster

prevention, sustainable development planning, and institution building, rather than as isolated local efforts focused solely on immediate disaster risk reduction goals.

Civic engagement is when people participate in a variety of initiatives aimed at improving their socio-economic status and solving problems. Everyone is involved in setting goals, developing plans and reviewing progress towards them. Participation is defined by the United Nations (1970) as the joint engagement of different segments of society or interest groups. Involvement in decision-making processes and developing the capacity of community members to deal with emerging issues and sustain the changes achieved in the long term are essential components of community participation (Sastry, 2001). Through their active engagement in a community, people develop a sense of belonging and mutual benefit, which in turn encourages them to work together and create a collective identity.

According to Awortwi (2012) and Singh (2018), community development programmes are more likely to be successful if the individual members of the community are actively involved. According to Chesoh (2010), community development activities in a particular region can be influenced and translated into action through the active participation of community members. The needs of disadvantaged groups can be better met and development programmes can be better planned and implemented with their help (Swapan, 2016; Singh, 2018). In addition, community involvement can lead to more equitable and targeted distribution of project benefits, better maintenance of community assets, and the development of knowledgeable and engaged beneficiaries (Dadvar-Khani, 2012). According to Barasa and Jelagat (2013), the participation of community members in community development projects not only improves their cost-effectiveness but also promotes equitable distribution of project benefits and empowers individuals within the community.

The concept of participation is widely recognised as an integral aspect of human well-being and serves as a crucial marker of an active and just society (McAraavey, 2009; Swapan, 2016). Economic growth in the community and participation go hand in hand, as the former promotes the formation of social capital, which enables people within social networks to increase and protect their economic advantages. According to Putnam (1995), a community's level of civic engagement is directly related to its social capital. A

loss of social capital — which includes trust and norms of reciprocity — means that people are less willing to help their neighbours, according to the author.

Putnam (1995) argued that social capital theory assumes that people are more likely to engage in their communities when they have established norms, trust each other, and have access to networks that facilitate cooperation for the benefit of all. Putnam's research on American culture shows that fewer people are engaged in their communities because they have lost social capital. However, there are many other factors, such as perceived rewards, that can influence an individual's propensity to engage, and these factors are independent of the level of social capital in a given community.

Another theoretical framework that has been used to describe people's commitment to their community is the sense of community hypothesis. According to McMillan and Chavis (1986), an essential prerequisite for belonging to a community is personal commitment, which includes various types of contributions and voluntary activities. Therefore, people need to be involved in the community and take an active role in decision-making. Especially in underdeveloped countries, there are a variety of variables that can influence people's community engagement besides the obvious personal benefits. Several factors can hinder participation in programmes. These include lack of knowledge or understanding of the programme, scepticism towards the programme and social and cognitive barriers such as deeply ingrained gender norms and problems accessing information (Singh, 2018; Swapan, 2016).

According to Swapan (2016), people's level of community engagement is largely influenced by the strength of their social and political connections and the amount of social capital in their local environment. A person's propensity to engage is strongly influenced by the current cultural and political climate. Many socio-cultural factors can influence an individual's level of involvement in a particular endeavour. According to Challcharoenwattana and Pharino (2018) and Nasrabadi et al. (2013), characteristics that influence engagement include, for example, the persuasiveness of friends or neighbours, the quality of relationships with other community members and the degree of acquaintance with project staff.

Community participation can be initiated by various entities, including governments, non-governmental organisations, corporations or community-based

organisations, and can be defined as the active engagement and support of people in the community for an intervention programme (Cohen and Uphoff, 2011). Community members must be actively involved in decision-making, implementation, benefit sharing, and evaluation of the intervention for participation to be effective (Cohen and Uphoff, 2011). Membership in groups, attending meetings, volunteering with local organisations, volunteering, donating money or goods and participating in projects to solve problems in the community are examples of the many ways people can get involved (Matarrita-Cascante and Luloff, 2008; Ramos et al., 2017).

Vulnerable populations must be actively involved for disaster risk reduction efforts to be effective. The participation of vulnerable populations in efforts to reduce the impact of disasters is crucial. By improving people's coping mechanisms and encouraging their active engagement, we can increase their self-confidence and help them become more self-reliant as a community. We must utilise all available resources if community participation in disaster relief is to be sustained. Effective disaster relief requires the general public, non-governmental organisations (NGOs), government institutions and the active participation of residents of vulnerable communities. To effectively support disaster relief, vulnerable people and the relevant formal and informal institutions need to be equipped with sound management methods, operational planning, education and training.

The effectiveness of developing a rational and practical system that is responsive to community needs can be enhanced through the active participation of community members in identifying resources, capacities, coping strategies, and existing facilities to assess vulnerability. The concept of citizen participation can be understood as a social phenomenon in which marginalised groups mobilise themselves to address their daily demands and challenges, using both local resources and external support when necessary. To improve the feasibility of citizen participation, concerted efforts in the areas of education, training and awareness-raising must be prioritised among disadvantaged groups as well as relevant government agencies and the general public. In prioritizing community participation initiatives, the focus should be on both pre-disaster and post-disaster activities (Newport and Jawahar, 2003).

In many areas of disaster management, the involvement of the population is essential for coping with flood disasters. Community participation can be encouraged

throughout the disaster management process — from prevention and preparedness to response, rehabilitation and reconstruction, according to Hendra and Kismartini (2018). Gaillard (2010) argued that community involvement is necessary to effectively reduce disaster risk. However, many issues make it difficult for the community to engage, such as how inadequate and unsustainable it is (Sufri et al., 2020). Research by Beck et al. (2017), Cialdini et al. (2006), Mileti and Darlington (1997), Sorensen and Sorensen (2007), Thompson et al. (2017), Lindell et al. (2006), McClure et al. (2016), Vinnell et al. (2019) and Vinnell et al. (2021) all point to the importance of social norms for community participation and readiness. Researchers McIvor and Paton (2007) and Morrisson et al. (2014) found that individuals who are part of a social network that promotes preparedness are less likely to have a fatalistic attitude and more likely to have a positive attitude towards preparedness.

2.18 The Moderating Effect of Trust in Public Protection

The extent to which citizens believe in the state's ability to control and mitigate the effects of catastrophic events is referred to as "trust in public protection" (Han et al., 2016). A society that values individualism over collectivism may place a different emphasis on responsibility and trust in authority when it comes to preventing, planning for, responding to, and recovering from natural disasters (Han et al., 2016). According to Han et al. (2016), there is a lack of research on how trust affects disaster risk management.

Researchers have shown great interest in the role of trust in risk management (Slovic 1993; Earle 2010; Cvetkovich and Lofstedt 2013), with most studies focusing on technical or behavioural hazards (Earle 2010). Researchers in the field of risk management have shown great interest in the issue of trust (Siegrist and Cvetkovich, 2000; Earle, 2010; Cvetkovich and Lofstedt, 2013). No one has yet investigated the extent to which trust affects how people assess the risk of natural disasters (Wachinger et al., 2013).

Trust is an important factor in how people perceive the risks of natural disasters and how they and their households adapt to these risks through actions such as mitigation and preparedness, but few studies examine this issue in depth (Solberg et al., 2010; Lindell, 2013; Wachinger et al., 2013). Many studies have examined the impact of trust concerning technological hazards, e.g. concerning food safety, nuclear risks and

genetically modified organisms (Poortinga and Pidgeon, 2005; Earle, 2010; Lobb et al, 2007; Zhu et al, 2016). When considering the potential consequences of natural disasters, the importance of trust has been underestimated.

Perceived stakeholder characteristics, particularly trust in key stakeholders, have received little attention in studies of natural disaster behaviour (Solberg et al., 2010; Lindell, 2013). The adaptation of individuals and households to hazards is highly influenced by the perceived characteristics of stakeholders as well as the characteristics of natural hazards and protective measures (including mitigation and preparedness measures) (Lindell, 2013).

According to Siegrist and Cvetkovich (2000), the presence of trust serves to mitigate the complexity inherent in a given circumstance. When individuals have little information about a potential hazard, their assessment of the risk depends on how much trust they place in the people responsible for managing that risk. Terpstra (2011) found that the presence of positive emotions and trust in risk managers are of great importance as they are the primary mechanisms through which individuals cope with their limited understanding of the risk. A large part of the population does not have the necessary knowledge to assess the risks that can lead to unexpected outcomes. Recognising these uncertainties and living reasonably carefree behind the flood protection walls can only succeed if citizens have confidence in the risk specialists (Earle and Cvetkovich, 1995).

Grothmann and Reusswig (2006) discovered evidence for this relationship in the population of Cologne, a German metropolis on the Rhine, located about 175 kilometres upstream from the Dutch border. According to the authors of the study, perceived flood risk, including the frequency and intensity of flood events, was lower among people with greater confidence in public flood defences. They were also less willing to take safety precautions in the event of flooding. According to Terpstra (2011), there is a correlation between people's trust in public protection and their flood preparedness behaviour. It was assumed that people would be less likely to take preventative measures in the event of a flood if they had a high level of trust in flood defence measures.

In a study conducted by Han et al. (2016), researchers in a Tibetan region of China investigated the relationship between household earthquake preparedness and trust in the government. The study found that people were less prepared for earthquakes if they had

less trust in the government. The hypothesis is that people are more likely to rely on government support during disasters and are less likely to take precautionary measures if they trust the government.

It is important to consider the qualities perceived by stakeholders, especially the credibility of public officials (Arlikatti et al., 2007). Although there is some empirical research on this topic, the results are not conclusive. The correlation between public trust in government and personal initiative is the subject of contradictory findings in the literature. Basolo et al. (2009) discovered a positive correlation between trust in government and perceived preparedness, in contrast to Terpstra (2011) who argued that trust in government hinders preparedness.

Empirical studies on the effects of belief in authority on risk adjustment behaviour in families and individuals have shown mixed results. Han et al. (2016) found that citizens in California and New Orleans, USA, felt better prepared for earthquakes and hurricanes when they trusted their local government to manage disasters. After natural disasters, Chinese citizens have an unusually high level of trust in their government (Norris, 2011; Wang et al., 2012). However, if citizens place too much trust in the government to handle emergencies, they may not realise the importance of taking precautions (Han et al., 2011).

Both the perception and acceptance of environmental hazards are influenced by the level of trust in the authorities, as previous research in Chile shows (Bronfman et al., 2008, 2015). Similarly, DeYoung and Peters (2016) found that North Carolina citizens' trust in their government was not a strong predictor of their level of preparedness. One study that has examined adaptation to seismic hazards in the United States is that of Arlikatti et al. (2007). This study shows that both the primary and peripheral pathways to behaviour change are influenced by how trustworthy and conscientious stakeholders are.

Culture plays a role in how people in different countries respond to and prepare for natural disasters (Viklund, 2003), but the type of risks people face also plays a role. When people lack knowledge or experience of a particular type of natural disaster, the importance of self-awareness in disaster preparedness becomes even more apparent (Paton, 2007). Siegrist (2010) claims that confidence as a relational concept can reduce resilience from an individual's perspective. A study by Su et al. (2015) found that in mainland China, people's level of preparedness for floods correlates with their perception

of danger. According to the data, people are more willing to take long-term measures to reduce the impact of flooding if they trust each other.

According to Paton (2008), over-reliance on authorities and specialists as the main source of knowledge about natural hazards can hinder efforts to mitigate and prepare for such events. The reason for this is the belief that authorities will intervene and help during a crisis. From another perspective, trust has the potential to facilitate and strengthen cooperative efforts. As people are more inclined to follow the advice of civil protection officials if they have confidence in those responsible, this could lead to an increase in the public's willingness to take precautions against natural disasters and to prepare for them (Solberg et al., 2010). A 2012 study by Wang et al. (2012b) came to the same conclusions regarding citizens' attitudes towards disaster insurance. People living in areas with a higher prevalence of multi-hazard threats are less likely to purchase disaster insurance, mainly because they rely on government assistance to mitigate potential losses.

2.19 Hypotheses Development

2.19.1 Attitude

The concept of attitude toward a behaviour can be described as a person's positive or negative evaluation of a particular behaviour (Ajzen, 2012; LaMorte, 2019). Attitude formation depends on the evaluation of the consequences of behaviour concerning a person's expectations and the desirability of the outcomes (Ajzen, 1985; 1991). it is the process by which a person weighs up the pros and cons of a particular action (Jacob et al., 2023; Zaremohzzabieh et al., 2021). According to USAID (2017), attitude is the belief that adopting the intended behaviour is assumed to result in a favourable outcome. If a person is convinced that the outcome of a certain behaviour is either satisfactory or unsatisfactory, this leads to a corresponding positive or negative attitude. As a result, the intention to perform certain behaviours is influenced.

According to Fishbein and Ajzen (2011), an attitude refers to positive or negative feelings about a person's opinions, intentions, or actual behaviour toward an object. The temporal development of belief and its effects on attitude can be explained using Fishbein's expectancy-value model, a theoretical framework also used in the TRA

(Diyana et al., 2020). According to Rhodes and Courneya (2003), attitudes can be divided into two different categories: instrumental attitudes, which involve evaluative judgments about the consequences of the behaviour (e.g., whether it is good), and affective attitudes, which refer to emotional evaluations (e.g., whether the behaviour is pleasant).

Previous studies (e.g., Schettino et al., 2024; Jacob et al., 2023; Taylor and Yang, 2014; Myers and Goodwin, 2012; Asare and Heights, 2015) have examined the correlations between attitude and behavioural intentions in different contexts. Research by Schettino et al. (2024) found that Italian physicians who were receptive to incorporating massive open online course (MOOC) content into their practice were more inclined to implement it. The relationship between attitude and behavioural intention has been studied in various contexts, including the intention to vaccinate. Taylor and Yang (2014) conducted a study in the United States that found a positive correlation between attitude and intention to be vaccinated against swine flu.

A study conducted in the UK by Myers and Goodwin (2012) found a robust and favourable relationship between views and the desire for a swine flu vaccination. Asare and Heights (2015) also found that people who had a good attitude were more likely to comply with the request, confirming the essential link between attitude and behavioural intention. Aboelmaged (2021) also found that there is a strong correlation between young consumers' attitudes and their intention to recycle e-waste. Ataei et al. (2021) found that people's attitudes towards health and disease prevention influence their propensity to use environmentally friendly pesticides.

According to previous studies (e.g., Faraji Dehsorkhi et al., 2022; Cheng et al., 2015), attitude is the strongest predictor of behavioural intention of all categories of the TPB. It also shows a positive correlation with behavioural intention. Faraji Dehsorkhi et al (2022) used the TPB to determine behavioural intention and found that attitude is the most important factor. Previous research has shown a good correlation between attitude and behavioural intention, however, these studies did not focus specifically on disaster management.

Disaster risk reduction research based on the TPB is increasing. When it comes to reducing the impact of and preparing for natural disasters, attitude is key (Ao et al., 2020). Many studies show that people's attitudes correlate positively with their intention

to prepare in the event of an earthquake (Ong et al., 2021; Zaremohzzabieh et al., 2021; Rostami-Moez et al., 2020), flood (Budhathoki et al., 2020) or general disaster (Wang and Ritchie, 2012). Wang and Tsai (2022) and Zaremohzzabieh et al. (2021) are among the earlier studies that have also found that attitude is the most important predictor of disaster preparedness intention.

Studies on this topic have shown that people with a higher level of expertise and training in DRR are better able to anticipate and consider all possible consequences and at the same time take precautionary measures. The more people know the more they can hope that these measures will work (Tekeli-Yesil et al., 2010; Zaalberg et al., 2009). The likelihood of Filipino tourists returning to Siargao after a typhoon was analysed in a study by Cahigas et al. (2023a). The study revealed that positive attitudes had a significant impact on the formulation of tourists' intention to revisit Siargao. The respondents believed that returning to Siargao would bring more personal benefits than disadvantages (Cahigas et al., 2023a).

Xing et al. (2023) found that people are more inclined to do something if they believe it will make a good difference. According to Jacob et al. (2021), local officials are more willing to engage in climate adaptation because they believe it will make their cities less vulnerable to heat waves and flooding. A study conducted by Wang et al. (2022) provided empirical evidence to support the claim that attitude is positively associated with an individual's behavioural intention. Respondents in their study expressed a willingness to proactively address the potential hazards of flooding in China, believing that such behaviour could mitigate the effects of flooding. Ranjbar et al. (2021) supported these findings by demonstrating that people's positive attitudes toward disaster preparedness can positively influence them. Sujarwo et al. (2018) also found that students' attitudes have a significant influence on their disaster preparedness intention.

Gumasing and Sobrevilla (2023) examined the determinants of protective behaviours among Filipinos and found that attitude was positively and significantly associated with disaster preparedness intention. According to Rostami-Moez et al. (2020), people were more inclined to increase their earthquake preparedness after learning about the benefits of disaster preparedness. In a study by Najafi et al. (2017), a strong correlation was found between a person's attitude and their intentions. Ajzen (1991) argued that the TPB examines the formation of intentions and the subsequent

changes in attitudes, culminating in the decision-making process about precaution. According to Allen (2015), there is a significant relationship between individuals' attitudes toward disasters and their emergency preparedness behaviours.

Zaremozhzabieh et al. (2021) used an extended TPB to investigate the extent to which households were prepared for possible earthquake disasters. The results of the study show that people's attitudes towards earthquake preparedness were positively associated with individuals' intention to prepare for earthquakes. According to the results of the extended TPB, a person's attitude towards disaster preparedness is a key component of effective disaster preparedness.

Samaddar et al. (2014) found in their study that people with a high intention to prepare for disasters generally perceive preparedness measures as effective. Wang and Tsai (2022) investigated how Taiwanese educators deal with emergencies in the classroom. Their results showed a strong positive relationship between attitude and intention in terms of disaster preparedness. According to their research, educators are more likely to engage in disaster risk reduction programmes if they have a positive attitude towards the potential benefits for their students. To increase the positive evaluation of teachers' disaster preparedness behaviours in schools, the researchers found that it is possible to increase their knowledge of the importance of disaster preparedness efforts and engage in activities that strengthen their self-concept and emotional attachment to participating in disaster preparedness teams.

According to Ong et al. (2021), there is a favourable correlation between people's attitudes and their intention to prepare for earthquakes. The research also shows that farmers with negative attitudes towards flooding are less likely to take flood prevention measures. In addition, Hoffman and Muttarak (2017) found that a positive attitude is positively associated with people's intention to engage in activities that reduce disaster risk. After the Leyte landslide, Cahigas et al. (2023) investigated whether survivors intended to volunteer or not. The researchers found that the intention to volunteer in disaster relief was positively correlated with people's opinions. Participants in the study rated their involvement in the response to the Leyte landslide as easy, acceptable, rewarding and fulfilling their sense of responsibility. In addition, a positive relationship between attitude and intention to participate in preparedness was found by Ong et al. (2021). Furthermore, Najafi et al. (2017) investigated the relationship between the

attitude of the Tehran population and their intention to prepare for disasters in a study. Their results indicate a correlation between attitude and the intention to prepare for disasters.

In addition, Vinnell et al. (2021) used the TPB as a framework to examine the correlation between individuals' intentions to engage in natural hazard preparedness activities and their actual behaviour in the context of New Zealand. The researchers found a favourable correlation between attitude and intention to engage in DRR. Ong et al. (2021) investigated how people in the Philippines prepare for an earthquake and how this relates to their intentions. The study found that attitudes correlated positively with participants' intentions to prepare for a major earthquake. People who are in favour of implementing flood protection measures are more likely to participate in such actions if they consider the risk of flooding (Wang et al., 2022; Jacob et al., 2023). From the above explanation, it is clear that most past studies have found that attitude and intention are positively correlated. Therefore, this study predicts that there is a positive relationship between attitude and intention to prepare for the flood. Therefore, the following hypothesis was formulated:

H1: There is a positive relationship between attitude and flood preparedness intention.

2.19.2 Subjective Norms

Subjective norms refer to an individual's perception of the expectations that others have of a certain behaviour. These norms can be divided into two components: the injunctive component, which represents the social network's perception of the desired behaviour, and the descriptive component, which reflects the behaviour exhibited by that social network (Armitage and Conner, 2001; Rhodes and Courneya, 2003). Santana et al. (2021) and Najafi et al. (2017) describe subjective norms as an individual's perception of social pressure to engage in or refrain from a particular behaviour. The subjective norm is a construct that refers to a social influence that compels an individual to approve of another person's participation in a particular activity, which is determined by the individual's beliefs in a social context (Asare and Heights, 2015; LaMorte, 2019). The pressure experienced by individuals is influenced by the perspectives, expectations and degree of conformity of their caregivers and ultimately affects their behavioural propensity. Zaremohzzabieh et al. (2021) suggested that an individual's behaviour could

be influenced by the level of acceptance they receive from certain individuals, leading to the attainment of recognition.

According to Xu et al. (2023), it is essential to understand how individuals perceive the importance of social support to gain insight into the underlying motivations and determinants of self-protective behaviour. According to McIvor and Paton (2007), there is a remarkable correlation between subjective norms and disaster preparedness. This correlation suggests that individuals who perceive social pressure and expectations related to earthquake preparedness are more likely to demonstrate an intention to prepare for such events.

Najafi et al. (2017) conducted a study on the disaster preparedness behaviour of a sample of 1233 residents of Tehran. The results indicated a significant relationship between subjective norms and the intention to prepare for disaster. Subjective norms were also found to be positively correlated with swine flu vaccination intention (Taylor and Yang, 2014; Myers and Goodwin, 2012). Ko et al. (2004) investigated the influence of personal attitudes, subjective norms, and perceived control on nurses' intention and voluntary behaviour in caring for patients with severe acute respiratory syndrome (SARS). The researchers discovered a significant positive correlation between nurses' subjective norms and their intention to care for patients with SARS.

People live in a community characterised by exchange between individuals rather than being isolated within different cultural groups. The opinions of others have been shown to influence individuals' perceptions of environmental risk and their decisions regarding disaster preparedness (Lion et al., 2002; McGee and Russell, 2003; Earle, 2004; Poortinga and Pidgeon, 2004). According to Palm (1999), there is a positive correlation between higher subjective norms within communities and the existence of a collective problem-solving orientation. This collective problem-solving orientation motivates families to take proactive measures to prepare for earthquakes. Wang and Tsai (2022) investigated school disaster preparedness among Taiwanese teachers and found that when teachers received strong support and recognition for the importance of school disaster preparedness from their caregivers, their intentions to engage in disaster preparedness were positively influenced, which subsequently led to greater participation in school disaster preparedness activities.

Ong et al. (2021) found in their study that subjective norms are positively associated with earthquake preparedness intention, which is consistent with the underlying assumptions of the TPB. Subjective norm is an important aspect of social psychology and is influenced by cultural collectivism in Taiwan, which plays a crucial role in shaping school disaster preparedness through social influence. In their study, Cahigas et al. (2023) investigated the willingness of individuals to participate in volunteer activities after a landslide in Leyte. The results showed that subjective norms exerted a significant and positive correlation with the volunteering intention. Specifically, the study showed that respondents' willingness to volunteer was influenced by people who were important to them, such as family members, friends, neighbours, and communities.

Furthermore, in a study, Najafi et al. (2017) investigated the relationship between subjective norms and the intention to prepare for disasters among residents of Tehran. Their results indicate a positive relationship between subjective norms and the intention to prepare for disasters. Zaremohzzabieh et al. (2021) suggested that an individual's behavioural intention could be influenced by the level of acceptance they receive from certain individuals as a means of gaining recognition. Paek et al. (2010) and Ejeta et al. (2015) have also found that subjective norms have a high degree of predictive power concerning an individual's disaster preparedness intentions and engagement. Interestingly, subjective norms were the only variable that was positively correlated with disaster preparedness intention in Ng's (2022) study. A study conducted by Luu et al. (2019) found a positive relationship between subjective norms and adaptive intentions and behaviour.

Cahigas et al. (2023a) investigated Filipino visitors' intention to revisit Siargao after a typhoon hit the island. The results of the study indicate that tourists' subjective norms had a favourable influence on their intention to revisit Siargao despite the negative impacts of Super Typhoon Rai. The influential factors of subjective norms, which include the perspectives of family members, friends, acquaintances, and society, played a crucial role in motivating tourists to consider revisiting Siargao. Individuals' perspectives and viewpoints were highly valued due to the trust that tourists placed in them. Moreover, travellers experienced a sense of satisfaction when they visited places that were officially recognised by society, such as Siargao, in the company of their travel companions (Evans and Gagnon, 2019). Previous research has shown a remarkable and favourable correlation

between subjective norms and the desire to revisit, as evidenced by the studies of Liu et al. (2021) and Seong and Hong (2021).

Previous research has also shown that subjective norms exert a favourable influence on behavioural intentions (Jacob et al., 2023; Woosnam et al., 2022; Zaremohzzabieh et al., 2019). Consequently, the above-mentioned studies have found that individuals' willingness behaviour could be influenced by perceived pressure from reference groups. Individuals are more likely to adopt a disaster preparedness strategy if they perceive that their important reference groups such as colleagues, business partners, agents, customers and shareholders attach importance to disaster planning and express a desire for them to participate in disaster planning. Conversely, they are less likely to implement a disaster preparedness strategy if they do not perceive the beliefs and desires of their stakeholders. According to Geber and Hefner (2019), the relationship between subjective norms and behavioural intentions is conceptualised by the expectation of communication with people who serve as reference points and the expectation that group members will monitor one's actions. According to Jaeger and van Vugt (2022), the influence of the social environment forces individuals to adopt certain behaviours. Furthermore, the social expectations of individuals have been found to influence their intention to volunteer (Rasouli and Hamdi, 2020).

Research has shown that people show a higher willingness to prepare for disasters when they observe their neighbours, acquaintances or family members taking protective measures, such as purchasing flood insurance (Bubeck et al., 2018; Kunreuther et al., 1978). Furthermore, Botzen et al. (2019) found that norms play an important role in motivating people to participate in the preparation and implementation of flood risk mitigation strategies. According to research by Deutsch and Gerard (1955), subjective norms have the potential to elicit conformity in individuals because they want to be liked by others. This phenomenon is due to the inherent human tendency to seek social acceptance, and there are often emotional consequences when individuals deviate from established group norms.

Social norms are an essential component for individuals to gain social acceptance. They play an important role in guiding decision-making processes and influencing the overall health and well-being of individuals. Nguyen et al. (2022) argued that the COVID-19 pandemic has had a positive impact on individuals' adherence to preventive

measures, which is reflected in subjective norms that include behaviours such as wearing face masks and staying indoors. This behaviour is determined by the influence of one's community and manifests itself in different ways, such as staying at home, limited participation in public events, personal and social distancing and adherence to basic personal hygiene practices.

As previous studies by Tan et al. (2020) showed, the influence of society plays an important role in shaping an individual's propensity to act. The propensity of residents to prepare for a typhoon was positively correlated with their awareness of societal, familial and interpersonal expectations for preparedness. The formation of a social environment in which individuals interact with others such as friends and family members contributes to the importance, value and benefits attached to decision-making processes (Becker et al., 2012). Cultivating a culture of preparedness within local communities is critical as individuals are more likely to take preparedness actions when they observe or believe others have done so (Ng, 2022).

According to Cahigas et al. (2023b), subjective norms are positively related to an individual's reputation, as they strive to avoid being perceived as apathetic. Furthermore, it has been observed that individuals often conform to the prevailing norms in their social circles to experience a sense of belongingness and integration (Cahigas et al., 2023b). According to Xing et al. (2023), people are more susceptible to the influence of others and are more inclined to be guided in decision-making by people who are important to them. This behaviour can be attributed to a sense of trust in the organisation and a feeling of social connectedness. According to Palm (1999), there is a positive correlation between communities with higher subjective norms and a collective problem-solving background. This correlation often leads to families taking proactive measures to prepare for earthquakes. According to Kurata et al. (2023), the establishment of social norms plays a crucial role in improving individuals' preparedness for future floods. These norms facilitate the coordination of collective efforts and the maintenance of social cohesion in times of crisis.

A school can be viewed as a collective entity that plays a critical role in cultivating a culture that prioritises disaster risk reduction efforts. This can be achieved by fostering a sense of the importance of disaster risk reduction work, motivating teachers to actively participate in disaster risk reduction initiatives, and enhancing their sense of belonging to

the organisation. These measures help to promote teachers' participation in disaster risk reduction activities (Wang and Tsai, 2021). Chen and Tung (2014) claimed that subjective norms have the potential to exert a positive correlation with individuals' behavioural intentions. The influence of social pressure exerted by family, friends, and government officials can cause individuals to consider whether they should conform to the actions of others around them. This leads them to consider, "If everyone in my social circle is taking action, should I do the same?" or "If there is a consensus that I should participate, should I make an effort to do so?"

Hudson et al. (2020) conducted a study that shows the importance of assessing social capital, which refers to the connections between individuals within a society to adequately prepare for flood events. Legros and Cislighi (2019) suggested that subjective norms play a significant role in shaping action-oriented behaviour and decision-making processes and thus exert an influence on an individual's overall well-being. Botzen et al. (2019) explained that people living in communities that implement flood protection measures are more likely to adopt similar behaviours. According to Lo (2013), a person's perception of risk may not only be influenced by the inherent characteristics of the hazard itself but may also indirectly influence their commitment to adaptive behaviour or protective measures by shaping their sense of subjective norms.

Research has shown that people are more likely to engage in disaster preparedness when they observe their neighbours, acquaintances, or family members taking mitigation measures, such as purchasing flood insurance (Kunreuther et al., 1978; Bubeck et al., 2018). Furthermore, Botzen et al. (2019) found that subjective norms play an important role in motivating people to participate in the preparation and implementation of flood risk mitigation strategies. Individuals rely on their family, social and community networks to inform their interpretation of events and their consequences (Paton et al., 2008; Paton et al., 2014).

People often seek validation from their friends to confirm their ideas and their desire to be right. This validation serves the purpose of ensuring that their understanding matches the requirements and expectations of their social community to gain social recognition. Furthermore, this process allows individuals to further refine and develop their existing beliefs (Deutsch and Gerard, 1955). According to Zheng et al. (2019), youths tend to conform to the expectations and social norms set by their primary

caregivers. Numerous studies have shown that the extent of conformity depends on age, with younger individuals showing greater susceptibility to social influence compared to older individuals (Costanzo and Shaw, 1966; Hoving et al., 1969; Knoll et al., 2017).

In addition, the study by Vinnell et al. (2021) used the Theory of Planned Behaviour as a framework to examine the relationship between individuals' intentions to engage in natural hazard preparedness activities and their actual activities in the context of New Zealand. The researchers discovered a positive correlation between subjective norms and intentions to prepare for natural disasters. In addition, Motoyoshi et al. (2005) conducted a study examining the determinants of individuals' intentions to engage in disaster preparedness using the theoretical framework of TPB. Their results indicate a positive relationship between subjective norms and the intention to participate in local disaster prevention initiatives. In addition, Ng (2022) investigated the readiness for typhoons. The study found that subjective norms are positively correlated with typhoon preparedness intention.

Based on the above discussion, it is clear that most past studies have found that subjective norms and intention are positively correlated. Therefore, this study predicts that there is a positive relationship between subjective norms and intention to prepare for the flood. It is believed that the youths in the East Coast region of Malaysia consider the opinions and suggestions of the people around them to prepare for floods. The social environment of the youths, including family, friends and the wider community, exerts a significant influence on their behaviour, especially their intention to prepare for floods. In summary, youth who have positive subjective norms are more willing to prepare for floods to gain recognition and social approval. The expectations of group members also contribute to their intentions to prepare for flooding. Based on these results, the hypothesis is put forward:

H2: There is a positive relationship between subjective norm and flood preparedness intention.

2.19.3 Perceived Behavioural Control

Perceived behavioural control refers to a person's assessment of how easy it is for them to perform a certain behaviour (Jacob et al, 2023; Ham et al, 2015; Ajzen, 2012;

Asare and Heights, 2015; Demirel, 2018). The inclusion of perceived behavioural control in the model includes a component related to an individual's will and ability to exert control. This phenomenon encompasses a person's impression that they are in control of their actions and is thought to be influenced by their past experiences and their belief in their ability to overcome challenges (Ajzen, 1991). The construct of self-efficacy, as conceptualised by Bandura (1977), is often used as a measure to assess an individual's perceived ability to engage in a particular behaviour.

Furthermore, Ajzen (2012) found that perceived behavioural control plays a crucial role within the TPB, as it differs from the TRA. In a study conducted by Najafi et al. (2017), the behaviour of Tehran residents regarding disaster preparedness was examined. The results of the study indicated a significant relationship between perceived behavioural control and the intention to prepare for disaster. Wang and Tsai (2022) found that perceived behavioural control exerts a direct influence on both behavioural intention and actual action. The results of Kahlor et al. (2019) and Najafi et al. (2017) have shown that perceived behavioural control has a positive influence on people's willingness to engage in disaster preparedness activities, which is consistent with the theoretical framework of the TPB. Teachers who have high levels of self-confidence and access to adequate and relevant resources to support their DRR efforts show a greater willingness to engage in school-based DRR activities. Therefore, their participation in disaster risk reduction activities in schools is greater. The results of this study suggest that teachers' participation in school disaster risk reduction is primarily influenced by their capabilities.

Furthermore, Zaman et al. (2021) conducted a study in Pakistan and the study found that perceived behavioural control was positively associated with the intention to use big data to prevent natural disasters. Ubaidillah et al. (2022) investigated the determinants of disaster preparedness and found a positive relationship between perceived behavioural control and intention to prepare for a disaster. They believed that this positive relationship occurs when the ease with which a person prepares for a disaster encourages them to adopt a higher level of disaster preparedness. In Thailand, Ong et al (2023) conducted a study on tsunamis and found that perceived behavioural control was positively associated with the intention to prepare for a tsunami. Grothmann and Reusswig (2006) found that perceived behavioural control was positively related to the intention to take preventive measures against flooding.

Vinnell et al. (2021) used the TPB as a framework to examine the correlation between individuals' intentions to engage in natural hazard preparedness activities and their actual activity in the context of New Zealand. The researchers' investigation revealed a positive correlation between perceived behavioural control and intentions to engage in natural disaster preparedness activities. From the above explanation, it is clear that most past studies have found that perceived behaviour control and intention are positively correlated. Therefore, this study predicts that there is a relationship between perceived behaviour control and intention to prepare for the flood. Therefore, the following hypothesis was formulated:

H3: There is a positive relationship between perceived behaviour control and flood preparedness intention.

2.19.4 Perceived Susceptibility

Perceived susceptibility is a cognitive assessment of the likelihood that a person will experience a particular outcome (Gerend and Shepherd, 2012). According to Weber (2017), perceived vulnerability refers to a person's expectation of the potential impact of a particular disaster on their geographical area in the coming year. Currently, Malaysia is more vulnerable to the hazards associated with climate change mainly due to its geographical location, leading to a significant increase in the severity of floods (Tang, 2019). For individuals to prepare for the threat of flooding, they must have a perception of susceptibility to these hazards as described in the HBM and its adapted version (Ejeta, 2016).

According to Mideksa (2021), people are more likely to take preventive measures if they perceive a higher susceptibility to a particular situation. People who live in earthquake-prone regions and are aware of the potential impact of seismic events are more inclined to take precautionary measures than people in unaffected areas. Similarly, people living in regions characterised by floodplains and low-lying topography, where there is a lack of adequate warning systems and awareness, are more vulnerable to the harmful consequences of floods (Mashi et al., 2020; WHO, 2020). Glanz et al. (2008) further explained within the HBM that people are more inclined to engage in risk-reducing behaviours if they perceive themselves to be vulnerable to a particular disease.

Smith et al. (2017) and Al-Amer et al. (2022) in their study found that perceived susceptibility was positively associated with intention.

Abunyewah et al. (2018) found there was a positive correlation between perceived susceptibility and intention to prepare for natural disasters. They added that risk perception especially, particularly perceived vulnerability, is considered a motivating factor for an individual to adhere to recommended actions when it comes to natural disaster preparedness. Kusumastuti et al. (2021) argued that people at risk of flood disasters tend to be proactive because they are familiar with the flood warning systems in their communities. Kurata et al. (2022b) emphasised that the proximity of residents to vulnerable regions increases their vulnerability to natural disasters. Residents of low-lying, flood-prone areas share a collective knowledge of their community that plays an important role in reducing flood-related casualties and property damage. However, this knowledge also increases their vulnerability to the negative consequences of flooding (Mashi et al., 2020).

Zaalberg et al. (2009) and Terpstra (2011) also find a significant positive correlation between perceived susceptibility and the intention to take flood protection measures. According to Kanakis et al. (2016), people were more inclined to support and participate in additional preparatory practices. This suggests that a person is aware of the potential risks associated with the challenges could lead to greater behaviour change. In their study, Muhammad Mehedi et al (2018) examined community responses to flood risk management in marine protected areas in Malaysia. The researchers found that perceptions of susceptibility were positively related to people's intention to participate in prevention measures. The study conducted by Motoyoshi et al. (2005) examined the determinants of individuals' intentions to engage in disaster prevention and found that individuals show a greater intention to engage in local disaster prevention activities when perceived susceptibility to disaster occurrence is increased. From the above explanation, it is clear that most past studies have found that perceived susceptibility and intention are positively correlated. Therefore, this study predicts that there is a positive relationship between perceived susceptibility and intention to prepare for the flood. The following hypothesis was formulated:

H4: There is a positive relationship between perceived susceptibility and flood preparedness intention.

2.19.5 Perceived Severity

In the context of the HBM, disaster preparedness depends on the individual's assessment of the severity of the disaster (Glanz et al., 2002; Rosenstock, 1966; Rosenstock et al., 1988). Researchers (e.g., Inal, 2018; Teitler-Regev et al., 2011; Glanz et al., 2008) have argued that according to the HBM, perceived severity predicts behaviour. Perceived severity of flood refers to an individual's belief about the potential extent of harm or damage that could occur as a result of a major flood event (Ejeta et al., 2016). Kurata et al. (2022a) have identified several important factors that contribute to the perceived severity of flood disasters, including personal experience of natural disasters, level of alertness and preparedness. The combination of high population density, poverty and limited resources to cope with flooding and evacuation exacerbates the severity of the situation and increases the suffering of affected people (Parvin et al., 2016).

Mideksa (2021) examined cognitive traits associated with typhoon preparedness among public high school students in the Philippines. The study found a significant positive relationship between perceived typhoon severity and intention to prepare for a disaster. This suggests that the level of exposure to threat communication can influence the perception of the severity of the hazard, the ability to take recommended protective measures, and the effectiveness of such measures (Campasano, 2010). Perceived severity also was found to be positively associated with intention in the study carried out by Caesaron et al. (2021). According to Mideksa (2021), people tend to engage in cognitive processing and proactive planning when they perceive a higher level of danger or severity associated with an impending typhoon.

Inal et al. (2017) found a positive correlation between perceived severity and people's general disaster preparedness. Similarly, Wirtz and Rohrbeck (2018) reported a positive correlation between the perceived severity of the disaster and people's preparedness behaviour. In their study, Gumasing and Sobrevilla (2023) also discovered a direct and positive effect of perceived severity on people's intention to prepare for a disaster. According to Hamidi et al. (2020), people with an increased perception of severity are inclined to take precautionary measures and participate in preparedness activities. This heightened awareness leads to increased attention to warnings, the

development of evacuation plans and the implementation of strategies to protect themselves and their property in the event of a flood (Isia et al., 2023).

McCourt et al. (2021) emphasised that the perceived severity of the disaster has a direct and positive influence on pharmacists' intention to prepare for a disaster. Moreover, Amini et al. (2021) discovered that perceived disaster severity can increase disaster preparedness among women, especially when supported by health education interventions. Zaremohzzabieh et al. (2021) emphasised that people are only motivated to prepare for disasters if they recognise the relevance of the risks they are exposed to. Xu et al. (2020) found that information about natural disasters, combined with its credibility, has a positive effect on individuals' willingness to prepare by influencing their perception of the magnitude. Furthermore, Masud et al. (2018) showed that individuals' knowledge and experience of natural disasters increase their perception of severity and vulnerability, thus strengthening their intention to prepare for such events.

In a recent study by Ong et al. (2021) on earthquake preparedness in the Philippines, participants' intention to prepare for a major earthquake correlated positively with their perception of the severity of such an event. Similarly, the results of a study by Muhammad Mehedi et al. (2018) on the intention to prepare for floods showed a positive correlation between the perception of the severity of the event and the propensity to engage in flood prevention. This suggests that individuals who correctly assess the severity of the challenges they face are more likely to engage in significantly changed behaviour. From the empirical results of previous studies, it can be deduced that the perceived severity of the problem is positively related to people's intention to prepare for floods and take protective measures. Therefore, this study predicts that:

H5: There is a positive relationship between perceived severity and flood preparedness intention.

2.19.6 Past Experience

The concept of experience in the context of flooding refers to the experience of being affected by a flood disaster at least once in a person's life (Atreya et al., 2017). Disaster events force the affected individuals or organisations to experience being confronted with the most adverse circumstances. According to Tierney (1997), personal

experiences of disruption and damage encourage individuals to increase their preparedness for upcoming events. Becker et al (2017) suggested that experience is a significant factor that is recognised to have an impact on preparedness. Further exploration of the relationship between disaster experience and preparedness is based on the recommendations of the Sendai Framework (United Nations, 2015), with a particular focus on the Build Back Better (BBB) recommendation. The notion of BBB goes beyond physical impacts to encompass the use of disaster experience as a catalyst for developing future disaster risk reduction capabilities, particularly in terms of preparedness.

A study conducted by Gammoh et al. (2023) examined the extent to which people living in Jordan are prepared for flooding. The results of the study showed a significant correlation between past experience of flooding and the intention to engage in flood preparedness. The results of the study confirm the assumption that Jordanian citizens who have experienced a flood disaster have an increased awareness of the potential benefits of implementing effective and efficient preparedness measures, resulting from both positive and negative experiences (Hoffmann and Muttarak, 2017). Furthermore, it is plausible that this finding could be linked to the resilience paradox described by Ogunbode et al. (2018). This paradox suggests that people who have directly experienced previous flood events show a greater propensity to take precautionary measures. This tendency can be attributed to an increased level of stress and anxiety due to past experiences, as well as an increased belief in one's ability to effectively manage flood risks.

According to previous studies (Ogunbode et al., 2018; Demuth et al., 2016), people tend to show behavioural changes in response to natural disasters, especially concerning very negative emotional reactions such as worry and anxiety. It is assumed that these changes are motivated by the desire to mitigate the expected emotional consequences of future crises. It has been shown that the acquisition of prior knowledge and experience increases people's preparedness for natural disasters. This is attributed to the fact that previous experience prompts people to seek additional information about specific natural disasters, enabling them to better assess the likelihood of similar events in the future. Consequently, this increased awareness and knowledge contribute to improved decision-making and preparedness measures about natural disasters (Weinstein, 1989; Lindell and Perry, 2000).

Even if previous disaster experiences do not always have a direct effect on readiness, numerous studies have demonstrated their indirect influence and established them as an important factor for readiness (Lindell and Whitney, 2000). In contrast, Schmidlin (2010), in his study on risk factors and social vulnerability, found that women who were affected by the flood and stayed in their homes during the flood were more inclined to prioritise fixing windows to enable rapid evacuation in future floods. According to Sattler et al. (1995), people who have personally experienced natural disasters and property destruction tend to follow news more closely than those who have not experienced such events. In addition, past experiences could serve as a valuable resource for the government. The knowledge gained from people's experiences could be used to improve people's response and preparedness for upcoming crises (Said, 2011).

Muhammad Mehedi et al. (2018) conducted a study on preventive and precautionary measures for flood hazards and found a positive correlation between previous experiences with floods and the intention to prepare for floods. According to Hoffman et al. (2017), households that have experienced loss and damage from disasters acquire knowledge about the potential negative impacts of such events. As a result, these households increase their preparedness for future disaster events. Numerous empirical studies have found a positive correlation between individuals who have experienced floods (Bubeck et al, 2013; Lawrence et al, 2014; Lindell and Hwang, 2008; Siegrist and Gutscher, 2008), earthquakes (Mileti et al, 1992; Tekeli-Yesil et al, 2010), hurricanes (Horney et al., 2008; Sattler et al., 2000) and forest fires (McGee and Russell, 2003) and their tendency to prepare for possible future events. Past experiences with flooding have significantly raised awareness of the importance of preventative measures to mitigate negative health outcomes, including mortality (Nuriah et al., 2021).

In the study by Botzen et al. (2009), it was hypothesised that people who have experienced a flood event are more likely to imagine the occurrence of future floods. Consequently, these individuals may have higher hazard perceptions than those who have no first-hand experience of flooding. According to Viscusi and Zeckhauser (2006), a Bayesian learning perspective suggests that risk perception is likely to intensify after the occurrence of a disaster. Previous studies have found that households that had experienced severe earthquakes in the past were better equipped and better prepared than households that had not experienced such events (Shapira et al., 2018; Najafi et al., 2015).

Previous research (e.g., Norris et al., 1999; Sattler et al., 2000; Weinstein, 1989) has shown that people who have already experienced a disaster are more willing to prepare for future events. Individual risk perception and subsequent adaptation to flood hazards are influenced by previous experiences with storms and evacuations (Ge et al., 2011; Dash, 2002). Once individuals have gained sufficient awareness of flood risk management, they will be inclined to develop a constructive attitude towards prevention measures. According to Bosschaart et al. (2016), this would lead them to participate in flood prevention initiatives.

In addition, Castañeda et al. (2020) argued that individuals who have direct prior experience and are more frequently exposed to threats tend to have a higher level of preparedness. Consequently, exposure to coastal hazards plays an important role in determining vulnerability and adaptation strategies (Ehsan et al., 2022). The occurrence of recurrent flooding within marine protected areas poses a significant threat to both marine ecosystems and coastal populations, jeopardizing their overall well-being and economic sustainability (Jones et al., 2012). Several studies have also shown that people who have experienced disasters in the past are more likely to engage in disaster preparedness activities (Dahlhamer and Souza, 1995; Josephson et al., 2017), particularly in cases where the severity of damage has led to a prolonged recovery period (Tierney, 1997; Josephson et al., 2017).

Similarly, Mohammad-pajooh (2014) conducted a study on household experiences that found a remarkable and favourable correlation between past experiences and intentions to prepare for future flood events. According to Takao et al. (2004), people who have already faced floods are more inclined to take certain precautionary measures to avoid such events. Furthermore, Gammoh et al. (2023) claimed that individuals who have such experiences can develop skills and information that serve as an incentive and enable the implementation of protective measures against flooding.

Demuth et al. (2016) conducted a study in Miami, Florida, to investigate the influence of past experiences on people's intention to evacuate during future hurricane events. The results of this study showed a significant positive correlation between past experiences and the likelihood of evacuating in the face of future hurricanes. According to Demuth et al. (2016), individuals who have had previous experience with hurricane evacuations are more likely to experience higher levels of risk and fear of future storm

events. Consequently, their intention to evacuate in future crises is also increased. Ogunbode et al (2018) found that people who had been directly affected by the flooding had higher levels of self-efficacy in terms of protection against future flooding. This result suggests a link between previous flood experiences and increased anxiety and distress.

Investigating factors such as previous disaster experiences that may influence the intention to prepare for disasters could be the main topic in the field of disaster preparedness (Aerts et al., 2018). More experience with disasters leads people to intend to adopt more active disaster preparedness behaviours (Ariccio et al., 2020). Previous studies (e.g., Silver and Andrey, 2014; Dillon et al., 2011; Grothmann and Patt, 2005) have mentioned that disaster experiences influence people's adaptive behaviour intention. Wang and Tsai (2022) conducted a study on teachers' disaster preparedness. Their study found that teachers who have disaster experience have the intention to prepare for disasters.

Terpstra (2011) and Schad et al. (2012) pointed out that disaster experiences can change people's understanding of the need for preventive measures and usually affect their motivation to deal with future risks. However, experiences of flooding can influence people's response and preparedness for disasters, but they may not be enough to bring about a change in behaviour as people are unwilling to deviate from their routine (Lawrence et al., 2014; Box et al., 2016; Soetanto et al., 2016). In addition, a study in Australia found that Australians who have experienced flooding are less willing to take additional measures to prevent flooding (Box et al., 2016). As past studies show mixed results regarding the relationship between past experiences and flood preparedness intention, the hypothesis of the study is formulated as follows:

H6: There is a relationship between past experience and flood preparedness intentions.

2.19.7 The relationship between Perceived Behavioural Control and Flood Preparedness Behaviour

Perceived behavioural control is identified as the third predictor within the TPB. It refers to the individual's subjective assessment of an individual capability to perform a particular behaviour. In general, it can be assumed that a person's desire to perform a particular behaviour is likely to be stronger if they have a more positive attitude and

subjective norm towards the behaviour and if they have a better sense of control over their ability to perform the behaviour. Intention is commonly regarded as the primary precursor to observable activity. However, success depends not only on the individual's intention but also on some external circumstances, some of which are not motivating. These elements include the presence of appropriate opportunities and resources that have a direct impact on a person's ability to control their behaviour (Najafi et al., 2017).

The anticipation of disaster preparedness behaviour depends on the temporal consistency of goals and perceived behavioural control. If the values of these variables change before the behaviour is observed, they no longer allow accurate predictions. In addition, the accuracy of behaviour prediction depends on the individual's level of perceived behavioural control. According to Najafi et al. (2017), the improvement of prediction accuracy in behavioural success depends on the condition that the perception of control is reasonably accurate. In their study, Najafi et al. (2017) found that perceived behavioural control plays an important role in predicting disaster preparedness behaviour. Furthermore, Ogden (2012) found that perceived behavioural control can predict behaviour regardless of intention. The construct of perceived behavioural control was found to have a significant impact on behavioural intention and the behaviour itself (Ajzen, 2006).

Ogden (2012) also found that perceived behavioural control can positively predict behaviour independently of intention. Numerous studies have provided evidence that a strong sense of self-efficacy can serve as a motivating factor for various behaviours (Van Valkengoed and Steg, 2019; Tang and Feng, 2018; Yu et al., 2020), including specific protective actions in emergencies such as evacuation (Samaddar et al., 2014). According to Heidenrich et al. (2020b), individuals who have confidence in their knowledge and ability to comply with precautionary measures successfully adopt behaviours aimed at preventing and mitigating the negative consequences associated with flood disasters.

It is generally accepted that the variable of perceived behavioural control has a direct impact on the prediction of behaviour. According to Giles and Cairns (1995), the successful performance of a particular behaviour depends not only on motivation but also on the presence of sufficient control over the behaviour in question. The revised version of the theory of planned behaviour recognises that perceived behavioural control can act as an indicator of genuine control. Consequently, a direct link between control and

behaviour is assumed, without intention playing a role. From this, it can be deduced that the ability to perceive and control one's behaviour plays an important role in predicting the achievement of goals, regardless of the intention to perform the behaviour. This prediction holds as long as the perceived behavioural control accurately reflects the actual level of control, as Ajzen found in 1988.

The construct of perceived behavioural control is similar to perceived self-efficacy in the context of the extended parallel process model and describes the subjective assessment of a person's ability to perform certain actions (Rogers, 1983). Self-efficacy, as defined in the health belief model, refers to a person's subjective assessment of his or her ability to perform a particular behaviour effectively (Rosenstock et al., 1988). The extent of a person's intrinsic motivation is determined by the self-confidence created (Bandura, 1977). Following this principle, it is important to ensure that young people are provided with sufficient external resources to enhance their understanding of disaster avoidance and their perceived ability to manage their behaviour in such situations. This in turn will increase their inherent incentive to engage in flood disaster preparedness.

Numerous studies have shown that a strong perceived behavioural control can serve as a motivating factor for individuals to engage in disaster risk reduction activities, including intention formation and actual behavioural responses (Van Valkengoed and Steg, 2019; Tang and Feng, 2018; Yu et al., 2020). In addition, perceived behaviour control has been found to play an important role in the adoption of certain protective measures in emergencies, such as emergency evacuation (Samaddar et al., 2014). Previous studies (Bubeck et al, 2017; Richert et al, 2017; Botzen et al, 2019; Seebauer and Babicky, 2020; Rostami-Moez et al, 2020; Valkengoed and Steg, 2019) have shown a positive relationship between perceived behavioural control and preparedness for floods, earthquakes and climate change-related hazards. From the above explanation, it is clear that most past studies have found that perceived behaviour control and behaviour are positively correlated. Therefore, this study predicts that there is a positive relationship between perceived behaviour control and flood preparedness behaviour. Therefore, the following hypothesis was formulated:

H7: Perceived behaviour control is positively associated with flood preparedness behaviour

2.19.8 Flood Preparedness Intention and Flood Preparedness Behaviour

Behavioural intention is a construct that refers to the effects of certain behaviours (Kagee and Freeman, 2017). When measuring intentions, individuals are often asked about their expectations to engage in a certain behaviour soon (Francis et al., 2004). A study conducted by Becker et al. (2013) found that the level of preparedness for various natural disasters such as tsunamis, floods, bushfires and volcanic eruptions is strongly influenced by individual preparation intentions. Paton et al. (2003; 2006b) have shown in their research that the desire to prepare is a significant predictor of the adoption of protective measures. According to Paton et al. (2006a), individuals who have the intention to prepare for disaster preparedness are more likely to take these measures.

Arafat and Mohamed Ibrahim (2018) and Mimiaga et al. (2009) have postulated that the cultivation of a positive attitude in conjunction with subjective norms and improved perceived behavioural control is associated with increased individual behavioural intention and leads to the performance of behaviour (Ajzen, 2012). Gerend and Shepherd (2012) discovered a positive correlation between individuals' intention to be vaccinated and actual uptake of vaccines. The most important determinant of behaviour in the theory of planned behaviour is an individual's intention to behave. The likelihood of engaging in an activity increases in proportion to the strength of one's intentions. Gerend and Shepherd (2012) found that intentions are the most influential factor in predicting vaccination participation, accounting for about 50% of the variability in individual behaviour. The results suggest that the inclusion of intentions, which are closely related to the components that influence behaviour, is likely to increase the effectiveness of the model.

Paton et al. (2005) argued that behavioural intention is a reliable measure for evaluating actual behaviour. Numerous academic studies address the concept of behavioural intention, as shown in the work of Najafi et al. (2017), Ong et al. (2021) and Zaremohzzabieh et al. (2021). Sheeran and Webb (2016) investigated the discrepancy between people's intentions and their subsequent behaviour. The researchers sought to determine the extent of this discrepancy, determine the point at which intentions are translated into actions, identify barriers that prevent individuals from achieving their goals, and suggest techniques aimed at reducing the discrepancy between intentions and behaviour. Therefore, it is important to examine the correlation between behavioural

intentions and concrete actions that affect teachers' willingness to engage in school disaster preparedness.

Wang and Tsai (2022) found that the overall model has significant explanatory power for both behavioural intention and actual action. This finding suggests that the theory of planned behaviour applies to the context of teachers' involvement in school disaster preparedness. Wang and Tsai (2022) found in their study that the comprehensive model has significant explanatory power with an R^2 value of 54% for variability in behavioural intention and 47% for variability in actual behaviour. Gumasing and Sobrevilla (2023) conducted a study to examine the different elements that influence the protective behaviour of Filipinos. Their results showed that the intention to prepare for a disaster was the most influential factor that positively affected people's protective behaviour. The importance of a person's inclination to engage in various preparedness activities, such as participating in drills, assembling disaster kits, and educating themselves about natural disaster preparedness, is evident in the development of disaster preparedness (Ng, 2022). This observation is in line with the conclusions of Kievik and Gutteling (2011) who found that a person's inclination or intention to prepare for floods has a remarkable and positive influence on the development of their self-protection measures in response to flood hazards.

González Riancho et al. (2017) back up this assertion with their study of the storm surge resilience of communities on the German North Sea coast. Their findings highlight the importance of community resilience and their willingness to engage in collaborative efforts to improve their ability to withstand the impacts of a storm surge. It can be inferred that the cultivation of an individual's defensive behaviour depends largely on their intention to make adequate preparations. Furthermore, Najafi et al. (2017) investigated the relationship between the intention to prepare for disasters and the actual disaster preparedness behaviour of Tehran residents. The results of their study indicate a positive relationship between the intention to prepare for disasters and participation in disaster preparedness activities. In addition, Ao et al. (2020) in their study also found that residents' disaster preparedness intention was positively correlated with disaster preparedness. From the above explanation, it is clear that most past studies have found that intention and behaviour are positively correlated. Therefore, this study predicts that

there is a positive relationship between flood preparedness intention and flood preparedness behaviour. Therefore, the following hypothesis was formulated:

H8: There is a positive relationship between flood preparedness intention and flood preparedness behaviour.

2.19.9 Moderating Effects of Community Participation on the Relationship between the Predictors and Flood Preparedness Intention

Community participation, in the role of a moderator, is a factor that strengthens or weakens the relationship between the predictors (attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, past experience) and the intention to prepare for the flood. Community participation encompasses a wide range of activities that help to raise public awareness of the causes and consequences of a disaster. These activities also include integrating socio-cultural values and norms and empowering the public to take responsibility and leadership in the communication process (Novak et al., 2019). Community participation refers to the extent of interpersonal engagement of individuals that facilitates the process of social construction of risk perceptions, the development of risk management ideas, and the implementation of risk reduction strategies through collaborative efforts to support other members of the community.

According to Abunyewah et al. (2020), community participation involves the mutual and ongoing communication of information on flood risk and preparedness within the community and between professionals and community members. Hikichi et al. (2017) expressed concern about the impact of social participation on elderly people who had experienced the Great East Japan Earthquake and tsunami in 2011. They observed that such participation served as a protective factor against the negative consequences of housing destruction and subsequent displacement.

Previous studies have shown that community participation is a predictor of preparedness intentions (Adhikari et al, 2018; Zaremohzzabieh et al., 2021; McGee and Russell, 2003; Paton et al., 2005; and Tierney et al., 2002). Adhikari et al. (2018) emphasised that community participation is a more accurate indicator of a person's propensity to engage in disaster risk reduction activities. Hofstede (2001) outlined five different cultural dimensions that can be used to analyze and understand cultural differences. These dimensions include individualism-collectivism, power distance,

uncertainty avoidance, masculinity-femininity and long-term orientation. Hofstede (2001) used the concept of individualism-collectivism to illustrate the extent to which, in a given society, the priorities and concerns of the individual take precedence over those of the collective. This observation has significant implications for improving flood preparedness at both the individual and community levels. In cultures that favour collectivism, people's behaviour is influenced by cultural beliefs that emphasise the importance of shared goals and adherence to social norms. This encourages the development of social bonds that are geared toward achieving collective goals and future aspirations (Paton and Jang, 2016).

Community participation includes various forms of engagement, such as volunteer activities, organisational affiliation, religious affiliation, provision of land to government agencies, and participation in disaster preparedness organisations (Ali and George, 2021; Rayamajhee and Bohara, 2021). Community participation also serves as a mechanism to alleviate the hardship and misery of marginalised populations (Abunyewah et al., 2020; Rayamajhee and Bohara, 2021). The active participation of the community, especially the younger generation, plays a crucial role in achieving sustainability through the initiatives outlined in the National Disaster Risk Reduction and Management Plan (NDRRMP). Communities are the foundation for disaster risk reduction and management. The involvement of community members is paramount in both the pre-disaster and post-disaster periods. Consequently, developing a community-based action plan allows people to voice their needs and determine appropriate strategies for support (Van der Meer et al., 2014). Therefore, to achieve sustainability in DRRM programs, it is essential to involve the community to effectively address all necessary DRRM strategies (Pandey and Okazaki, 2005).

In the context of preparedness decisions, social networks play an important role in shaping individuals' attitudes to many issues, including risk. These networks create an ecosystem of influence that helps to develop and shape people's views on such issues. In the area of risk management, these networks provide various management strategies and support risk perception, confirm or dispel uncertainty, and disseminate relevant and helpful material that matches participants' preferences and expectations. Uncertainty in risk perception and risk management is influenced by the information disseminated by others (Paton et al., 2008; Earle, 2004; Lion et al., 2002). According to Paton and

McClure (2013), community participation plays a crucial role in the social construction of risk attitudes by facilitating collective attempts to help other members of the community.

In addition, building trust, providing opportunities for public participation, and implementing community participation and education programs can serve as facilitators for successful interactions between communities and agencies related to natural disaster preparedness. Elsworth et al. (2009) and Olsen and Shindler (2010) have already addressed this issue. According to Mondal et al. (2021), people associated with non-governmental organisations show a greater propensity to take preparedness measures in the aftermath. According to Maidl et al. (2021), there is a positive correlation between a higher level of social participation and a greater tendency towards responsible and preventive behaviour. This assumption is further supported by the findings of Chiu et al. (2013), who postulate that personal networks play an important role in the dissemination of knowledge and attitudes. Zaremohzzabieh et al. (2021) found that community participation strengthened the correlation between the independent factors and the dependent variables studied.

Based on the previous discussions, it is hypothesised that community participation is a crucial predictor that can enhance individuals' intention to prepare for disasters. However, previous studies have shown conflicting results regarding the relationships between predictors (attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, and past experience) and flood preparedness intention. As mentioned earlier, many studies have found positive associations between attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, and past experience with flood preparedness intention (Taylor and Yang, 2014; Wang and Tsai, 2022; Ong et al, 2021; Najafi et al, 2017; Vinnell et al, 2021; Kahlor et al, 2019; Muhammad Mehdi et al, 2018; Mideksa, 2021; Josephson et al, 2017; Mohammad-pajooh, 2014).

In contrast, several studies have found no significant relationship between the predictors (attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, and past experience) and the intention to prepare for flooding (Vinnell et al, 2019; Prasetyo et al, 2020; Armitage and Conner, 2010; Morris et al, 2012; Taylor and Yang, 2014; Myers and Goodwin, 2012; Kanakis and McShane,

2016; Paton et al, 2001; Palm and Hodgson, 1992; Ashenefe et al, 2017; De Dominicis et al, 2014; Sun and Xue, 2020; Cheng, 2016; Singh et al, 2014).

According to Baron and Kenny (1986), the inclusion of moderator variables is usually used in situations where there is an unexpectedly weak or incongruent relationship between the exogenous variables and the endogenous variables. Therefore, in this study, community participation was used as a moderating variable to moderate the relationships between the variables in the study. Dawson (2014) emphasised the importance for researchers to not only anticipate the presence of an interaction effect but also to anticipate its specific manifestation or direction. Therefore, this study hypothesised that:

- H9: The positive relationship between attitude and intention will be stronger when community participation is higher.
- H10: The positive relationship between subjective norms and intention will be stronger when community participation is higher.
- H11: The positive relationship between perceived behavioural control and intention will be stronger when community participation is higher.
- H12: The positive relationship between perceived susceptibility and intention will be stronger when community participation is higher.
- H13: The positive relationship between perceived severity and intention will be stronger when community participation is higher.
- H14: Community participation moderates the relationship between past experience and flood preparedness intention.

2.19.10 Moderating Effect of Trust in Public Protection on the Relationship Between Flood Preparedness Intention and Flood Preparedness Behaviour

Based on the theoretical framework of TPB, it is postulated that intention plays a crucial role in predicting behaviour as it has the potential to motivate individuals to engage in certain behaviours (McEachan et al., 2011). The influence of intentions on behaviour is considerable, and changing behavioural intentions leads to a corresponding

change in behaviour (Sassen et al., 2015). Even when several individuals have the intention to change their health-related behaviour, they do not necessarily take proactive action. The phenomenon described above has been identified and termed the 'intention-behaviour gap' (Sniehotta et al., 2005).

The strength of the relationship between intention and behaviour is enhanced when intentions remain consistent over time, and the degree of stability of intentions can influence the nature of this relationship (Conner and Godin, 2007). According to Fishbein and Ajzen (2010), the likelihood of an activity being performed is higher when there is a strong intention behind it. Although the TPB has demonstrated significant predictive abilities, it is evident that there is a notable discrepancy between individuals' intentions and their subsequent behaviour (Sheeran, 2002). The predictive power of intentions as assessed before engaging in an activity can be influenced by various factors, such as the acquisition of new information or the occurrence of unforeseen obstacles (Conner and Godin, 2007). This can ultimately lead to a decrease in the accuracy of these predictions. Previous studies have pointed out a potential limitation of this theory, which is that there is not always a direct translation from behavioural intention to actual behaviour (Mimiaga and Safren, 2009). Sutton (1998) conducted a meta-analysis to evaluate the effectiveness of the TRA and the TPB in predicting and explaining health intentions and behaviours. In general, these models explain about 40 % to 50 % of the variability in intentions and 19 % to 38 % of the variability in behaviour.

According to Amireault et al. (2008), intention plays a decisive role in influencing one's behaviour. Nevertheless, there is a discrepancy between intention and actual behaviour that needs to be clarified. Empirical evidence from reviews and meta-analyses suggests that intention has significant predictive power and explains approximately 20 to 40% of the variance in exercise behaviour (Godin and Kok, 1996; Hagger et al., 2002; Downs and Hausenblas, 2005). As Cohen (1992) found, this phenomenon can be classified as a medium to large effect size. However, there is a discrepancy between the individual's intentions and their subsequent actions (Kelley and Abraham, 2004). This discrepancy arises primarily among those who have good intentions to engage in physical activity but do not follow through with their intentions. This particular group makes up about a third of the total population (Godin and Conner, 2008). This discovery is

consistent with the findings of Sheeran (2002), who also identified this group as the main contributor to the intention-behaviour gap.

It is worth noting that the available research suggests that the differences in the association between intention and behaviour between active and inactive individuals cannot be attributed to differences in cognitive factors such as attitude, subjective norm, perceived behavioural control, and intention (Sheeran, 2002; Godin et al., 1986). The discrepancy between individuals' intentions and their subsequent behaviour may be attributed to differences in cognitive processes or other unidentified variables. Therefore, it is essential to examine certain elements in more detail.

There is a well-documented discrepancy in the literature between consumers' self-reported intentions and their actual behaviour (Carrington et al., 2010). People often believe that they intend to do something but do not stick to their actual behaviour. Wang et al. (2020b) found that there is a discrepancy between intention and behaviour. Residents often state that they have the intention to sort waste, while the actual rate of waste sorting is rather low (Czajkowski et al., 2014; Zhang et al., 2019). Hage et al. (2008) suggested that the link between intention and behaviour depends on external conditions. Certain external conditions help to transform intention into actual behaviour (Wang et al., 2020b).

Baron and Kenny (1986) asserted that the lack of consistency in the expected correlation between an independent variable, such as intention, and a dependent variable, such as behaviour, may indicate the influence of a third variable on the direction and magnitude of that relationship. The relationship between intention and behaviour may show fluctuations due to the varying magnitude of a third variable, sometimes referred to as an effect modifier or moderator. The relationship between intention and behaviour is expected to show a stronger correlation for a given level of moderator. Therefore, one possible research approach to gain insight into the discrepancy between intention and behaviour is to examine the factors that moderate this relationship.

The importance of intention as a preparatory factor for human action is generally recognised in the literature. However, it is important to note that there is no direct causal relationship between intention and subsequent behaviour. According to Ajzen (1987), intentions are responsible for about 30% of the variability in behaviour. This statement

was confirmed by a comprehensive meta-analysis by Armitage and Conner (2001), which examined a total of 185 papers. The researchers found that on average 27% of behavioural variability can be explained by behavioural goals. Sheeran (2002) pointed out that those who have positive intentions but do not act are referred to as "inclined abstainers" This observation suggests that the relationship between intention and behaviour lacks consistency, as pointed out by various researchers (Kolvereid, 1996; Wiedemann et al., 2009).

Valois et al. (2020) found in their study that the intention to adopt these behaviours does not provide such a good explanation for the adoption of adaptive behaviours (R^2 was only 26.2%). Further studies are needed to understand how to improve the transition from intention to the adoption of protective behaviours (Valois et al., 2020). Fayolle and Liñán (2014) suggested that the link between intention and behaviour deserves special attention. Trust in public protection has received considerable attention in recent literature (Basolo et al, 2009; DeYoung and Peters, 2016; Kim and Oh, 2015; Han et al, 2017; Lin et al, 2007). According to Wei et al. (2019), there is a need to investigate the impact of trust in public protection on improving individuals' disaster preparedness.

Several studies conducted in the European context have shown a favourable correlation between trust in public protection and disaster preparedness behaviour (Poussin et al., 2014; Maidl et al., 2021). Wei et al. (2019) discovered a positive correlation between trust in public protection and the extent to which households participate in preparedness measures. According to Paton (2003), trust in public protection has been suggested as a potential moderating variable for the relationship between the intention to prepare for a disaster and actual behaviour. In their study, Seebauer and Babcicky (2018) found a positive correlation between trust in public protection and the actual implementation of risk reduction measures. The following hypothesis was therefore put forward:

H15: The positive relationship between flood preparedness intention and flood preparedness behaviour will be stronger when trust in public protection is higher.

2.20 Conceptual Framework

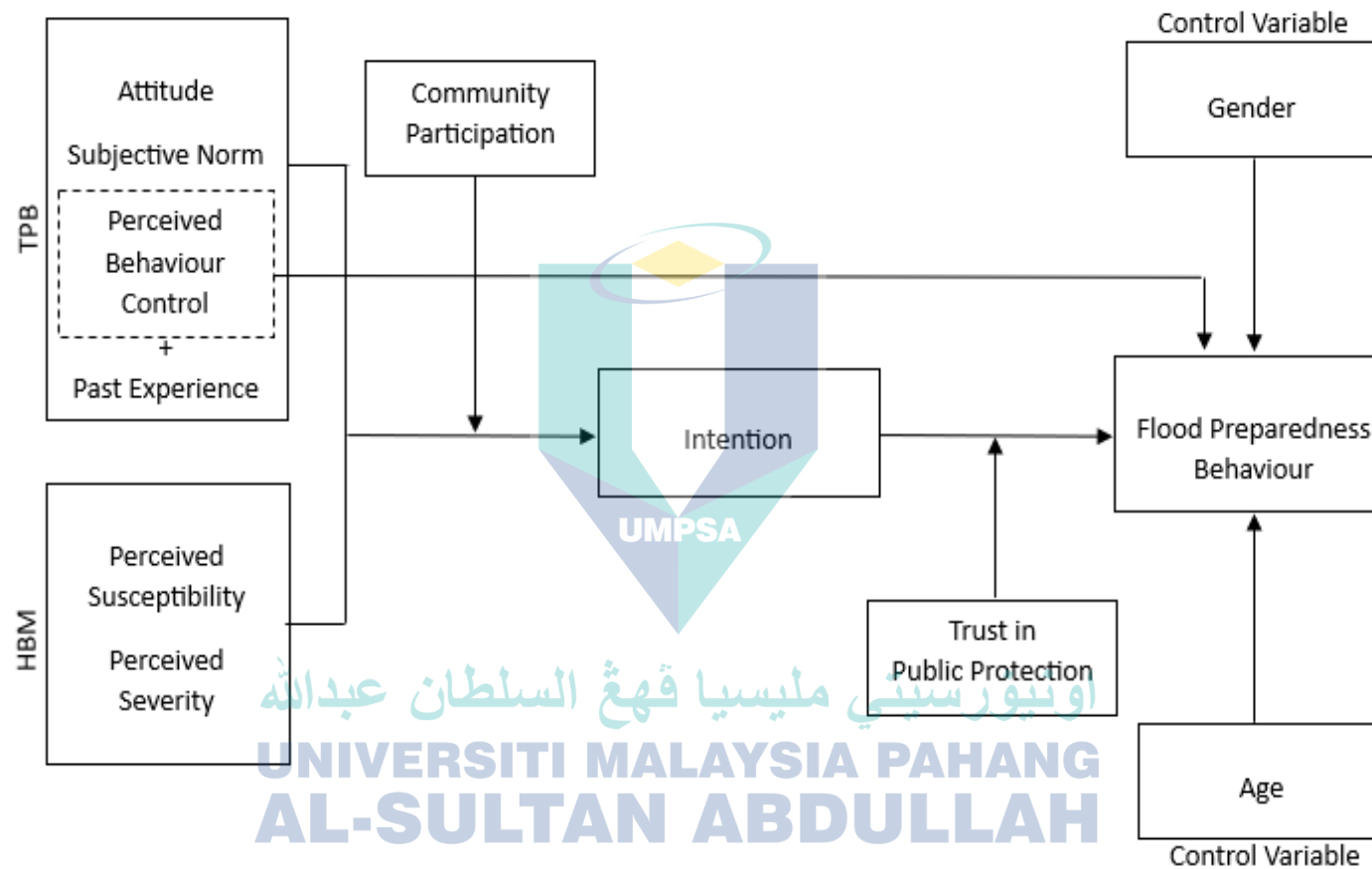
Floods are one of the most devastating natural disasters, causing widespread damage and posing a significant threat to communities worldwide. In the context of disaster risk reduction, it is of paramount importance to understand the factors that influence people's intentions to prepare for floods and their subsequent behaviour. This study utilised two theories, namely the TPB and the HBM, to underpin the examination of the factors influencing flood preparedness.

Several predictors play a crucial role in shaping individual flood preparedness intentions. These predictors include attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, and past experience. Based on the integrated framework, these factors are hypothesised to be associated with youths' intentions to prepare for flooding. Youths who have a positive attitude toward preparing for floods, who perceive social pressure to prepare, who believe in their ability to take preparatory actions, who acknowledge their vulnerability to floods, and who recognise the severity of potential flood consequences are more likely to express an intention to prepare for future floods. This study also predicted that there is a relationship between past experience and flood preparedness intention.

The intention to prepare for floods is an important step towards behaviour. Therefore, the intention to prepare for floods is expected to be positively associated with actual flood preparation behaviour. Youths who have a strong intention to prepare for floods are more likely to translate this intention into concrete actions, such as donning emergency kits, developing evacuation plans, or reinforcing their homes to withstand flooding. In addition, two moderating variables, community participation and trust in public protection, are introduced in this study to further elucidate the relationships within the integrated framework. Community participation is predicted to positively influence the relationship between the predictors (attitude, subjective norms, perceived behavioural control, perceived susceptibility, and perceived severity) and the intention to prepare for flooding. This means that the influence of these predictors on the intention to prepare for flooding is likely to be stronger when people are actively engaged in their communities. This study also predicted that community participation moderates the relationship between past experience and flood preparedness intention.

It is predicted that trust in public protection will positively moderate the relationship between flood preparedness intention and flood preparedness behaviour. Youths who have a higher level of trust in public institutions will be more likely to translate their intentions into concrete preparedness actions. By examining these predictors and moderators, researchers and policymakers can gain valuable insights into how to promote flood preparedness at both individual and community levels. Implementing policies that target these factors can contribute to more resilient and disaster-ready communities that ultimately mitigate the negative impacts of flooding and save lives in times of crisis. The constructs of the study and their interactions in predicting the behaviour of youths in the East Coast region of Malaysia concerning flooding can be illustrated in Figure 2.5.





Note: TPB – Theory of planned behaviour, HBM – Health belief model.

---- Direct relationship between perceived behavioural control and flood preparedness behaviour.

Figure 2.5 Conceptual Framework.

Table 2.5 Summarised Hypotheses

Hypothesis	Description
H1	There is a positive relationship between attitude and flood preparedness intention.
H2	There is a positive relationship between subjective norms and flood preparedness intention.
H3	There is a positive relationship between perceived behavioural control and flood preparedness intention.
H4	There is a positive relationship between perceived susceptibility and flood preparedness intention.
H5	There is a positive relationship between perceived severity and flood preparedness intention.
H6	There is a relationship between past experience and flood preparedness intentions.
H7	Perceived behaviour control is positively associated with flood preparedness behaviour.
H8	There is a positive relationship between flood preparedness intention and flood preparedness behaviour.
H9	The positive relationship between attitude and intention will be stronger when community participation is higher.
H10	The positive relationship between subjective norms and intention will be stronger when community participation is higher.
H11	The positive relationship between perceived behavioural control and intention will be stronger when community participation is higher.
H12	The positive relationship between perceived susceptibility and intention will be stronger when community participation is higher.
H13	The positive relationship between perceived severity and intention will be stronger when community participation is higher.
H14	Community participation moderates the relationship between past experience and flood preparedness intention.
H15	The positive relationship between flood preparedness intention and flood preparedness behaviour will be stronger when trust in public protection is higher.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This study incorporates six exogenous variables, two moderating variables and two endogenous variables. Chapter Two presented a conceptual framework describing the various relationships between the variables in the study. In the chapter, fifteen hypotheses were developed, which were derived from theories and previous empirical studies. Therefore, Chapter Three describes and justifies the methods and procedures used to answer the research questions and objectives. This section describes the research paradigm, the research design, the sampling technique, the data collection procedures, the instrumentation, the pretest and pilot test, the statistical tools used and the approaches to data analysis.

3.2 Research Paradigm

A research paradigm must be clearly defined before a research project can begin (Creswell, 2003). It refers to the underlying belief system that guides the researcher (Guba and Lincoln, 1994). Research paradigms are classified as positivism, constructionism, critical realism, and pragmatism (Sekaran and Bougie, 2016; Bougie and Sekaran, 2019). The most important approach to choosing the research paradigm for a study is to refer to previous studies related to the researcher's field of study. The research paradigm can be established by reviewing the pertinent literature, which can offer a distinct prediction of the behaviour of a certain phenomenon (Remenyi et al., 1998). This study is based on the positivist research paradigm. Specifically, a positivist epistemology, an objectivist ontology and a deductive approach (methodology) were chosen in this study.

The paradigm of positivism is a research belief that supports quantitative studies. Many empirical studies on flood preparedness have used a quantitative methodology (Terpstra, 2011; Mishra et al., 2010; Samaddar et al., 2014; Poussin et al., 2014; Mishra

and Suar, 2011; Kerstholt et al., 2017; Ashenefe et al., 2017; Atreya et al., 2017; Mabuku et al., Ejeta et al., 2018; Babcicky and Seebauer, 2019; Boonyaratkalin et al., 2021; Monteil et al., 2022). These studies used theories to underpin their research. Drawing from existing theories and prior research, this study developed several hypotheses to examine the relationship between the exogenous and endogenous variables. This study also employed questionnaire surveys as a means of collecting data from respondents and used SmartPLS software to examine the research model.

The research paradigm of positivism was used in this study because the research area at hand (disaster risk reduction) is similar to the studies conducted by the stated scholars. This is because the present study also uses theories to underpin the variables of the study. In this study, a deductive approach was used in which the hypotheses of the study were developed and derived from the theories. In other words, 15 hypotheses were developed, all of which were derived from theories. After the hypotheses were developed, the researcher proceeded with the data collection where 350 youths in the East Coast region of Malaysia answered the questionnaire. Data analysis was conducted using SmartPLS software to examine and test the 15 hypotheses. This study is based on the ontology of objectivism, which is related to the epistemology of positivism, as analyzing the factors that motivate youths to prepare for a flood should be based on a collective response through a questionnaire survey rather than subjective assessments from a smaller number of individuals.

The choice of the positivism paradigm is also appropriate for the research objectives and questions of this study, as it is consistent in examining factors related to flood preparedness intention and behaviour. This research objective is appropriate for the positivism paradigm because the study requires empirical observation and quantifiable data to examine the relationships between variables such as attitudes, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, past experience, and flood preparedness intention and behaviour. By adhering to the principles of positivism, this study aims to provide rigorous, replicable findings on the factors that influence flood preparedness, thus contributing to an evidence-based understanding of the phenomenon. In addition, the application of positivism increases the objectivity of the study by minimizing the influence of subjective interpretations. This ensures that the

results contribute to a more reliable and evidence-based understanding of the phenomena studied.

3.3 Research Process

Frankfort-Nachmias and Nachmias (1992) found that there is a reciprocal relationship between theory and the individual phases of research in which they influence each other. As depicted in Figure 3.1, the study began with a comprehensive review of the existing literature, whereby the identification of gaps in the scientific discourse facilitated the formulation of research questions or problems. This part also addressed the scope and significance of the study.

The literature review facilitated the identification of relevant theories, namely the TPB and the HBM. These theories served as the basis for formulating the research objectives and the research framework of the study. In the present study, 15 hypotheses were formulated based on previous literature reviews. The hypothesis includes a combination of a direct relationship between the variables and the inclusion of moderating variables that were expected to alter the relationship between exogenous and endogenous variables. In this study, community participation and trust in public protection were used as moderating variables. Chapter Two of this study provides a comprehensive description of the details.

The next step was to determine the appropriate research design for the study. First, the researcher had to determine the appropriate study paradigm as outlined in the previous section of this chapter. The procedure mentioned above is of great importance in determining the research paradigm, regardless of whether the study is quantitative or qualitative. As mentioned earlier, a positivist ontological perspective, an empirical epistemological framework and a quantitative research approach were used in this study. From this, it can be deduced that a quantitative research approach is used in this study to address the research problem. After selecting the research paradigm, the researcher proceeded to describe the appropriate research design.

In the measurement phase, this study utilises and modifies the measurements used in previous studies. A combination of 5-point and 7-point Likert scales was used to prevent the occurrence of common method bias. In the final phase, this study embarked

on a pretest and a pilot study to assess the validity and reliability of the measurements. The knowledge gained in the previously described phase was used to make significant changes to the questionnaires. The final instrument was developed to gather data from the chosen sample after the questionnaire had been revised. The data analysis process began with data cleaning. Once data cleaning was completed, the data was subjected to further measurement and structural model analysis using SmartPLS 4.0 software. Chapter Four presents the study's findings in a more digestible format through the use of tables and figures. Chapter Five of the study provides the reader with a discussion of the findings, the contributions of the study, and concludes with the final remarks. This chapter also includes the outcome of the study, which consists of a comprehensive model derived from the integration of HBM and TPB.

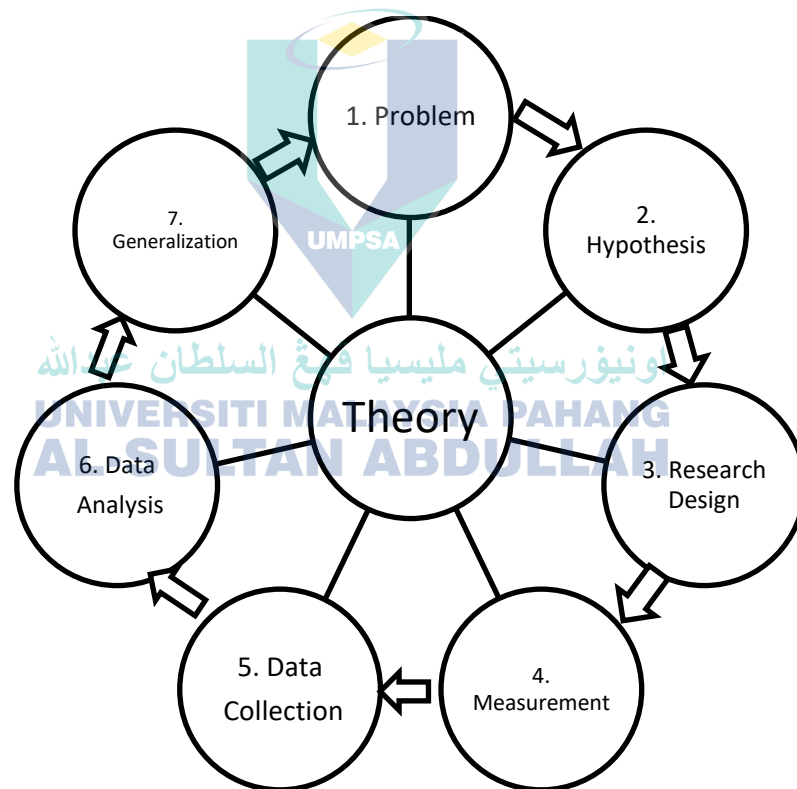


Figure 3.1 The main stages of the research process

Source: Frankfort-Nachmias and Nachmias (1992)

3.4 Research Design

The research design of a study refers to a systematic plan that involves collecting, measuring, and analyzing data to answer research questions (Sekaran and Bougie, 2016; Bougie and Sekaran, 2019). De Vaus (2001) asserted that the main purpose of research design is to ensure that the analysis provides data that effectively answers the research questions. Research design entails a series of rational decisions on the study's objective, which might be exploratory, descriptive, or hypothesis-testing. Important aspects of research design include study type, researcher intervention, time horizon, and unit of analysis decisions (Sekaran, 2003).

The first element of the research design is the purpose of the study and includes exploratory, descriptive or hypothesis-testing approaches. A hypothesis-testing approach was used in this study, whereby 15 hypotheses were developed based on theories and previous empirical studies. These hypotheses served as guiding hypotheses that the researcher wanted to investigate and test through empirical research. In chapter four of this study, all of these hypotheses were tested using SmartPLS 4.0 to determine whether each hypothesis was supported.

For the type of investigation, this study employed a correlational design to examine the relationship between the predictors and flood preparedness intention and behaviour. In correlational studies, the relationship between variables is often expressed through hypotheses. Since the researcher has chosen to conduct a correlational study, the degree and direction of the relationship, whether positive or negative, among others, must be considered. 13 hypotheses of the study assumed a positive relationship between the variables (directional hypotheses) and the remaining 2 hypotheses utilised alternate hypotheses (H6 and H14). The 15 hypotheses of the study were formulated based on theories and findings from previous studies. In the section of the thesis devoted to hypothesis development, most of the previous studies cited by the researcher indicated a positive correlation.

Creswell and Creswell (2018) contended that the alternative and directional hypothesis is commonly used in journal articles. It implies that the researcher predicts the expected outcome derived from previous literature and research, suggesting a possible conclusion. Based on previous studies, the researcher knows the likely outcomes of the

investigation. The actual findings on the strength and direction of the relationships are explained in chapter four.

In terms of the extent of researcher interference, Bougie and Sekaran (2019) categorised it into three levels which are minimal, moderate and excessive. In the present study, the researcher's interference is minimal because it is a correlational study and not a cause-effect study. The researcher's interference is limited to the administration of a questionnaire. In this case, apart from administering a questionnaire to respondents, the researcher did not interfere with the natural course of events or manipulate the variables in any way. The study relies on the collection and analysis of data from the participants' responses, which allows for the examination of associations and relationships without the inclusion of external factors that could influence the results. This non-experimental approach increases the validity of the results and provides a more realistic picture of the relationships between the variables in this study.

The time horizon is another element of research design. Time horizons in research refer to the temporal dimension or length of time over which a study is conducted. Bougie and Sekaran (2019) categorised the time horizon into two types: cross-sectional studies and longitudinal studies. In this study, a cross-sectional design was used as the data was collected in a single time. The choice of a cross-sectional study is appropriate for the aim of the study, which is to investigate the relationship between exogenous and endogenous variables, as it does not require more than a single data collection. Longitudinal studies, in which data are collected more than once, are necessary when researchers want to examine respondents' behaviour before and after a change. However, this study does not meet the criteria for a longitudinal study as its research objectives focus on examining associations between variables rather than capturing change over time.

The last element of the research design is the level of the unit of analysis. The unit of analysis refers to the specific level at which the data is analysed and from which the conclusions are derived (Bougie and Sekaran, 2019). They also stated that the level of unit analysis in the study depends on the research questions or objectives. Determining the level of unit analysis is significant because it serves as a guide for other important aspects of the research, including sample size and data collection methods. Bougie and Sekaran (2019) outlined all levels of unit analysis, including individuals, dyads, groups, organisations, and cultures. In this study, individuals were used as the unit of analysis as

the aim was to explore the factors associated with the flood preparedness intention and behaviour of individual youths in the East Coast region of Malaysia. However, not all individual youths became respondents in the study as the number of respondents was based on the sample size, which is further explained in Section 3.6 of this study.

3.5 Sampling Design

This study examines the factors associated with flood preparedness intention and behaviour among youth in the East Coast region of Malaysia. The questionnaires were distributed to participants who fulfilled the study's predefined criteria:

1. Youth aged between 15 and 40;
2. Living in the East Coast region of Malaysia (Pahang, Terengganu and Kelantan).

The target population of this study consists of youths between the ages of 15 and 40 living in the East Coast region of Malaysia. It is beneficial to learn their views on the factors that motivate them to prepare for a flood. As discussed in the problem statement section of this thesis, many flood-related deaths have been reported in the East Coast region of Malaysia, primarily due to inadequate preparation for floods. In addition, youths living in the East Coast region of Malaysia are more affected by flooding compared to those in other regions, as this region has higher annual rainfall and greater variability compared to other parts of Malaysia. Therefore, this study focuses on youths residing in the east coast region of Malaysia (Kelantan, Pahang and Terengganu). In addition, the study was conducted in the East Coast region as this region is prone to increased rainfall during the northeastern monsoon season from November to February. This climatic phenomenon leads to annual flooding in the states of Kelantan, Terengganu and Pahang within the East Coast region (JPS, 2009; Tick and Samah, 2004).

3.6 Sampling Frame and Sample Size

The participants of this study are youth residing in the East Coast region of Malaysia. For this study, youth refers to individuals between the ages of 15 and 40. It is not always feasible to investigate the entire population owing to limits in time, effort, and money, even though a large number of participants is typically expected (MacKinnon et

al., 2012; Barlett et al., 2001; Chuan, 2006). Hence, the sample size is adequate for the findings of the study to represent the overall population. The size of the response pool should be neither too small nor too large. A study may end up in a situation of low statistical power if the sample size is inadequate. Meanwhile, a large number of participants may lead to inefficiency and waste (Chuan, 2006), possibly resulting in type 2 errors (Sekaran, 2003). Marcoulides and Saunders (2006) argued that there is no consensus among scholars and statisticians on the categorisation of a high sample size as it depends on several aspects. Previous studies by Ngah et al. (2015), Ismail et al. (2015), Dalvi-Esfahani et al. (2017) and Pramudita et al. (2023) have used SmartPLS software to investigate their hypotheses. The sample sizes for this study were 140, 123, 146 and 160 respondents respectively. It is argued that a sample size of 100 cases is generally adequate for utilising PLS-SEM analysis (Reinartz et al., 2009; Hair et al., 1998).

As stated by Roscoe (1975), a sample size of 10 per cent of the population is a reliable representation. Barclay et al. (1995) highlighted that a commonly used approach for determining sample size is the multiplication rule by a factor of 10. However, the ten-fold rule is only a rough guideline for calculating the minimum sample size required and this principle should not be used as a solid justification (Aguirre-Urreta and Rönkkö, 2015; Kock and Hadaya, 2018). Green (1991) strongly encouraged researchers to use power analysis when conducting SEM. Green (1991) stated that there are three different effect sizes—small, medium, and large—and that the number of predictors associated with each one determines the sample size for this method. When trying to figure out how many respondents to include in a study, many researchers use the medium effect size as a guideline.

Researchers should perform power analysis before conducting their analysis to determine the required sample size (Sarstedt et al., 2022). Gefen et al. (2011) highlighted that G*Power software can be used by researchers to perform a priori power analysis and determine the minimum sample size. G*Power is a complete power analysis programme that, according to Erdfelder et al. (1996), is usually employed in social science studies to conduct statistical tests. The researchers in this study used the G*Power programme to perform a regression F-test. A power analysis is performed for a multiple regression model with thirteen predictors to determine the appropriate sample size.

A priori power analysis is a method for determining the minimum sample size needed to obtain adequate statistical power for a given study. Researchers are urged to perform this analysis to examine the adequacy of the sample size, especially when the research model involves many predictors (Chin and Newsted, 1999). Gefen et al. (2011) suggested that researchers use a guideline of 80% power, a medium effect size and a significance level of $p = 0.05$. Hence, with a medium effect size of 0.15, a confidence level of 0.05, and a desired power of 80%, the analysis showed that at least 131 respondents would be required to ensure adequate statistical power for a model with 13 predictors. Figure 3.2 shows an a priori power analysis for a model consisting of 13 predictors.

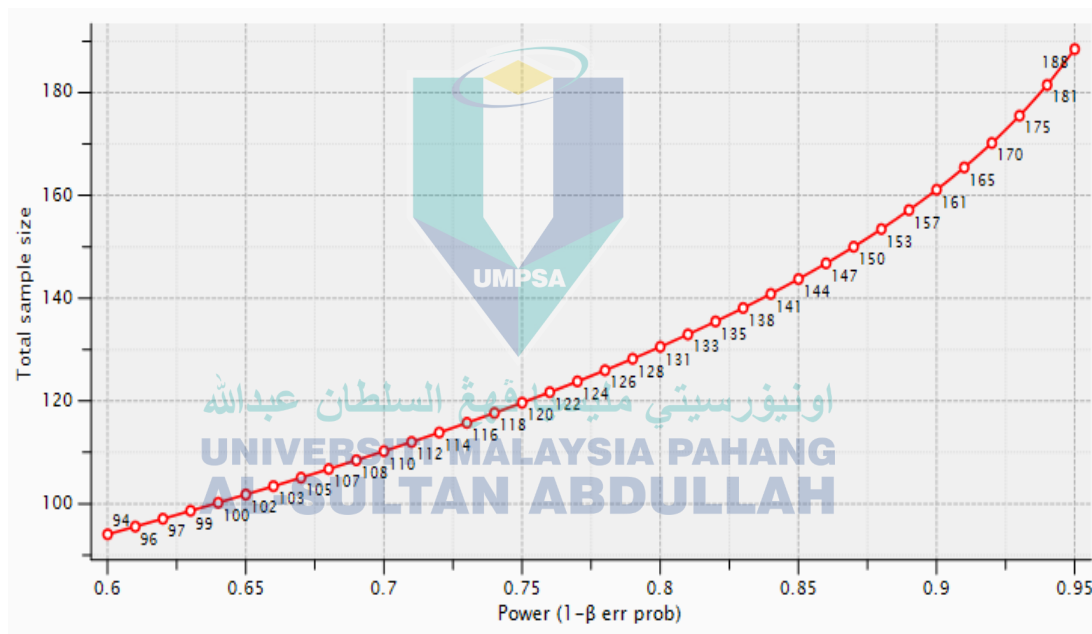


Figure 3.2 A priori power analysis

Furthermore, existing literature indicates that the inclusion of statistical power calculations is necessary to determine the adequacy of the sample size (Marcoulides and Saunders, 2006). However, it is advisable to include more data collection than the minimum number of respondents to mitigate the problem of underpowered analysis in post hoc studies. G*Power was also used to perform a post-hoc power analysis before the data analysis began (Faul et al., 2007, 2009). The analysis showed that of the 350 available data sets, a power of 0.9997 was achieved for a model with 13 predictors. This value exceeds the recommended threshold of 0.80. Consequently, the collection of 350

data sets has the necessary statistical power to refute the null hypothesis, as stated by Faul et al. (2007).

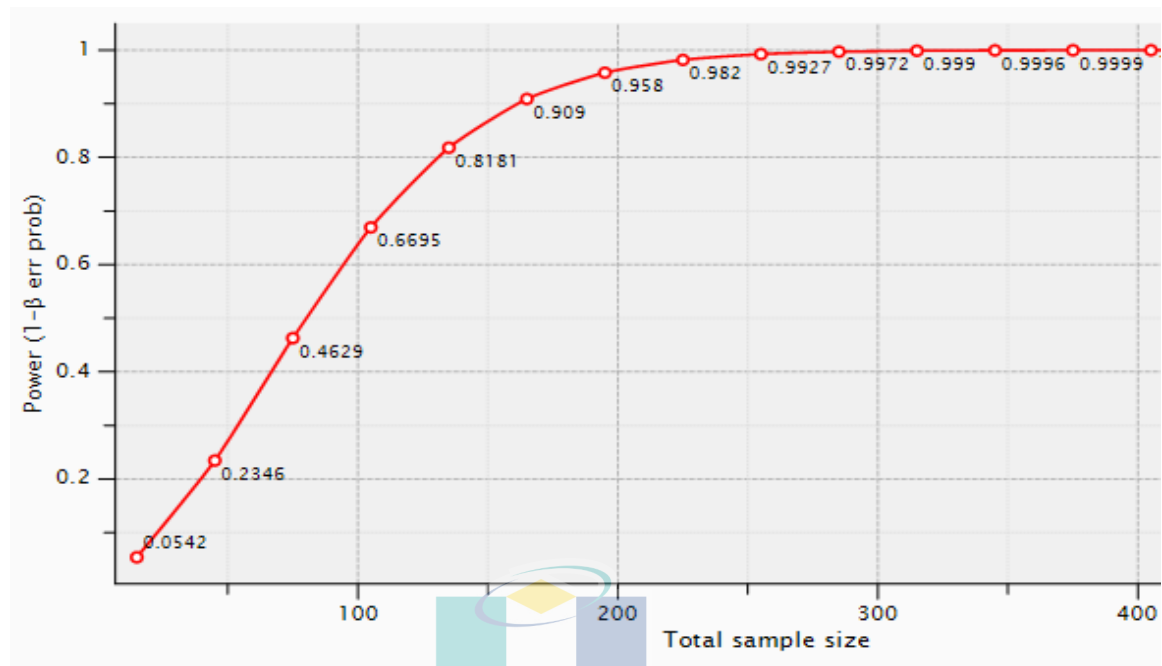


Figure 3.3 Post hoc power analysis

3.7 Sampling Technique

The sampling technique is a process used to select a subset of individuals from the overall population of a study. In this study, purposive sampling techniques were used under the non-probability sampling technique to obtain research data. Probability sampling requires researchers to acquire or access a comprehensive set of all individuals (the population's full contact information included in the sampling frame) within the targeted population (Cooper and Schindler, 2011; Saunders et al., 2016). However, non-probability sampling was used in this study because the researcher was not able to access the complete population list of youths residing in the East Coast region of Malaysia.

Attempts were made to request the population list but the researcher was unable to obtain it due to the dynamic nature of the youth population where ages and places of residence change by the second, daily and yearly. The lack of a fixed, current, and comprehensive population dataset compelled the researcher to use a non-probability sampling technique. Given the dynamic nature of the youth population, which is characterised by constant changes in age and place of residence, it proved impractical to

obtain a complete and up-to-date list. Therefore, the non-probability sampling method was chosen, which allowed the researcher to select participants based on eligibility criteria.

The reliability of the sample was increased by applying the technique of purposive sampling. It is considered appropriate given the unique characteristics or requirements of the individuals involved (Rowley, 2014). Using the purposive sampling technique, the researcher determined the criteria for selecting the respondents. Only people who met the researcher's criteria were allowed to complete the survey. The criteria include individuals aged between 15 and 40 who live in the East Coast region of Peninsular Malaysia.

Sarstedt et al. (2018) emphasised that not every research setting requires probability sampling. Given that social science research primarily concerns the examination of human behaviour, non-probability sampling has been proposed by several scholars (e.g., Krause, 2019; Baker et al., 2001; Dattalo, 2010). According to Polit and Beck (2010), research projects involving humans are generally less inclined to use the probability sampling technique. Furthermore, non-probability sampling is more typical and suitable for field research, especially for studies with human subjects (Bryman and Bell, 2015). This suggests that, in their view, non-probability sampling methods are often chosen and considered appropriate for research projects conducted in real-world settings, especially when human subjects are involved.

Furthermore, the quality of the research is not affected by the choice between probability and non-probability samples (Memon et al., 2017). Previous social science studies (e.g., Sonmez and Gokmenoglu, 2023; Vinnell et al., 2023; Ngah et al., 2024; Ngah et al., 2020; Sanny et al., 2020; Pramudita et al., 2023; Low et al., 2023; Qostal et al., 2024; Al Azizah et al., 2022; Ubaidillah et al., 2022; Sharma et al., 2019) have utilised the non-probability sampling technique and used PLS-SEM to conduct their research. Also falling under the umbrella of social science research, the present study's use of a non-probability sampling technique is appropriately justified.

Krause (2019) added that the concept of chance in probability sampling is mathematically elegant but conceptually unsuitable for empirical studies in the social sciences. Krause (2019) also argued that it has been widely used as a means of circumventing certain crucial questions about contemporary research techniques in the

field of social sciences rather than effectively addressing them. The probability sampling technique is not suitable for social science studies as there are individuals who are untraceable, unavailable or refuse to participate. Therefore, researchers are advised to use the non-probability sampling technique instead (Krause, 2019; Baker et al, 2001; Dattalo, 2010; Ganguli et al, 1998; Markides et al, 1982; Thompson et al, 1994). Rowley (2014) stated that even if a researcher manages to create a solid sampling framework and use a probability sampling technique, it is highly impossible to achieve a 100% response rate (Rowley, 2014) and is a major challenge (Pramudita et al., 2023). Non-response is an additional factor that can introduce potential bias into the study (Rowley, 2014).

Rowley (2014) noted that a significant proportion of social science researchers largely rely on non-probability sampling when collecting quantitative data through the use of questionnaires (Rowley, 2014), rather than aiming for statistical generalisation (Calder et al., 1981). According to Calder et al. (1981), the concept of generalisation is not suitable for research projects that aim to rigorously test theories. According to Hulland et al. (2018), non-probability sampling is more appropriate when a study aims to evaluate stated theoretical assumptions. Hulland et al. (2018) further emphasised that the use of convenience sampling technique is sufficient if the study aims to evaluate the accuracy of the postulated theoretical effects. These sentences explain that social science researchers often use non-probability sampling techniques because their aim is not to generalise the findings from the sample to the population (statistical generalisation). Instead, when the study aims to rigorously test theories, using non-probability sampling techniques is sufficient.

Therefore, it can be argued that when a social science study uses theories to explain a phenomenon in a particular setting, its main focus is on the generalisation of theory rather than the generalisation of samples (Memon et al., 2017). When testing theories rigorously, non-probability samples are better suited than probability samples, which are good for generalisation sampling (Calder et al., 1981; Hulland et al., 2018). Social science studies are about expanding knowledge and generalising theory, not generalising samples (Memon et al., 2017).

3.8 Data Collection

A field survey was conducted for this study to obtain primary data from respondents. Research projects using a sizable sample can benefit from field surveys (Hair et al., 2003) because this method is efficient (Churchill, 1995; Sekaran, 2003; Zikmund, 2003). A survey is an appropriate method for eliciting respondents' thoughts, beliefs, opinions, attitudes and emotions (Shaughnessy and Zechmeister, 1997; Burns and Bush, 2000).

In the present study, an online data collection method was used. According to Selm and Jankowski (2006), the use of online surveys can be justified by certain demographic characteristics of the target group. The youth demographic has a higher level of computer literacy compared to other age groups, making them more likely to be able to answer questionnaires via online surveys. Selm and Jankowski (2006) emphasised that the appeal of computers to certain age groups can be a valuable factor for researchers using online surveys. Youths have excellent information management abilities and access to a wealth of knowledge. Therefore, accessibility to technology is greater than for other groups of people (Koumachi, 2019).

Using the internet to conduct surveys among youths has the potential to achieve higher response rates compared to traditional paper and pencil surveys. In addition, online surveys are particularly well-suited for research conducted on non-risk samples (Selm and Jankowski, 2006). Online surveys offer a convenient and accessible way of collecting data. Respondents can participate from any location with an internet connection, eliminating geographical restrictions and providing a diverse range of participants. According to a study conducted by UNDP (2020), Malaysian youth are highly dependent on social media platforms as their main source of knowledge on climate change. This trend is indicative of their extensive digital connectivity and adeptness in using social media platforms.

The survey was designed on the Google Forms platform and its link was distributed via various popular social networking platforms such as Facebook, WhatsApp and Instagram. Data was collected via social media platforms such as Facebook, WhatsApp and Instagram. The link to the Google form was distributed to various groups on Facebook, WhatsApp and Instagram (e.g. groups for Kelantan, Pahang and Terengganu residents). To ensure the validity of the respondents, the student filtered the

demographic profiles to ensure that only responses from eligible youth (aged 15 to 40) living in the East Coast region were analysed and interpreted.

Previous empirical studies in the field of disaster risk reduction (e.g., Sonmez and Gokmenoglu, 2023; Cahigas et al., 2023; Daellenbach et al., 2018) published in high-impact journals (WOS Q1) and SCOPUS-indexed journals (e.g, Kurniawan et al. 2021; Rosario, 2022; Suharini and Kurniawan, 2021; Nifa et al., 2018), have used online data collection as a means of collecting data for their respective studies. Respondents were informed that their participation was completely voluntary. In the cover letter of the questionnaire, it was made clear that completion of the questionnaire should be voluntary. The researcher's contact information was provided in the cover letter to facilitate communication between the respondents and the researcher in case they had any problems or questions about the questionnaire. In collecting the research data, the researcher used a purposive sampling technique to ensure a wide range of participants. Data was collected from various districts in the region, with a particular focus on flood-prone areas in Pahang, Terengganu and Kelantan.

3.9 Instrumentation

The use of questionnaires for data collection is widely recognised as a highly effective method for gathering information from extensive samples (McClelland, 1994; Clarke, 1999). In this study, a questionnaire was used as a means of collecting quantitative data from respondents. The questionnaire begins with a cover letter that refers to the official logo of the university, a brief explanation of the purpose of the study, and information about the respondents' voluntary participation. The cover letter also included the researcher's contact number so that respondents could easily contact him or her if they had any questions or concerns. As suggested by previous scholars (Horst, 1968; Oppenheim, 1986), the number of words for each item was less than 20. Besides that, the questionnaire was designed less than 12 pages as suggested by several scholars (e.g., Frazer and Lawley, 2000; Hoinville and Jowell, 1978).

To avoid potential respondent fatigue, Alreck and Settle (1995) suggested strategically placing the demographic questions towards the end of the research instrument. This was to ensure that respondents would focus more of their attention and effort on the initial questions and may be less concerned with demographic details when

answering. The anticipated time for respondents to complete the questionnaire was around 10 to 15 minutes.

The items in this study were adopted and adapted from previous empirical studies. The use of established and validated measures offers two major advantages. Firstly, it provides a means of testing the credibility and accuracy of already-existing tools. Secondly, by incorporating these well-established tools, it becomes much easier to compare the current results to those of earlier research (Leedy and Ormrod, 2001; Kitchenham and Pfleeger, 2002). The preliminary version of the instrument was presented to several experts in the respective fields to identify potential problems associated with the instrument. This technique has the potential to increase the validity and reliability of the questionnaire (Churchill, 1995; Frazer and Lawley, 2000). A questionnaire consisting of 54 items was developed to measure the relationships between exogenous, moderating and endogenous constructs and to describe the demographic profile of the participants. Table 3.1 details the questionnaire's sections, variables, and item sources in addition to the total number of items.

Table 3.1 Number of items in the questionnaire

Section	Variables	No. of Items	Sources
A	Flood Preparedness Intention	3	Sai (2022).
B	Flood Preparedness Behaviour	5	Kurata et al. (2022a).
C	Community Participation	5	Ejeta et al. (2016).
D	Trust in Public Protection	4	Terpstra (2011).
E	Attitude	3	Sai (2021).
F	Subjective Norm	3	Sai (2021).
G	Perceived Behaviour Control	3	Sai (2021).
H	Perceived Susceptibility	5	Ejeta et al. (2016).
I	Perceived Severity	5	Ejeta et al. (2016).
J	Past Experience	6	Gumasing et al. (2022).
K	Social Desirability Bias	7	Fischer and Fick (1993).
L	Demographic Profile of the Respondents	5	Wei et al. (2019).
Total items		54	

The survey used in this research was available in two versions: Bahasa Malaysia and English. According to Burns and Bush (2000), the design of the instruments should be concise, simple and understandable to ensure the validity of the measurements. All items in the questionnaire of this study are short, concise and easy to understand. The questionnaire consists of twelve sections, with each section representing each construct of this study. The sections of the questionnaire were organised as follows; (1) Section A – Flood Preparedness Intention, (2) Section B – Flood Preparedness Behaviour, (3) Section C – Community Participation, (4) Section D – Trust in Public Protection, (5) Section E – Attitude, (6) Section F – Subjective Norm, (7) Section G - Perceived Behaviour Control, (8) Section H – Perceived Susceptibility, (9) Section I – Perceived Severity, (10) Section J - Past Experience, (11) Section K – Social Desirability Bias, and Section L - Demographic Profile of Respondents. Each section was delineated by its heading, effectively separating it from the previous section.

3.9.1 Demographic Profile of the Respondents

The demographic profile of the study includes five main elements: gender, age group, living states, ethnicity and living areas. These elements were derived from a study by Wei et al. (2019).

3.9.2 Exogenous Construct

In this study, a total of six exogenous variables were included in the questionnaire, namely attitude, subjective norm, perceived behaviour control, perceived susceptibility, perceived severity, and past experience. All variables presented in the study are considered as predictors. In the following subsection, the exogenous variables are explained along with a discussion of the measurement tools used to assess them.

3.9.2.1 Attitude

Attitude refers to a favourable or unfavourable feeling toward flood preparedness (Kurata et al., 2023). This study adopted the three-item attitude towards flood preparedness scale employed by Najafi et al. (2017), and Sai (2022). The attitude towards flood preparedness scale consisted of three items measured on a 5-point Likert scale (1 Strongly Disagree and 5 Strongly Agree). The reliability coefficients for this measure

were found to be adequate: $\alpha = 0.756$, Construct Reliability (CR) = 0.825 (Sai, 2022). The indicators used to measure the attitude toward flood preparedness of the respondents are as follows:

Table 3.2 Items for Attitude

No.	Items
1	My attitude toward making preparation for flood is effective.
2	My attitude toward making preparation for flood is useful.
3	My attitude toward making preparation for flood is beneficial.

3.9.2.2 Subjective Norm

The second variable in this study is the subjective norm. It refers to the individual's perception of social pressure to engage in flood preparedness activity (Najafi et al., 2017). This study utilised the three-item subjective norm scale employed by Najafi et al. (2017), and Sai (2022). The subjective norm scale comprises three items measured on a 5-point Likert scale. The reliability coefficients for this measure are adequate: $\alpha = 0.736$; Construct Reliability (CR) = 0.746 (Sai, 2022). The indicators used to measure subjective norms are as follows:

Table 3.3 Items for Subjective Norms

No.	Items
1	My family or friends think that I should make preparation for flood.
2	Regarding making preparation for a flood, doing what people think I should do is important.
3	I feel under social pressure to make preparation for a flood.

3.9.2.3 Perceived Behaviour Control

The third exogenous variable of this study is perceived behavioural control. It refers to an individual's subjective assessment of the ease or difficulty in preparing for a flood (Kurata et al., 2023). This study employed the three-item perceived behavioural control scale from Najafi et al. (2017), and Sai (2022). The perceived behavioural control scale comprises three items measured on a 5-point Likert scale. The reliability

coefficients for this measure were found to be adequate: $\alpha = 0.718$; Construct Reliability (CR) = 0.760 (Sai, 2022). The indicators used to capture perceived behavioural control are as follows:

Table 3.4 Items for Perceived Behaviour Control

No.	Items
1	I am confident that I could prepare for a flood if I wanted to.
2	Whether I prepare for a flood is entirely dependent on me.
3	Preparing for a flood is an easy thing for me.

3.9.2.4 Perceived Susceptibility

The fourth exogenous variable of this study is perceived susceptibility. Perceived susceptibility refers to a person's expectation of being exposed to a threat, such as a flood reaching his or her house (Grothmann and Reusswig, 2006). All five items for this construct have been adopted from Ejeta et al. (2016) and utilise a 5-point Likert scale. The reliability coefficient for this measure was adequate, with $\alpha = 0.93$ (Ejeta et al., 2016). The indicators used to assess perceived susceptibility are as follows:

Table 3.5 Items for Perceived Susceptibility

No.	Items
1	I think the place where I am living is prone to flood disasters.
2	I think my house is prone to flood disasters.
3	I think my family members and I are prone to flood disasters.
4	I think my property is prone to flood disasters.
5	I think electricity and water supplies in my area are prone to flood disasters.

3.9.2.5 Perceived Severity

The fifth exogenous variable in this study is perceived severity. Perceived severity of flood refers to an individual's belief about the potential extent of harm or damage that could occur as a result of a major flood event (Ejeta et al., 2016). All five items for this construct have been adapted from Ejeta et al. (2016). The perceived severity construct comprises five items measured on a 5-point Likert scale. The reliability coefficient for

this measure was found to be adequate, with $\alpha = 0.93$ (Ejeta et al., 2016). The indicators used to assess perceived severity are as follows:

Table 3.6 Items for perceived severity

No.	Items
1	I think if a major flood event occurs, the place where I am living could be affected severely.
2	I think if a major flood event occurs, my home could be damaged severely.
3	I think if a major flood event occurs, my family members and I could be affected severely (injured or killed).
4	I think if a major flood event occurs, my property could be damaged severely.
5	I think if a major flood event occurs, electricity and water lines could be damaged severely, and supplies could be interrupted.

3.9.2.6 Past Experience

The sixth exogenous variable in this study is past experience. Flood past experience can be defined as being exposed to a flood disaster at least once in a lifetime (Atreya et al., 2017). This study adapted the six-item past experience scale employed by Almazan et al. (2019), Prasetyo et al. (2020), van Manen (2014), and Gumasing et al. (2022). The past experience scale consists of six items measured on a 5-point Likert scale. The reliability coefficients for this measure were found to be adequate: $\alpha = 0.712$, Composite Reliability (CR) = 0.835 (Gumasing et al., 2022). The indicators used to assess past experience are as follows:

Table 3.7 Items for Past Experience

No.	Items
1.	I have experienced several heavy floods in the past.
2.	I have experienced a flood where people in my area were left homeless.
3.	I have experienced a flood where our house was destroyed and damaged.
4.	I have experienced a flood where our house was drowned by floodwater.
5.	I have experienced a flood where our properties and assets were submerged in water.
6.	I have experienced a flood that is traumatizing that I couldn't sleep.

3.9.3 Moderating Variables

In this study, two moderating variables are included to assess their influence on the relationship between the variables of the study. The first moderating variable is community participation. This study aims to examine its moderating effect on the relationships between the predictors of the study, namely attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, past experience, and flood preparedness intention. The second moderating variable in this study is trust in public protection. It is predicted that trust in public protection will positively moderate the relationship between flood preparedness intention and flood preparedness behaviour.

3.9.3.1 Community Participation

Community participation reflects people's participation in activities within the wider community people's active involvement in their community (Ejeta et al., 2016). This study adopted the five-item community participation scale employed by Ejeta et al. (2016), measured on a 7-point Likert scale (1 for Strongly Disagree and 7 for Strongly Agree). The reliability coefficient for this measure was found to be adequate, i.e., $\alpha = 0.90$. The indicators used to assess community participation are as follows:

Table 3.8 Items for Community Participation

No.	Items
1.	I have worked with others on something to improve community life.
2.	I participate in local activities or events (e.g., festivals, fetes, fairs).
3.	I have contributed money, food or clothing to local causes, charities, and others in my community.
4.	I have attended public meeting on community issues.
5.	I have been involved in volunteering activities intended to benefit my community (e.g., fundraising, clean-up days, making drainage systems, local groups and Scouts).

3.9.3.2 Trust in Public Protection

Trust in public protection refers to confidence in the government's ability to handle floods (Han et al., 2016). This study adopted the four-item trust in public protection scale employed by Terpstra (2011), measured on a 7-point Likert scale. The reliability coefficient for this measure was found to be adequate, i.e., $\alpha = 0.90$. The indicators used to assess trust in public protection are as follows:

Table 3.9 Items for trust in public protection

No.	Items
1.	I am confident that the flood defenses along my residential area are maintained well.
2.	I have confidence in the technological skills of flood risk managements.
3.	I have confidence in the strength of the flood defenses in my residential area.
4.	I am confident that there are sufficient and qualified people working with the flood management authorities.

3.9.4 Endogenous Construct

An endogenous construct in this study is flood preparedness behaviour and flood preparedness intention. Flood preparedness behaviour refers to how individuals are prepared to take defensive actions in advance or immediately before a flood threat (Frieman et al., 2011; Schmidlin, 2010). Meanwhile, flood preparedness intention refers to people's willingness to incur private expenses to protect themselves against future floods (Papagiannaki et al., 2019).

3.9.4.1 Flood Preparedness Behaviour

Flood preparedness behaviour is the actions, practices, and measures that individuals, undertake in anticipation of a flood event (Frieman et al., 2011). This study adopted the measurement items from Weichselgartner and Pigeon (2015), Cosgrave (2014), and Kurata et al. (2022a). The Cronbach Alpha of the items from Kurata et al. (2022b) was 0.881, and the Composite Reliability was 0.861. This study also used a 7-point Likert scale (1 for Strongly Disagree and 7 for Strongly Agree) to measure flood preparedness behaviour.

Table 3.10 Items for flood preparedness behaviour.

No.	Items
1.	I always make myself updated on emergency information about flooding.
2.	I always contact my loved ones or friends and let them know where I am and who am I with.
3.	I always go to higher grounds when the flood starts to rise.
4.	I always keep the emergency items and supplies (i.e., ID, Passport, money, water) prepared in case of flooding and evacuation.
5.	I am practising taking only well-cooked foods and boiled water to prevent contamination.

3.9.4.2 Flood Preparedness Intention

Flood preparedness intention refers to the extent to which individuals intend to take precautionary measures for future floods (Papagiannaki et al., 2019). This study adopted the three-item flood preparedness intention scale employed by Najafi et al. (2017), and Sai (2022). The flood preparedness intention scale consists of three items measured on a 7-point Likert scale. The reliability coefficients for this measure were found to be adequate: $\alpha = 0.833$; Construct Reliability (CR) = 0.843 (Sai, 2022). The indicators used to assess flood preparedness intention are as follows:

Table 3.11 Items for Flood Preparedness Intention.

No.	Items
1.	I expect to prepare for a flood.
2.	I plan to prepare for a flood.
3.	I will make preparation for a flood.

3.9.5 Marker Variable

Lindell and Whitney (2001) introduced the marker variable as a means of detecting the presence of common method variance (CMV) using a partial correlation approach. This approach entailed the removal of the weakest correlation between any substantive variable and the marker variable to effectively address the CMV issues. CMV refers to systematic error variance present when multiple variables are measured using the same sources or methods (Richardson et al., 2009). The Marker Variable approach, described by Podsakoff et al. (2003), involves incorporating a covariate in the statistical analysis to assess the presumed origin of CMV. The study employed marker variable questions, comprising seven items, each assessed using a 7-point Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The items of the Marker Variable were adopted from Fischer and Fick (1993).

Table 3.12 Items for Marker Variable (Social Desirability Bias).

No.	Items
1.	I like to gossip at times.
2.	There are occasions where I take advantage of others.
3.	I am always willing to admit when I make any mistakes.
4.	I sometimes try to get even rather than forgive and forget.
5.	At times, I really insist on having things according to my own way.
6.	I have never been annoyed when people expressed ideas very different from my own.
7.	I have never had the intention to say something that might hurt someone's feelings.

3.10 Scale Development

As already mentioned, all constructs used in this study were adopted and adapted from past studies. A total of 42 items were used to assess the constructs in this study. All constructs were operationalised using Likert scales. Podsakoff et al. (2003) have described various techniques to prevent the occurrence of common method bias, and one of these techniques is the use of different scale endpoints. To mitigate the potential influence of common method bias, a combination of 5-point and 7-point Likert scales was used (Syafiq et al., 2023) to measure the exogenous, moderating and endogenous variables. The mean scores from both the 5-point and 7-point Likert scales were similar (Dawes, 2008; Ala'a et al., 2024).

The exogenous variables were measured with a five-point Likert scale, while the endogenous and moderating variables of the study were measured with a seven-point Likert scale. Both the five- and seven-point Likert scales were adapted from Vagias (2006). A five-point agreement scale is structured as follows: 1 – strongly disagree, 2 – disagree, 3 – neither agree nor disagree, 4 – agree and 5 – strongly agree. A seven-point level of agreement is structured as follows: 1 – strongly disagree, 2 – disagree, 3 – somewhat disagree, 4 – neither agree nor disagree, 5 – somewhat agree, 6 – agree and 7 – strongly agree (Vagias, 2006).

Table 3.13 Scale development

Constructs	No. of Items	Scale
Flood Preparedness Behaviour	5	Seven-Point Likert Scale
Flood Preparedness Intention	3	Seven-Point Likert Scale
Attitude	3	Five-Point Likert Scale
Subjective Norms	3	Five-Point Likert Scale
Perceived Behaviour Control	3	Five-Point Likert Scale
Perceived Susceptibility	5	Five-Point Likert Scale
Perceived Severity	5	Five-Point Likert Scale
Past Experience	6	Five-Point Likert Scale
Community Participation	5	Seven-Point Likert Scale
Trust in Public Protection	4	Seven-Point Likert Scale

3.11 Translation Process

The questionnaire used in the study originally came from an English-language version. Since the native language of the respondents is Malay, it is necessary to create a Malay version of the questionnaire as well. Therefore, the researcher utilised the services of a translator who had a Master's degree in translation from Universiti Sains Malaysia (USM) to facilitate the respondents' understanding of the questionnaire items. The researcher then brought in an experienced bilingual English lecturer from Universiti Teknologi MARA (UiTM) to thoroughly review the translation from Malay to English to ensure its accuracy and overall quality. The inconsistencies and ambiguities were identified and eliminated. It is anticipated that the Malay version of the questionnaire will achieve equivalence with the original English version of the questionnaire after the consecutive translation process.

3.12 Pretest Study

This study utilised a pretest to reduce the number of items that had to be removed during the measurement model analysis (Mumtaz et al., 2017). The present study adheres to the guidelines suggested by Lewis et al. (2005) for determining content validity. This is achieved by conducting both a pretest and a pilot test. Content validity is a must-have

since it proves that an instrument's items are a good fit for measuring the construct in question (Lewis et al., 2005). A pretest is also conducted to identify problems related to the instructions of the questionnaire and to determine the time required to complete it (Lewis et al., 2005). In addition, a pretest is crucial as it helps to assess the order of questions and improve participants' understanding of the items in the study (Bryman and Bell, 2007).

During the process of face and content validation, experts with academic and professional backgrounds are often appointed to validate a survey instrument (Elangovan and Sundaravel, 2021). The pretest included two different procedures. The questionnaire was assessed by three academic experts and three industry experts, including representatives from the NADMA, the MKN, and the BOMBA. The researcher used a systematic framework to direct in-depth interviews and face-to-face conversations and then had experts fill out a questionnaire.

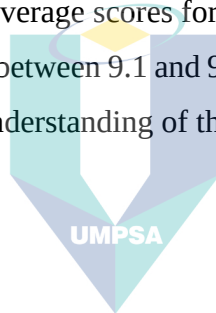
All items underwent expert review, which included an assessment of content, scope and purpose. The experts offered feedback on the questionnaire's clarity or ambiguity of definition, item representativeness, scale appropriateness, and instructions comprehensibility, among other things. In addition, before the actual data collection began, the questionnaire was tested on a sample of three youths with similar characteristics to the intended or actual respondents.

The participants were selected to represent three age groups: Youth 1 represented respondents aged 15 to 20, Youth 2 represented respondents aged 21 to 30 and Youth 3 represented respondents aged 31 to 40. In this phase, the participants had the opportunity to make suggestions for the inclusion, removal or modification of the measurement items of the questionnaire. The background characteristics of the participants who took the pretest are shown in Table 3.14. Participants rated the relevance of each indicator in terms of its applicability to the constructs, and each survey item was subjected to scrutiny. The results of the cognitive survey show that participants had no difficulty with sentence structure. In addition, the questions assessed were found to be clear and easy to understand.

Table 3.14 Background of the pretesting participants

Coding	Institution	Position
A	National Disaster Management Agency (NADMA)	Director of National Disaster Command Center (NDCC)
B	The Malaysian National Security Council (MKN)	Chief Assistant Director of the National Security Council, Pahang State Prime Minister's Department
C	Fire and Rescue Department of Malaysia (BOMBA)	Head of Station, Raub Fire and Rescue Department
D	Universiti Teknologi MARA	Senior Lecturer (PhD)
E	Universiti Teknologi MARA	Senior Lecturer (PhD)
F	Heze University, China	Senior Lecturer (Associate Professor)
G	Youth 1	15 Years Old
H	Youth 2	29 Years Old
I	Youth 3	38 Years Old

Table 3.15 displays the average scores for each item as rated by nine panels. The majority of average scores were between 9.1 and 9.8. The findings indicate that all pretest panels showed consensus and understanding of the items presented to them.



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Table 3.15 Pretesting participants' assessments

Construct	Indicator	Panels									Mean Score
		A	B	C	D	E	F	G	H	I	
Flood Preparedness Intention	I expect to prepare for a flood	10	10	9	10	10	9	10	10	10	9.7
	I plan to prepare for a flood	10	10	9	9	10	9	10	10	10	9.6
	I will make preparation for a flood	10	10	9	10	10	9	10	10	10	9.7
Flood Preparedness Behaviour	I always make myself updated on emergency information about flooding.	10	10	10	10	10	10	9	10	10	9.8
	I always contact my loved ones or friends and let them know where I am and who am I with.	10	10	9	9	9	9	10	10	10	9.5
	I always go to higher grounds when the flood starts to rise.	10	9	9	8	10	10	10	10	10	9.5
	I always keep the emergency items and supplies (i.e. ID, Passport, money, water) prepared in case of flooding and evacuation	10	10	9	10	10	10	10	10	10	9.8
	I am practicing taking only well-cooked foods and boiled water to prevent contamination.	10	9	9	10	10	8	10	10	10	9.5
Community Participation	I have worked with others on something to improve community life.	10	10	9	9	10	10	10	10	7	9.4
	I participate in local activities or events (e.g. festivals, fetes and fairs).	10	8	5	10	10	9	10	10	10	9.1
	I have contributed money, food or clothing to local causes, charities and others in my community.	10	10	9	10	9	10	10	10	10	9.7
	I have attended public meeting on community issues.	10	10	9	9	10	9	10	10	10	9.6
	I have been involved in volunteering activities intended to benefit my community (e.g. fundraising, clean-up days, making drainage systems, local groups and Scouts).	10	10	9	10	10	10	8	10	10	9.6
Trust In Public Protection	I am confident that the flood defenses along my residential area are maintained well.	10	10	9	10	10	10	10	10	10	9.8
	I have confidence in the technological skills of flood risk managements.	10	10	8	10	10	9	10	10	10	9.6
	I have confidence in the strength of the flood defenses in my residential area.	10	10	9	10	10	10	10	10	10	9.8
	I am confident that there are sufficient and qualified people working with the flood management authorities.	10	10	9	10	10	9	10	10	8	9.5
Attitude	My attitude toward making preparation for flood is effective	10	9	9	10	10	10	10	10	9	9.6
	My attitude toward making preparation for flood is useful	10	10	9	9	10	10	10	10	9	9.6
	My attitude toward making preparation for flood is beneficial	10	9	9	10	10	10	10	10	9	9.6

Table 3.15 Continued

Construct	Indicator	Panels									Mean Score
		A	B	C	D	E	F	G	H	I	
Subjective Norms	My family or friends think that I should make preparation for flood	10	10	7	10	10	10	9	10	10	9.5
	Regarding making preparation for a flood, doing what people think I should do is important	10	10	9	10	10	9	10	10	8	9.5
	I feel under social pressure to make preparation for a flood	10	9	9	9	10	9	10	10	10	9.5
Perceived Behavioural Control	I am confident that I could prepare for a flood if I wanted to.	10	10	10	9	10	9	10	10	10	9.7
	Whether I prepare for a flood is entirely dependent on me.	10	10	9	10	10	10	10	10	10	9.8
	Preparing for a flood is an easy thing for me	10	10	9	10	10	9	10	10	10	9.7
Perceived Susceptibility	I think the place where I am living is prone to flood disasters.	10	9	9	9	10	10	10	10	10	9.6
	I think my house is prone to flood disasters.	10	10	6	10	10	10	10	10	10	9.5
	I think my family members and I are prone to flood disasters.	10	10	9	10	9	10	10	10	10	9.7
	I think my property is prone to flood disasters.	10	10	6	10	10	9	10	10	10	9.4
	I think electricity and water supplies in my area are prone to flood disasters.	10	9	9	9	10	9	10	10	10	9.5
Perceived Severity	I think if a major flood event occurs, the place where I am living could be affected severely.	10	9	9	10	10	10	10	10	10	9.7
	I think if a major flood event occurs, my home could be damaged severely.	10	10	9	10	10	10	10	10	10	9.8
	I think if a major flood event occurs, my family members and I could be affected severely (injured or killed).	10	10	9	10	9	10	10	10	10	9.7
	I think if a major flood event occurs, my property could be damaged severely.	10	9	9	10	10	10	10	10	10	9.7
	I think if a major flood event occurs, electricity and water lines could be damaged severely, and supplies could be interrupted.	10	10	9	9	9	10	10	10	10	9.6
Past Experience	I have experienced several heavy floods in the past.	10	10	9	10	10	10	10	10	10	9.8
	I have experienced a flood where people in my area were left homeless.	10	10	9	9	10	9	10	10	10	9.6
	I have experienced a flood where our house was destroyed and damaged.	10	8	9	10	10	10	10	10	10	9.6
	I have experienced a flood where our house was drowned by floodwater.	10	9	9	10	10	10	10	10	10	9.7
	I have experienced a flood where our properties and assets were submerged in water.	10	9	5	9	9	10	10	10	10	9.1
	I experienced a flood that is traumatizing and I couldn't sleep.	10	9	9	10	10	8	10	10	10	9.5

After the pretest phase, the instrument was tested in a pilot study with respondents who were similar to the actual survey sample. The following section explains how the pilot study was conducted.

3.13 Pilot Study

At the end of the pretest phase, the researcher made improvements to correct possible shortcomings in the questionnaire. Then, a pilot study was carried out to examine the reliability of the instrument before the actual data collection. The questionnaires were distributed to a sample of forty youths who were then asked to answer the given questions. Participants were allowed to provide comments to improve the questionnaire. The aim is to obtain feedback from the participants on the content and structure of the instruments used in the pilot study. Additionally, this procedure can serve as practice for conducting quantitative data collection and analysis methods in preparation for the actual fieldwork.

The reliability of the items was determined by observing the Cronbach Alpha value. The items should have a Cronbach Alpha value higher than 0.70 to be considered reliable (Nunnally, 1978; Nunnally and Bernstein, 1994). The data obtained from the pilot test were used solely to validate the questionnaire and were not to be included in the final data analysis. All items in this study were found to be reliable, as seen in Table 3.16, where Cronbach's Alpha values were over the threshold of 0.7 for all constructs. Therefore, the questionnaire was deemed suitable for distribution to respondents.

Table 3.16 Reliability of the construct

Construct	Indicator	Cronbach's Alpha
Flood Preparedness Intention	3 items	.915
Flood Preparedness Behaviour	5 items	.857
Community Participation	5 items	.928
Trust in Public Protection	4 items	.930
Attitude	3 items	.954
Subjective Norms	3 items	.936
Perceived Behavioural Control	3 items	.886
Perceived Susceptibility	5 items	.962
Perceived Severity	5 items	.922
Past Experience	6 items	.897

3.14 Contrasting PLS-SEM and CB-SEM

SEM is a statistical method for evaluating the relationship between latent variables. The two most well-known types of SEM are covariance-based SEM (CB-SEM) and variance-based SEM (VB-SEM). CB-SEM usually uses AMOS software, while VB-SEM predominantly relies on Partial Least Squares (PLS). Each approach has specific criteria that must be met to ensure that it is suitable for the research objectives and framework. It is crucial to understand the underlying assumptions of these statistical methods to determine whether they are suitable for use in this study. When selecting statistical procedures, it is important to consider several elements, such as the research objectives, the definition of the measurement model, the structural model, the characteristics of the data, and the evaluation of the algorithms and models (Hair et al., 2011).

According to Hair et al. (2011), the PLS-SEM method is primarily intended for exploratory research and theory development, while the CB-SEM method is intended for confirmatory research or theory validation. Besides that, the PLS-SEM method is appropriate when the objectives of the study include predicting the primary target construct or identifying the main driving construct (Awang et al., 2015). Furthermore, CB-SEM is best suited for hypothesis testing (Hair et al., 2014; Barclay et al., 1995). On

the other hand, PLS-SEM is suitable for adoption when causal prediction analyses are being conducted (Barclay et al., 1995).

Researchers also use PLS-SEM when their study approach incorporates both formative and reflective items. Meanwhile, CB-SEM may only be used with research models that incorporate reflective items. Additionally, PLS-SEM is suitable for use when the research model is complex (Hair et al., 2011) and contains at least seven constructs (Hair et al., 2014). PLS-SEM is also considered a more appropriate statistical approach when dealing with a small sample size and data that does not follow a normal distribution. The use of CB-SEM, on the other hand, is considered appropriate when the study involves a large sample size and the data collected follow a normal distribution (Awang et al., 2015; Hair et al., 2014). In addition, the use of CB-SEM may be more appropriate in research scenarios where a comprehensive measure of goodness of fit is required (Hair et al., 2011).

Table 3.17 Alternatives in Structural Equation Modelling

No.	According to Hair et al. (2014), CB-SEM is more suitable if;
1	The goal is to test the theory confirmation or comparison of alternative theories
2	Error terms require additional specifications, such as covariation
3	The structural model has non-recursive relationships
4	The research requires global goodness of fit.
No.	Hair et al. (2014) also proposed to use PLS-SEM if;
1	The goal is to predict key target constructs or identify key driver constructs
2	Formatively measured are part of the structural model
3	The structural model is complex, with many constructs and many indicators. The model with seven constructs already can be assumed as a complex model.
4	The sample size is small, and the data are not required to be normally distributed

3.15 Justification for the Choice of Statistical Method

In this study, PLS-SEM was chosen as the statistical approach to evaluate the research model. As previously mentioned, this study incorporates two theories underpinning the research, namely the TPB and the HBM, with EST used as the overarching theory. As the research objectives are an exploratory study, it is considered appropriate to use the PLS-SEM approach (Peng and Lai, 2012). In addition, PLS-SEM was used in this study due to the complexity of the research model. Peng and Lai (2012)

suggested that researchers should consider using PLS-SEM in cases where the research model has a high degree of complexity, which may lead to problems in estimation under CB-SEM. A research model can be considered complex if it consists of seven or more constructs (Hair et al., 2014). The present study consists of ten constructs, which exceeds the minimum number of seven constructs highlighted by Hair et al. (2014). Therefore, the research model of this study is considered complex and suitable for PLS-SEM. Furthermore, the main objective of the study is to investigate the predictive power of these constructs and to determine the relative influence of each variable within the model. Therefore, PLS-SEM (VB-SEM) is considered to be the most appropriate and effective approach for investigating the relationships between the variables in this study.

3.16 Statistical Tools and Data Analysis Approaches

In this study, four statistical tools were employed to examine the data collected from the participants. The statistical tools used in this study include Statistical Package for the Social Sciences (SPSS) version 28, Smart Partial Least Squares (SmartPLS) 4.0, G-Power software, and Mardia Multivariate Skewness and Kurtosis.

3.16.1 Statistical Package for the Social Sciences (SPSS)

This study utilised SPSS Version 28 to conduct preliminary analysis, including the data cleaning process. Before conducting data analysis, a preliminary step involving data cleaning was undertaken to identify any instances of straight-lining responses. SPSS was also employed in this study to analyze the reliability of the data during the pilot test phase. This software was further used to run descriptive analysis, providing frequency and percentage information related to the demographic profiles of the respondents.

3.16.2 Smart Partial Least Squares (Smart-PLS) Software

In this study, SmartPLS was used to examine both the measurement and structural models. First, Smart-PLS 4.0 was used to analyze the measurement model, which must be examined before proceeding with the analysis of the structural model. During the analysis of the measurement model, convergent validity, consisting of composite reliability, factor loading and AVE, was assessed to ensure that the data were free from reliability and convergent validity issues. A discriminant validity assessment was then

conducted to ensure that all constructs differed from each other. Once the measurement model had been analyzed and the researcher had confirmed that the data met all the required criteria, the structural model analysis could be conducted. The bootstrapping approach was used to examine the relationships between the variables in the study.

3.16.3 G-Power Software

In the present study, this software was also used to assess the analytical capacity of the study. There are two different categories of power analysis, namely a priori power analysis and post-test power analysis. A comprehensive explanation of the analysis is provided in Chapter Four.

3.17 Normality Test

As suggested by Hair et al. (2017), the present study used multivariate skewness and kurtosis to assess the normality of the data. This study analysed the multivariate skewness and kurtosis using the software available at the following URL: <https://webpower.psychstat.org/models/kurtosis/results.php?url=13c14737f9b5997c68f1a001b58adbcf>. PLS-SEM is an appropriate approach when the obtained data do not meet the assumption of multivariate normality. Chapter four explains the result of multivariate skewness and kurtosis for this study in more detail.

3.18 Assessment of the Measurement Model

The researchers utilised the two-step analytical technique suggested by Anderson and Gerbing (1988) to examine the hypothesis that was formulated. The initial stage involves assessing the measurement model by examining its convergent validity and discriminant validity.

3.18.1 Convergence Validity

Convergent validity refers to the assessment of the extent to which different items effectively capture and align with the same underlying concepts. Campbell and Fiske (1959) defined convergent validity as the extent to which all items developed to measure a particular construct show a consistent pattern of loading on that construct. Convergent validity is confirmed when all items measuring a particular construct are consistent with

a single factor. Hair et al. (2013) suggested using the factor loading value, composite reliability (CR) and average variance extracted (AVE) as a measure for assessing convergent validity. Table 3.18 summarises the principles of convergent validity, including the minimum values for loading, AVE and CR.

Table 3.18 Principles of Convergent Validity (Loading, CR and AVE)

Convergence Validity	The Threshold value
Loading	≥ 0.5
AVE	≥ 0.5
CR	≥ 0.7

Source: Hair et al., (2017)

3.18.2 Discriminant Validity

Once the confirmation of convergent validity is no longer a problem for the study, it must be demonstrated that these indicators can be distinguished from the indicators of the other constructs. The following phase is therefore concerned with establishing discriminant validity. Discriminant validity refers to the extent to which a particular construct can be distinguished from other constructs (Gholami et al., 2013). There are two different approaches to assessing discriminant validity in the context of PLS: Fornell and Larcker's (1981) criterion and heterotrait-monotrait (HTMT).

3.18.2.1 Fornell and Larcker (1981) Criterion.

There are two different categories of indicators: formative and reflective. In the present study, all constructs are reflective forms. Fornell and Larcker (1981) suggested that for constructs with reflective indicators, researchers assess the square root of the average variance extracted for each construct. Researchers should also examine the loading and cross-loading of the indicators. Hair et al. (2010) mentioned that the cutoff value for loading and cross-loading is 0.5 and that all items of the constructs should weigh heavily on their respective constructs to differentiate them from other constructs.

3.18.2.2 Heterotrait-Monotrait (HTMT)

Due to the criticism of the criterion of Fornell and Larcker (1981), as presented by Henseler et al. (2015), the HTMT ratio was used in the present study to examine the discriminant validity of the data. According to Franke and Sarstedt (2019), the determination of discriminant validity can be determined by examining the HTMT values, which should be less than or equal to 0.85. Grewal et al. (2004) stated that a value of 0.85 can be considered the upper limit for acceptable construct correlations. If the study meets the HTMT criteria, this is evidence that the participants understood the presence of 10 unique constructs included in the present study.

Table 3.19 Principles of Discriminant Validity (HTMT Ratio)

Discriminant Validity	The Threshold value
Heterotrait-Monotrait (HTMT)	< 0.85

3.19 Assessment of The Structural Model

Examining and evaluating the structural model follows the confirmation of the study's validity and reliability. In this study, the bootstrapping approach proposed by Chin (1988) was used with a total of 10,000 replicate samples. The bootstrap procedure is a non-parametric technique used to measure the accuracy of PLS estimates (Chin, 2010). Before analyzing the structural model, the study must ensure that collinearity does not pose significant problems. Hair et al. (2011) stated that the variance inflation factor (VIF) value for each construct should be less than 5 to confirm that a study is free of collinearity problems. After confirming the absence of collinearity problems in the study, the next step is to perform the path coefficient analysis. Table 3.20 shows the principles of the structural model, which consists of the cut-off values for the beta value, the *t*-value and the *p*-value.

Table 3.20 Principles of Structural Model (Hypothesis Testing)

Bootstrapping Procedure	The Threshold value
beta value	(the direction of the beta value must be aligned with the hypothesis direction)
<i>t</i> -values	> 1.645
<i>p</i> -values	< 0.05
confidence interval gained from employing a bootstrapping procedure	(no zero value in between the lower level (LL) and the upper level (UL))

Source: Hair et al. (2019)

This study also examines the evaluation of the coefficient of determination (R^2), PLSpredict, and effect size (f^2). Table 3.21 depicts the level of effect size (f^2), ranging from small to large effect size.

Table 3.21 Effect Size

	Effect Size (f^2)
Small	0.02
Medium	0.15
Large	0.35

After the structural model analysis, researchers are advised to perform a PLSpredict analysis. Before PLSpredict can be performed, some prerequisites must be fulfilled. Shmueli et al. (2019) described several steps to determine PLSpredict. First, researchers must assess the PLS-SEM Q^2 predict for all indicators of a measurement model. Researchers can perform PLSpredict if the Q^2 value is greater than 0. Otherwise, they must check the data or measurement model for problems. Then the researcher must decide whether to use the RMSE or the mean absolute error (MAE). The decision to use either depends on whether the prediction errors are symmetrical. Finally, researchers must check whether the RMSE PLS-SEM value is smaller than the linear regression model (LM) value. The results of PLSpredict for the present study are presented in Chapter Four.

Table 3.22 Conditions of Predictive Relevance

Two Conditions of Predictive Relevance
RMSE for PLS-SEM is lower than LM
Q^2 for PLS-SEM is more than 0

Source: Shmueli et al. (2016)

3.20 Moderation Analysis

According to Hair et al. (2017), a moderator, which can be an exogenous variable or construct, has the potential to change the strength or direction of the association within a model with two constructs. The present study investigated the potential moderating effects of community participation and trust in public protection on the variables analyzed. To gain a more detailed understanding of the moderating effects, Dawson (2014) proposed the use of a pattern of interaction effect. This approach allows the researcher to determine how the moderator influences the relationship. However, only the relationships that have a moderating effect are shown in the pattern. The results of the moderating effect in the study are discussed further in Chapter Four.

3.21 Data Preparation

It is essential to recognise and mitigate the potential influence of common method bias and social desirability bias on the accuracy and validity of study findings (Yuksel, 2017). However, according to Yuksel (2017), only 0.0015% of publications examined the topic of common method bias, while a slightly higher percentage of 0.003% addressed the topic of social desirability bias. In addition to the above considerations, it is important to address the issues of missing values (Hutchenson and Pampaka, 2012), control variables (Green et al., 2016) and data normality (Jackson et al., 2009).

3.21.1 Missing Value

A missing value refers to the absence or unavailability of data for a particular variable or observation in a data set. It is advisable to thoroughly investigate and correct the missing values in a dataset before conducting an inferential analysis (Hutchinson and Pampaka, 2012). Kock (2014) claimed that the presence of missing data in the context of PLS-SEM leads to bias. Tabachnick and Fidell (2007) emphasised that when dealing with

missing data, any method can be considered appropriate as long as the proportion of missing values in a large data set is below 5 per cent. In this study, the online data collection was carried out using the web survey service Google Form. Online data collection via Google Forms prevents the occurrence of missing values as the features ensure that respondents complete all required fields before submission. Therefore, all downloaded responses were classified as complete and without missing values.

3.21.2 Common Method Variance

Questionnaires are often used as a method of data collection in social science research. While the use of questionnaires facilitates the collection of large amounts of data, it is important to note that this approach is susceptible to common method bias, which has the potential to compromise the reliability and validity of the study (Mohamed Ariff and Arshad, 2013). Considering the use of a singular source method in this study, it is imperative to recognise the potential presence of common method variance (CMV) as a significant problem. There are two different approaches to address the CMV problem, namely procedural and statistical methods.

- 1) Employing diverse sources to address both the criterion and predictor variables.
- 2) Utilise a variety of procedural interventions in the construction and implementation of the questionnaire, such as altering the sequence of questions, employing diverse scale endpoints, and employing distinct formats for predictor and criterion measures.
- 3) Elaborate specifications of regression analysis.
- 4) Using statistical methods to detect and eliminate problems associated with CMV.

The factors related to the independent variable were rated using a 5-point Likert scale, with a rating of 1 indicating strong disagreement and a rating of 5 indicating strong agreement. To address the potential issue of CMV in this study, a separate scale was used to assess both the independent variables and the dependent variable (procedural method). In this study, a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used to measure the endogenous and moderating variables. For the items related to the exogenous variables, 5-point Likert scales were used. To address the

problem of common method bias in statistical analysis, it is recommended to adopt the approach proposed by Kock and Lynn (2012) and Kock (2015), which includes a comprehensive assessment of collinearity. According to Diamantopoulos and Siguaw (2006), if the VIF is less than 5, it can be assumed that the use of data from a single source does not result in bias.

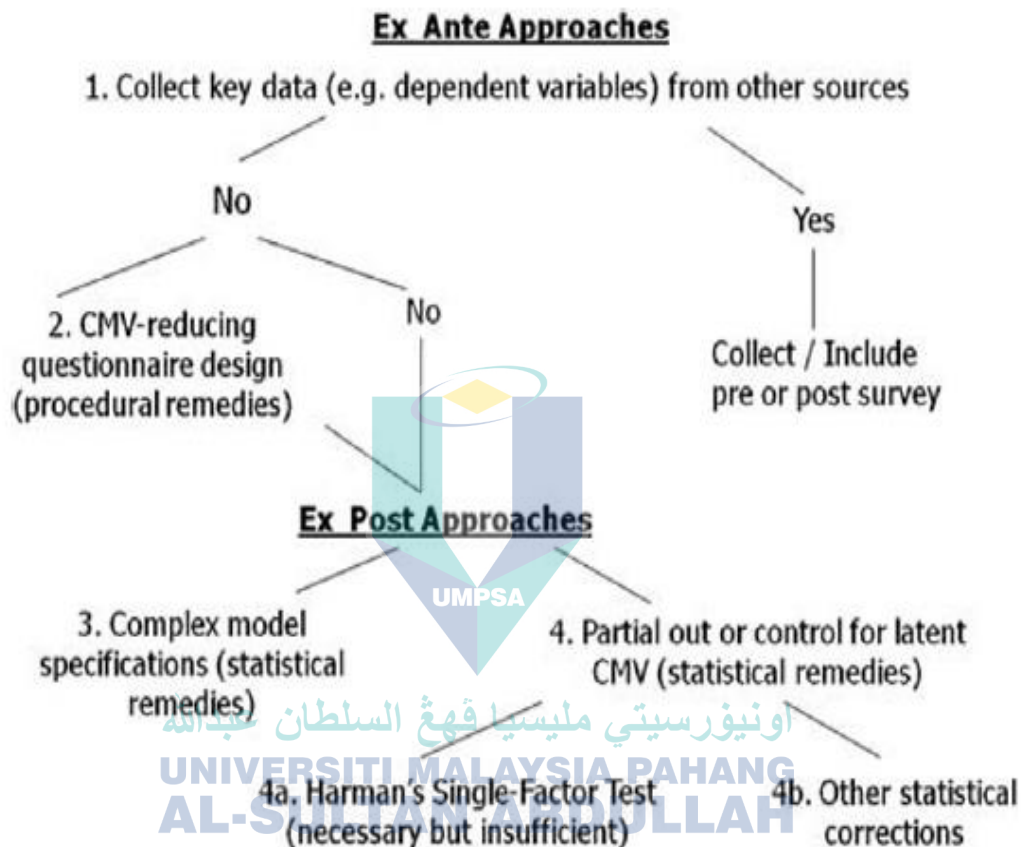


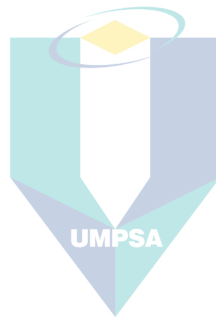
Figure 3.4 Approaches for handling CMV

Source: Chang et al. (2020)

3.22 Summary

This chapter explains the methodology of the study, including the research design, instrumentation, pretest, pilot test, data collection and rationale for the choice of PLS-SEM. In addition, this study also discusses the principles and theories related to PLS-SEM. This information is critical to understanding the rigorous process that was used in the data collection and analysis to ensure the validity and reliability of the study's findings. Through the detailed description of the research design and methodology, the

reader gains insight into the systematic and thoughtful approach that was used to answer the research questions or hypotheses. In addition, the discussion of the principles and theories related to PLS-SEM provides a theoretical framework that provides a basis for interpreting and contextualizing the results of the study.



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CHAPTER 4

DATA ANALYSIS AND RESEARCH FINDINGS

4.1 Introduction

This chapter presents the findings of the study. It begins with an explanation of the data preparation and data cleansing, followed by a description of the respondents' profiles. The results of the reliability and validity are then examined and detailed insights into the measurement model analysis of the study are provided. The structural model analysis is then presented to test the study's hypotheses. As mentioned earlier, SPSS version 28 and SmartPLS 4.0 were used to analyze the data in this study. SPSS version 28 was used for data preparation, data cleaning and performing the reliability analysis (Cronbach's alpha) during the pilot test study. It was also used to describe the demographic profile of the study. In addition, SmartPLS 4.0 was used to examine the measurement model, the structural model and the PLSpredict of the study. The chapter concludes with a brief overview of the results.

4.2 Data Preparation and Data Cleaning

Data preparation is the initial step in data analysis before evaluating the research model. The process of data preparation includes many activities such as data entry, coding, and editing that are performed to ensure the accuracy and sufficiency of the data (Cooper and Schindler, 2014). The process of data cleaning involves examining the data for anomalies such as missing values and straight-lining analysis.

4.2.1 Missing Value Analysis

According to Touvier et al. (2010), data entry errors can occur in traditional paper-based surveys and there is a possibility of missing, inconsistent or incorrect data. In contrast, the online survey does not allow for missing values as respondents must complete all items to move to the next screen. According to Evan and Mathur (2005), one advantage of online surveys is that respondents are obliged to answer thoroughly. One

feature of online surveys is the ability to make respondents answer a question before going on to the next or finishing the survey altogether.

According to Evan and Mathur (2005), online surveys offer several advantages over surveys that require human contact. First, online surveys eliminate the problem of missing or incomplete responses, ensuring a more comprehensive data set. In addition, respondents are under less time pressure when completing online surveys compared to surveys that require human contact. This approach effectively mitigates the problem of missing values and eliminates the need to discard incorrectly entered responses. Ilieva et al. (2002) pointed out that the completion rate for online surveys is significantly higher than for postal surveys. More detailed responses to open-ended questions were also found in online surveys compared to mail surveys.

When gathering and analysing data, it is crucial to account for the possibility of missing values (Sarstedt et al., 2022). An additional factor leading to bias in PLS-SEM is the presence of missing data, which is usually considered a nuisance rather than the primary object of investigation (Newman, 2014). The presence of missing values is a major challenge for researchers in many survey-based or experimental studies. In certain cases, researchers may encounter a situation where a questionnaire for a particular observation contains some missing responses. As a result, researchers may have to discard the entire data set on that questionnaire despite the considerable efforts they have made to include the observation in the survey and collect its data.

The phenomenon described above leads to inefficient use of data collection and thus, hinders the development of the model (Wang et al., 2022). The design of the online questionnaire can be optimised to increase response rates for each item. An effective approach is to require respondents to answer one question before they can proceed to the next question. Besides that, the online survey is purposely structured to prevent data loss and make it easier to transfer data to a database like Excel or SPSS for additional analysis (Bainbridge and Carbonaro, 2000; Ilieva et al., 2002).

In this study, the use of a web survey (Google Form) eliminates the need for a missing value analysis. The web survey service is equipped with an automatic function that recognises and identifies incomplete responses. The system only recognises a complete response. Therefore, all downloaded responses were classified as complete and

without missing values. In other words, there are no missing values in this study dataset, as all respondents completed all items in the questionnaires.

4.2.2 Straight Lining

In the present study, the response pattern is additionally examined to detect the presence of a straight-line pattern. This trend emerges when a respondent offers the same comment or response to most of the questions (Hair et al., 2017). Of the 359 cases received and analyzed, a total of 9 cases with a straightforward response pattern were identified. These 9 cases were then excluded from further analysis, leaving a sample size of 350 cases for further analysis.

4.2.3 Common Method Variance

Podsakoff et al. (2003) pointed out that CMV may be observed when a study employs the same respondents to answer the exogenous and endogenous variables at the same time in a study. Conventional methods therefore have the potential to introduce systematic biases into the measurements, leading to over- or underestimation of the observed associations between variables and thus causing both Type I and Type II errors (Chang et al., 2020). Given that this study relies on data collected from a single respondent who filled out forms for both exogenous and endogenous variables, it is crucial to address the possibility of CMV.

As discussed in section 3.21.2 of this study, the CMV issue can be prevented and addressed by two different approaches, namely procedural and statistical approaches. The procedural approaches were discussed in Chapter 3, where the researchers took the necessary measures to prevent the occurrence of CMV, such as using different scale endpoints for exogenous and endogenous measures and equalizing the order of the measures in the questionnaire. Therefore, this section (Section 4.2.3) discusses the statistical approach to solving the problem of CMV. It is recommended to perform a full collinearity test (Kock and Lynn, 2012; Kock, 2015). This approach involves performing a regression analysis for all variables related to a common variable. According to Kock (2015) and Hair et al. (2017), a single data source is considered to be bias-free if the VIF is 5 or less.

Table 4.1 shows the full collinearity analysis of the study. The table shows that the VIF values for all constructs are below 5, which means that there are no significant problems related to collinearity.

Table 4.1 Full collinearity analysis

Constructs	INT	SN	TPP	ATT	PBC	SUC	CP	FPB	PE	SEV
VIF	2.51	2.358	1.205	2.821	1.717	3.666	1.076	2.764	2.404	3.19

In addition to performing a full collinearity analysis, a measured latent marker variable (MLMV) was also used in this study to investigate the potential presence of CMV. The findings of the MLMV analysis indicate that the change in R^2 when the marker variable (MV) is included is below the threshold of 0.09 as suggested by Lindell and Whitney (2001). Simply put, there is no discernible shift in the R^2 change when MV is included. Therefore, this result is an additional indication of the lack of substance of CMV, leading to the conclusion that CMV was not a problem in this study.

Table 4.2 Comparison of R^2 value between baseline model and marker included the model

	INT	FPB
R^2 without Marker Variable	.488	.571
R^2 with Marker Variable	.496	.575

Note: INT – Intention, FPB – Flood preparedness behaviour

4.2.4 Social Desirability Bias

The problem of social desirability bias (SDB) poses a significant risk to the validity of data obtained through the use of a multiple-indicator self-report scale (King and Bruner, 2000). The self-report method has been shown to encourage respondents to provide inaccurate information, especially when sensitive topics are addressed (Tourangeau and Yan, 2007). According to Van de Mortel (2008), researchers are advised to control the SDB scale to ensure that the study model variables of interest can be focused on. The present study included a set of seven items from the SDB scale, which was first developed by Fischer and Fick in 1993. Specific information on the measurement items is provided in Table 3.12 in Chapter Three.

4.2.5 Control Variables

Assessing the influence of control factors on the dependent variable is crucial to exclude external effects that are not related to the hypothesised relationships (Kock et al., 2008). Demographic factors are usually considered suitable control variables. In this study, age and gender were used as control variables to exclude possible confounding effects on flood preparedness behaviour. Several studies have identified age (Al-Rousan et al., 2015; Kim and Kang, 2010; Dooley et al., 1992; Heller et al., 2005; Lindell and Whitney, 2000; Russell et al., 1995; Turner et al., 1986) and gender (Miceli et al., 2008; Bassett et al., 1996; Flynn et al., 1994; Savage, 1993) as potential determinants of disaster preparedness behaviour.

The path coefficient was analysed with SmartPLS. After including the control variables (age and gender), the correlations between the exogenous variables (ATT, SN, PBC, SUC, SEV, PE) and the endogenous variable (INT) as well as between INT and FPB (the second endogenous variable) remained statistically significant, as the results for the correlations between age, gender and flood preparedness behaviour was found to be not significant (see Table 4.11). It can therefore be concluded that there was still a statistically significant relationship between the study's variables even after considering the influence of age and gender.

4.3 Normality Testing

Normality tests are divided into two types: univariate normality and multivariate normality. Although crucial, many studies refrain from reporting multivariate normality analysis as researchers may not fully understand the concept of multivariate normality (Jackson et al., 2009; Cain et al., 2016). Farooq (2016) recommended that researchers using SEM consider conducting multivariate normality testing. The assessment of Mardia's multivariate skewness and kurtosis was carried out in this study and conforms to the guidelines provided by Cain et al. (2017).

Table 4.3 shows that the data distribution deviated from normality, as indicated by the observed values for skewness ($\beta = 17.387$, $z = 1014.249$) and kurtosis ($\beta = 150.030$, $z = 18.132$). The study data were not normally distributed, as the values for skewness and kurtosis exceeded the limits of ± 3 and ± 20 , respectively (Hair et al., 2017). This justifies employing PLS-SEM, a non-parametric analysis method. PLS-SEM is based on the

bootstrap approach and, in contrast to CB-SEM, does not assume normally distributed data (Hair et al., 2017). As Hair et al. (2017) elaborated, bootstrapping is extracting a large number of replacement samples (bootstrap samples) from the original sample.

Table 4.3 Output of skewness and kurtosis

Skewness and kurtosis analysis						
Sample size: 350						
Number of variables: 10						
Univariate skewness and kurtosis						
	Skewness	SE_skew	Z_skew	Kurtosis	SE_kurt	Z_kurt
ATT	-1.238	0.13	-9.494	1.897	0.26	7.297
CP	-0.450	0.13	-3.455	-1.091	0.26	-4.195
FPB	-1.856	0.13	-14.236	4.342	0.26	16.700
INT	-1.505	0.13	-11.541	2.050	0.26	7.883
PBC	-1.035	0.13	-7.940	0.991	0.26	3.811
PE	-0.258	0.13	-1.980	-1.334	0.26	-5.131
SEV	-0.734	0.13	-5.633	-0.341	0.26	-1.313
SN	-1.026	0.13	-7.867	0.871	0.26	3.350
SUC	-0.577	0.13	-4.426	-0.853	0.26	-3.280
TPP	-0.199	0.13	-1.524	-0.802	0.26	-3.084
Mardia's multivariate skewness and kurtosis						
	<i>b</i>	<i>z</i>				
Skewness	17.387	1014.249				
Kurtosis	150.030	18.132				

4.4 Demographic Profile of the Respondents

The demographic profile of the respondents is shown in Table 4.4. In this study, frequency and percentage values were used to describe the participants. The sample comprised 350 participants, of which 53.4% were male and 46.6% were female. The majority (37.4%) were between 21 and 30 years old, followed by 15- to 20-year-olds (33.4%) and 31- to 40-year-olds (29.1%). Notably, 35.7% of the total sample resided in Kelantan, closely followed by Pahang (33.7%) and Terengganu (30.6%). The survey respondents identified themselves predominantly as Malays (74.9%), 15.4% were Chinese, 9.1% were Indian and 0.6% belonged to another ethnic group. Table 4.4 also shows that the majority of participants live in suburbs, accounting for 38.9% of the total responses.

Table 4.4 Demographic profile of the respondents

Demographic	Frequency	Percentage (%)
Gender		
Male	187	53.4
Female	163	46.6
Age Group		
15-20 Years Old	117	33.4
21-30 Years Old	131	37.4
31-40 Years Old	102	29.1
States		
Kelantan	125	35.7
Pahang	118	33.7
Terengganu	107	30.6
Ethnicity		
Malay	262	74.9
Chinese	54	15.4
Indian	32	9.1
Others	2	.6
Living Areas		
Rural	99	28.3
Sub-urban	136	38.9
Urban	115	32.9

4.5 Measurement Model Analysis

The research model used in this study was evaluated with SmartPLS 4.0. In this study, the two-stage analysis processes proposed by Anderson and Gerbing (1988) were used to evaluate the measurement model, including the validity and reliability of the measurement items, as well as the structural model to evaluate the hypothesised relationships. According to Henseler (2017) and Ramayah et al. (2011), the evaluation of measurement models is often concerned with two fundamental elements, namely reliability and validity. According to Anderson and Gerbing (1988), it is necessary to validate the measurement model before proceeding with the assessment of the structural model. After analysing the measurement model, the structural model was examined in this study.

In the measurement model analysis, the study tested the validity of these ten latent constructs concerning their convergent validity and discriminant validity. Cabrera-Nguyen (2010) emphasised the need to assess convergent and discriminant validity in the reports of researchers using the CFA-SEM method. Convergent validity is assessed by examining the loading of indicators, internal consistencies of measurement by assessing composite reliability (CR) and average variance extracted (AVE). Discriminant validity is assessed using the heterotrait-monotrait ratio of correlations (HTMT).

4.5.1 Indicator Reliability (Outer Loading)

As shown in Table 4.5, the loading values for all indicators exceeded Hair et al.'s (2010) recommended value of 0.50. The loading values for the indicators ranged from 0.579 (PBC3) to 0.972 (ATT2), indicating the strength of the association between each indicator and its latent construct. These values suggest that all indicators have relatively strong relationships with their corresponding latent constructs and meet or exceed the generally accepted threshold for factor loadings (>0.50). This strengthens confidence in the measurement model and means that the selected indicators reliably measure their respective latent constructs. Therefore, all items have satisfactory indicator reliability and no items were excluded or deleted from the analysis.

4.5.2 Internal Consistency Reliability (Composite Reliability)

According to Hair et al. (2010), reliability refers to the extent to which a collection of indicators shows internal consistency concerning the construct. The internal consistencies of measurement were assessed using two statistical indicators: composite reliability (CR) and Cronbach's alpha (CA). There is an ongoing debate about the utility of Cronbach's alpha (α) as a measure for assessing reliability. CA provides an estimate of reliability based on the intercorrelations of the observed indicator variables. However, one of the weaknesses of CA is that it weighs all items equally, and the reliability of the items increases when the number of items is high.

Hair et al. (2017) and Sijsma (2009) have pointed out that the CA value tends to underestimate true reliability. Due to its limitations and drawbacks, McNeish (2017) proposed an alternative measure of reliability, the Composite Reliability Index. The CR

is often considered the most appropriate point estimator for assessing the reliability of internal consistency, as evidenced by the studies of Dijkstra and Henseler (2015) and Hair et al. (2022). Chin (1998) argued that CR is a more robust measure of reliability compared to CA. This is because CR considers the appropriateness of the various indicators in representing the respective constructs (Fornell and Larcker, 1981). It is therefore recommended to use CR as it considers the different outer loadings of the indicator variables when determining internal consistency reliability (Hair et al., 2019). Therefore, the CR value was used to determine internal consistency reliability in the present study.

According to Hair et al. (2011), a CR value of more than 0.7 is necessary and acceptable to demonstrate sufficient internal consistency. Table 4.5 presents the CR values for all constructs. The minimum value observed is 0.844 (perceived behaviour control). This value is above the recommended threshold value of 0.7 as suggested by Fornell and Larcker (1981), Nunnally and Bernstein (1994) and Hair et al. (2011). Therefore, the reliability of the constructs was ensured in this study. The fact that all constructs have CR values above the recommended threshold suggests that the observed indicators are reliable measures of the corresponding latent constructs. This increases the overall trustworthiness of the measurement model and implies that the observed indicators contribute to a reliable and internally consistent measurement of their respective latent constructs, thereby improving the overall quality of the structural equation model.

4.5.3 Convergent Validity

Convergent validity is the extent to which a measurement correlates positively with alternative measurements of the same construct (Hair et al., 2019). Urbach and Ahlemann (2010) defined convergent validity as the extent to which individual indicators reflect the constructs compared to indicators that measure other constructs. Sarstedt et al. (2022) analyzed the use of PLS-SEM in marketing research, focusing on articles published in the top 30 marketing journals between 2011 and 2020. They found that approximately 77 per cent of the 479 studies correctly assessed convergent validity using the average variance extracted, while 3.34 per cent and 19.21 per cent of studies either

incorrectly assessed convergent validity using criteria such as cross-loadings and composite reliability, respectively, or did not explain this aspect of model assessment.

To assess convergent validity, researchers usually use the average variance extracted (AVE) as a measure. AVE is the overall mean of the squared loadings of the indicators associated with the construct (i.e., the sum of the squared loadings divided by the number of indicators) (Hair et al., 2019). The threshold value for the AVE should be 0.50 (Fornell and Larcker, 1981; Hair et al., 2010). A value of 0.50 means that the construct explains on average more than half of the variance of its indicators. Conversely, an AVE of less than 0.50 means that, on average, more variance remains in the error of the items than in the variance explained by the construct (Hair et al., 2019; Chin (2010a); Hair et al., 2017).

Table 4.5 shows the AVE values for all constructs. The table shows that the AVE values for all constructs range from 0.651 (perceived behavioural control) to 0.902 (attitude). In other words, perceived behavioural control scored the lowest AVE values (0.651), followed by subjective norms (0.652) and flood preparedness behaviour (0.660). The attitude construct had the highest AVE score (0.902), meaning that it explained more than 90% of the total variation in its indicators.

Similarly, constructs such as perceived susceptibility, flood preparedness intention, community participation, and trust in public protection accounted for more than 80% of the total variance. The use of valid and reliable measurements is critical in the context of social research involving the collection and analysis of data (Cabrera-Nguyen, 2010). Hair et al. (2014) emphasised the need to carefully consider the removal of indicators as this can potentially improve reliability and AVE. However, it is important to note that this action may also affect the content validity of the measurement. In this study, it is worth noting that all constructs achieved an AVE value above 0.50. The findings show that the measurement model has a satisfactory level of convergent validity.

Table 4.5 Results summary for the reflective measurement model

Construct	Indicator	Indicator Reliability	Internal Consistency Reliability	Convergent Validity
		Outer Loadings	CR	AVE
ATT	ATT1	> .50 0.930	> .70 0.965	> .50 0.902
	ATT2	0.972		
	ATT3	0.946		
CP	CP1	0.948	0.960	0.829
	CP2	0.933		
	CP3	0.881		
	CP4	0.851		
	CP5	0.935		
FPB	FPB1	0.773	0.907	0.660
	FPB2	0.828		
	FPB3	0.788		
	FPB4	0.878		
	FPB5	0.793		
INT	INT1	0.896	0.940	0.839
	INT2	0.946		
	INT3	0.906		
PBC	PBC1	0.911	0.844	0.651
	PBC2	0.888		
	PBC3	0.579		
PE	PE1	0.847	0.951	0.764
	PE2	0.823		
	PE3	0.893		
	PE4	0.897		
	PE5	0.924		
SEV	SEV1	0.855	0.945	0.775
	SEV2	0.886		
	SEV3	0.925		
	SEV4	0.829		
	SEV5	0.934		
SN	SN1	0.820	0.847	0.652
	SN2	0.863		
	SN3	0.891		
SUC	SUC1	0.646	0.970	0.865
	SUC2	0.920		
	SUC3	0.952		
	SUC4	0.937		
	SUC5	0.950		
TPP	TPP1	0.890	0.949	0.823
	TPP2	0.897		
	TPP3	0.928		
	TPP4	0.914		
		0.891		

Note 1: ATT – Attitude, CP – Community Participation, FPB – Flood Preparedness Behaviour, INT – Intention, PBC – Perceived Behavioural Control, PE – Past Experience, SEV – Perceived Severity, SN – Subjective Norms, SUC – Perceived Susceptibility, TPP – Trust in Public Protection.

Note 2: CR - Composite reliability; AVE – Average variance extracted

4.5.4 Discriminant Validity

The degree to which one construct differs from another is known as its discriminant validity (Hair et al., 2019). For a construct to be considered discriminantly valid, it must be distinct from all others (Franke and Sarstedt, 2019; Farrell, 2010). Discriminant validity evaluation is widely recognised as a necessary step in the investigation of relationships between latent constructs (Ab Hamid et al., 2017). To determine discriminant validity, it is common practice to look for correlations between variables that might contain some overlapping items (Ramayah et al., 2018). Researchers using PLS-SEM are strongly encouraged to analyse loadings and cross-loadings, using the Average Variance Extracted-Squared Variance method (also known as the Fornell-Larcker criterion), and using the recently introduced heterotrait-monotrait ratio of correlations (HTMT) introduced by Henseler et al. (2015).

A cross-loading indication should have a higher outer loading on the linked construct than any of its other cross-loadings. The cross-loadings are best evaluated and shown in a table with rows for the indicators and columns for the latent variable. Table 4.6 displays the loadings and cross-loadings of the items. The researchers used a cut-off value of 0.5 (Hair et al., 2010) to assess the appropriateness of the loading of the indicators. Table 4.6 depicts that all indicators have loadings that exceed the 0.5 threshold. The analysis of the cross-loadings shown in Table 4.6 indicates that discriminant validity has been established.

Table 4.6 Loading and cross-loadings

	ATT	CP	FPB	INT	PBC	PE	SEV	SN	SUC	TPP
ATT1	0.930	-0.045	0.635	0.593	0.537	0.352	0.345	0.626	0.332	0.325
ATT2	0.972	-0.040	0.655	0.587	0.555	0.336	0.336	0.642	0.315	0.305
ATT3	0.946	0.023	0.625	0.600	0.562	0.301	0.322	0.650	0.296	0.304
CP1	-0.052	0.948	-0.040	-0.141	-0.009	-0.023	-0.069	-0.055	-0.146	0.081
CP2	-0.013	0.933	-0.030	-0.082	0.031	0.007	-0.024	-0.056	-0.112	0.119
CP3	-0.035	0.881	-0.019	-0.073	0.017	-0.035	-0.024	-0.061	-0.129	0.102
CP4	0.017	0.851	-0.002	-0.050	0.056	0.086	0.074	0.018	0.009	0.184
CP5	0.007	0.935	-0.041	-0.123	0.071	0.043	0.040	-0.004	-0.064	0.128
FPB1	0.517	-0.042	0.773	0.569	0.289	0.348	0.396	0.471	0.399	0.139
FPB2	0.521	-0.025	0.828	0.591	0.350	0.219	0.326	0.461	0.307	0.191
FPB3	0.518	0.019	0.788	0.576	0.385	0.259	0.370	0.459	0.346	0.157
FPB4	0.655	-0.011	0.878	0.662	0.431	0.271	0.397	0.536	0.330	0.217
FPB5	0.509	-0.081	0.793	0.584	0.356	0.284	0.398	0.513	0.351	0.191
INT1	0.452	-0.164	0.557	0.896	0.289	0.253	0.399	0.478	0.405	0.128

Table 4.6 Continued

	ATT	CP	FPB	INT	PBC	PE	SEV	SN	SUC	TPP
INT2	0.549	-0.105	0.654	0.946	0.344	0.262	0.409	0.510	0.376	0.181
INT3	0.684	-0.061	0.778	0.906	0.458	0.267	0.393	0.586	0.332	0.227
PBC1	0.563	0.009	0.475	0.394	0.911	0.203	0.291	0.540	0.176	0.147
PBC2	0.480	0.053	0.376	0.330	0.888	0.200	0.230	0.477	0.117	0.155
PBC3	0.326	0.023	0.145	0.237	0.579	0.154	0.094	0.313	0.079	0.297
PE1	0.318	0.003	0.394	0.284	0.218	0.847	0.585	0.362	0.639	-0.071
PE2	0.341	0.062	0.288	0.243	0.218	0.823	0.552	0.353	0.598	-0.048
PE3	0.287	0.001	0.229	0.218	0.170	0.893	0.588	0.334	0.639	-0.024
PE4	0.305	0.003	0.294	0.239	0.199	0.897	0.625	0.337	0.667	0.018
PE5	0.298	-0.007	0.296	0.253	0.209	0.924	0.628	0.342	0.678	-0.019
PE6	0.263	-0.008	0.245	0.244	0.181	0.855	0.541	0.335	0.601	-0.094
SEV1	0.325	-0.026	0.435	0.383	0.225	0.611	0.886	0.415	0.773	-0.058
SEV2	0.329	-0.008	0.411	0.409	0.221	0.680	0.925	0.454	0.779	-0.018
SEV3	0.238	-0.020	0.329	0.357	0.223	0.547	0.829	0.398	0.599	-0.006
SEV4	0.322	0.012	0.416	0.396	0.251	0.621	0.934	0.457	0.728	-0.017
SEV5	0.330	-0.008	0.447	0.373	0.294	0.488	0.820	0.362	0.600	-0.058
SN1	0.652	-0.005	0.607	0.539	0.518	0.340	0.427	0.863	0.408	0.12
SN2	0.585	-0.016	0.527	0.511	0.498	0.315	0.421	0.891	0.320	0.176
SN3	0.337	-0.102	0.252	0.314	0.321	0.317	0.283	0.646	0.271	0.103
SUC1	0.289	-0.093	0.385	0.351	0.141	0.668	0.692	0.393	0.920	-0.087
SUC2	0.290	-0.091	0.352	0.346	0.126	0.712	0.732	0.385	0.952	-0.079
SUC3	0.329	-0.093	0.446	0.418	0.15	0.686	0.736	0.384	0.937	-0.069
SUC4	0.331	-0.107	0.393	0.363	0.167	0.713	0.777	0.415	0.950	-0.045
SUC5	0.294	-0.118	0.385	0.377	0.167	0.619	0.749	0.362	0.890	-0.103
TPP1	0.273	0.131	0.176	0.167	0.151	-0.092	-0.048	0.122	-0.100	0.897
TPP2	0.298	0.118	0.237	0.207	0.211	-0.024	0.015	0.137	-0.037	0.928
TPP3	0.259	0.070	0.131	0.130	0.189	-0.084	-0.079	0.118	-0.149	0.914
TPP4	0.339	0.117	0.224	0.196	0.21	0.001	-0.043	0.207	-0.052	0.891

Note: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

The cross-loadings are the first approach to assess the discriminant validity of the indicators. The second approach to examining discriminant validity is to use the Fornell-Larcker criterion. In Table 4.7, the AVE_SV method (Fornell and Larcker, 1981) was applied to determine the relationship between the constructs. The results show that the square root of the average variance extracted for each construct is greater than the correlation values with other constructs, both horizontally and vertically. According to Fornell and Larcker (1981), the linked construct must share a greater proportion of variance with its indicators to achieve discriminant validity. Table 4.7 shows that the diagonal elements of the square roots of AVE have larger values both vertically and

horizontally than the non-diagonal elements. This pattern of results supports the AVE-SV approach and confirms the presence of discriminant validity.

Table 4.7 Fornell-Larcker criterion

Construct	ATT	CP	FPB	INT	PBC	PE	SEV	SN	SUC	TPP
ATT	0.950									
CP	-0.021	0.910								
FPB	0.672	-0.034	0.813							
INT	0.625	-0.115	0.735	0.916						
PBC	0.581	0.033	0.448	0.406	0.807					
PE	0.347	0.010	0.338	0.285	0.229	0.874				
SEV	0.352	-0.011	0.464	0.437	0.276	0.672	0.880			
SN	0.673	-0.038	0.601	0.578	0.565	0.395	0.475	0.808		
SUC	0.331	-0.108	0.424	0.401	0.162	0.731	0.794	0.417	0.930	
TPP	0.328	0.124	0.222	0.200	0.213	-0.047	-0.035	0.166	-0.082	0.907

Note 1: Diagonals (bolded) represent the squared root of AVE while the other entries represent the inter-correlation values between constructs.

Note 2: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

The commonly used measure is the widely recognised Fornell-Larcker criterion (Fornell and Larcker, 1981), either as an independent measure or in combination with other criteria. Examination of the cross-loading of indicators is the second most commonly used criterion. Recent studies have shown that these criteria are largely unsuitable for the assessment of discriminant validity due to conceptual and empirical considerations (Sarstedt et al., 2022). As the field of statistical theory has evolved considerably in recent times, researchers need to consider the availability of more modern statistical methods (Guide and Ketokivi, 2015). Henseler et al. (2015) proposed the HTMT ratio of correlations as a surrogate measure for assessing discriminant validity. Subsequent studies by Franke and Sarstedt (2019), Radomir and Moisesescu (2020) and Voorhees et al. (2016) have further substantiated its reliability.

Hair et al. (2017) defined HTMT as the measure of the ratio between the correlations observed between traits and the correlation observed within a single trait. As discussed by Henseler et al. (2015), the HTMT ratio was identified as the primary approach for determining discriminant validity. The studies conducted by Voorhees et al. (2016) showed that the HTMT ratio regularly performs better than the AVE-SV approach. According to Voorhees et al. (2016), researchers in the field of VB-SEM are

recommended to use the HTMT test as it provides a more comprehensive assessment of discriminant validity.

A stricter HTMT criterion, e.g., 0.9, may be appropriate for conceptually similar constructs, while conceptually different structures should be analysed with a lower threshold, e.g., 0.85 (Franke and Sarstedt, 2019; Hair et al., 2022). An HTMT value above 0.90 indicates a lack of discriminant validity (Hair et al., 2019). Table 4.8 shows that the HTMT values are less than 0.85 (between 0.042 and 0.838). This result is evidence that all constructs are realistically differentiated from each other. Therefore, the discriminant validity has been established.

Table 4.8 Heterotrait-Monotrait (HTMT) Ratio Results

Construct	ATT	CP	FPB	INT	PBC	PE	SEV	SN	SUC	TPP
ATT										
CP	0.042									
FPB	0.738	0.050								
INT	0.662	0.116	0.814							
PBC	0.681	0.069	0.514	0.479						
PE	0.367	0.050	0.371	0.306	0.278					
SEV	0.375	0.055	0.517	0.477	0.310	0.719				
SN	0.782	0.070	0.717	0.686	0.742	0.484	0.567			
SUC	0.346	0.107	0.464	0.432	0.183	0.769	0.838	0.493		
TPP	0.343	0.140	0.233	0.205	0.298	0.071	0.057	0.193	0.098	

Note: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

The researchers also employed bootstrapping to assess the statistical significance of the HTMT value concerning 1.00, following the recommendation by Henseler et al. (2015) and Hair et al. (2019). According to Henseler et al. (2015), the presence of the value 1 within the confidence interval suggests a deficiency in discriminant validity. Table 4.9 demonstrates that all of the confidence intervals do not encompass the value of 1. Hence, it can be inferred that all items in this study are notably different from one another. Construct validity, namely convergent validity and discriminant validity, is established based on the mentioned criterion. Construct validity is defined as the extent to which a measurement accurately evaluates the intended construct it is designed to measure (Peter, 1981, p. 134). The findings of the CFA indicate that the research variables have been confirmed as distinct and suitable for further examination. Thus, the measurement model demonstrated adequate discriminant validity and convergent validity.

Table 4.9 HTMT confidence interval bias corrected

	5.00%	95.00%
CP <-> ATT	0.022	0.047
FPB <-> ATT	0.625	0.818
FPB <-> CP	0.026	0.053
INT <-> ATT	0.564	0.740
INT <-> CP	0.064	0.190
INT <-> FPB	0.747	0.864
PBC <-> ATT	0.582	0.769
PBC <-> CP	0.032	0.079
PBC <-> FPB	0.379	0.628
PBC <-> INT	0.350	0.596
PE <-> ATT	0.273	0.450
PE <-> CP	0.027	0.051
PE <-> FPB	0.288	0.449
PE <-> INT	0.205	0.399
PE <-> PBC	0.173	0.379
SEV <-> ATT	0.265	0.472
SEV <-> CP	0.029	0.059
SEV <-> FPB	0.430	0.598
SEV <-> INT	0.375	0.563
SEV <-> PBC	0.207	0.419
SEV <-> PE	0.652	0.775
SN <-> ATT	0.702	0.840
SN <-> CP	0.035	0.079
SN <-> FPB	0.588	0.805
SN <-> INT	0.578	0.779
SN <-> PBC	0.638	0.833
SN <-> PE	0.383	0.573
SN <-> SEV	0.463	0.659
SUC <-> ATT	0.242	0.437
SUC <-> CP	0.055	0.179
SUC <-> FPB	0.378	0.542
SUC <-> INT	0.340	0.521
SUC <-> PBC	0.085	0.289
SUC <-> PE	0.715	0.815
SUC <-> SEV	0.798	0.875
SUC <-> SN	0.389	0.577
TPP <-> ATT	0.247	0.432
TPP <-> CP	0.060	0.244
TPP <-> FPB	0.129	0.335
TPP <-> INT	0.109	0.300
TPP <-> PBC	0.194	0.406
TPP <-> PE	0.035	0.100
TPP <-> SEV	0.027	0.072
TPP <-> SN	0.097	0.301
TPP <-> SUC	0.045	0.188

Note: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

4.6 Structural Model Analysis

As previously discussed, reliability and validity are ensured by all of the reflectively measured constructs. The subsequent stage involves evaluating the path coefficients, explanatory, and predictive capabilities of the structural model (Hair et al., 2020b). Before evaluating the structural correlations, it is vital to examine collinearity to ascertain that it does not introduce any bias into the regression outcomes.

4.6.1 Assessment of the Structural Model for Collinearity Issues

Before performing a path modelling assessment, researchers need to conduct collinearity estimation by examining the VIF. Aguirre-Urreta and Rönkkö (2018) and Hair et al. (2022) have advocated for the utilisation of the VIF as a means to evaluate collinearity among all predictor components inside the structural model. Hair et al. (2011; 2022) suggested that VIF values below 5 indicate the absence of collinearity issues. Table 4.10 shows that the greatest VIF value observed for the constructs is 3.590. This value is significantly lower than the established threshold of 5. To address the collinearity issue, Hair et al. (2017) suggested that researchers delete constructs if the constructs' VIF exceeds 5. Therefore, the collinearity results indicated that multicollinearity did not pose a significant concern in this study, as the VIF values were below the threshold of 5. Hence, no items were deleted in this study.

Table 4.10 Structural Model for Collinearity Issues

	ATT	CP	FPB	INT	PBC	PE	SEV	SN	SUC	TPP
ATT				2.095						
CP				1.042						
FPB										
INT			1.234							
PBC			1.235	1.713						
PE				2.331						
SEV				3.088						
SN				2.259						
SUC				3.590						
TPP			1.090							

Note: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

4.6.2 Assessing the Significance of the Structural Model Relationships

Table 4.11 displays the results of testing the hypotheses using a bootstrapping procedure on each path link in the model. Bootstrapping in PLS is a statistical technique that involves the generation of several bootstrap samples using random sampling with replacement from the original sample. This process is utilised to estimate standard errors for hypothesis testing purposes (Hair et al., 2011).

A total of fifteen hypotheses were formulated throughout this study. To assess the significance level, t-statistics are computed for all pathways using the bootstrapping function in SmartPLS 4.0. The significance level for the bootstrapping procedure is set at 0.05, indicating a level of confidence in the results. The test is conducted in a one-tailed manner, focusing on a specific direction of the hypothesis. Besides that, the analysis is performed using 10,000 subsamples, allowing for a robust assessment of the data. According to Ramayah et al. (2018), the significant values for a significant level of 1 per cent ($\alpha = 0.01$), 5 per cent ($\alpha = 0.05$), and 10 per cent ($\alpha = 0.1$) are 2.33, 1.645, and 1.28, respectively, for the one-tailed test.

4.6.2.1 Path Coefficients – Direct Effects

The estimated direct effects of path coefficient values were obtained using the SmartPLS 4.0 algorithm. If the path coefficients' beta values are very close to zero, it suggests a lack of statistical significance. Hair et al. (2017) claimed that path coefficients that are predicted to be near +1 indicate robust positive interactions, whereas coefficients that approach 0 suggest weaker relationships. However, researchers are required to do a bootstrapping technique to determine the significance of the path coefficient, as the reliability of the path coefficient depends on the bootstrap standard error. The utilisation of bootstrap standard error values allows researchers to evaluate the empirical t-value (Chin et al., 2013; Hair et al., 2014). A set of eight hypotheses were formulated to examine the associations among these latent components.

- H1: There is a positive relationship between attitude and flood preparedness intention.
- H2: There is a positive relationship between subjective norms and flood preparedness intention.

- H3: There is a positive relationship between perceived behavioural control and flood preparedness intention.
- H4: There is a positive relationship between perceived susceptibility and flood preparedness intention.
- H5: There is a positive relationship between perceived severity and flood preparedness intention.
- H6: There is a relationship between past experience and flood preparedness intention.
- H7: Perceived behaviour control is positively associated with flood preparedness behaviour.
- H8: There is a positive relationship between flood preparedness intention and flood preparedness behaviour.

The analysis concludes that the path coefficient is statistically significant within a certain range of probability error, as indicated by an empirical t -value exceeding the critical value (Hair et al., 2014). In this study, a significance level of 5% was established, and critical t -values greater than 1.645 were utilised for a one-tailed test. Additionally, a resampling strategy consisting of 10,000 iterations with 350 bootstrap instances was employed. The utilisation of a bootstrapping approach facilitates the establishment of statistical significance for the research model.

Table 4.11 shows the results of the path coefficients representing the direct effects of H1 to H8, considering the influence of age and gender as control variables in the study. Relationships with t -values greater than or equal to 1.645 are considered statistically significant at a significance level of 0.05. In this study, the results indicate that Attitude ($\beta = 0.430$, $t = 6.409$, $p < 0.05$), Subjective Norms ($\beta = 0.199$, $t = 2.620$, $p < 0.05$), Perceived Susceptibility ($\beta = 0.141$, $t = 1.766$, $p < 0.05$), and Perceived Severity ($\beta = 0.195$, $t = 2.520$, $p < 0.05$) exhibit positive associations with Flood Preparedness Intention. The study results also indicate a positive relationship between Perceived Behavioural Control ($\beta = 0.172$, $t = 3.623$, $p < 0.05$) and Flood Preparedness Behaviour. This study also found that there is a relationship between Past Experience ($\beta = -0.179$, $t = 2.833$, $p < 0.05$) and Flood Preparedness Intention. In contrast, the analysis showed that Perceived Behavioural Control ($\beta = 0.010$, $t = 0.216$, $p > 0.05$) had no positive association

with the intention to prepare for flooding. Hence, H1, H2, H4, H5, H6, H7 and H8 were supported and only H3 was not supported.

Table 4.11 Path Coefficients – Direct effect

Hypotheses - Path	Beta	SE	t-value	p-value	LL	UL	f^2	VIF
H1 ATT -> INT	0.430	0.067	6.409	0.000	0.323	0.542	0.173	2.095
H2 SN -> INT	0.199	0.076	2.620	0.004	0.066	0.318	0.034	2.259
H3 PBC -> INT	0.010	0.048	0.216	0.415	-0.066	0.093	Nil	1.713
H4 SUC -> INT	0.141	0.080	1.766	0.039	0.017	0.281	0.011	3.590
H5 SEV -> INT	0.195	0.077	2.520	0.006	0.069	0.324	0.024	3.088
H6 PE -> INT	-0.179	0.063	2.833	0.002	-0.284	-0.079	0.027	2.331
H7 PBC -> FPB	0.172	0.047	3.623	0.000	0.092	0.249	0.056	1.235
H8 INT -> FPB	0.658	0.044	15.123	0.000	0.584	0.726	0.818	1.234
Control Variables								
Age -> FPB	0.023	0.036	0.636	0.262	-0.035	0.082		
Gender -> FPB	-0.033	0.075	0.443	0.329	-0.154	0.093		

Note: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

4.6.3 The Coefficient of Determination (R^2)

The subsequent step involves assessing the model's predictive power using the coefficient of determination score (R^2). The R^2 is a statistical metric for evaluating a model's predictive power. According to Hair et al. (2017), it can only take on values between 0 and 1, with larger values indicating higher levels of predictive precision. The R^2 is computed using the SmartPLS software. The principle of deciding the rule of thumb for an acceptable R^2 is difficult to establish since the value depends on the research field and model complexity. In the domains of consumer behaviour and customer satisfaction, an R^2 value of 0.20 is deemed high (Hair et al., 2019).

This study adheres to the guidelines outlined by Cohen (1988) for determining the permissible range of R^2 . Table 4.12 shows that the R^2 value of 0.488 for INT indicates that approximately 48.8 per cent of the variability in flood preparedness intention can be accounted for by factors such as attitude, subjective norms, perceived behaviour control, perceived susceptibility, perceived severity, and past experience. According to Cohen's (1988) guideline, an R^2 value of 0.488 can be considered significant.

In addition, the findings presented in Table 4.12 indicate that the R^2 value of 0.571 for FPB suggests that around 57.1 per cent of the variability in flood preparedness

behaviour may be accounted for by factors such as attitude, subjective norms, perceived behaviour control, perceived susceptibility, perceived severity, past experience, and flood preparedness intention. Generally, the R^2 values obtained in this study exhibit a notable resemblance to those documented in the majority of studies within the existing body of literature.

In a study conducted by Gumasing and Sobrevilla (2023), the researchers found that the R^2 value for flood preparedness behaviour was 52.4%, while for flood preparedness intention, it was 37.6%. The study by Wang and Tsai (2022) yielded an R^2 value of 54% for explaining the variation in behavioural intention and 47% for explaining the variance in actual behaviour. McEachan et al. (2011) examined 206 studies, and their meta-analysis found that, on average, the TPB accounted for 19.3% of the variance in behaviour and 44.3% of the variance in intention

Based on Table 4.12, it can be inferred that the research model of the study is capable of anticipating around 57.1% of the variables that impact flood preparedness behaviour. This level of predictive ability is deemed satisfactory within the realm of social science research. As explained previously, the R^2 values are contingent upon both the complexity of the model and the specific phenomena being investigated. It should be noted that exceptionally high R^2 values, such as 0.90, often suggest overfitting of the model when assessing theoretical notions. According to scholars (e.g., Hair, 2021; Hair et al., 2019b; Shmueli and Koppius, 2011), researchers can present the R^2 value, provided that they do not use it as the sole basis for understanding the model's predictive power.

Table 4.12 R-square values

	R-square
FPB	0.571
INT	0.488

Note: FPB – Flood preparedness behaviour,
INT – Flood preparedness intention

4.6.4 Assessment of the Effect Size (f^2)

The effect size (f^2) is utilised to determine the relative influence of a predictor construct on endogenous constructs. The f^2 helps to determine the contribution of a specific predictor or set of predictors to the variance explained in the dependent variable. Sullivan and Feinn (2012) argued that it is essential to report both the f^2 and statistical

significance (p -value). In other words, f^2 is employed to provide additional information beyond statistical significance, helping to understand the magnitude of the impact of the predictors on the dependent variable

To quantify the magnitude of the influence, researchers adhere to the guidelines proposed by Cohen (1988). According to Cohen (1988), the values of 0.02, 0.15, and 0.35 correspond to small, medium, and large effect sizes, respectively. The results presented in Table 4.11 indicate that the variable Attitude ($f^2 = 0.173$) exhibits a medium influence on the R^2 value for Flood Preparedness Intention. Conversely, the variables Subjective Norms ($f^2 = 0.034$), Perceived Susceptibility ($f^2 = 0.011$), Perceived Severity ($f^2 = 0.024$) and Past Experience ($f^2 = 0.027$) demonstrate a small effect on the R^2 value for Flood Preparedness Intention.

Nevertheless, the Perceived Behavioural Control shows no positive correlation with the intention to prepare for the flood. Furthermore, the findings suggest that Perceived Behavioural Control exerts a small effect ($f^2 = 0.056$) on the generation of the R^2 value for Flood Preparedness Behaviour. It is noteworthy to observe that the Flood Preparedness Intention variable exerts a large effect size ($f^2 = 0.818$) on the determination of the R^2 value for Flood Preparedness Behaviour.

4.6.5 Assessment of the Predictive Power (PLSpredict)

Sarstedt et al. (2022) analysed the use of PLS-SEM in the field of marketing research. Their study specifically examined publications in the top 30 marketing journals during the period from 2011 to 2020. During their examination, the researchers observed that several writers perceived the R^2 value as an indicator of the predictive efficacy of their models. Nevertheless, the calculation of R^2 relies on the complete dataset and, therefore, serves as an indicator of a model's ability to explain the observed variation (Shmueli, 2010).

As discussed previously in section 4.6.3, researchers can present the R^2 value, provided that they do not use it as the sole basis for understanding the model's predictive power (Hair, 2021; Hair et al., 2019b; Shmueli and Koppius, 2011). Moreover, the R^2 value only examines the in-sample model fit of the dependent constructs' composite scores (Shmueli et al., 2019). It solely evaluates a model's explanatory power, not

indicating its out-of-sample predictive power—its ability to predict the values of new cases not included in the estimation process.

Hence, Shmueli et al. (2016) suggested researchers use PLSpredict in their research. This procedure employs k-fold cross-validation to produce predictions at the case level for various indicators. The methodology involves dividing the dataset into k distinct subsets and utilizing k-1 of these subsets to forecast the indicator values of a certain target construct inside the remaining subset of data, commonly referred to as the holdout sample. The aforementioned procedure is iterated k times, ensuring that each subset is used as a holdout sample exactly once.

The PLSpredict technique is a recently developed method, and scholarly research has provided instructions for its application (Shmueli et al., 2019). Many researchers are not aware of this recent development in PLS-SEM. Due to its recent introduction, the availability of PLSpredict applications is still limited, as evidenced by studies conducted by Felipe et al. (2017) and Svensson et al. (2018). According to observations made in online forums, such as the one found at <http://forum.smartpls.com/>, it appears that researchers encounter difficulties in properly interpreting the results obtained through PLSpredict. Moreover, the available guidelines for effectively interpreting these results often lack specificity and clarity.

Hence, it is not surprising that only 23 out of the total 295 studies (7.80%) employed PLSpredict. In contrast, a significant number of researchers (162 out of 486 models, accounting for 33.33% of the total) utilised the blindfolding-based Q^2 statistic as a method to evaluate predictive power. This approach has been widely regarded by scholars as an appropriate means of assessment (Sarstedt et al., 2014). Nevertheless, the validity of this interpretation has been called into question by recent research, which highlights the conflation of explanatory and predictive power evaluation in this statistic (Shmueli et al., 2016). In other words, many scholars agree that the blindfolding technique is no longer to be accepted for use, as it presents numerous drawbacks in predicting the model.

Therefore, Shmueli et al. (2019) recommended that researchers adhere to the most up-to-date guidelines and employ k-fold cross-validation techniques, such as utilizing PLSpredict or including holdout samples. Evaluating the predicted efficacy of a statistical

model is an essential component of any research endeavour (Shmueli et al., 2019). In their study, Shmueli et al. (2016) introduced PLSpredict, a process that uses holdout samples to provide case-level predictions at the item or construct level. This approach allows for the assessment of predictive models in the context of PLS-SEM. PLSpredict provides a method for evaluating the out-of-sample predictive capability of a model, namely, its accuracy in forecasting the result value of fresh cases.

It is recommended that researchers incorporate out-of-sample prediction as a fundamental component for evaluating models in PLS-SEM and as a means to gauge the practical significance of their models (Homburg et al., 2015; Reibstein et al., 2009; Lehmann et al., 2011). In cases where the Q^2 predict value is more than zero, it is recommended for researchers to proceed by conducting a comparative analysis of the Root Mean Square Error (RMSE) or Mean Absolute Error (MAE) values against the benchmark of the naïve Linear Model (LM). This comparative analysis can yield four potential outcomes.

- (1) PLS-SEM < LM for none of the indicators: If the PLS-SEM analysis (compared to the LM) yields lower prediction errors in terms of the RMSE (or the MAE) for none of the indicators, this indicates that the model lacks predictive power.
- (2) PLS-SEM < LM for a minority of the indicators: If the minority of the dependent construct's indicators produces lower PLS-SEM prediction errors compared to the naïve LM benchmark, this indicates that the model has a low predictive power.
- (3) PLS-SEM < LM for a majority of the indicators: If the majority (or the same number) of indicators in the PLS-SEM analysis yields smaller prediction errors compared to the LM, this indicates a medium predictive power.
- (4) PLS-SEM < LM for all indicators: If all indicators in the PLS-SEM analysis have lower RMSE (or MAE) values compared to the naïve LM benchmark, the model has high predictive power.

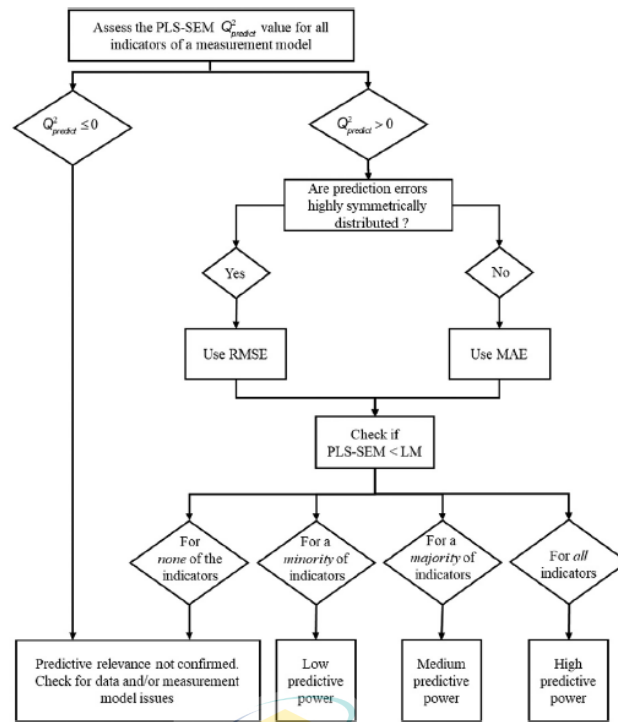


Figure 4.1 Guidelines for using PLSpredict

Upon comparing the RMSE values obtained from the PLS-SEM analysis with those of the LM benchmark, as presented in Table 4.13, it is evident that the PLS-SEM analysis yields reduced prediction errors for the variables FPB2 and FPB3. When employing PLS-SEM to estimate the model, the indicators FPB2, FPB3, and FPB5 exhibit PLS-SEM-based RMSE values of 1.112, 1.247, and 1.176, respectively. In contrast, the LM yields RMSE values of 1.126, 1.295, and 1.203 for these particular indicators. In the present scenario, it can be shown that the LM yields RMSE values that exhibit greater prediction errors compared to the RMSE values obtained using PLS-SEM. Meanwhile, the indicators FPB1 and FPB4 exhibit PLS-SEM-based RMSE values of 1.187 and 0.989, respectively, while the LM yields RMSE values of 1.165 and 0.981 for these particular indicators. To clarify, it can be said that the RMSE generated by the PLS-SEM approach exhibits greater prediction errors compared to the RMSE values produced by LM. The predictive strength of the endogenous FPB is moderate, as indicated by the larger LM RMSE values compared to PLS RMSE for the majority of the items (namely, FPB2, FPB3, and FPB5).

This study has three indicators, namely INT1, INT2, and INT3, that pertain to Flood Preparedness Intention (INT). The indicators INT1 and INT2 exhibit PLS-SEM-

based RMSE values of 1.378 and 1.240, respectively, while the LM yields RMSE values of 1.419 and 1.303 for these same indicators. In the present scenario, it is observed that the LM exhibits RMSE values that are associated with greater prediction errors in comparison to the RMSE values obtained using PLS-SEM. However, the RMSE value (1.247) of indicator INT3, as determined by PLS-SEM, exhibits larger prediction errors compared to the RMSE value (1.295) produced by LM. The predictive potential of the endogenous INT is moderate, as the bulk of the items (namely, INT1 and INT2) exhibit higher LM RMSE values compared to PLS RMSE.

Table 4.13 Predictive Power

	PLS RMSE	LM RMSE	PLS-LM	Q ² _Predict
FPB1	1.187	1.165	0.022	0.265
FPB2	1.112	1.126	-0.014	0.278
FPB3	1.247	1.295	-0.048	0.289
FPB4	0.989	0.981	0.008	0.396
FPB5	1.176	1.203	-0.027	0.299
INT1	1.378	1.419	-0.041	0.289
INT2	1.240	1.303	-0.063	0.359
INT3	1.019	1.007	0.012	0.475

Note 1: RMSE - Root Mean Square Error, LM - Linear Model

Note 2: FPB – Flood preparedness behaviour, INT – Flood preparedness intention.

4.7 Assessment of Moderation Analysis

The moderator is defined as an additional factor that can modify or influence the association between the independent and dependent variables (Dawson, 2014; Hair et al., 2016). This study utilised two moderating variables, namely community participation and trust in public protection. This section presents the findings of path coefficients, specifically focusing on the moderating effects. A total of seven hypotheses were formulated to investigate the potential interaction effects of community participation and trust in public protection on the relationship between exogenous and endogenous variables. The present study employed continuous data types as the moderating variable, and the analysis was performed using SmartPLS 4. The study hypothesised that:

- H9: The positive relationship between attitude and intention will be stronger when community participation is higher.
- H10: The positive relationship between subjective norms and intention will be stronger when community participation is higher.
- H11: The positive relationship between perceived behavioural control and intention will be stronger when community participation is higher.
- H12: The positive relationship between perceived susceptibility and intention will be stronger when community participation is higher.
- H13: The positive relationship between perceived severity and intention will be stronger when community participation is higher.
- H14: Community participation moderates the relationship between past experience and flood preparedness intention.
- H15: The positive relationship between flood preparedness intention and flood preparedness behaviour will be stronger when trust in public protection is higher.

The findings presented in Table 4.14 provide a summary of the 10,000 bootstrap resamples method for estimating interaction effects. These estimates were obtained after accounting for the influence of age and gender accompanied by 95% bias-corrected confidence intervals. The findings of the study indicated that:

Table 4.14 Moderating effect results

	Relationship	Beta	SE	t-value	p-value	f^2	VIF	LL	UL	Decision
H9	CP x ATT -> INT	0.077	0.040	1.920	0.027	0.010	1.113	0.007	0.139	Supported
H10	CP x SN -> INT	0.070	0.037	1.917	0.028	0.009	1.118	0.007	0.127	Supported
H11	CP x PBC -> INT	0.049	0.034	1.457	0.073	Nil	1.100	-0.006	0.104	Not Supported
H12	CP x SUC -> INT	0.098	0.033	2.983	0.001	0.017	1.092	0.045	0.151	Supported
H13	CP x SEV -> INT	0.077	0.037	2.102	0.018	0.011	1.086	0.020	0.141	Supported
H14	CP x PE -> INT	0.065	0.031	2.110	0.017	0.009	1.061	0.016	0.117	Supported
H15	TPP x INT -> FPB	-0.010	0.069	0.140	0.444	NIL	1.167	-0.113	0.114	Not Supported

Note 1: SE- Standard error, f^2 – Effect size, VIF - Variance inflation factor, LL - Lower level confidence interval, UL - Upper-level confidence interval.

Note 2: ATT – Attitude, CP – Community participation, FPB – Flood preparedness behaviour, INT – Flood preparedness intention, PBC – Perceived behavioural control, PE – Past experience, SEV – Perceived severity, SN – Subjective norms, SUC – Perceived susceptibility, TPP – Trust in public protection.

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This study analysed beta path coefficients to investigate the impact of interaction variables on the relationship between exogenous and endogenous variables. The findings obtained from the analysis of data presented in Table 4.14 indicate that the interaction product terms related to attitude (ATT) exhibit statistical significance ($\beta = 0.077$, $t = 1.920$, $LL = 0.007$, and $UL = 0.139$). Subjective norms (SN) ($\beta = 0.070$, $t = 1.917$, $LL = 0.007$ and $UL = 0.127$), perceived susceptibility (SUC) ($\beta = 0.098$, $t = 2.983$, $LL = 0.045$ and $UL = 0.151$), perceived severity (SEV) ($\beta = 0.077$, $t = 2.102$, $LL = 0.020$ and $UL = 0.141$), and past experience (PE) ($\beta = 0.065$, $t = 2.110$, $LL = 0.016$ and $UL = 0.117$) also demonstrate statistically significant associations. Thus, the H9, H10, H12, H13, and H14 were supported. Nevertheless, the interaction product item related to perceived behavioural control (PBC) does not exhibit statistical significance ($\beta = 0.049$, $t = 1.457$, $LL = -0.006$ and $UL = 0.104$). Therefore, the H11 was not supported.

In other words, community participation positively moderated the relationship between the predictors (attitude, subjective norms, perceived susceptibility, perceived severity) and the intention to prepare for the flood. Community participation also moderated the relationship between past experience and the intention to prepare for flooding. However, community participation does not moderate the relationship between perceived behavioural control and flood preparedness intention.

Finally, it should be noted that the trust in public protection (TPP) does not moderate the relationship between flood preparedness intention (INT) and flood preparedness behaviour ($\beta = -0.010$, $t = 0.140$, $LL = -0.113$ and $UL = 0.114$). Therefore, H15 was not supported. This study adheres to the methodology proposed by Kenny (2016) in terms of quantifying the effect size of the moderating effect. According to Kenny (2016), there exist three distinct levels of moderating effect sizes: small (0.005), medium (0.01), and large (0.025). The moderating impact sizes of attitude, perceived susceptibility, and perceived severity are of medium magnitude, with f^2 values of 0.010, 0.017, and 0.011, respectively.

According to Dawson (2014), to offer a more comprehensive understanding of moderating effects, it is recommended to examine the interaction effect pattern. This allows the researcher to determine how the moderator alters the relationship. However, only the relationships that have the moderating effect can be explained in the figures.

Hypothesis 9: The positive relationship between ATT and INT will be stronger when CP is higher.

Figure 4.2 shows that the line labelled 'high CP' has a steeper gradient compared to 'low CP,' indicating that the positive relationship is indeed stronger when CP is high. In other words, the relationship between ATT and INT becomes stronger with high CP.

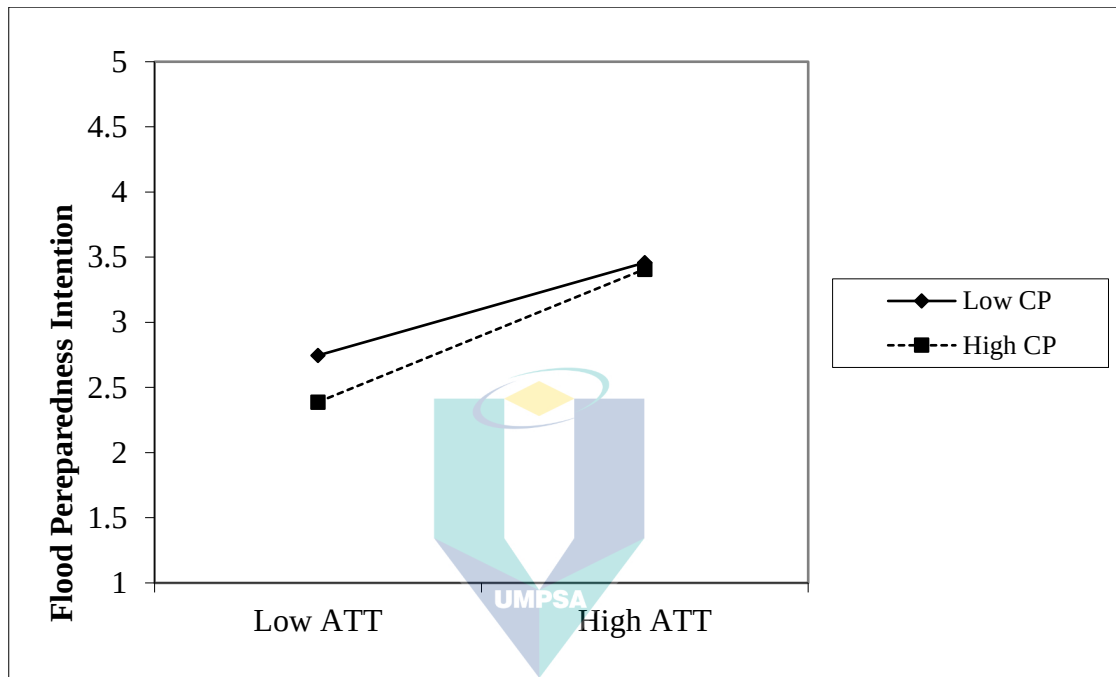


Figure 4.2 The moderating effect of CP on the relationship between ATT and INT.

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Hypothesis 10: The positive relationship between SN and INT will be stronger when CP is higher.

Figure 4.3 shows that the line labelled 'high CP' has a steeper gradient compared to 'low CP,' indicating that the positive relationship is indeed stronger when CP is high. In other words, the relationship between SN and INT becomes stronger with high CP.

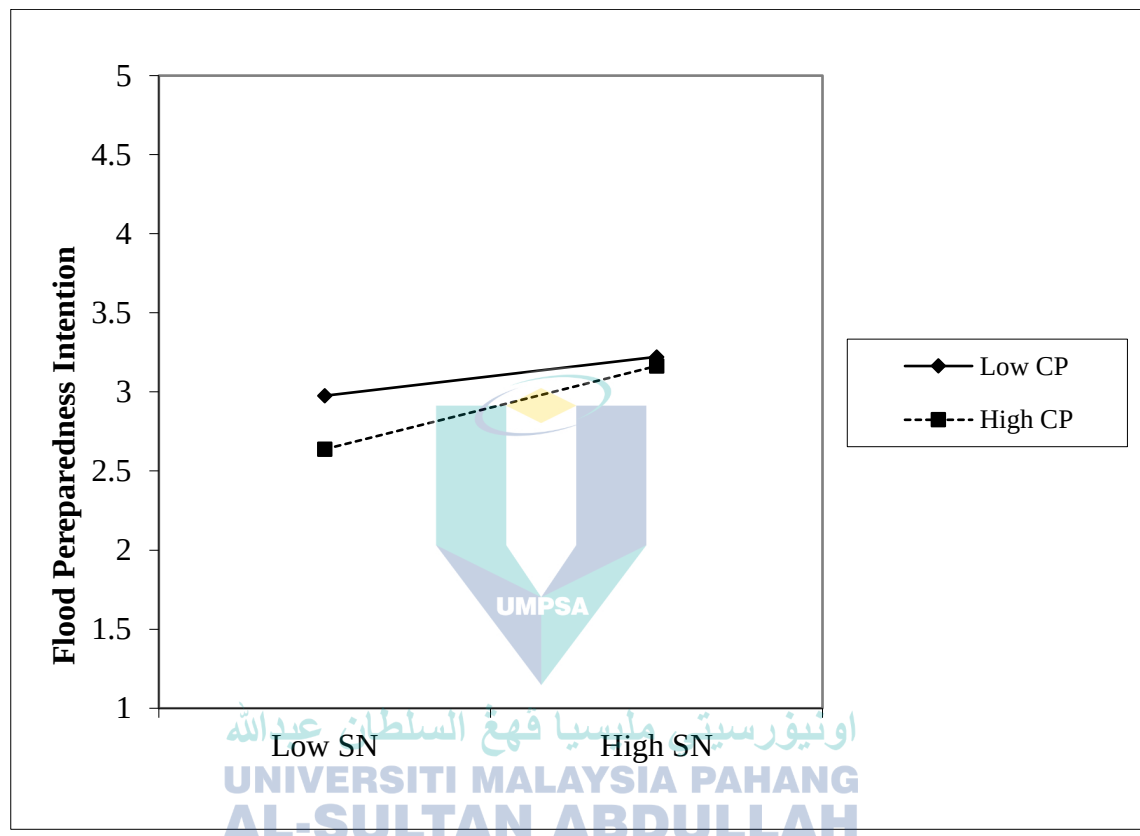


Figure 4.3 The moderating effect of CP on the relationship between SN and INT.

Hypothesis 12: The positive relationship between SUC and INT will be stronger when CP is higher.

Figure 4.4 shows that the line labelled 'high CP' has a steeper gradient compared to 'low CP,' indicating that the positive relationship is indeed stronger when CP is high. In other words, the relationship between SUC and INT becomes stronger with high CP.

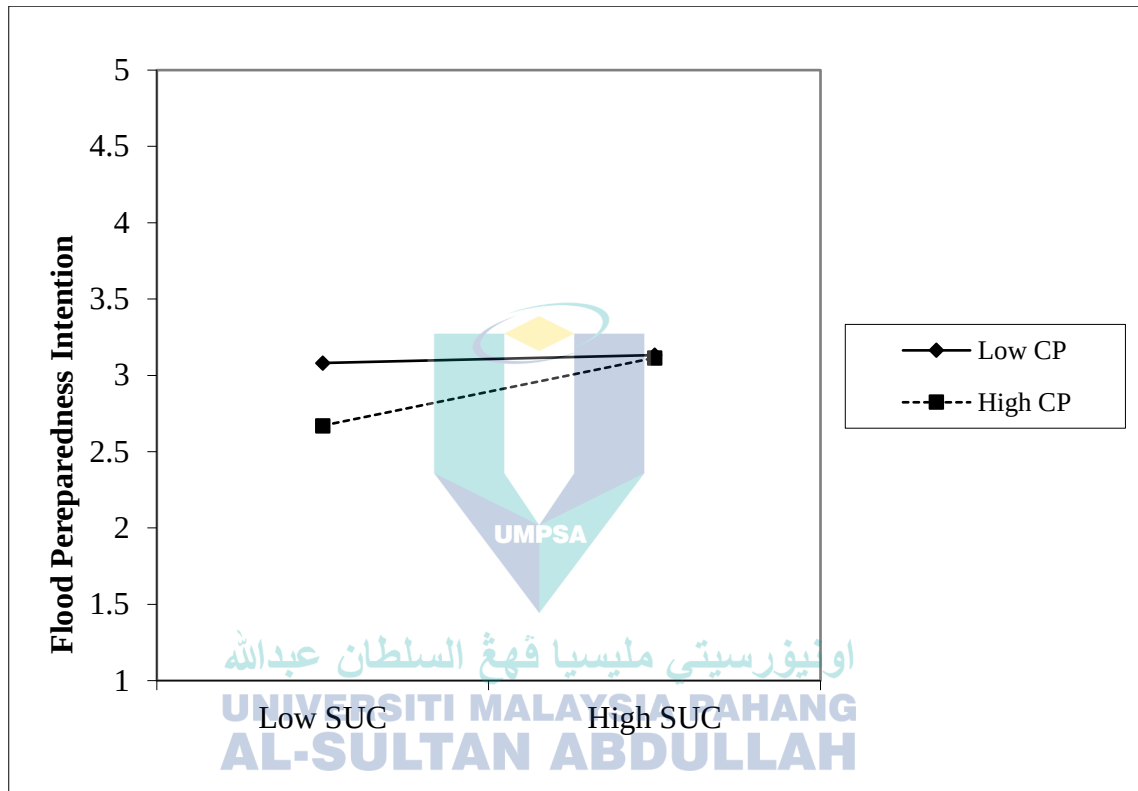


Figure 4.4 The moderating effect of CP on the relationship between SUC and INT.

Hypothesis 13: The positive relationship between SEV and INT will be stronger when CP is higher.

Figure 4.5 shows that the line labelled 'high CP' has a steeper gradient compared to 'low CP,' indicating that the positive relationship is indeed stronger when CP is high. In other words, the relationship between SEV and INT becomes stronger with high CP.

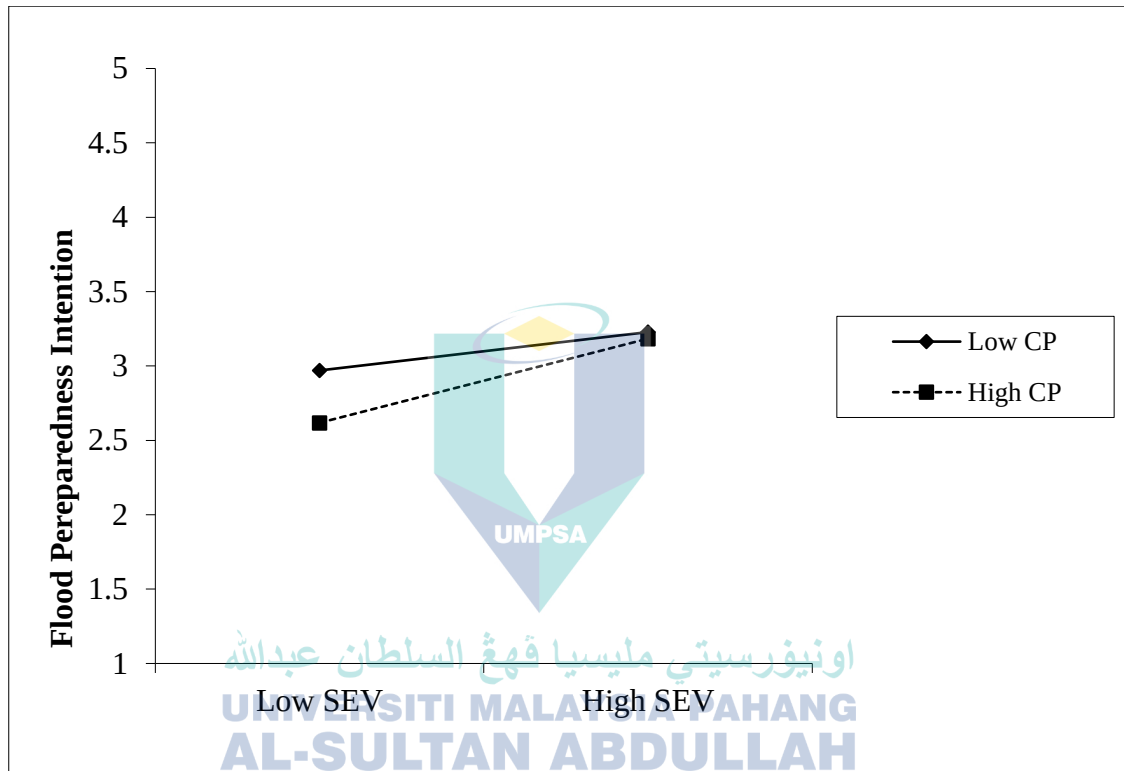


Figure 4.5 The moderating effect of CP on the relationship between SEV and INT.

Hypothesis 14: CP moderates the relationship between PE and INT.

Figure 4.6 illustrates that the relationship between PE and INT is stronger when CP is low. In other words, when community participation among youths is low, the relationship between past experience and flood preparedness intention is strengthened.

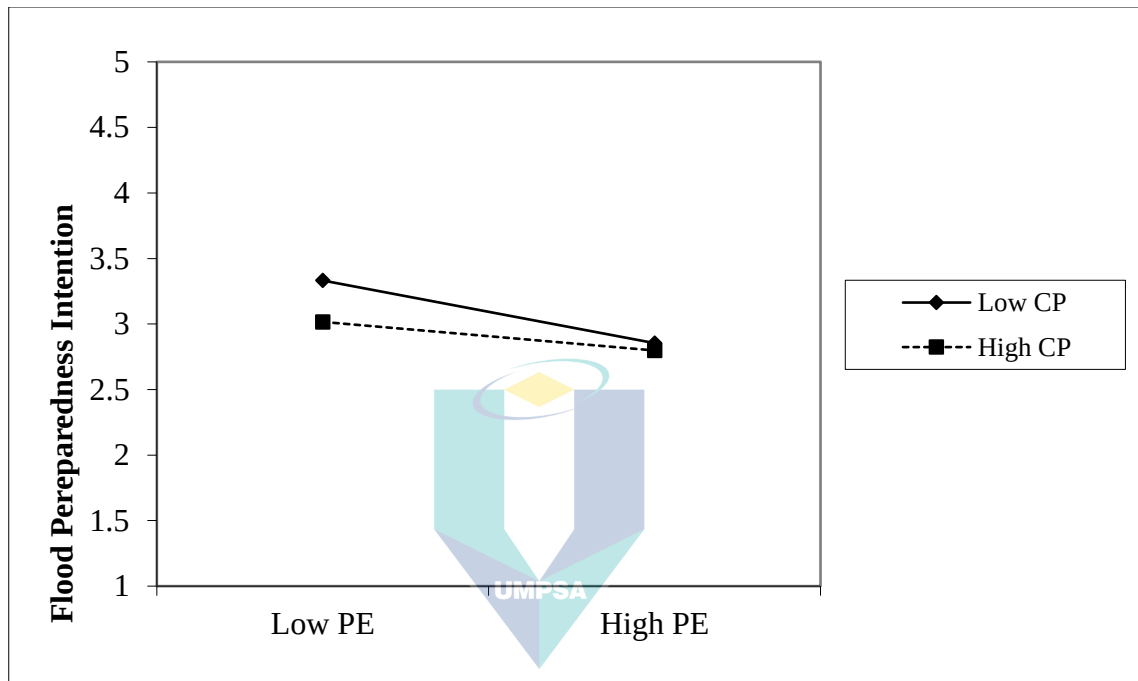


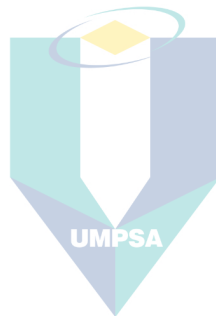
Figure 4.6 The moderating effect of CP on the relationship between PE and INT.

Table 4.15 Summary of hypotheses testing

	Hypothesis Statement	Decision
H1	There is a positive relationship between attitude and flood preparedness intention	Supported
H2	There is a positive relationship between subjective norms and flood preparedness intention	Supported
H3	There is a positive relationship between perceived behavioural control and flood preparedness intention	Not Supported
H4	There is a positive relationship between perceived susceptibility and flood preparedness intention	Supported
H5	There is a positive relationship between perceived severity and flood preparedness intention	Supported
H6	There is a relationship between past experience and flood preparedness intention	Supported
H7	Perceived behaviour control is positively associated with flood preparedness behaviour	Supported
H8	There is a positive relationship between flood preparedness intention and flood preparedness behaviour	Supported
H9	The positive relationship between attitude and intention will be stronger when community participation is higher.	Supported
H10	The positive relationship between subjective norms and intention will be stronger when community participation is higher	Supported
H11	The positive relationship between perceived behavioural control and intention will be stronger when community participation is higher	Not Supported
H12	The positive relationship between perceived susceptibility and intention will be stronger when community participation is higher	Supported
H13	The positive relationship between perceived severity and intention will be stronger when community participation is higher	Supported
H14	Community participation moderates the relationship between flood preparedness and flood preparedness intention.	Supported
H15	The positive relationship between flood preparedness intention and flood preparedness behaviour will be stronger when trust in public protection is higher.	Not Supported

4.8 Summary

In summary, this chapter presented the profiles and summaries of the respondents. Following this, an assessment was conducted on the measurement model, revealing a satisfactory level of validity and reliability. The threshold for establishing the structural model was subsequently determined. The structural model segment provides a summary of the results obtained from the evaluation of hypotheses in this study. The study investigated the hypotheses by analysing the path coefficients to determine direct effects. The moderating effects were assessed using the bootstrapping technique. The chapter concludes with a summary of the research findings.



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CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

As mentioned in the previous chapters, the main aim of the study is to examine the factors associated with youths' intentions and behaviour in preparing for the flood. In addition to examining the relationship between the predictors (attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity and past experience), flood preparedness intention and flood preparedness behaviour, this study also aims to examine the moderating effects of community participation and trust in public protection. Therefore, this section will focus on the findings that relate to the research objectives of the study. The first section provides an overview of the findings of the study, and the second section then discusses these findings. The theoretical and practical implications of the study are then discussed. Finally, at the end of the chapter, the limitations of the study and suggestions for future research are discussed.

5.2 Recapitulation and Summary of Findings

This study addresses factors related to flood preparedness behaviours among youth in the East Coast region of Malaysia. The impact of natural disasters can be mitigated through effective preparedness measures (Wankmüller and Reiner, 2020). Researchers have proven that it is crucial to take precautionary measures to avoid further damage from natural disasters (Sawalha, 2020; Wankmüller and Reiner, 2020). Based on this concern, this study has integrated two main theories, the TPB and the HBM, and developed a comprehensive research model.

The results are used to substantiate the research objectives in this research, as summarised below:

1. To examine the predictors associated with flood preparedness intention.
2. To investigate the predictors associated with flood preparedness behaviour.

3. To analyse the moderating effects of community participation on the relationships between the predictors and flood preparedness intention.
4. To analyse the moderating effect of trust in public protection on the relationship between flood preparedness intention and flood preparedness behaviour.

Results obtained from the analysis have succinctly discoursed with the research questions highlighted in this study.

1. Is attitude positively associated with flood preparedness intention?
2. Is subjective norm positively associated with flood preparedness intention?
3. Is perceived behavioural control positively associated with flood preparedness intention?
4. Does perceived susceptibility positively associate with flood preparedness intention?
5. Does perceived severity positively associate with flood preparedness intention?
6. What is the relationship between past experience and flood preparedness intention?
7. Does perceived behavioural control positively associate with flood preparedness behaviour?
8. Does flood preparedness intention positively associate with flood preparedness behaviour?
9. Does community participation moderate the relationships between attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, and past experience, and flood preparedness intention?
10. Does trust in public protection moderate the relationship between flood preparedness intention and flood preparedness behaviour?

5.3 Discussion of Findings

Due to the lack of studies on flood preparedness in Malaysia, particularly concerning youth, the main objective of this study is to investigate the factors associated with flood preparedness among youth in the East Coast region of Malaysia. In this study, fifteen (15) hypotheses were developed on the relationship between the predictors, flood preparedness intention and behaviour. The findings of the study show that attitude, subjective norms, perceived susceptibility and perceived severity were positively associated with flood preparedness intentions. This study also found that there is a relationship between past experience and flood preparedness intention. In other words, H1, H2, H4, H5 and H6 were supported. Perceived behavioural control, on the other hand, was not positively associated with flood preparedness intention. Therefore, H3 was not supported.

This study also found that perceived behaviour control and flood preparedness intention have a positive relationship with flood preparedness behaviour. Therefore, H7 and H8 were supported. As for the moderating effect, community participation was found in this study to positively moderate the relationship between the predictors (attitude, subjective norms, perceived susceptibility, and perceived severity, except for perceived behaviour control) and flood preparedness intention. In addition, community participation also moderated the relationship between past experience and flood preparedness intention. Therefore, H9, H10, H12, H13, and H14 were supported, while H11 was not supported).

In other words, the relationship between the predictors (attitude, subjective norms, perceived susceptibility, and perceived severity) and flood preparedness intention will be stronger when youth have high levels of community participation. This study also found that trust in public protection did not have a moderating effect on the relationship between flood preparedness intention and flood preparedness behaviour (H15 was not supported). In the following section, the results of the study are discussed and justified by answering all the research questions.

5.3.1 Research Question 1

Is attitude positively associated with flood preparedness intention?

H1: There is a positive relationship between attitude and flood preparedness intention

Attitude refers to an individual's positive or negative evaluation of performing a certain behaviour. It includes the person's beliefs and feelings about the behaviour and its possible consequences (Kurata et al., 2023; Ajzen, 1985; Ajzen, 1991). It also refers to a person's assessment of the advantages and disadvantages associated with a particular behaviour (Zaremohzzabieh et al., 2021). The answer to the first research question is yes, there is a positive correlation between attitude and flood preparedness intention. This study found a positive correlation between the attitude of the youth in the East Coast region of Malaysia towards flood preparedness and their intention to participate in flood preparedness. Therefore, the first hypothesis was supported in this study.

Youth who believe that participating in flood preparedness activities can effectively mitigate the impacts of flooding are more likely to have a positive attitude and a strong intention to prepare for floods. In other words, if youths in the Malaysian East Coast region believe in the effectiveness of flood preparedness activities, they are more likely to have a positive attitude and a strong intention to actively participate in these activities. In particular, youths in the Malaysian East Coast region believe that participation in flood preparedness activities is effective, useful and beneficial. They believe that flood preparedness activities can have a positive impact in mitigating the effects of floods.

Youth in the East Coast region believe that flood preparedness measures can significantly reduce the risk of casualties, minimise property damage, and promote community resilience. Youth who are well prepared mentally, physically and emotionally are better able to cope with the consequences of flooding. This resilience allows for a quicker recovery and reduces the long-term impact on youths' well-being. A positive attitude can come from a higher level of awareness and understanding of the risks and consequences of flooding in the East Coast region. When youth are well informed, they are more likely to recognise the importance of being prepared, which promotes a positive attitude and intention to prepare for flooding.

This finding strengthens the TPB by highlighting the positive relationship between attitude and intention to prepare for flooding, particularly in the context of youth in the East Coast region of Malaysia. While the TPB, in general, provides a

comprehensive understanding of attitudes towards certain behaviours, this study contributes to the body of knowledge by examining the complex aspects of attitudes and intentions among youth, focusing specifically on their preparation for flooding in the East Coast region of Malaysia. It goes beyond the theoretical framework to provide empirical evidence and insights that shed light on the factors that influence youth preparedness intentions in the face of potential flooding events.

This finding is unique because the context of the present study differs from that of past studies. It is interesting to note that this study differs from the earlier studies by Ng (2002). Ng (2022) found no significant relationship between attitude and intention, suggesting that attitude may not effectively explain behavioural intention under extreme circumstances, such as during a typhoon. Although previous research (e.g., Ong et al., 2021; Zaremohzzabieh et al., 2021) found a positive relationship between attitude and intention, they focused on earthquakes, unlike the present study which specifically focuses on floods. In Malaysia, especially in the East Coast region, floods pose a greater challenge to residents compared to earthquakes. Therefore, this finding may provide new insights into the relationship between attitude and intention to prepare for floods among youth in the East Coast region of Malaysia.

The East Coast region of Malaysia is repeatedly hit by floods, a fact that calls for increased preparedness among residents, especially the youth. Unlike earthquake-prone areas where flood preparedness strategies can vary significantly, the unique challenges that floods bring encompass a broader spectrum. The unique characteristics of floods and earthquakes require different strategies and considerations to effectively mitigate their respective impacts. In terms of an evacuation plan, flood preparedness involves planning for the evacuation of areas prone to flooding, identifying safety routes and establishing emergency shelters. In contrast, evacuation plans for earthquakes are less emphasised due to the sudden onset of earthquakes and are aimed more at preparing people to “drop, take cover and hold” during an earthquake. Given these particular environmental factors, the present study, with its explicit focus on flood-related contexts, not only contributes to the academic discourse by broadening the understanding of the link between attitude and preparedness intentions but also offers pragmatic insights for policymakers, disaster management agencies and community leaders.

In a study conducted by Wang and Tsai (2022), the TPB was used as a framework to examine the various elements that influence teachers' behavioural intentions related to school disaster preparedness in Taiwan. The researchers discovered a significant correlation between teachers' views on school disaster risk reduction efforts and their behavioural intentions, suggesting that teachers with more positive attitudes are more willing to engage in such activities. The key element that determined teachers' behavioural intentions toward school disaster risk reduction was their attitude.

Although the study conducted by Wang and Tsai (2022) found a positive relationship between attitude and intention, the effect of this study differs significantly from the present study. The difference lies in three elements: the type of disasters, the subjects and the location of the study. Wang and Tsai studied general disaster preparedness behaviour, which included various types of disasters such as earthquakes, typhoons, landslides and droughts. The subjects studied were elementary and middle school teachers, and the location of the study was Taiwan. As the present study focused specifically on floods and youth in the East Coast region of Malaysia, the findings of this study may offer new insights into the study of flood preparedness behaviours. This is because the nature of flooding, with its unique challenges and characteristics, requires a tailored approach to preparedness.

Unlike Wang and Tsai's broad study, which covered a wide range of disasters, this study specifically addresses the intricacies of flood scenarios. Furthermore, the subjects of this study are the youth in the East Coast region of Malaysia. This population group brings their perspectives, experiences and challenges that are particularly relevant to flood preparedness. The dynamic nature of youth attitudes and behaviours, coupled with the particular environmental context of Malaysia's East Coast region, adds a layer of specificity to the findings.

Geographical location is another distinguishing factor. Taiwan, where Wang and Tsai conducted their study, may face different contextual and environmental challenges than the East Coast region of Malaysia, which has its own unique landscape, climate and socio-economic aspects. Therefore, the present study not only refines the understanding of the link between attitude and intention to prepare for floods but also provides valuable context-specific knowledge that can inform targeted interventions, education campaigns

and policies to improve flood resilience among youth in the East Coast region of Malaysia.

Based on the discussions above, it is believed that youths who are positive about flood preparedness are more inclined to participate in flood preparedness activities because they believe that such preparedness brings benefits, positive consequences and a sense of satisfaction. Youth residing in the East Coast region of Malaysia are more inclined to engage in flood preparedness activities if they believe that such preparations can have positive and rewarding effects. It is a widely held belief that undertaking flood preparedness activities can be an effective means of protecting oneself and others from the potential dangers and negative consequences of flooding. This belief may have its origins in the knowledge and understanding that people have of the effectiveness of flood prevention measures. When a person is convinced that the outcome of participating in a certain behaviour is either good or unsatisfactory, this leads to the formation of a positive or negative attitude. Consequently, behavioural intention is influenced.

5.3.2 Research Question 2

Is subjective norm positively associated with flood preparedness intention?

H2: There is a positive relationship between subjective norm and flood preparedness intention

The subjective norm refers to the perception of social pressure exerted on an individual to engage in certain behaviours. The pressure experienced by the individual is the result of the perspectives, expectations and level of conformity displayed by those around them and thus influences their behavioural intentions. The answer to the second research question is yes, there is a positive correlation between the subjective norm and flood preparedness intention. The present study found a positive correlation between subjective norms and intention to prepare for the flood in the East Coast region of Malaysia. Therefore, the second hypothesis was supported in this study.

It can be interpreted that the decisions made by youths in the East Coast region of Malaysia to prepare for floods were based on the influence of important people, such as family members and friends. Youth in this region believed that what other people think they should do is important and they feel under social influence to prepare for a flood.

The findings of this study suggest that youth in the East Coast region place great value on the opinions and actions of their close social circles. This propensity for social influence in flood preparedness decisions can be attributed to the strong community ties prevalent in the East Coast region, where family and peer networks play a critical role in shaping individual behaviours. This highlights the importance of community engagement and the role of interpersonal relationships in fostering effective flood preparedness initiatives among youth in this particular geographic context.

As Malaysia is a country with a collectivist culture, the youth in the East Coast region can rely on the suggestions and recommendations of their significant individuals regarding flood preparedness. According to Oyserman (2008), people in collectivist societies are likely to be interdependent and pursue group goals rather than individual goals. Therefore, subjective norms may be a key factor in influencing an individual decision. Collectivism, a cultural orientation that emphasises group harmony, cooperation and interdependence, is prevalent in Malaysia. In collectivist cultures, the needs and goals of the group take precedence over the personal preferences of the individual. The emphasis is on being part of a collective or group. In return for loyalty, the individual receives protection and security from the in-group (Noordin et al., 2002). According to Palm (1999), disaster preparedness behaviour is influenced by an individual's significant others. Therefore, it is important to establish a link between subjective norms and flood preparedness intention.

Subjective norms play a crucial role, as individuals in collectivist cultures tend to conform to social expectations and norms. Societal expectation refers to the expected behaviours that are considered desirable in a given society. These expectations are communicated and reinforced through various channels, such as family upbringing, educational institutions, media and cultural traditions. In the present study, youth in the East Coast region of Malaysia shared a similar opinion on whether a certain behaviour is desirable in their living environment. The opinions and expectations of their family members, friends and significant others hold considerable weight in influencing their flood-preparedness behaviour. If they have this kind of belief, they are more likely to prepare for the flood.

In collectivist cultures, people often rely on close relationships for support and assistance. Preparing for floods requires a collective effort, and youth may recognise the

interdependence within their social networks. Following advice from family and peers can be seen as contributing to collective safety and well-being. Cultural values and norms shape individual behaviour. When the cultural norm in the East Coast region emphasises family and community ties, youth may internalise the expectation that following family and peer advice is not only socially acceptable but also virtuous. Youth in the East Coast region believed that preparing for the flood was considered morally good, righteous, or in line with accepted ethical standards.

Engaging in virtuous practices is seen as a way of demonstrating moral integrity, contributing to the well-being of oneself and others, and upholding ethical standards. In this context, flood preparedness can be seen as virtuous behaviour that demonstrates a sense of responsibility and care for self, family and community. It reflects an ethical attitude that values the well-being and safety of the individual and the wider community. Flood preparedness often involves community efforts, such as helping neighbours, participating in community drills, and sharing resources. This is consistent with virtuous practices that prioritise the collective good over individual interests. Youth are also likely to show compassion and solidarity with those who are more vulnerable or less able to prepare themselves.

Youth may feel a strong sense of duty and connection to their family and peers, which motivates them to adhere to shared norms and expectations. Family members and peers are powerful sources of social influence. When these influential people emphasise the importance of flood preparedness, youth in the East Coast region of Malaysia are more likely to conform to these expectations to maintain positive relationships and group cohesion. Trust is also one of the factors why youth prefer to follow the suggestions of their family members and peers. Youth trust the judgment and experience of their family members and peers and believe that these individuals have their best interests at heart. This trust can increase the persuasiveness of flood preparedness advice. Furthermore, the motivation behind this behavioural influence is the desire to receive recognition. In other words, youth in the East Coast region may adapt their actions to the approval or acceptance they receive from certain individuals with the ultimate goal of receiving recognition for their efforts.

Based on the above discussion, it is believed that youth in the East Coast region are more likely to prepare for floods due to the collectivist culture in the region. Youths'

decision to prepare for flooding is influenced by their family members, peers, and people important to them, as this behaviour is considered virtuous and socially acceptable. Youth also have the intention to prepare for floods because they believe that this activity will not only help them in emergencies but also benefit the people around them.

Although past studies (e.g., Zaremohzzabieh et al., 2021; Ong et al., 2021) found that subjective norms are positively associated with flood preparedness intention to prepare for a flood, they failed to include youth as the subject of their studies. Zaremohzzabieh et al. (2021) found that subjective norms were correlated with intention, but their study focused on household preparedness in general and not specifically on flood preparedness among youth. Furthermore, their study focused on the earthquake disaster and not the flood itself. Similar to the study by Ong et al. (2021), although their study focused on the major earthquake in the Philippines.

Subjective norms and flood preparedness intention to prepare for flooding can vary between households and youth within a community. While subjective norms and intentions to prepare for flooding have common elements, the specific influences and considerations can vary significantly between households and youth within a community. Understanding these differences is critical to developing targeted and effective strategies to promote flood resilience. Because this study focuses on youth, formal education and outreach programs targeting youth can influence their intent to prepare for flooding. Youth are also often more connected to media and technology, which can shape their subjective norms. Information from social media, influencers and online communities can play a role in their attitudes. Therefore, the findings of the present study are crucial as they can help policymakers and government agencies formulate specific strategies to improve subjective norms and flood preparedness activities.

5.3.3 Research Question 3

Is perceived behavioural control positively associated with flood preparedness intention?

H3: There is a positive relationship between perceived behaviour control and flood preparedness intention.

Perceived behavioural control is a construct that refers to the subjective perception of a person's ability to exercise control over a particular behaviour. The answer to the third research question is no, there is no positive relationship between perceived behavioural control and flood preparedness intention. Surprisingly, the present study found no positive correlation between perceived behavioural control and intention to prepare for flood in the East Coast region of Malaysia. Therefore, the second hypothesis was not supported in this study. This finding is in line with the past studies (Gumasing et al., 2023; Ng, 2022) but contradicted these past studies (e.g. Samaddar et al., 2014; Kurata et al., 2023; Kahlor et al., 2019).

The results of the present study are a unique contribution to the TPB. This theory provides a framework for understanding and predicting human behaviour. The theory states that perceived behavioural control has a direct influence on the formation of intentions. The more control individuals perceive over behaviour, the stronger their intention to engage in that behaviour. However, in the context of this study, this is not the case as this study did not find a positive relationship between perceived behavioural control and intention to prepare for flooding among youth in the East Coast region of Malaysia.

For the specific population of youth in the East Coast region of Malaysia, the study found that the level of control these individuals believe they have over flood preparedness does not appear to influence their expressed intention to engage in flood preparedness activities. This finding suggests that other factors, such as subjective norms, may have a greater influence on youth's intentions to prepare for flooding. As mentioned earlier, in the present study, subjective norms were found to be positively associated with intentions to prepare for flooding among youth in the East Coast region of Malaysia. Cultural norms or social expectations within a community may not emphasise individual control over flood preparedness. In a cultural context where collective responsibility or community-wide efforts take precedence over individual actions, the influence of subjective norms may overshadow the role of perceived behavioural control in shaping flood preparedness intentions.

This situation arises from the shared responsibility that emerges from collectivist culture. Shared responsibility in a collectivist culture fosters the belief that collective efforts are more effective in overcoming challenges. In this context, individuals may feel

less compelled to rely on their own perceived behavioural control because they trust in the collective ability to manage flood preparedness. In other words, even though it is difficult for youth to prepare for a flood, they still have the intention to prepare because they know that important people such as family members, neighbours and friends will support them. Youth in Malaysia's East Coast region trust that important people will offer them help in return when they face difficulties. This mutual understanding strengthens the intention to prepare for a flood.

Youth often rely on their social networks, which may include family members, neighbours and friends. These individuals provide a safety net and contribute to the overall resilience of the community. In addition, important people in the youth's life may have resources, knowledge or skills that complement the individual's efforts. This collective approach to sharing resources increases the overall effectiveness of flood preparedness activities. The cultural values of collectivism often prioritise the well-being of the group over individual concerns. Therefore, the intention to prepare is not only influenced by personal motives but also by the desire to contribute to collective safety.

There are several reasons why the third hypothesis of the study was not supported. Even when people believe that they have the ability (PBC) to prepare or take an action, their lack of confidence in the efficacy of their actions (low outcome expectancy) weakens the link between their perceived control and their intention to act. This is supported by the research of Artistico et al. (2014), which suggests that when people do not expect a positive outcome from their efforts, their perceived control is less likely to translate into intention or behaviour.

Besides that, Malaysia is also one of the countries that practise a collectivist culture. Collectivist societies may be more open to sharing resources, such as emergency supplies or shelter, during and after disasters. This can increase the overall resilience of the community. People are more willing to work together to overcome common challenges and share resources. Furthermore, people are more likely to rely on other members of society to solve problems to improve their well-being (Bandura, 1986), and rational Malaysians tend to benefit from the efforts of others (Zaremohzzabieh et al., 2021). Hence, regardless of their perceived behavioural control, they still have the intention to prepare for a flood. Similar to the results of Tan (2022), who also found that perceived behavioural control was not positively correlated with the intention to prepare.

This is due to the fact that respondents generally perceive disaster preparedness as an activity in which they have no choice but to participate.

Based on the above, it can be explained that for youth in the East Coast region, the perceived ease or difficulty of individual flood preparedness measures is not the main reason for their motivation to prepare for floods. Instead, their motivation to prepare for floods is rooted in the belief that preparing for floods is a collective endeavour involving various stakeholders, including peers, family members, residential communities, youth organisations, and the government. Youth in the East Coast region view flood preparedness as a shared responsibility that goes beyond individual efforts. They understand that flooding can have far-reaching and severe impacts and therefore believe that managing this risk requires a collective response. Furthermore, youth are aware that their families and communities play an important role in flood preparedness. They believe that involving family members and working with housing associations can lead to more effective and comprehensive precautionary measures.

5.3.4 Research Question 4

Does perceived susceptibility positively associate with flood preparedness intention?

H4: There is a positive relationship between perceived susceptibility and flood preparedness intention.

Perceived susceptibility refers to a person's constitutional vulnerability to a hazard (Brewer et al. 2007; Shreve et al. 2016). The path model analysis revealed that perceived susceptibility is positively associated with the intention to engage in flood preparedness activities in the East Coast region of Malaysia. Hence, H4 was supported. The positive relationship is consistent with the HBM, which states that people are more likely to engage in preventive behaviours if they perceive themselves to be vulnerable to a particular threat. In the context of flood preparedness, this means that youth in the East Coast region of Malaysia who feel vulnerable to the effects of flooding are more likely to express an intention to prepare. The positive relationship suggests that as perceived susceptibility to the risks of flooding increases, the likelihood of having the intention to take preparedness measures also increases.

As mentioned earlier, the East Coast region of Malaysia, which includes Pahang, Terengganu and Kelantan, is characterised by geographical and climatic conditions that make it prone to flooding (Tang, 2019). Frequent rainfall, river systems and low-lying areas contribute to a higher risk of flooding. The pervasive influence of local narratives, community discussions, and educational initiatives that emphasise the region's vulnerability to flooding has increased the susceptibility of youth. Furthermore, individuals who are vulnerable to flood disasters tend to exhibit higher levels of proactivity because they are more familiar with the flood warning systems implemented in their respective communities (Kusumastuti et al., 2021). This situation may in turn increase their willingness to prepare for future floods.

The finding that there is a positive relationship between perceived susceptibility and flood preparedness intention contributes significantly to the research model by bridging and integrating two established theories namely the TPB and HBM. In the TPB, individuals' behavioural intentions are influenced by their attitudes, subjective norms, and perceived behavioural control. The positive relationship between perceived susceptibility (a key component of health beliefs) and flood preparedness intention to be prepared for flooding is consistent with the TPB, as it emphasises the role of individuals' beliefs and perceptions in shaping their behavioural intentions.

The HBM, on the other hand, focuses on the individual's perception of the severity of a health threat, their susceptibility to this threat and the benefits of preventive measures. The result supports the HBM by highlighting the importance of perceived susceptibility in the context of flood preparedness, emphasising that individuals who perceive themselves as vulnerable to the negative effects of flooding are more likely to express an intention to prepare.

By integrating these two theories, the research model becomes more comprehensive and nuanced. It recognises that both the cognitive processes emphasised by the TPB and the perceptual components emphasised by the HBM play a critical role in influencing individuals' flood preparedness intentions. This integration provides a more comprehensive understanding of the factors influencing preparedness behaviour, improves the theoretical framework of the study, and potentially offers more effective insights for the development of interventions or strategies to promote flood preparedness.

5.3.5 Research Question 5

Does perceived severity positively associate with flood preparedness intention?

H5: There is a positive relationship between perceived severity and flood preparedness intention

Perceived severity refers to the perception of potential harm caused by the disaster (Brewer et al., 2007; Shreve et al., 2016). The present study found that there was a positive relationship between the perceived severity of the disaster and flood preparedness intention. In other words, the study found that perceived severity was positively related to flood preparedness intention to prepare for flooding among the youth in the East Coast region of Malaysia. This suggests that individuals who perceive flooding to be very severe are more likely to express an intention to prepare for such events, indicating the importance of considering perceptions of severity in developing effective flood preparedness measures. Hence, H5 was supported.

The occurrence of a positive association between perceived severity and flood preparedness intention among youth in the East Coast region of Malaysia can be attributed to several factors. Individuals who perceive flooding to be very severe may have a heightened awareness of risk. The perceived severity of the potential consequences may motivate them to take precautionary measures and prepare for the event of flooding. In addition, increased awareness and access to information about the serious impacts of flooding could influence people's perceptions. If there are effective communication campaigns or education programmes that highlight the extent of flooding, people are more likely to take the threat seriously and take precautionary measures. It is assumed that youth in the East Coast region are aware of and recognise the serious effects of flooding. Therefore, they have a high willingness to prepare for a flood in the hope that the impact of the flood can be mitigated.

In addition, the attitudes and behaviours of the community or peer groups play a critical role in educating youth about the severity of flooding. Collective understanding within the community about the severity of flooding makes youth more likely to align their precautions with this shared perception. In addition, culture also plays an important role in how youth perceive and respond to the severity of flooding. It is believed that the culture present in the East Coast region that emphasises flood preparedness and

community resilience has a positive influence on youth and encourages the intention to prepare for flooding.

According to Lazo et al. (2015), people tend to prepare for the likely severity of a disaster and adopt certain behaviours. People have negative feelings when they perceive a flood event as highly risky based on their assessment of its severity (Altarawneh et al., 2018). Kurata et al. (2023) emphasised that people's perception of the severity or consequences of a flood increases their fear of the hazard because they believe in a higher probability of future floods. Fear plays a role in influencing preparedness and thinking (Kurata et al., 2023b). According to Altarawneh et al. (2018), people who perceive flooding as high risk due to its perceived severity feel more anxious, powerless, angry and fearful. Fear plays a role in influencing preparedness. Miceli et al. (2008) suggested that risk perception (e.g., perceived severity) has both cognitive and affective influences on a person's decision-making and desire to take preparatory action. Dangerous and life-threatening situations trigger negative emotions such as worry, anger, regret, guilt, fear, disappointment and shame (Dionne et al., 2018, Liao et al., 2011).

5.3.6 Research Question 6

What is the relationship between past experience and flood preparedness intention?

H6: There is a relationship between past experience and flood preparedness intention

Flood experience can be defined as having been exposed to a flood disaster at least once in a lifetime (Atreya et al., 2017). This study posited that there is a relationship between past experience and flood preparedness intention. The result of the study shows that past experience is correlated with the intention to prepare for a flood. Therefore, H6 is supported. It is interesting to note that the relationship between past experience and the intention to prepare for a flood is negative. This result therefore suggests that a higher score in past experience decreases flood preparedness intention or a lower score in past experience increases flood preparedness intention. In other words, the more past experience youth have with floods, the less likely they are to intend to prepare for future

floods and the less past experience youth have with floods, the more likely they are to intend to prepare for future floods.

This study finding depicts that youth in the East Coast Region who have less flood experience are more likely to prepare for a flood due to the perceived severity of the flood. In other words, the findings for hypotheses 6 and 5 are interrelated. As discussed previously, youths in the East Coast Region of Malaysia will be more likely to prepare for a flood when they perceive the severity of the flood as high. Although some of them have less flood experience, they still have the intention to prepare for a flood because of the influence of various factors that shape their perception and understanding of the potential risks associated with floods. Media exposure, educational initiatives, and community narratives contribute to creating a collective awareness among youths, even those without direct flood experience. Additionally, the acknowledgement of the historical context of severe flooding events in the East Coast Region and the psychological impact of risk communication further reinforce their belief in the high severity of floods.

Furthermore, the sense of responsibility instilled through social learning (subjective norms), where they hear about the challenges faced by their peers, family members, or neighbours during previous flood incidents, plays a crucial role. Even if individuals personally have less experienced floods, they may have friends, family, or neighbours who have. Hearing about others' experiences can prompt youths to take precautions, especially if they are located in a region with a history of flooding. Hearing about the challenges faced by others can make youth more inclined to believe in the seriousness of the threat and take precautions. This firsthand information, combined with a broader cultural understanding of the destructive nature of floods, motivates youths to take proactive measures, demonstrating a commitment to personal and community safety. Individuals learn from the experiences of others, and if youth in the East Coast Region hear about the severe consequences of floods from their peers, family, or community members, they are more likely to perceive the situation as serious and take preparatory actions to face future floods.

The East Coast Region have a history of severe flooding events, and this historical context can contribute to the perception of floods as a serious threat. Even if individuals have not experienced floods personally, knowledge of past events can shape their

perception of the potential severity. Media plays a major role in shaping the perception of youth regarding the severity of floods through images and stories. Youth who have not experienced a flood firsthand may rely on media coverage, which tends to highlight the destructive impact of floods, leading to an elevated perceived severity. Youth are always associated with social media platforms such as Twitter, Instagram, Facebook, and so on. The images and stories depicting the severity and damages resulting from floods may provide valuable lessons for them to prepare, even if they have not directly experienced a flood.

Lindell and Perry (2004) suggested that the effect of hazard experience depends on how people interpret their experiences or what they have learned from them. Terpstra (2011) believed that people may interpret their hazard experiences differently, depending on whether these experiences evoke negative emotions. Different people might have different interpretations of the flood past experience. That is the reason why some people might or might not have an intention to prepare for the flood.

In another situation, this study found that youth in the East Coast Region of Malaysia who have experienced more floods may be less likely to prepare for a flood. This situation occurs because, since they have already faced such an event, they believe they are better equipped to handle it in the future. In other words, youth who have experienced a flood event managed to bounce back successfully from the previous flood event and were able to overcome the occurrence of respective natural disasters in the future as well. This perception could lead to a reduced sense of urgency in preparing for a similar occurrence.

Besides that, some youth who lived through a flood might normalize the risk, considering it as a part of their lived experience. This normalization could lead to a decreased perception of the severity of future flood events and, consequently, less motivation to prepare. Youths are also overconfident that they can cope with future floods since they have successfully coped with previous flood events. Perhaps, the flood events that they have experienced were less severe and this situation may have led them to become complacent as they believed that the impact of future floods would also be minimal. This complacency can discourage proactive preparation efforts.

Ardaya et al. (2017) contend that people who have more past experiences with floods may believe that they will not experience the same disaster in the same place twice in their lifetime. Past experience can lower the perceived risk of future disaster through “gambler’s fallacy” reasoning (i.e., the belief that the likelihood of an event occurring is lower after it has occurred (Croson and Sundali, 2005). This situation can be related to the present study’s finding where there is a negative association between past experience of flood and flood preparedness intention. Youth may have a gambler fallacy feeling where they believe that since they have already faced a flood in the past, the likelihood of experiencing another flood in the same location is now diminished. This sense of "gambler's fallacy" reasoning may lead them to underestimate the potential recurrence of a flood and, consequently, reduce their perceived need for extensive flood preparedness measures.

The belief in the gambler's fallacy creates a cognitive bias wherein individuals incorrectly interpret the probability of future events based on past occurrences. In the context of floods, individuals might assume that because they have already gone through such an event, the chances of it happening again in the same place are significantly reduced. This cognitive bias can contribute to a lower perceived risk, leading to a decreased motivation to prepare for a similar disaster. In essence, the negative association found in the present study between past flood experiences and flood preparedness intention among youth could be attributed to this gambler's fallacy mentality. This psychological phenomenon may instil a false sense of security, diminishing the urgency and perceived severity of the potential threat, and subsequently influencing the youth's intention to prepare for future flood events.

Another crucial factor that needs to be discussed to explain why youth who have flood experience are less likely to prepare for a flood is the time lapses factor. Although people have experienced a flood, the impact of that experience starts to fade from memory. This situation will make the flood preparedness activity becoming less important (Ashenefe et al., 2017; Keller et al., 2006). The substantial time gap between the past flood experience and the present may induce youth to develop a false sense of security, believing that the likelihood of another flood occurring in the near future is low. This perception can lead to a decreased motivation to prepare among youth in the East Coast Region of Malaysia.

Based on the above discussion, it can be interpreted that youth who have less flood experience will be more likely to prepare for flood while youths who have more flood experience will be less likely to prepare for flood. There are multi-angles to look at this situation and among the suitable justifications are related to the perceived unpredictability of the flood, time lapses from the most recently experienced flood, perceived low probability and severity of the flood, fatalistic mindset, and perceived ease of preparing for flood. Besides that, youth who take the past flood as a lesson learned will be more likely to prepare for the flood. Hence, suitable programs need to be designed to change youth's mindset to ensure that they are always taking precautionary measures for floods.

5.3.7 Research Question 7

Does perceived behavioural control positively associate with flood preparedness behaviour?

H7: There is a positive relationship between perceived behavioural control and flood preparedness behaviour.

Perceived behavioural control refers to an individual's self-assessment of their ability to engage in a particular behaviour, specifically preparing for flooding. The present study found that there was a positive relationship between perceived behavioural control and flood preparedness behaviours among youth in the East Coast region. Hence, H7 was supported. According to Ajzen (2006), perceived behavioural control can be directly related to behaviour.

This finding can underpin and strengthen the TPB as it highlights the crucial role that individuals' perceived control over their actions plays in influencing actual behaviour, which is in line with the central tenets of the theory of planned behaviour. Increasing the self-confidence of youth and their ability to take certain actions to prepare for a flood disaster could be a key element in promoting effective disaster resilience among youth in the region. The positive association between perceived behavioural control and flood preparedness behaviours provides empirical support for the predictive validity of the TPB and underscores the importance of considering perceived control when designing interventions to promote flood preparedness behaviours.

As already mentioned, subjective norms can influence the perception of one's ability to control and perform a behaviour. Positive subjective norms create a supportive social environment and strengthen individuals' confidence in their ability to engage in flood preparedness. While flood preparedness intention to prepare for flooding depends on various factors such as attitude, subjective norms, and perceived severity of flooding, the translation of intention into behaviour is strongly influenced by the perceived behavioural control individuals have over flood preparedness activities. The positive relationship between perceived behavioural control and flood preparedness behaviours suggests that it is important to remove tangible barriers and increase people's confidence in their ability to take preparedness actions. This requires a multi-faceted approach that combines education, community engagement and practical action. This finding is important to support NADMA and other government agencies in developing strategies to enhance the capability of youth to prepare for floods.

Conner and Armitage (1998) claimed that people engage in behaviours that they believe they are capable of. Youth engagement in flood disaster preparedness is higher when they have self-confidence and access to appropriate and relevant resources to assist them in their disaster risk reduction efforts. The findings of this study are consistent with previous research by Wang and Tsai (2021) and Najafi et al. (2017), while contradicting the findings reported by Ng (2022).

In contrast to previous studies (Wang and Tsai, 2021; Najafi et al., 2017; Ng, 2022), the present study provides new insights that address previously unexplored aspects and shed light on the flood preparedness of youth in the East Coast region of Malaysia. The findings of this study differ significantly as this study uses a more representative sample of the local youth population. In addition, this study took into account the socio-cultural dynamics of the Malaysian East Coast, providing a contextual understanding that goes beyond the scope of previous research. These contextual differences contribute to the distinctiveness of the findings of this study and enhance the overall understanding of the complexity of behaviour related to flood preparedness in the East Coast region of Malaysia.

5.3.8 Research Question 8

Does flood preparedness intention positively associate with flood preparedness behaviour?

H8: There is a positive relationship between flood preparedness intention and flood preparedness behaviour.

According to Arendt et al. (2013), the concept of behavioural intention refers to the motivational aspect that drives a person to engage in a certain behaviour. According to Ning et al. (2020), there is evidence that behavioural intention plays a crucial role in determining a person's ability to behave in the context of natural disaster preparedness. In this study, it was found that there was a positive relationship between flood preparedness intention to prepare for a flood and the flood preparedness behaviour of youth in the East Coast region of Malaysia. Hence, H8 was supported.

The TPB posits that behavioural intention is an important predictor of actual behaviour. When individuals, in this case, youth in the East Coast region, express a strong intention to engage in flood preparedness activities, they are more likely to take concrete action to fulfil that intention. The positive correlation is in line with the basic principles of the TPB. In the TPB, behavioural intention is an important predictor of actual behaviour. This suggests that individuals with a strong intention to prepare for flooding are more likely to translate this intention into actual action. The positive relationship between flood preparedness intention to prepare for flooding and actions is consistent with the core principle of the TPB that intentions significantly influence the likelihood of engaging in a particular behaviour.

As mentioned earlier, the present study found that attitude, subjective norms, and perceived severity were positively associated with flood preparedness intention. In addition, research question 8 revealed that there was a positive relationship between flood preparedness intention and the behaviour of preparing for a flood. Youth's positive attitudes towards flood preparedness, subjective norms and perceptions of severity contribute to an increased intention to prepare for flooding. This intention then has a positive effect on the likelihood that the individual will take concrete measures to prepare.

Intention is a motivational factor that drives purposeful behaviour. When youth have a clear intention to prepare for flooding, they are motivated to translate this intention into actions to prepare for flooding. This finding is related to the previous finding of this study, which states that perceived behavioural control is directly related to flood preparedness behaviours. Youth who have a strong intention may have the confidence to overcome obstacles and challenges, making them more likely to participate in preparedness activities. Perceived behavioural control, a component of the theory of planned behaviour, plays a critical role in determining whether individuals believe they are capable of performing a behaviour, and in this case, engaging in flood preparedness activities. Therefore, youth who can prepare for flooding are more likely to translate their intention to prepare for flooding into actual preparedness actions.

To initiate a behaviour, a person must have the conscious intention to engage in the action. The probability of performing the behaviour increases with the intensity of the intention to perform it (Skurka et al., 2018). The correlation between the desire to prepare for flooding and the actual behaviour of youth in the East Coast region of Malaysia underscores a well-established psychological concept that individuals are more likely to participate in behaviours that they intend to perform.

According to Yuduang et al. (2022), both intention and preparation show a clear correlation when individuals know the harmful effects of hazards on human health. Within the current research, it can therefore be concluded that when youth have an understanding of the negative consequences (perceived severity) of flooding, this often leads to a favourable link between their propensity to prepare for flooding and their preparedness actions. Acquiring knowledge about the negative consequences of flooding enables youth to make well-informed decisions for their personal safety and general well-being. Understanding the potential dangers and impacts of flooding could encourage individuals to take preparedness more seriously.

A strong intention to prepare for a flood may be associated with a clear understanding of the benefits of flood preparation (attitude). In other words, youth who understand the benefits of preparing for a flood may have a high intention to prepare for a flood. This positive relationship is reinforced when people who are important to them, such as family members and peers, influence them to prepare for a flood (subjective norms). This situation combined with the perception of the severity of flooding

(perceived severity) can result in youth having a high intention to prepare for flooding and translating this intention into action to prepare for flooding.

According to Paton et al. (2005), behavioural intention serves as a reliable measure for the evaluation of actual behaviour. Kurata et al. (2022a) found that there is a direct correlation between a person's behaviour and behavioural intentions. To change people's habits and mindsets, it is necessary to facilitate behavioural change. In the context of the present study, policymakers, government agencies and community members need to support youth in implementing flood preparedness measures to ensure that the translation of intention into actual behaviour is possible.

5.3.9 Research Question 9

Does community participation moderate the relationships between attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, and past experience, and flood preparedness intention?

H9: The positive relationship between attitude and intention will be stronger when community participation is higher.

H10: The positive relationship between subjective norms and intention will be stronger when community participation is higher.

H11: The positive relationship between perceived behavioural control and intention will be stronger when community participation is higher.

H12: The positive relationship between perceived susceptibility and intention will be stronger when community participation is higher.

H13: The positive relationship between perceived severity and intention will be stronger when community participation is higher.

H14: Community participation moderates the relationship between past experience and flood preparedness intention.

(H9) Attitude and Flood Preparedness Intention

Attitudes encompass an individual's perception of the importance and effectiveness of undertaking flood preparedness actions. The present study found that the positive relationship between attitude and flood preparedness intention is strengthened when youth have high community participation. In essence, community participation serves as a moderating factor in the positive association between attitude and intention toward flood preparedness among youth in the East Coast Region of Malaysia. Hence, H9 was supported.

This study distinguishes itself from prior research by innovatively incorporating community participation as a moderating variable, shedding new light on the intricate dynamics influencing the relationship between attitude and flood preparedness intention. Hence, it contributes to the body of knowledge in disaster preparedness by not only uncovering novel insights into the role of community participation but also by presenting a more in-depth understanding of how this moderating factor shapes individuals' attitudes and enhances their intentions towards flood preparedness, filling a crucial gap in the existing literature.

The inclusion of community participation as a moderating variable in the present study challenges the traditional TPB, which posited a direct relationship between attitude and intention. Contrary to the conventional understanding, the present study's findings reveal a positive moderation effect, indicating that community participation plays a vital role in enhancing the relationship between attitude and flood preparedness intention, particularly among the youth demographic. This unexpected result not only extends the theoretical framework but also highlights the importance of considering community dynamics in shaping individuals' intentions and behaviours in the context of disaster preparedness. Therefore, this study not only expands upon existing theoretical frameworks but also highlights the imperative of recognizing and integrating community-level factors in enhancing the effectiveness of interventions aimed at promoting flood preparedness among youth. This novel perspective contributes valuable insights for policymakers, practitioners, and researchers seeking more comprehensive strategies to foster resilience and proactive responses to flooding incidents within communities.

To recap, community participation refers to the extent of interpersonal engagements among individuals, which enables the development of shared risk attitudes, risk management concepts, and risk reduction strategies through collaborative

endeavours aimed at assisting fellow community members (Zaremozhzabieh et al., 2021; Abunyewah et al., 2020). The positive moderation effect of community participation on the relationship between attitude and flood preparedness intention among youth in the East Coast Region due to the existence of subjective norms. As discussed previously, this study found that there is a positive relationship between subjective norms and flood preparedness intention.

According to Abunyewah et al. (2020), the implementation of risk communication strategies that involve a two-way exchange of timely, accurate, and current information on flood risk has the potential to influence the community's perspective and attitude toward disaster preparedness. In other words, youth who actively participate in the community are likely to develop positive attitudes towards flood preparedness activities. This positive attitude is a result of engaging in effective communication that emphasises the importance of flood preparedness among community members. When youth perceive that their community places a high importance on flood preparedness, it can positively influence their attitudes and intentions to prepare for a flood. Increased community participation implies more opportunities for the exchange of information and experiences related to flood preparedness. If positive attitudes are actively communicated and shared within the community, youths are more likely to adopt similar perspectives, reinforcing the relationship between attitude and flood preparedness intention.

Novak et al. (2019) asserted that community participation comprises a wide range of activities that enhance the public's comprehension of the origins and consequences of a disaster. It also involves the integration of socio-cultural values and norms, as well as empowering the public to take ownership and leadership in the communication process. The involvement of individuals in community activities has the potential to shape their attitudes through the provision of direct experiences, information acquisition, and exposure to diverse perspectives. By actively participating in community events, individuals have the opportunity to cultivate a favourable disposition towards a particular behaviour, such as flood preparedness. This occurs as they observe the advantages associated with such behaviour and gain firsthand knowledge of the experiences encountered by fellow community members.

Regular discussions among youth and community members create an ongoing dialogue about flood preparedness. This continuous conversation helps reinforce key messages and promote a shared understanding of the importance and benefits of preparedness. The focus on discussing the importance and effectiveness of flood preparedness within the community serves to emphasise its significance. Understanding the rationale behind preparedness measures can lead to a positive evaluation of these actions, shaping favourable attitudes among youth. Through discussions, youth may gain insights into the tangible benefits of flood preparedness, such as reduced risk of harm, protection of property, and enhanced community resilience. Recognizing these benefits can positively influence their attitudes and reinforce the intention to prepare.

The act of participating in a community fosters social bonding, which in turn motivates society to collectively study and share preparedness measures (Yamamura 2010). Community participation provides a platform through which one can gather insights into the views, attitudes, and experiences of individuals who receive messages, as well as effectively distribute necessary information. Actively sharing relevant and current information about flood risks with the community and engaging in ongoing communication, can influence the individual attitude toward the benefits of preparing for the flood. According to Trejo-Rangel et al. (2023), the inclusion of youth in risk communication discussions enables them to devise contextually-based solutions through the development of novel social mechanisms.

The ongoing interaction between professionals and the general public provides an opportunity to address unclear messages, acquire further knowledge, and establish trust (Habibi et al., 2014; Abunyewah et al., 2018; Abunyewah et al., 2019; Umansky and Fuhrberg, 2018). The aforementioned findings illustrate the concurrent association between the degree of community involvement and the inclination to engage in flood disaster preparedness, which aligns with the increasing recognition of the significant role that community participation holds in discussions within the realms of theory and professional practice regarding disaster preparedness (Novak et al., 2019).

Hence, the implementation of participatory disaster management, encompassing various communication processes and mechanisms, holds significant potential to foster favourable disaster preparedness outcomes, aligning with the overarching objective of global catastrophe risk reduction (Abunyewah et al., 2020). Therefore, the involvement

of the community aids in the distribution of information and understanding regarding the potential dangers of floods, the necessary precautions to be taken, and the significance of proactive efforts. When community members actively participate in conversations, workshops, or awareness campaigns, they enhance their knowledge regarding the importance, benefits and effectiveness of preparing for a flood.

(H10) Subjective Norms and Flood Preparedness Intention

Subjective norm pertains to an individual's perception of the societal pressure exerted upon them to partake in a specific behaviour. The present study revealed that the association between subjective norms and intention to engage in flood preparedness is enhanced in cases when youths exhibit a high level of community participation. To clarify, community participation serves as a moderating factor in the association between subjective norms and the intention to engage in flood preparedness activities. Hence, H10 was supported.

The promotion of disaster risk reduction is not solely reliant on individual endeavours, but can also be facilitated by the engagement of social networks. The significance of community participation is frequently underscored in initiatives aimed at advancing catastrophe risk reduction (Witvorapong et al., 2015). According to DeYoung and Peters (2016), the researchers posited that an enhanced feeling of community fosters a heightened sense of duty towards others, thereby leading to a "spillover" effect in terms of engagement in disaster preparedness endeavours. According to Diyana et al. (2020), Malaysian participants who exhibited a strong sense of community were found to be more inclined to engage in collaborative efforts with both their fellow community members and government agencies to improve their level of readiness for flood events.

According to Bandura (1986), individuals, being social beings, tend to depend on other members of society when it comes to resolving conflicts and enhancing their overall well-being. Palm (1999) posited that individuals' risk assessment and engagement in disaster mitigation behaviours are influenced by their view of others. The author posits that within a cultural context where individuals are perceived as interconnected rather than unique and autonomous entities, the influence of shared social norms and standards on risk-mitigation behaviour may outweigh that of individual perspectives. Moreover, communities characterised by elevated subjective norms often possess a history of

collaboratively addressing challenges, perhaps fostering a proactive stance among households towards disasters.

According to Bubeck et al. (2012), the acquisition of knowledge from the social environment has a positive impact on the adoption of risk-reducing behaviours. According to the study conducted by Lo and Chan (2017), it was observed that active engagement in social networks had a positive impact on individuals' intentions to make preparations for extreme weather occurrences. The engagement of community members can have an impact on subjective norms through the facilitation of interactions and social influence within the community. The involvement of individuals in community conversations, interaction with experts, and observation of their peers' actions might impact their view of socially expected and valued behaviours related to flood preparedness, known as a normative influence. The presence of positive subjective norms about readiness has the potential to enhance individuals' intentions to partake in the associated behaviour.

In addition to the aforementioned points, it is worth noting that social capital has a significant impact on disaster preparedness, as evidenced by studies conducted by Chamlee-Wright (2010), Reininger et al. (2013), and Yamamura (2010). The inclusion of social capital components, such as trust and public engagement, has the potential to foster endorsement for efficient adaptation at both the individual and community levels (Gamper and Turcanu, 2009; Norris et al., 2009). The concept of social capital has been identified as a potential means for individuals to access a range of resources in the face of hazards. These resources may include immediate assistance, information about hazards, essential living supplies, and emotional support. This is because individuals with a higher level of social capital are more inclined and capable of collaborating with others or providing assistance during times of disaster (Choo and Yoon, 2022). The possession of substantial social capital, characterised by elevated levels of trust within a community, active participation in civic affairs, and robust social networks, plays a crucial role in the effective dissemination of information (Kawachi and Berkman, 2003; Putnam, 2001). This is particularly advantageous in facilitating individuals' preparedness for natural disasters.

Prior research has indicated that engaging in civic activities, such as volunteering and being a member of voluntary associations, enhances an individual's ability to be

prepared for disasters (Reininger et al., 2013). Recent empirical research has indicated that there exists a positive correlation between possessing higher levels of individual-level social capital, such as a perception of trust and fairness, and residing in communities with elevated social capital, characterised by cohesiveness and a greater number of civic organisations, with disaster prevention, preparedness, and recovery (Reininger et al., 2013; Aldrich, 2011; Aldrich, 2011b; Bihari and Ryan, 2012). According to Jovita et al. (2019), the establishment of mutual trust has the potential to significantly increase the level of awareness regarding emergency management and volunteer participation, hence, improving the community's capacity to respond to hazards.

This remark suggests that community participation can create a conducive atmosphere wherein individuals are motivated and positively reinforced to engage in flood preparedness activities. The presence of positive social support has the potential to enhance the influence of subjective norms on individuals' willingness to engage in flood preparedness activities. According to a study conducted by Riad et al. (1999), individuals residing in Charleston, North Carolina who possessed higher levels of social support demonstrated a greater propensity to evacuate before the arrival of Hurricanes Hugo and Andrew, in comparison to those individuals with lower levels of social support. In a similar vein, research has indicated that individuals who are affiliated with a social organisation tend to experience an increase in the support they receive in the aftermath of a hazardous occurrence (Beggs et al., 1996; Nakagawa and Shaw, 2004). Conversely, people who are socially isolated are less inclined to be rescued, evacuated, or provided with aid (Dynes, 2005), hence facing an increased risk of mortality (Klinenberg, 2002). Hence, it is reasonable to anticipate that individuals with strong social connections would derive advantages from their network in terms of preparedness and responsiveness during emergencies (Witvorapong et al., 2015).

A study conducted in Japan further corroborates earlier research indicating that carers of older individuals who receive greater support from their families and communities are more inclined to claim a higher degree of preparedness for disasters (Wakui et al., 2017). In the context of flood preparedness, if youths believe that their community values and supports preparedness activities, they are more likely to feel the social pressure to conform to these norms. The significance of social or altruistic community support outweighs that of socio-demographic characteristics to catastrophe

susceptibility and resilience, as argued by Aldrich (2012) and supported by Kaniasty and Norris (2009).

Strong support networks influence an individual's ability to locate information since information is regularly disseminated through informal talks among friends, family, and neighbours (Zakour and Gillespie, 2012). Community members work together, share information, and form partnerships to prepare for disasters (Asare Okyere et al., 2022). Hence, community participation can provide youths with a network of social support. When individuals feel supported and connected to others who share their beliefs and intentions, it can boost their motivation and willingness to engage in flood preparedness activities.

Additionally, they can actively disseminate information regarding emergency aid in response to such calamities. The presence of robust community involvement in flood preparedness endeavours offers numerous benefits. The implementation of appropriate incentives and active engagement from the community can effectively raise the elevation of low-lying regions inside the village. During the period of disasters, it is possible to do repairs and maintenance of Panchayat radios to ensure their optimal functioning to disseminate catastrophe alerts. The restoration of weak community institutions and individual assets necessitates the active engagement of the community through the practice of "Shramadhanam," which involves voluntary participation in development efforts (Newport and Jawahar, 2003).

Social involvement plays a crucial role in the realm of social capital, particularly in the context of risk reduction initiatives. This is due to its ability to expand an individual's social networks, improve the flow of information, and enhance the influence of encouragement and peer pressure (Witvorapong et al., 2015). Furthermore, the social cognitive theory primarily examines the impact of the social environment on the level of catastrophe preparedness (Paton, 2008). According to Jang et al. (2016), the promotion of resident involvement in community organisations can foster interpersonal connections among community members, thereby bolstering their sense of affiliation within the community. Consequently, this heightened sense of belonging may subsequently contribute to an increased propensity among community members to actively participate in disaster preparedness efforts.

(H11) Perceived Behaviour Control

Perceived behavioural control refers to an individual's belief in their ability to perform the necessary actions to prepare for floods. It focuses on personal control and self-efficacy. This study found that community participation does not moderate the relationship between perceived behaviour control and flood preparedness intention among youth in the East Coast region of Malaysia. Hence, H11 was not supported.

This finding is in line with the principle highlighted by Ajzen (1988). According to Ajzen (1988), an individual's behaviour is directly influenced by Perceived Behavioural Control. Perceived behaviour control, as per the TPB, represents an individual's perception of their ability to perform a behaviour. It relates to the perceived ease or difficulty of executing the behaviour. Unlike attitudes and subjective norms, perceived behaviour control is more directly related to actual behaviour (in this case, flood preparedness behaviour). If youths believe they have the tools, knowledge, and means to carry out flood preparedness tasks, they are directly performing flood preparedness activities, even if their initial intention to prepare for a flood was not particularly strong. In other words, perceived behaviour control is a more proximal factor to behaviour and directly relates to an individual's ability to act. Therefore, it may have a stronger influence on actual behaviour (flood preparedness behaviour), even when the youth's intention to prepare for a flood is not very high.

According to Foltz et al. (2016), individuals would participate in behaviours that they seem to have control over. According to Ajzen (1991, p. 188), the impact of perceived behavioural control on intention is prone to variation depending on the specific behaviours and contexts. Ajzen (1991) added that the strength of the relationship between perceived behavioural control and intention is contingent upon the specific behaviour being examined and the contextual circumstances surrounding it. In instances where attitudes exhibit a high degree of strength or when subjective norms influence exert a significant impact, the predictive ability of perceived behavioural control on intentions may be diminished.

Based on the preceding discourse, it is believed that there is no significant association between perceived behaviour control and flood preparedness intention, even in the presence of a moderating variable such as community participation. This is because

both attitude and subjective norms adequately serve as motivators for youth to have flood preparedness intention. Other exogenous variables such as perceived susceptibility and perceived severity were also positively associated with flood preparedness intention. In other words, a positive attitude (attitude) and social approval from friends, family, or community members (subjective norms), as well as youth perception about the severity (perceived severity) of the flood, can contribute to a stronger intention to engage in flood preparedness. In this particular setting, the youth actively and directly participated in flood preparedness activities, driven by their perception of possessing the capabilities to engage in such behaviour, even in the absence of moderating variables such as community participation.

(H12) Perceived Susceptibility

Perceived susceptibility pertains to an individual's inherent vulnerability to a potential threat (Brewer et al., 2007; Shreve et al., 2016). The present study revealed that community participation serves as a moderator in the positive association between perceived susceptibility and intention to engage in flood preparedness. In the present scenario, the association between perceived susceptibility and flood preparedness intention is anticipated to exhibit greater strength among youth who engage in higher levels of community participation. Hence, H12 was supported.

This finding can enhance the HBM, as this study suggests that community participation plays a crucial role in strengthening the positive relationship between perceived susceptibility and youth's intention to prepare for a flood. Therefore, this study contributes to the body of knowledge because it highlights the combination role of individual perceptions and communal engagement in shaping health-related behaviours. By emphasising the significance of community involvement in enhancing the impact of perceived susceptibility, the research provides valuable insights into the complex factors influencing individuals' intentions and actions. This contribution not only extends people's understanding of the HBM but also highlights the importance of considering social and communal contexts when designing interventions to promote health behaviours and preparedness initiatives.

The introduction of community participation as a moderating variable implies that the relationship between perceived susceptibility and flood preparedness intention is

contingent upon the level of community involvement. Communal engagement and collaborative efforts within the community could enhance the perceived susceptibility to the potential impact of a flood. The existence of social capital resulting from community participation may strengthen the youth's resilience in facing floods. Jamshed et al. (2020) highlighted that social capital plays a crucial role in helping individuals be resilient, as information is shared among community members. This sharing of information can enhance their capability to prepare for disasters.

In the context of the present study, youth who are actively involved in community activities will be more inclined to prepare for a flood because their participation fosters the development of strong social ties and networks. These connections serve as channels for the exchange of valuable information, experiences, and resources related to flood preparedness, thereby influencing the youth's perceived susceptibility to the potential risks of flooding. Engaged youth are likely to benefit from collective knowledge, support, and collaborative efforts within the community, thereby increasing their awareness and readiness to respond effectively to the challenges posed by floods. Additionally, the sense of shared responsibility and mutual trust cultivated through communal engagement can contribute to a heightened sense of preparedness, as individuals recognise the collective strength derived from their interconnectedness in facing potential disasters.

Community participation is considered significant in the concept of preparedness due to the impact of discussions and narratives that take place in social settings where individuals interact with others who share similar perspectives. These interactions play a role in shaping individuals' social construction of their comprehension of potential future hazard events (Becker et al., 2012; Lion et al., 2002; Paton, 2008). The active collaboration, participation, and interaction of individuals, particularly the youth within a community or group, can strengthen their belief in the susceptibility to future floods. This situation may, in turn, enhance their intention to prepare for a flood.

The engagement of community members can contribute to the improvement of people's understanding and awareness of flood risks and their vulnerability to such hazards. By employing community participation initiatives, such as workshops, seminars, or information campaigns, citizens can enhance their comprehension of their susceptibility to flood hazards. The heightened level of consciousness can affect individuals' perception of their vulnerability to the hazard, subsequently leading to a

favourable influence on their inclination to engage in flood preparedness activities (Bubeck et al., 2012; Grothmann and Reusswig, 2006). According to Newport and Jawahar (2003), the effectiveness of vulnerability assessment can be enhanced by involving the community in the process.

According to Ong et al. (2023), understanding the consequences, level, and aftermath of a disaster is expected to result in an elevated impression of severity and vulnerability. To establish disaster-resistant communities, the initial phase involves fostering community knowledge regarding the potential hazards of future disasters. This entails empowering local communities and authorities to engage in a collaborative process of formulating and executing action plans aimed at mitigating and preparing for such events (Karanci and Aksit, 2000).

According to Witvorapong et al. (2015), social networks serve as conduits for the transmission of risk perception and reasons to engage in preventive measures. Communities that exhibit a high degree of cohesion tend to possess greater levels of preparedness in the face of hazardous events, as its members are more inclined to engage in collaborative efforts aimed at resolving shared challenges (Agrawal and Monroe, 2006). According to Witvorapong et al. (2015), individuals who engage in social activities regularly can derive advantages from the exchange of valuable information and warnings, particularly during periods of emergency. The transmission of disaster-related information between the general public and experts provides an opportunity for the incorporation of cultural, social, and value systems of a community into the communication process (Abunyewah et al., 2020).

According to Ngo et al. (2020), an increase in the frequency of community participation is associated with heightened perceptions of susceptibility and severity of disaster risks as well as an increased intention to prepare for the flood. The correlation between learning and disasters is predicated upon the premise that enhancing comprehension of the origins, detrimental ramifications (severity), probability of occurrence (perceived susceptibility), and capacity to glean insights from prior disasters (past experience) can facilitate the development of efficient disaster preparedness measures (Antonacopoulou and Sheaffer, 2014). According to Ejeta et al. (2016), residents' level of participation in community-oriented initiatives aimed at preventing and

reducing the impacts of flood hazards is determined by their perception of susceptibility and severity.

The engagement of community members facilitates the implementation of collective efforts and cooperation in the development of strategies to enhance resilience against potential flood events. Through the utilization of knowledge gained from previous occurrences of flooding, individuals within a community can recognise vulnerabilities, formulate specific measures to reduce risks, and actively promote essential alterations in infrastructure or policy. Participating in community-oriented initiatives that prioritise flood resilience has the potential to foster a collective sense of responsibility and dedication toward preparedness. The collaborative endeavour described above serves to augment the inclination of individuals to be prepared for floods, as they actively participate in fostering a society that is more capable of withstanding and recovering from such events (Webler et al., 2001).

(H13) Perceived Severity

Perceived severity pertains to the subjective assessment of the potential harm resulting from a disaster (Brewer et al., 2007; Shreve et al., 2016). The present study found that the association between the perceived severity of floods and flood preparedness intention is expected to be more pronounced among young individuals who exhibit greater levels of community participation. In other words, the extent to which youths who are involved in community activities are expected to influence the relationship between their perception of the severity of floods and their intention to prepare for such events. Therefore, H13 was supported.

Community participation serves as a medium via which individuals can engage in the exchange of information, coping techniques, and personal experiences on flood preparedness. Utilizing these interactions, youths have the opportunity to acquire knowledge from each other regarding efficient preparedness measures and methods. The exchange of knowledge can augment individuals' perception of the severity of floods, as they gain a deeper understanding of the possible consequences of insufficient preparedness. Hence, the efforts to enhance flood preparedness can be reinforced (Lindell and Perry, 2012; Ronan and Johnston, 2005).

Community meetings can be organised at the village level when the occurrences and analyses of various natural disasters in different regions of the state are deliberated upon. The meetings catalyzed raising the villagers' awareness of the severity of the problem, hence igniting the notion of readiness (Newport and Jawahar, 2003). According to Becker et al. (2017) and Russell et al. (1995), individuals' motivation is influenced by their sense of the severity of natural dangers. According to Guo et al. (2020), there is a positive correlation between the level of comprehension regarding natural disasters and the perception of associated dangers. This heightened perception subsequently motivates individuals to engage in proactive measures aimed at mitigating the impact of such events.

In the context of preparedness decision-making, social networks serve as a dynamic environment of influence, wherein individuals form their views about a specific subject matter, such as potential dangers. In the realm of risk management, these networks offer many management alternatives and uphold risk perceptions, validate or dispel uncertainties, and disseminate informational material that aligns with the requirements and anticipations of participants. Uncertainty regarding risk perception and risk management is known to be influenced by the information disseminated by other individuals (Paton et al., 2008; Earle, 2004; Lion et al., 2002). Hence, it is imperative to acknowledge the significance of the community-agency connection, as it rests upon the foundation of trust, a critical component in navigating situations characterised by ambiguity and unpredictability (Earle and Cvetkovich, 1995; Siegrist and Cvetkovich, 2000).

According to Paton (2008), there is a correlation between the perception of an agency's efforts to empower community action and the level of trust individuals place in that agency as a source of information. Furthermore, this trust influences individuals' inclination to utilise the information provided by the agency to shape their preparedness measures. Paton (2019) suggested that individuals should actively participate in their social networks to collaboratively develop their risk management requirements and strategies. In a study conducted by Ngo et al. (2020), it was discovered that there exists a positive correlation between the frequency of community participation and the perception of severity. According to Ngo et al. (2020), an increase in community participation frequency is associated with heightened perceptions of the severity of climate change

threats, as well as an increased intention to adapt to both climate and flood risks, and an enhanced perception of the capacity to adapt to flood risks.

Community participation generates tighter social bonds, reinforcing the severity of the event and creating a stronger sense that the event is uncontrollable (Hudson et al., 2020). Community participation facilitates a reciprocal and consistent sharing of flood risk and preparedness knowledge within the community, fostering communication between community members and specialists. The concept of information sufficiency is employed in this particular context to refer to the evaluation of supplementary information by those who are at risk, to effectively manage and mitigate the risks associated with disasters (Abunyewah et al., 2020). According to Paton and McClure (2013), community participation plays a significant role in the social construction of risk perceptions. Furthermore, the establishment of trust between community and agency can play a crucial role in fostering successful interactions. This trust can be cultivated through several means, such as offering chances for public participation, engaging with the community, and providing educational activities focused on natural disaster preparedness (Elsworth et al., 2009; Olsen and Shindler, 2010).

Active engagement of the public in community matters has the potential to rectify people's perception of risk and facilitate the adoption of protective behaviours (Li and Liu, 2019). Risk communication is a process that aims to promote the dissemination of risk information to the general public (Perko et al., 2012). Risk communication encourages the public to receive risk information (Perko et al., 2012), which in turn affects public behaviour decision-making (Ortwin and Christina, 2013; Vicente et al., 2014). This dissemination of information has been found to have an impact on the decision-making processes of individuals within the public sphere (Ortwin and Christina, 2013; Vicente et al., 2014). Previous research has indicated that community participation when utilised as a kind of risk communication channel, has been shown to influence individuals' intentions to engage in protective behaviours (Davis and Cole, 2005; Wang, 2009; Wei et al., 2009; Cuanalo and Becerra, 2016).

(H14) Past Experience

The concept of flood experience can be characterised as the occurrence of a flood disaster at least once in a person's lifetime (Atreya et al., 2017). In the present study, past

experience is defined as having been directly or indirectly exposed to a flood disaster at least once in a lifetime. Interestingly, the results of the present study show that community participation serves as a moderating factor for the association between past experience and the intention to prepare for floods. Consequently, H14 was supported. Figure 4.6 in Chapter 4 illustrates that community participation negatively influences the relationship between past experience and intention to prepare for flooding. That is, when community participation is low, there is a stronger relationship between past experiences and the intention to prepare for flooding. Conversely, when community participation is high, the relationship between past experience and the intention to prepare for flooding is weaker.

The east coast of Malaysia is prone to seasonal flooding, which can have a significant impact on communities. Flooding occurs regularly from December to January in the East Coast regions of Peninsular Malaysia (Safiah Yusmah et al., 2020). Youths in this region may have varying degrees of personal experience with flooding. Several scholars (e.g. Atreya et al., 2017; Priyanti et al., 2019) have claimed that experience with flooding is considered an important factor in disaster preparedness. When youths in the east coast of Malaysia have had personal experiences with flooding, their awareness and concern regarding flood preparedness may be greater. For example, if a youth has experienced severe flooding in the past, they are likely to be more motivated to prepare for future flooding. However, it is relevant if youth have a high level of flood experience. Several researchers (e.g. Lawrence et al., 2014; Box et al., 2016; Soetanto et al., 2016) believe that individuals who have experienced an excessive amount of natural disasters are likely to develop coping strategies.

If youth are directly affected by flooding and their community does not have strong flood preparedness programmes or collective activities, individual youth may rely heavily on their personal experiences in their preparedness efforts. For example, if a youth's home was severely damaged in a flood and there was no community support or organised action, this experience itself will have a stronger influence on their intention to prepare for future floods. The lack of collective action may lead individuals to rely more on their own experiences to guide their preparedness intentions. The influence of past experiences on their preparedness intentions thus becomes stronger because they may not receive as much community guidance or support. An individual youth in the East Coast

region of Malaysia who has experienced severe flooding in a village with minimal community support may be more diligent in creating a personal flood preparedness plan due to the lack of a collective community approach or resources.

In contrast, when community participation is high, there is more organised effort, resources and collective knowledge shared within the community. This could include community-based flood preparedness programmes, shared resources for emergency planning and discussion of shared experiences. In an environment with high community participation, the influence of previous individual experiences on preparedness could be reduced. Youths might rely on community initiatives and collective advice rather than their own experiences. If there is a high level of community engagement with regular flood preparedness training, information sharing and collective response plans, youth may be less driven by their personal flood experiences and more influenced by community-led practices and information. A youth in a very active community that frequently conducts flood preparedness exercises and shares information may be less influenced by their personal flood experiences as they have access to a more organised and collaborative approach to preparedness.

To summarise, the relationship between past experiences and the intention to prepare for floods is stronger when community participation is low because, without strong community support systems, people rely more on their own experiences to prepare for future events. In regions such as the east coast of Malaysia, where flooding is a recurring problem, understanding this dynamic helps to develop better flood preparedness programmes that take into account both individual experiences and community support.

Considering the context of youths in the East Coast region of Malaysia and the relationship between past experiences, community participation and flood preparedness intention, several practical suggestions could be made to enhance flood preparedness intention. As mentioned earlier, youth who have experienced flooding and whose community lacks robust flood preparedness programmes or collective efforts rely primarily on their own experiences to inform their precautionary actions. However, the level of experience varies from youth to youth. When youth have less experience with flooding and lack community participation, it is quite difficult for them to rely solely on their experiences to formulate their flood preparedness intentions.

For youths with limited experience of flooding, relying on their experience alone may not be enough. They may not have learnt enough scenarios or details to fully understand the extent of potential risks or appropriate preparedness measures. Without robust community programmes or collective activities, youths with less experience of flooding may struggle to develop effective preparedness strategies. They may not have access to reliable information, practical advice or resources to help them prepare appropriately. To address the challenges faced by youths with limited personal experience, it is therefore important to combine community-led initiatives with individual experiences. Providing educational resources, organising community exercises and offering mentorship can improve overall preparedness.

Practical suggestions can also be made to those who have a lot of experience with flooding but are less involved in community activities. Whilst personal experience of flooding provides valuable insight, it may not encompass all potential scenarios or risks associated with future flooding. Individuals may miss out on broader community-level strategies and resources that could be critical to comprehensive preparedness. Through community participation, youth have access to a broader range of knowledge, resources and strategies for flood preparedness. This allows them to learn from the experiences of others, participate in collaborative planning, and benefit from community resources.

Therefore, it is suggested that youth need to connect their personal experiences with community participation. When youths combine their personal experiences with active participation in the community, they benefit from a more holistic approach to flood preparedness. This integration helps them develop a comprehensive understanding of flood risks and effective response strategies. NADMA and other government agencies can develop and organise a unique training programme that combines youths's individual experiences with community participation. The workshop programme could combine personal stories of experienced youth with community-led preparedness training.

In the field of Disaster Risk Reduction, it is crucial to examine the relationship between individuals' past experiences and their disaster preparedness intentions (Aerts et al., 2018). In addition to the variables embedded in the TPB, the theory proposes that variables such as past experience may also influence people's behavioural intentions (Valois et al., 2020). Armitage and Conner (2001) claimed that supplementing the TPB with additional variables can improve its predictive capability. Ng (2023) asserted that

TPB can be combined with past experience to predict protective behaviour intention. Past studies (e.g., Silver and Andrey, 2014; Dillon et al., 2011; Grothmann and Patt, 2005) utilised the extended TPB and incorporated past disaster experience into their research models to predict disaster preparedness intentions. Their studies revealed that past experience was able to predict disaster preparedness intentions and enhance the predictive power of their research models.

Furthermore, both the TPB and the HBM have flexibility, allowing for the addition of supplementary variables. Community participation is another variable suitable for inclusion in both the TPB and the HBM. This is evident in studies where community participation was added to the HBM employed by (Ejeta et al., 2016) and the TPB employed by (Zaremohzzabieh et al., 2021). Hence, the present study's research findings have proven to enhance the predictive power of the study by integrating the TPB and the HBM.

5.3.10 Research Question 10

Does trust in public protection moderate the relationship between flood preparedness intention and flood preparedness behaviour?

H15: The positive relationship between flood preparedness intention and flood preparedness behaviour will be stronger when trust in public protection is higher.

According to Paton et al. (2005), behavioural intention serves as a reliable metric for assessing actual behaviour. In their study, Sheeran and Webb (2016) investigated the disparity that exists between individuals' intentions and their subsequent behaviours. The researchers sought to ascertain the magnitude of this gap, determine the point at which intentions translate into actions, identify the obstacles that hinder individuals from completing their objectives, and propose techniques that could potentially reduce the intention-behaviour gap. The current investigation revealed that trust in public protection does not serve as a significant moderator in the association between flood preparedness intention and flood preparedness behaviour.

Trust in public protection pertains to the level of confidence and dependence that individuals have on government agencies, authorities, and public institutions in properly addressing and safeguarding them against the risks posed by flood hazards. The function

of confidence in public protection is of paramount importance in the context of disaster management. However, it is not necessarily a moderating factor in the relationship between the intention to engage in flood preparedness and actual flood preparedness behaviour.

The level of trust in public protection is contingent upon individuals' subjective evaluations of the dependability and promptness of governmental interventions. Nonetheless, the implementation of preparedness measures typically necessitates timely action, as proactive steps need to be taken far in advance of a flood event. During a crisis, individuals may perceive that public protection operations could experience delays or get overwhelmed. Consequently, they may opt to prioritise their preparatory steps, irrespective of their level of faith in public authorities. The behaviour of individuals regarding flood preparedness is determined by their perception of personal agency and responsibility.

Despite placing trust in official safety measures, individuals may nonetheless acknowledge the significance of undertaking personal initiatives to safeguard themselves and their properties from the potential hazards posed by floods. The individual's motivation to participate in flood preparedness may arise from a desire for self-sufficiency and acknowledgement of their responsibility in reducing potential hazards, rather than just depending on public safety measures. Despite having faith in the efficacy of public authorities' response, individuals may still perceive the necessity of personal preparedness owing to the unpredictable nature of when and how assistance will be rendered in the case of a flood.

Besides that, the lack of a positive moderating effect of trust in public protection on the relationship between youth's flood preparedness intention and their actual flood preparedness behaviour can be attributed to their lack of confidence in the government's flood protection system, which they regard as flawed. As a result, this situation serves as a catalyst for youth to proactively undertake preparations in anticipation of prospective flood events. An identical scenario occurred, as elucidated by Terpstra (2011). According to Terpstra (2011), it is argued that even if the Netherlands has implemented rigorous flood protection requirements, no flood protection system can be considered flawless. During the years 1993 and 1995, the occurrence of substantial river discharges posed an unforeseen threat to several villages located upstream, so placing them at significant risk

of potential flood-related calamities. Therefore, irrespective of the efficacy of public safety measures, citizens must make adequate preparations for potential flooding events.

The average correlation between intentions and behaviours was 0.53 in a meta-analysis that drew from 422 studies conducted in different settings (Sheeran, 2002). The average correlation in a different meta-analysis of 206 separate trials was 0.43 (McEachan et al., 2011). Based on past research, there is a strong, direct connection between people's intention to prepare for floods and their actual preparedness behaviours, and therefore, there is less need to complicate the analysis by introducing additional variables like "trust in public protection" as a moderating variable of the study.

5.4 Contributions of The Study

The findings reported in this study offer valuable insights into enhancing public understanding of flood preparedness among youth in the East Coast region of Malaysia. In this section, the researcher provides a comprehensive analysis of the theoretical and practical contributions of the present study. The present study contributes to the academic discourse on flood preparedness behaviour by integrating two prominent theories which are the TPB and the HBM. This study also holds significant practical implications for stakeholders involved in disaster preparedness and response efforts in Malaysia, providing vital insights that can inform the design and implementation of more effective policies and interventions.

5.4.1 Theoretical Contributions

There are several important implications to the theory provided by this study. Within the realm of the disaster risk reduction field, this study strives to make significant theoretical contributions that extend beyond the existing boundaries of knowledge. By critically engaging with established theories and frameworks, this research endeavours to introduce innovative perspectives and theoretical syntheses that address previously unexplored dimensions within the subject matter.

Najafi et al. (2017) argued that researchers must investigate the factors associated with the adoption of disaster preparedness behaviours to improve people's preparedness to cope with disasters. Although disaster preparedness behaviours are driven by several factors, the clear picture of these factors is not yet well understood (Najafi et al., 2017).

Ng (2022) pointed out that most previous studies on disaster preparedness behaviour lack an underpinning theory (e.g., Efendi et al., 2024; Sufian et al., 2022; Hashim et al., 2021; Diyana, 2022; Rosario, 2022). Utilizing theories in academic writing is crucial to ensure that the constructs of the study can accurately predict a specific behaviour and contribute to the body of knowledge.

The neglected consideration of environmental, community and individual factors is one of the reasons why disaster risk reduction efforts are often insufficient to adequately protect individuals from disasters (Buergelt and Paton, 2014). It has been shown that focusing solely on prevention at the individual level is unsuccessful and does not produce sustainable behaviours (Feng et al., 2017; Solis et al., 2015). Therefore, in this study, a comprehensive flood disaster preparedness model consisting of multi-level variables was developed to effectively predict flood disaster preparedness behaviours of youths in the East Coast region of Malaysia. In this study, TPB and HBM were integrated to act as the theoretical underpinnings of the study. The integration allowed for a robust and comprehensive examination of how various factors interact at different levels to shape youth flood preparedness behaviours. The theory served as a unifying framework and foundation for improving the ability of all stakeholders, such as individual youth, community members, and government agencies, to effectively improve flood preparedness behaviours.

Furthermore, one of the theories that can best be associated with disaster risk reduction is the TPB. The TPB is often used in academic discourse to examine and analyze the behavioural aspects of people's disaster preparedness (Wang and Tsai, 2022). Despite the success of the TPB, some researchers, such as Sommestad et al. (2015), question whether the three variables of the model, such as attitude, subjective norm and perceived behavioural control, are sufficient to predict intention. Samah et al. (2019) argued that the TPB needs to be extended in some respects, as certain disaster preparedness actions cannot be adequately categorised under the existing three basic elements of the TPB model - attitude, subjective norm and perceived behavioural control. Heidenreich et al. (2020a) and Ong et al. (2023) argued that the TPB is inadequate when examining the protective behaviour of individuals in situations with potential risks.

Ubaidillah et al. (2022) used the TPB as a theoretical framework to examine the determinants of disaster preparedness behaviour. They suggested future researchers

integrate this theory with other theories to comprehensively predict the determinants that influence disaster preparedness. Therefore, this study integrates two theories, namely the TPB and the HBM, to address the limitations identified by Sommestad et al. (2015) and provide a more comprehensive understanding of the factors associated with flood preparedness behaviours among youth in the East Coast region of Malaysia. Previous studies have included the TPB and HBM in their research framework, but these theories have been applied separately, with researchers using either the TPB (Jacob et al., 2023; Vinnell et al., 2023; Ubaidillah et al., 2022; Wang and Tsai, 2022; Zaremohzzabieh et al., 2021) or applying the HBM (Ullah et al., 2024; Sonmez and Gokmenoglu; 2023; Mohd Tariq et al., 2021; Rostami-Moez et al., 2020) separately. Therefore, this research has filled the existing knowledge gap by integrating the TPB and HBM to investigate the interrelationships between the factors.

The HBM is widely recognised as one of the most established and enduring conceptual frameworks for understanding human behaviour. The model is used in disaster risk reduction initiatives, with a focus on human behaviour (Ejeta et al., 2015). The HBM exhibits considerable versatility that makes it beneficial in the context of disaster risk reduction. Its applicability lies in its ability to promote behavioural change in individuals and thus mitigate potentially harmful impacts (Azhar et al., 2022). To the best of the author's knowledge, this study represents the first attempt to integrate the HBM and TPB into a predictive framework. This integration provides a thorough theoretical foundation for understanding the emergence of youths' behavioural intentions and actual behaviour toward flood preparedness.

By combining the strengths of the TPB and the HBM, this integration aims to enrich the predictive power of the model and provide a more comprehensive perspective on the determinants of flood preparedness intention and behaviour. This expanded theoretical framework aims to capture a more holistic view of the psychosocial and health-related factors that influence youth flood preparedness intentions and behaviours. By merging these two theories, this study not only addresses the critique raised by Sommestad et al. (2015) but also utilises the synergies between TPB and HBM to offer a more robust and contextually relevant model. This synthesis aims not only to enrich the theoretical discourse but also to provide a more solid foundation for practical applications and future research endeavours. The development of a comprehensive and integrated

psychosocial framework is of great importance for the study of people's flood protection behaviour (Tiantian et al., 2022).

This study confirms the assertion of Ong et al. (2021) that the various latent variables within the theories and extensions can holistically measure the behavioural aspects of individuals in terms of control, coping, and threat appraisal during natural disasters. The integrated approach applied in this study could potentially be extended to other types of natural disasters such as earthquakes, tsunamis, droughts, landslides, etc. Therefore, the research framework of the present study can also be utilised by future researchers. This work can potentially serve as an initial reference for future researchers who want to study disaster preparedness intention and behaviour. It can inspire further research efforts that involve refining and improving the existing model through ongoing testing.

The inclusion of two moderating variables, namely community participation and trust in public protection, in the theoretical framework not only enhances the comprehensiveness of the model but also introduces a new dimension that provides a unique and valuable theoretical perspective. As mentioned earlier, the present study found that community participation positively moderates the relationships between attitude, subjective norms, perceived susceptibility, perceived severity, and past experience. This compelling evidence demonstrates the central role of community participation as a positive moderator that illuminates the influence on the relationships between attitude, subjective norms, perceived susceptibility, perceived severity, and past experience with flooding. The findings not only confirm the expanded scope of the theoretical framework but also highlight the practical importance of incorporating community participation as a dynamic factor influencing the complex interplay of variables associated with flood-related perceptions and behaviours. This deepened understanding, enabled by community participation, contributes to theoretical advances, particularly in the field of disaster risk reduction.

In addition, this study extends the literature on disaster preparedness by examining the factors associated with flood preparedness intention and behaviour among youth in the East Coast region of Malaysia. Kurniawan et al (2021) found that there are few studies on youth and disaster management in floods. Pfefferbaum et al. (2018) emphasised the lack of empirical studies on youth engagement in activities related to

disaster risk reduction. Ubaidillah et al. (2022) also argued that there is limited research on disasters related to youth, who are considered a vulnerable group to such events. Nifa et al. (2018) expressed concern about the urgent need to improve disaster preparedness studies among youth to promote their resilience to disasters. Therefore, the findings of this study will provide a new perspective on youths' flood preparedness behaviours.

The theoretical contribution of this study, then, lies in its potential to fill the existing gaps in the literature on disaster risk reduction, particularly concerning youth and the management of flood disasters. By addressing the limitations highlighted by Kurniawan et al. (2021), Pfefferbaum et al. (2018), and Ubaidillah et al. (2022) and acknowledging the pressing concerns raised by Nifa et al. (2018), this study not only expands the empirical base but also enriches the theoretical framework that guides our understanding of youths' preparedness intentions and behaviours in the context of floods. The integration of these different perspectives allows for a more holistic examination of the factors that influence youth engagement in disaster preparedness activities. Consequently, the findings of this study can make an important contribution to theoretical advances in the disaster risk reduction literature. They offer valuable insights for researchers and practitioners seeking to improve youth resilience to the effects of disasters.

The United Nations has recognised the significant contribution of youth to disaster risk reduction (DRR) through the establishment of the Children and Youth Forum and the inclusion of youth in the 2015 UN Third World Conference on Disaster Risk Reduction (WCDRR) under the Sendai Framework for Disaster Risk Reduction (UNISDRR, 2015). Youth are of great importance in the ASEAN region as they make up about a third of the total population. Consequently, their skills and capabilities can be effectively utilised to engage in activities related to disaster adaptation, mitigation and resilience enhancement (Haliza, 2020). Therefore, the findings of this study have the potential to enhance the existing knowledge on flood preparedness among the youth population in Malaysia.

This study also adds to the existing body of knowledge by filling the research gap in the geographical context of the study. According to Ejeta et al. (2015), existing studies that addressed behavioural theories related to disaster risk reduction were mainly conducted in developed countries. This raises concerns about the applicability of these

ideas in countries, particularly in Asia and the Middle East, whose cultural characteristics differ from those prevalent in the Western countries where these theories have been formulated and studied. According to Kerstholt et al. (2017), there is a need to study and analyze the factors related to individuals' behaviours in preparing for flooding. However, there is limited empirical research on the factors that influence disaster preparedness in non-developed countries (Muttarak and Pothisiri, 2013; Hoffman and Muttarak, 2017).

The authors Noorhashirin et al (2016) emphasised the limited number of studies that have been conducted on disaster risk reduction in Malaysia. Previous research has predominantly relied on various sources such as policies, laws, reports and direct ministerial orders to assess the effectiveness of Malaysia's disaster preparedness plan. In addition, it is worth noting that previous research has predominantly focused on the application of behavioural theories to study disaster risk reduction in developed countries. According to Ubaidillah et al. (2022), there is little research on the Asian region, although it is known to be more frequently affected by annual disaster events and has more casualties compared to other continents. Ejeta et al. (2015) suggested that future researchers should examine the veracity of behavioural theories related to disaster risk reduction in developing countries.

Previous studies (e.g., Efendi et al., 2024; Sonmez and Gokmenoglu, 2023; Vinnell et al., 2023; Wang and Tsai, 2022; Wijaya et al., 2022; Ubaidillah et al., 2022; Inal et al., 2018) have examined general disaster preparedness. In contrast to most previous research, which has examined disaster preparedness mainly in the context of earthquakes or more broadly defined disasters, the present study aims to contribute to a more comprehensive theoretical understanding of flood-related behaviour. Previous research has shown that various psychosocial factors such as self-efficacy, sense of community and experience have the potential to influence people's level of disaster preparedness. However, the effects of these variables are inconsistent when studying different types of disasters and comparing different nations (Gammoh et al., 2023). Mishra et al. (2010) have recommended that researchers conduct separate studies for each type of natural disaster rather than treating "natural disasters" as a single category because different types of disasters have different characteristics and features. The focus of this study is on the flooding disaster, which has the potential to contribute new perspectives to the current body of knowledge on flood preparedness research in the Malaysian setting.

5.4.2 Practical Contributions

The study of factors related to flood preparedness intention and behaviour is crucial to comprehensively address the problem of flood disasters in the country and promote the adoption of protective behaviours among Malaysian youths in the East Coast region. Adoption of protective behaviours is important to mitigate the impact of floods and promote resilience among the youth community. To improve overall disaster preparedness, the World Health Organisation (2017) suggests that key stakeholders, including policymakers, government agencies, youth NGOs and others, should gain a better understanding of flood-related behaviours and the elements that affect them.

The present study found that attitude, subjective norms, perceived susceptibility, and perceived severity were positively associated with flood preparedness intention among youths. Community participation was found to be a moderator in the relationship between the predictors (attitude, subjective norm, perceived susceptibility, perceived severity, past experience) and flood preparedness intention. In addition, both perceived behaviour control and flood preparedness intention were positively correlated with flood preparedness behaviour among youths in the East Coast region of Malaysia. By incorporating these findings into their policy efforts, governments and organisations can work towards improving flood preparedness among youth to ultimately reduce the impact of flooding and promote community resilience.

This study offers an important contribution for policymakers. The results of this study show that youth attitudes in the East Coast region of Malaysia are positively related to the intention to prepare for floods. Policymakers can use these findings to develop specific strategies related to flooding. When youth have a positive attitude towards preparing for floods, they are more likely to take proactive measures such as preparing emergency kits, evacuating when necessary, and following safety guidelines. Policymakers can use this insight to develop policies aimed at promoting positive youth attitudes toward flood preparedness. Policymakers can actively involve youth in the development and implementation of flood-related measures. By seeking their opinions and involving them in decision-making processes, policymakers can make youths feel that they have a stake in the resilience of their community.

It is therefore suggested that policymakers should engage directly with youths in the East Coast region to gain insight into their specific concerns and preferences

concerning flood preparedness. Involving youth in the planning process and implementation of measures to mitigate future disasters can foster a sense of personal competence and empowerment. This has the potential to counteract feelings of powerlessness (Masten et al., 2015; Osofsky et al., 2018). However, in Malaysia, there is no comprehensive government policy that aims to mitigate the problem of flooding. The main document governing disaster management in Malaysia is Directive No. 20, which sets out the roles of the various government agencies in controlling and mitigating the effects of disasters.

Nevertheless, the directive does not provide explicit guidelines on disaster risk reduction strategies specifically for flood disasters (Ridzuan et al., 2022). According to Ridzuan et al. (2022), the SFDRR recognises the importance of youth involvement and empowerment in disaster risk reduction. To achieve the goals of the Sendai Framework and create resilient communities, youth participation is considered crucial. Therefore, it is important to emphasise the importance of youth participation in flood management, especially in flood preparedness initiatives.

Policymakers are urged to involve young people in flood prevention considerations. The involvement of youth leaders and community members through the Malaysian Youth Council (Majlis Belia Malaysia) and Youth Parliament can facilitate the development of a comprehensive public policy on flood management. One possible approach is to utilise the successful strategies used in the United States in engaging youth in the policy-making process. A variety of youth engagement and preparedness techniques are part of the comprehensive National Youth Preparedness Initiative developed by the United States FEMA. An example of an initiative aimed at youth interested in promoting disaster preparedness and community involvement is the Youth Preparedness Council (YPC) (Cox et al., 2019).

The YPC aims to train young leaders who are passionate about disaster preparedness and want to get involved in their communities. This is achieved through the implementation of disaster preparedness projects at national and local levels (Cox et al., 2019). The Council supports FEMA's commitment to engaging America's younger generation in disaster preparedness initiatives. It also provides opportunities for youth to articulate their views, provide feedback, and express their ideas to Federal Emergency

Management Agency staff. The youth frequently meet with FEMA staff and participate in the annual Youth Preparedness Council Virtual Summit (FEMA, 2023).

Community-based programs could also facilitate youth participation in the public policy decision-making process related to flooding. According to Towers et al. (2014), the effectiveness of community-based programs targeting youth can be increased by establishing formal collaboration between youth organisations and disaster management agencies. This collaboration would facilitate the building of trust, provide a structured framework for the implementation of youth initiatives and undertakings, and ensure the continued inspiration and engagement of youth. At the local level, schools can establish emergency management subcommittees to ensure that school emergency plans take into account the specific needs of children and youths.

Young people must be given sufficient time and resources to enable them to make informed decisions and actively participate in the political decision-making process. It must be ensured that the allocation of time for participation initiatives does not come at the expense of other important aspects of youths' lives, such as studies, leisure activities and domestic commitments. When certain criteria are met, both consultation processes and participatory initiatives offer significant benefits for youths to articulate their perspectives in a way that upholds and protects their rights, enhances their ability to actively engage in policy formulation and decision-making, and, most importantly, reduces their susceptibility and exposure to hazards and disasters (Towers et al., 2014). Following the formulation of specific policies related to flooding, policymakers also need to establish mechanisms to monitor the effectiveness of policies and interventions aimed at youth flood preparedness. With strong youth involvement in public policy and flood-related programs, more youth will have a positive attitude towards flood preparedness and this insight may lead to more youth participation in flood preparedness activities.

As mentioned earlier, this study found a favourable correlation between attitude and intention to prepare for flooding among youths living in the East Coast region of Malaysia. Youths who exhibit a positive attitude towards flood preparedness are more likely to show an inclination to engage in flood preparedness activities because they recognise the beneficial consequences and benefits associated with such behaviour (Gumasing and Sobrevilla, 2023). Therefore, this study is of practical value to many government agencies including the National Disaster Preparedness Agency (NADMA),

the Malaysian Civil Defense Force (APM), the Fire and Rescue Department of Malaysia (BOMBA), the Public Health Department, local authorities and the District Office. The NADMA, in collaboration with other government agencies, has the potential to develop a comprehensive training program aimed at improving the knowledge and understanding of the youth on the risks associated with floods and the appropriate measures to effectively prepare for such events. The results of this study have the potential to help policymakers and government agencies, particularly NADMA, to improve flood preparedness systems, formulate appropriate flood risk reduction measures, and increase public knowledge about flood hazards and the importance of preparedness.

To better prepare for disasters, NADMA and other government organisations should follow Canada's lead and focus on youth. Youth leaders, indigenous planners, community workers and emergency management experts were involved in the development of "the "Preparing Our Home" project" in Canada. Its main goal is to give young people the tools they need to take control of disaster preparedness in their communities through hands-on experiences, lessons and internet resources. The Youth as Active Partner (Y-AP) paradigm, on which the project is based (Cox et al., 2019), encourages young people to take an active role in the development of disaster risk reduction programmes and initiatives.

According to McBride et al. (2019), empirical research has supported the notion that individuals who have received prior training are more likely to exhibit proactive behaviour and effectively anticipate and respond to emergencies. Therefore, public administrators must provide sufficient guidance on public perceptions of disaster prevention throughout the process of organising and implementing activities. Policymakers can take numerous disaster prevention and mitigation measures to increase public awareness of disaster prevention initiatives. These efforts can include the establishment of collaborative teams composed of professionals and social organisations to conduct risk mapping and outreach, give informative lectures, and provide training for self-help and mutual support (Xing et al., 2023).

The results of the study also suggest that community participation plays a moderating role in the interaction between youth attitudes, subjective norms, perceived susceptibility, perceived severity, past experience, and flood preparedness intention. Therefore, it is imperative to promote the engagement of youth in the East Coast region

in community initiatives as this will increase their motivation to adequately prepare for possible flooding in the future. According to Jang et al. (2016), encouraging youth engagement in community programs can promote social interaction among community members, thus strengthening community bonds and fostering a greater sense of belonging. Consequently, this stronger sense of belonging has the potential to positively influence the propensity of youth to actively participate in disaster risk reduction.

To improve community participation in practice, it is imperative to emphasise the need for targeted efforts in education, training and awareness campaigns (Newport and Jawahar, 2003). Therefore, NADMA, local authorities and youth non-governmental organisations (NGOs) under the leadership of the Malaysian Youth Council (Majlis Belia Malaysia) have the potential to adopt exemplary approaches that have been observed in several countries, including Canada. Canada, as a member of the Sendai Framework for Disaster Risk Reduction, has committed to adopting a comprehensive disaster risk reduction strategy that includes the active involvement of youth as legitimate stakeholders (Cox et al., 2019). In Canada, there is a community-based program known as Preparing Our Home. This initiative aims to enhance the capacity of youth as community leaders in the field of emergency preparedness. This includes working with youth to develop programs that foster their potential to effectively lead disaster risk reduction efforts (Pickering et al., 2022).

Therefore, government agencies such as NADMA, local authorities, the Ministry of Health, the Fire and Rescue Department, Majlis Belia Malaysia and non-governmental organisations must take proactive measures to successfully engage the youth in flood preparedness programs. To achieve this goal, it is imperative to develop programmes and events that effectively engage the younger population by taking into account their specific interests, hobbies and concerns. Incorporating interactive and engaging components such as workshops, competitions, games and hands-on activities is crucial to sparking and maintaining young people's interest in flood preparedness initiatives.

The government must prioritise the organisation of special workshops and training aimed at the younger population. The proposed courses should cover basic topics such as rudimentary first aid, emergency response and disaster preparedness. The government must recognise the importance of such training and offer certifications or

awards upon successful completion, as these could serve as a strong incentive for young people to actively participate in the program.

In addition to educating young people, it is of utmost importance to involve them in the decision-making processes on community preparation programs. It must be ensured that the voices of individuals are not only recognised but also respected and taken into account. Allowing youths to articulate their concerns and new approaches to flood preparedness creates a sense of ownership and responsibility. To encourage greater youth participation, the government must recognise and acknowledge their contributions in promoting flood preparedness. This goal could be achieved through celebratory ceremonies, the presentation of awards or the organisation of recognition events that highlight the achievements of individuals.

Village leaders, community groups, NGOs and the relevant local authorities must encourage young community members to participate in the development and implementation of emergency plans. The formulation of a village-level emergency plan requires the active engagement and participation of youth communities. A village-level emergency plan is an all-encompassing collection of steps that a community in a village agrees to take to reduce the likelihood of flooding and the damage it causes. The main objective of such a plan is to protect human lives, livelihoods and property within the village. The proposed plan should include a comprehensive analysis of the community's experience in the various phases of previous disasters. This analysis should include a detailed description of the village, including a mapping of social conditions and resources. In addition, the plan should include a thorough examination of the hazards present in the area, followed by a comprehensive risk assessment. Strategies should be developed to mitigate these risks, with an emphasis on community participation and external support (Newport and Jawahar, 2003).

The results of the study also show that there is a significant positive relationship between perceived susceptibility and the intention of youth in the East Coast region to engage in flood preparedness activities. In addition, community participation strengthened the relationship between perceived susceptibility and intention to prepare for flooding. This suggests that the variable of community participation plays an important role in improving youths' perceived susceptibility to flooding and their intention to prepare for flooding. The same is true for the variables related to past

experience. The present study found that past experiences were not positively associated with the intention to prepare for the flood. However, community participation was able to moderate the relationship between past experience and intention to prepare for the flood. From these results, it can be inferred that community participation plays a critical role in motivating youth in the East Coast region to prepare for flooding.

These findings provide important insights for relevant stakeholders such as NADMA, the Ministry of Youth and Sports and the Ministry of Local Government Development, the state government, district offices and civil society to take action to improve youth preparedness activities. Stakeholders, especially ministries, can organise or sponsor community events that focus on flood preparedness and resilience. During the event, youths receive important information about flooding, such as susceptibility and severity. Bradford et al. (2012) stated that it is crucial to prioritise public risk perception, as the failure of flood risk management measures is due to people's insufficient knowledge about flood risks.

As an essential component of flood risk management, Messner and Meyer (2006) emphasise the need to promote the communication process about flood risk and its perception. Education and publicity campaigns are necessary to improve public knowledge and risk perception, as risk perception is of great importance in disaster risk reduction (Chan et al., 2016). It is also important to learn what causes people to make ill-informed decisions when it comes to disaster risk reduction because risk perceptions are distorted. Lazo et al. (2015) contended that people will not take precautions against disasters if they do not fully understand the hazards they face. Hajito et al. (2015) emphasised the possibility that people lack sufficient information or awareness of the potential hazards associated with floods. Shen (2009) assumes that risk awareness decreases in situations where there is a lack of information.

To effectively educate the public about risks, disaster management experts and legislators must make public engagement a top priority. The only way to get people to change their behaviour in terms of disaster risk reduction is to inform them in an interactive, thorough and interesting way. Experts and professionals at the community level should ensure that young people are actively involved in flood defence and not just passively consuming knowledge. Instead, they should actively involve the public in

shaping the type, mode and procedure of disaster risk communication, taking into account specific local conditions and circumstances.

This study is also crucial for the growth of civil society. This study would benefit civil society organisations such as the Malaysian Red Crescent Society and Majlis Belia Malaysia (MBM) as well as youth and community organisations. This means that they can learn all about what young people on the east coast need to know about flood prevention. The results of the study emphasise the importance of community involvement in improving the correlation between variables. Community-based initiatives that focus on disaster risk reduction education have the potential to make an important contribution to educating youth about climate change. Reducing the likelihood of hazards and better preparing for and responding to extreme weather events is part of this endeavour (Ribeiro et al., 2021; Marchezini et al., 2017). It is therefore essential to promote cooperation within civil society to strengthen cohesion among youths and enable them to participate in the decision-making process on flood prevention policy.

It is advisable to offer community education programs that include flood disaster preparedness exercises or workshops with a specific focus on flood disaster preparedness tactics. These programmes should target youth with limited educational backgrounds to help them implement sustainable prevention measures and improve their overall preparedness for potential disasters. Russo and Rindone (2013) and Russo and Rindone (2014) have found that a variety of educational and training activities such as seminars, workshops, drills, and functional exercises were identified. Tang and Feng (2018) suggested a gradual change in education and training activities and advocated a transition from discussion-based exercises to mission-based exercises. This transition should allow youths to raise their risk awareness before acquiring the skills required for risk mitigation.

Community involvement is crucial for effective flood management (Hapsari et al., 2016). Participation refers to the active involvement of the community in various aspects of planning and decision-making, including determining courses of action, implementing programs, providing resources, collaborating with specific organisations or activities, sharing the benefits of building programs, and evaluating the effectiveness of such programs (John and Norman, 1980). Early community involvement is the most effective approach to mitigating the consequences of a disaster because it allows

community members to stay informed about and actively participate in the many actions taken to minimise the consequences.

The next generation of flood survivors should feel empowered to speak out and share their experiences. Survivors of the younger generations can work with schools, non-governmental organisations or local authorities to develop youth-specific educational materials (brochures, films, websites) that address the issue of flood safety. They can use social media platforms to share flood preparedness tips, videos and stories. With engaging content on platforms like Instagram, TikTok and YouTube, you can reach a wide audience. They need to use personal stories, data and information to highlight the real susceptibility and severity of flooding in the community. Young people who are actively engaged can help get these messages across effectively. This can inspire others and show that the preparedness measures are effective. In addition, the Ministry of Youth and Sports and the Ministry of Local Government Development need to recognise and celebrate the contributions of youth telling their stories, perhaps with awards, recognition or community events.

The present study also found that trust in public protection has no moderating effect on the positive relationship between the intention to prepare for flooding and flood response behaviour. This means that regardless of whether youth trust the government, those who intend to prepare for a flood will also prepare for a flood. Government agencies such as NADMA, BOMBA and local authorities must step up their communication efforts. This is to send the message that these agencies and the community, especially the youth, share responsibility for flood preparedness. Although trust in public protection did not play a moderating role in this study, the government should strive to communicate more clearly and emphasise that flood preparedness is a shared responsibility between citizens and government (Raungratanaamporn et al., 2014; Raikes et al., 2022).

Effective communication requires clarity and comprehensibility. The aim is to remove any potential for ambiguity or uncertainty and ensure that all individuals have a clear understanding of the collective commitment to flood preparedness. Communication should emphasise that flood preparedness is neither solely the responsibility of the government nor primarily the duty of individual residents. Rather, it must be emphasised that it is a collective endeavour in which both the youth and the authorities assume different responsibilities. It is essential to delineate the specific roles and duties associated

with these tasks. For example, youths might be responsible for being well-informed, having emergency supplies and following evacuation instructions. In contrast, it is plausible for the government to take responsibility for various aspects such as developing infrastructure, setting up early warning systems and implementing disaster preparedness measures. The main objective of this collaboration is to increase community safety and resilience. Joint efforts by communities can increase their resilience and facilitate recovery after a flood.

To ensure that trust in public protection acts as a moderator of the relationship between intentions to prepare for flooding and flood behaviour, it is critical to implement specific strategies aimed at enhancing this trust and motivating people to translate their intentions into actual behaviour (flood behaviour). The government should actively engage with the community and encourage a bi-directional conversation where concerns are heard, questions are answered and community members are involved in the planning and decision-making process.

In addition, it is advisable to conduct regular surveys and interviews with the population to determine the level of trust in public protection institutions and to use this data to design strategic approaches. The government should also communicate to youth that flood preparedness initiatives require the combined efforts of youth and government agencies. When youth have confidence in the government's commitment to protect them from floods, their willingness to participate in preparedness activities for such disasters is greater. This increased motivation stems from their perception of government support and reinforcement.

Furthermore, the results of this study indicate a favourable correlation between subjective norms and the intention to participate in flood preparedness measures. Conventional efforts to promote willingness tend to focus on the decision-making process of the individual, sometimes overlooking the broader social factors that influence such decisions (Becker et al., 2012). In reality, the likelihood of individuals taking precautionary action is positively influenced by the observation or perception of others taking precautionary action. Therefore, it is crucial to promote a culture of preparedness within local communities (Ng, 2022).

Fostering a culture of preparedness in local communities through educational institutions is a proactive and effective approach to promoting disaster resilience at an early stage. According to Wang and Tsai (2022), educational institutions play a crucial role in imparting knowledge on disaster risk reduction. The implementation and effectiveness of disaster management protocols in educational institutions have a significant impact on the overall resilience of the school in the event of disasters. Incorporating disaster risk reduction education through schools is one way to disseminate disaster risk reduction messages to every home in the community (Petal and Izadkhah, 2008).

Previous studies (Parham et al., 2021; Shaw et al., 2011) and international frameworks (UNISDR, 2015) have recognised the positive impact of disaster education in mitigating the impact of natural disasters in communities. Education is considered one of the most effective ways to prepare a society to deal with disasters (Izadkhah et al., 2005). Schools are crucial as they serve as nodes for DRR, linking schools to community DRR and other activities (Takeuchi et al., 2011; Petal and Izadkhah, 2008). Incorporating DRR education through schools is one way to disseminate disaster preparedness-related messages to every home in the community and develop the knowledge base for future generations (Petal and Izadkhah, 2008).

Teachers play a crucial role in the implementation of school disaster preparedness and are responsible for carrying out various tasks related to school disaster preparedness. The understanding of disasters is closely linked to the comprehensive approach that educational institutions adopt in managing such events, which in turn can significantly influence students' views and inclination to effectively address and cope with disasters. The ability of educators to understand the importance of disaster management and implement appropriate measures efficiently is a critical component in improving school disaster resilience (Shiwaku et al., 2016).

According to Wang and Tsai (2022), improving the positive evaluation of teachers' DRR behaviour in schools can be achieved by recognising the importance of teachers' DRR efforts and introducing initiatives that enhance teachers' self-confidence and emotional involvement in DRR teams. A school can be seen as a community that has successfully fostered a mindset that emphasises minimising the likelihood of disasters. These characteristics include an environment that fosters a strong sense of community

among educators and inspires them to participate in efforts to reduce the likelihood of disasters. Teachers are more willing to participate in DRR initiatives when these measures are in place (Wang and Tsai, 2022).

It is important that education authorities and policymakers, such as the Ministry of Education in Malaysia, learn from the experiences and best practices of other nations in terms of school-based disaster risk reduction activities. Malaysia would do well to study and perhaps emulate the strategies and programmes that the Philippines has put in place to emphasise the role of schools in reducing the likelihood of disasters. As one of the top five nations with the most recorded disasters, the Philippines has made it a priority to involve its young people in efforts to reduce the likelihood of such disasters.

Science club membership is associated with increased youth engagement in disaster preparedness in the Philippines (Fernandez and Shaw, 2015). President Ferdinand Marcos officially designated September as National Science Club Month (NSCM) in 1979 through Presidential Decree No. 1895. This decree honoured and highlighted the importance of the science club movement (Shiwaku and Fernandez, 2011). Recent tragic events have prompted science clubs to focus more on environmental protection and disaster preparedness (Fernandez and Shaw, 2015).

In the Philippines, there are two prominent networks of science clubs, most notably the Philippine Society of Youth Science Clubs (PSYSC) and the Youth for the Environment in Schools Organisation (YES-O). The PSYSC is run exclusively by about 100 college students from the College of the Philippines who work as volunteers. The national summer camp organised by the PSYSC provided science club members the opportunity to gain knowledge and skills related to hazard preparedness and disaster preparedness (Fernandez, 2012). Workshops and presentations dealt with community-based disaster risk management and detailed explanations of various hydrometeorological and geological threats. It also highlighted practical initiatives that science clubs could take to improve their community's disaster resilience (Fernandez and Shaw, 2015).

In addition, YES-O is an educational organisation that operates in the school environment and provides a platform for students to actively participate in initiatives aimed at preserving, protecting and conserving the environment for the benefit of future

generations. In addition to its main focus on environmental initiatives, YES-O is also actively involved in disaster risk reduction activities (Fernandez, 2012). The club has organised several camps aimed at providing youth with comprehensive knowledge and practical skills in disaster risk reduction.

During the camps, the participants learnt about climate change adaptation and DRR which were developed and compiled for the most disaster-prone areas in the Philippines. Youth need to be more involved in disaster risk reduction efforts, and science clubs could be an excellent vehicle for this (Fernandez and Shaw, 2015). This is because they are present throughout the country and have mastered the art of incorporating disaster risk reduction ideas into their programmes.

The government of the Republic of Korea has begun a programme to make schools safer for kids and educators alike. Japan has made catastrophe risk mitigation education a part of both the school curriculum and after-school programmes (Yildiz et al., 2023). Therefore, the Ministry of Education in Malaysia has the opportunity to adopt the successful approach of the Philippines, the Republic of Korea and Japan and integrate disaster risk reduction into the education system. However, the Ministry needs to anticipate and consider additional variables in formulating this approach. Due to the heavy academic workload that students typically face, school clubs should be involved in flood preparedness plans ahead of their disaster risk reduction activities. This strategic planning will facilitate the involvement of a greater number of students as well as the science club advisor in these initiatives. A recommended approach would be to align disaster preparedness initiatives with less busy periods in the school calendar.

This study also found that the perceived severity of flooding was positively related to East Coast youths' intentions to prepare for flooding. Thus, youths who perceive flooding as a serious threat are more likely to intend to prepare for it. However, previous researchers have reported that greater perceived severity of experienced trauma was associated with greater symptomatology related to post-traumatic stress disorder (Besser et al., 2009; Lee et al., 2014). The Ministry of Health can use these findings to design and implement public awareness campaigns that emphasise the severity and potential consequences of flooding. These campaigns can educate people about the psychological and physical risks of flooding and show them the importance of being prepared.

However, the Ministry of Health needs to provide clear and balanced information about flood risks. While it is important to emphasise the potential severity of flooding to motivate preparedness, it is equally important to provide information on effective preparedness and coping strategies. This can include concrete steps that individuals and communities can take to reduce their vulnerability. The key is to strike a balance between motivating preparedness by recognizing the severity of the risks and helping people cope with the psychological consequences of traumatic events.

The ministry also develops and implements educational programmes and training for youth, including specific information on the impact of flooding on mental health. The Ministry can work with mental health professionals to support coping strategies and resilience building. The ministry can provide easily accessible information and resources to prepare for flooding and support mental health. This information should be disseminated through various channels, including websites, social media, community meetings and local health facilities. In addition, school psychologists and parents should increase the ability of youths to withstand and cope with challenging situations (Quan et al., 2017). Youths are also advised to participate in community programs and activities so that they have the opportunity to share their negative emotions with others. The Ministry of Health can also educate youth about the serious consequences of not taking precautions when flooding occurs. These consequences include drowning, electrocution, disruption of food and clean water supplies (resulting in those affected not having access to clean drinking water) and the risk of contamination from floodwaters, which can lead to the spread of diseases such as leptospirosis, diarrhoea and dengue fever.

In this study, perceived behavioural control was found to be positively associated with flooding preparation behaviours. Therefore, it is believed that youth prepare for flooding when they believe they can perform such behaviour. The Ministry of Education and the Ministry of Higher Education can incorporate this concept into their curriculum. By teaching students and youth that they are capable of preparing for floods and providing them with practical skills and knowledge, the ministries can empower the younger generation to take responsibility for their safety. In addition, recognizing that self-efficacy plays a role in youth preparedness, ministries can provide resources for programs that strengthen self-efficacy, including skill-building activities, information dissemination, and community participation.

To facilitate flood preparedness, the Ministry of Education and the Ministry of Higher Education can use these findings to encourage academics to develop innovative flood preparedness products. Game-based learning is an interesting pedagogical method that can be used to improve youths's knowledge and understanding of flood preparedness. However, Rosli et al. (2017) found that there is a lack of both the development and research of educational games on the topic of natural disasters. Experts agree that games are an effective way to impart knowledge to youths with different learning styles and abilities. Therefore, it is logical to utilise gaming strategies to assess youth preparedness for flood disasters (Clerveaux and Spence, 2009). Therefore, ministries can encourage academics to develop innovative flood preparedness products by awarding more innovation grants to academics.

The government can offer incentives to youth who engage in flood preparedness as part of its efforts to reduce disaster risk and strengthen community resilience. Incentives can increase the ability of youth to take proactive steps to prepare for floods. The government can provide financial rewards, scholarships, or grants to youth who actively engage in flood preparedness activities, participate in training programs, or contribute to community resilience projects. The government may also provide resources or tools such as emergency kits, flood-proof building materials or information to support their preparedness efforts.

Table 5.1 summarises the comprehensive plan, identifying the responsible parties for each recommended proposal and the expected outcomes. These recommended strategies aim to improve youth flood preparedness, particularly in the East Coast states of Malaysia. Overall, these recommendations will benefit policymakers, government agencies, particularly NADMA, and youth organisations.

Table 5.1 Recommendations to enhance youth's flood preparedness

Stakeholders	Suggestions
Policymakers Malaysian Youth Council Youth Parliament NADMA	Enhancing youths' attitude toward flood preparedness. Highly engage youths in decision-making / public policymaking process related to flood policy. Emulate the Youth Preparedness Council (YPC) in the United States. Give youths the chance to articulate their viewpoints to the personnel of NADMA. Designing and offering incentives to increase youths' motivation to prepare for floods.
NADMA Ministry of Health Malaysia (Health Education Division) Civil societies (NGOs, Residential Associations, and village leaders) Ministry of Youth and Sports Ministry of Local Government Development (BOMBA, Local authorities) State Government District Office Ministry of Education (Schools)	Develop a comprehensive training program and provide certifications or accolades upon successful completion. The provision of comprehensive and engaging information to the public in an interactive manner. Ensuring that the youths are not merely passive recipients of information in the context of flood disaster management. Instead, they should actively involve the public in shaping the nature, mode, and procedure of disaster risk communication, considering the specific local conditions and circumstances. Recognise youths' contributions to the promotion of flood disaster preparedness by employing ceremonial proceedings, the bestowal of awards, or the organisation of appreciation events that specifically highlight the accomplishments of individual youths. The development and implementation of contingency plans. Organise or sponsor community events focused on flood disaster preparedness and resilience. During the event, the youths will be exposed to important information related to floods such as the susceptibility and the severity of the flood and how to prepare for flood. Enhancing government agencies' communication efforts. Convey the message that flood preparedness behaviours are a shared responsibility. Promoting a culture of preparedness within local communities via educational institutions Embracing school-based flood preparedness activities. Emulating the Philippines's best practices where they established science clubs. The clubs conduct more environmental and disaster preparedness activities.

Table 5.1 Continued

Stakeholders	Suggestions
Ministry of Health (Health Education Division)	Public awareness campaigns.
Psikologi Kaunseling, Jabatan Kesihatan Negeri (JKN)	Providing clear and balanced information about flood risks. The Ministry of Health often collaborates with other government agencies, international organisations, and non-governmental organisations to address health threats comprehensively.
Mental Health and Psychosocial Support Services (MHPSS)	Educate youth about the susceptibility and the severe impacts of not taking precautionary measures when facing floods. These impacts include drowning, electric shock, disruptions to food and clean water supplies (resulting in a lack of access to safe drinking water for those affected), as well as the risk of contamination from floodwater, which can lead to the spread of diseases like leptospirosis, diarrhoea, and dengue fever.
	Collaborate with mental health professionals to guide coping strategies and resilience-building.
Ministry of Education and Ministry of Higher Education (Schools and Universities)	Encourage academicians to create innovative products for flood preparedness.
	Offering more grants for innovation to academicians.
	Establishing and empowering science clubs in schools.
	Local communities could consider funding disaster-related education programmes that teach kids about local catastrophes, how to be ready, and what to do in an emergency. By informing families and educating students, this would strengthen societal norms.
Youth organisations	Checklists of flood preparedness could be circulated via schools, community meetings, business work-
Residential Associations	places, local swimming pools, and so forth (i.e., in places where people gather).
Malaysia Youth Council	Similar messages could be reinforced via other community-related gatherings such as in conjunction with a “neighbourhood watch” program or local fairs/street parties. The message reinforced in a social context may result in increased discussion with friends, family, and coworkers, thus reinforcing subjective norms.
	Encouraging youth residents to participate in community organisations
	Encouraging youth to actively participate in community organisations, disaster preparedness committees, and local projects related to flood resilience.
	Invite youth in community decision-making processes related to disaster risk reduction and response planning.

Table 5.1 Continued

Stakeholders	Suggestions
Youth flood survivors	Sharing their personal stories, experiences, knowledge, and insights. Youth survivors can collaborate with local authorities, NGOs, or schools to create educational materials such as brochures, videos, or websites that provide practical information on flood preparedness tailored to a youth audience. Use social media platforms to share tips, videos, and stories related to flood preparedness. Engaging content on platforms like Instagram, TikTok, and YouTube can reach a wide audience. Engage with local policymakers and government agencies to advocate for policies that promote flood preparedness and resilience, particularly those that prioritise the needs and concerns of young people. Use personal stories, data, and information to emphasise the actual susceptibility and severity of floods in the community. Young people who are actively engaged can then help convey these messages effectively Share success stories of youth who have successfully translated their preparedness intentions into action. This can inspire others and demonstrate that preparedness efforts are effective.
The Ministry of Youth and Sports and the Ministry of Local Government Development need to	Acknowledge and celebrate the contributions of youth who share their stories, perhaps with awards, recognition, or community events.

5.5 The Outcome of the Study

One of the reasons why PLS-SEM was used in this study is due to the nature of the study, which is exploratory research for theory development. Hair et al. (2019) emphasised that researchers can use PLS-SEM when they intend to explore the theoretical extensions of established theories. To recap, in this study, two main theories, namely the TPB and the HBM, were integrated to predict flood preparedness behaviour among youths in the East Coast region. The integration of these theories provides new insights and a new framework for the study area of disaster risk reduction, particularly for flood behaviour. The findings of the study show that attitude, subjective norm, perceived susceptibility and perceived severity are positively associated with flood preparedness intention. In addition, perceived behavioural control and flood preparedness intention are positively associated with flood preparedness behaviour. In addition, the

first moderating variable, community participation, positively moderates the relationship between the predictors (attitude, subjective norm, perceived susceptibility, and perceived severity) and flood preparedness intention. Community participation also moderated the relationship between past experience and flood preparedness intention. However, the second moderating variable, trust in public protection, does not positively moderate the relationship between flood preparedness intention and flood preparedness behaviour. This study also includes gender and age as control variables to partially exclude their potential influence and isolate the specific effects of the main variables studied. The outcome of the integrated research model is illustrated in Figure 5.1.

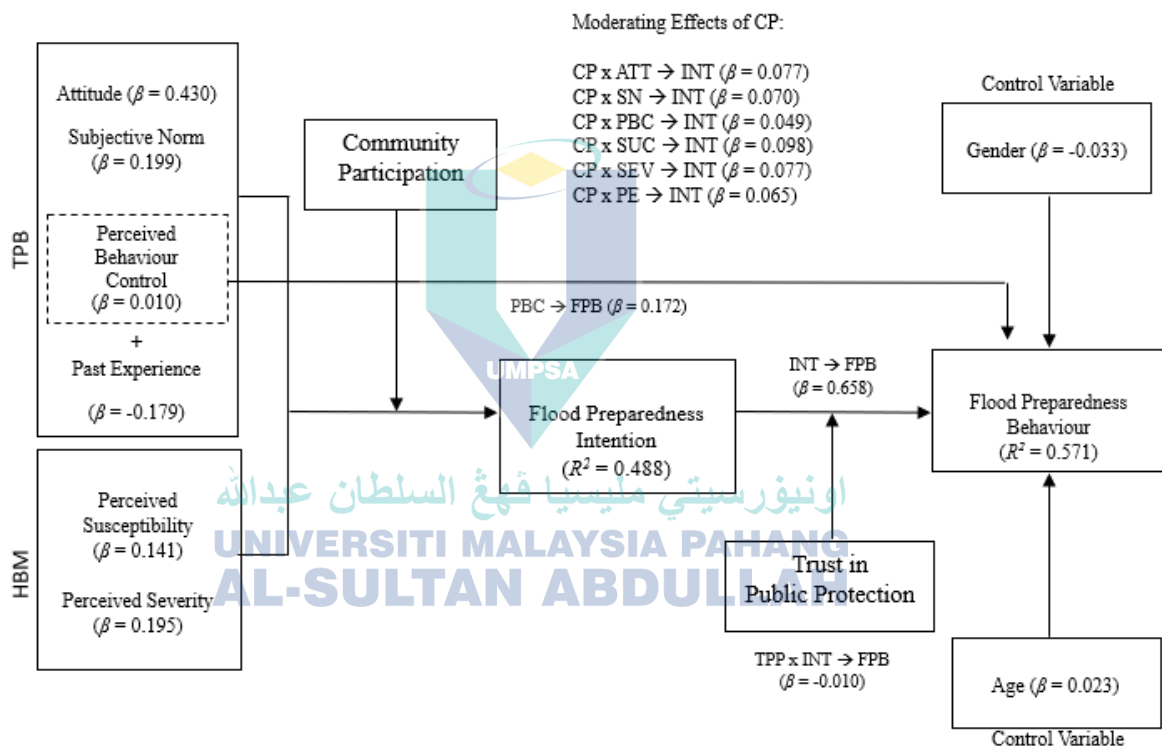


Figure 5.1 The outcome of the integrated research model

5.6 Limitations and Suggestions for Future Research

The study fulfilled the presented objective. While this study makes several valuable theoretical and practical contributions, several limitations draw attention to the need for further improvements. Future disaster preparedness research is needed to address this study's limitations. Notwithstanding the current constraints, the researcher guaranteed the validity of the study by endorsing the reliability of the suggested research framework. However, the researchers made recommendations to aid future researchers in

refining this work and incorporating those recommendations into other pertinent studies. There are a few significant limitations to this study that point to areas that warrant further investigation.

Firstly, the study was carried out among youth in the East Coast region, Peninsular Malaysia. This precludes extrapolating the study's results to other settings. Malaysia experiences occasional occurrences of floods, particularly during the monsoon seasons. The frequency and severity of floods can vary depending on factors such as rainfall patterns, geographical location, and infrastructure development. Some areas that are more prone to flooding include low-lying coastal regions, river basins, and areas with inadequate drainage systems.

The East Coast region experiences higher annual precipitation and greater variability compared to other regions in Malaysia (Muhammad et al., 2020). Approximately 2800 mm of rainfall falls on the East Coastal zone each year, whereas 2400 mm falls on the West Coastal zone (Tick and Samah, 2004). Thus, the findings of the study cannot be overestimated in other areas without such a significant experience of a disaster. Future researchers must be cautious about generalizing these findings to distinct contexts.

In addition, this research aims to provide a more comprehensive theoretical understanding of flood preparedness behaviour, in contrast to most earlier studies that concentrated on disaster preparedness for events like earthquakes or even general disasters. Hence, the findings of the study might not be generalised to other types of disasters such as earthquakes, hurricanes, tsunamis, etc. Previous studies have demonstrated that a multitude of psychosocial variables (attitude, subjective norms, perceived behaviour control, perceived susceptibility, perceived severity, and past experience) can influence disaster preparedness. Nonetheless, these factors' impacts have varied considerably between disaster kinds and nations. In particular, Mishra et al. (2010) have cautioned against lumping all "natural disasters" into one umbrella term and instead recommended that researchers examine different types of disasters separately due to the inherent diversity in these events.

Scholars from all around the globe have been studying disaster preparedness and protective practices, but the disparities between urban and rural households' levels of readiness have received very little attention. There is a significant disparity between urban and rural regions when it comes to the following factors: the likelihood of dangers,

the susceptibility of communities, socioeconomic and cultural traits, the availability of infrastructure, and the ability to react (Susan et al., 2016). For more representative results that are applicable nationwide, it is advised to use a larger sample of respondents. Future researchers may consider Multi-Group Analysis (MGA) to compare models between rural and urban areas as their levels of hazard, vulnerabilities, and socioeconomics are very dissimilar.

Youths were the primary subjects of the research. Since youths are among the most vulnerable demographics in the face of a natural catastrophe, the study's findings cannot be applied to a broader population but do shed light on an important age bracket. It is suggested that future researchers can utilise other vulnerable groups such as the elderly to become the research subject. Fatmah (2022) noted that the elderly population suffers from diminished functional abilities, cognitive disturbances, dementia, frail physical conditions, and several degenerative diseases. Gumasing and Sobrevilla (2023) stressed that the older generation (41 years old and above) is more vulnerable and susceptible to the impacts of natural calamities.

Another limitation is this study utilised a cross-sectional study. Since cross-sectional studies collect and capture data at a specific moment (one-time data collection), they may not adequately capture changes or temporal variations in youths' flood preparedness behaviours. Although this study utilised cross-sectional study, this study can identify associations between various factors and provide a foundation for more in-depth research using longitudinal study. Hence, it is suggested that future researchers could consider embracing longitudinal studies to examine changes in youth's flood preparedness behaviours over time.

This study also did not collect data from the study subject's head of village or youth leaders, who may be aware of the study subject's flood preparedness behaviour. This study gathered data from a single source and this may overstate the relationships owing to the likelihood of common method bias (Podsakoff et al., 2003). The self-report method of study does have some limitations as the respondents' memory retaining deficit (Kormos and Gifford, 2014) and social desirability bias (Podsakoff and Organ, 1986; Podsakoff et al., 2003) which may depreciate the truthfulness of self-reports. However, the researcher has already tackled the issue of common method bias by using the procedural and statistical remedy advised by Podsakoff and Organ (1986), and Podsakoff et al. (2003). Besides that, the researcher also assured the respondents that their responses

were anonymous. This action is crucial to prevent respondents from providing what they perceived to be a socially desirable response. Thus, this study assured that CMV does not excessively affect the hypothesised structural model.

Despite the aforementioned shortcomings, the self-report method is still the best available method to diminish the possibility of social difficulty for respondents and the possibility of social desirability biases (Grimm, 2010; Kormos and Gifford, 2014). Furthermore, Turner and Stets (2006) contended that emotions are internal events that occur within an actor. Human emotions are felt individually (Martin and Ochsner, 2016). Therefore, self-report measures are appropriate and justified. Despite relying on self-report data, this study considers the method's shortcomings in many ways. One approach to increase the validity of self-report behaviour assessments is to employ several items (Ajzen, 2002). Nevertheless, future researchers may consider multiple sources of data to perfectly eliminate biases. Despite these caveats, the study does manage to combine the TPB and HBM into a single model that may be utilised to forecast how youths in Malaysia's East Coast Region will behave in the event of a flood.

5.7 Conclusion

Globally, the DRR agenda can and is being driven by youth (Shaw and Kishore, 2023). Therefore, youth need to learn about crisis management so that they can help people of all ages to cope with emergencies. Stakeholders should give youth engagement in DRR and collective resilience the serious attention it deserves (Octastefani and Rum, 2019). Extensive research has provided robust evidence supporting the assertion that catastrophic disasters are not inevitable, but rather can be prevented or significantly mitigated through proactive preparedness measures and well-considered mitigation actions (Wankmüller and Reiner, 2020; Ong et al., 2023).

Studies have consistently affirmed that proactive preparedness efforts and strategic mitigation actions lead to tangible benefits, including lower mortality rates, reduced economic losses, and less widespread destruction. They underscore that disasters are not merely acts of fate but are influenced by human choices and societal actions. As such, investing in preparedness and mitigation is not only cost-effective in the long run but also ethically imperative, as it helps protect lives, livelihoods, and the well-being of communities. While there has been a lot of research on flood disaster preparedness, there

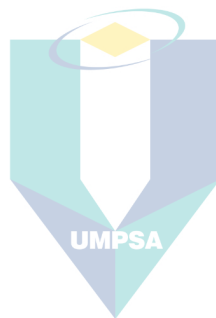
has been surprisingly little done in the Asian region. This is surprising given that Asia is thought to have a higher number of disaster events and victims per year compared to other continents (Ubaidillah et al., 2022; Gammoh et al., 2023).

The lack of research on the behavioural factors that influence youths' readiness for disasters in both developed and developing nations was highlighted by Ubaidillah et al. (2022). In addition, there have been new requests to improve studies on youth disaster preparedness, which is critically important for building resilience to disasters (Nifa et al., 2018). Therefore, this study has been conducted to address this limitation by examining factors associated with flood preparedness intention and behaviour among youth in the East Coast region of Peninsular Malaysia.

The results of the study provide additional data on the factors that affect youth preparedness for flood disasters, which are a lifeline during flood disasters. This study differs from previous works as it integrates two theories into a model, namely the TPB and the HBM. With the inclusion of community participation and trust in public protection as moderating variables, this study creates a more comprehensive and nuanced understanding of the dynamics within a youth's safety and security framework on flood disaster preparedness. These moderating variables play a pivotal role in shaping the effectiveness of youth's public protection measures, influencing both their implementation and outcomes. Incorporating community participation and trust as moderating variables in the study of public protection allows for a more holistic assessment of the factors influencing safety outcomes.

The study reveals that attitude, subjective norms, perceived susceptibility, and perceived severity exhibited a positive relationship with flood preparedness intention, whereas past flood experience showed a negative relationship, and perceived behaviour control did not demonstrate a significant relationship with flood preparedness intention. This study also finds that perceived behaviour control and flood preparedness intention have a positive relationship with flood preparedness behaviour. It is interesting to highlight that, except for perceived behaviour control, community participation has positively moderated the relationship between attitude, subjective norms, perceived susceptibility, perceived severity, and flood preparedness intention. Community participation also moderated the relationship between past experience and flood preparedness intention.

There was a correlation between flood preparation intentions and behaviours, but trust in public protection did not act as a moderator. This research adds to our understanding of how people behave in the event of a flood disaster. In addition, it could pave the way for more studies on flood preparedness intentions and behaviours, which could lead to more research that includes ongoing testing to refine and enhance the model. By including the HBM and TPB, this study has improved people's comprehension and provided direction for future public policy efforts. Insights from this study can help youth organisations and government agencies, particularly NADMA, create more effective flood preparedness programmes for youths living along the East Coast, which will increase their resilience and lessen the severity of future floods.



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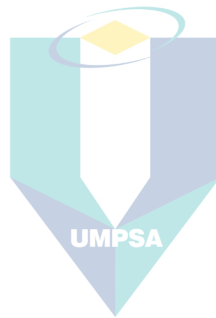
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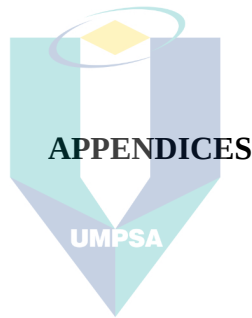
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Appendix A: List of Publications

Newspapers Articles

1. Hapus Birokrasi Dalam MKN 20, Utusan Malaysia, 6 January 2022.
2. Impak Fenomena Perubahan Iklim: Kita Kesuntukan Masa!, Harian Metro, 17 January 2022.
3. Perkasa belia dalam pengurusan bencana, banjir, Berita Harian, 27 January 2022
4. Berpadu Menangani Kesan Musibah: Bantuan Banjir and Impak Emosi, Harian Metro, 28 February 2022.
5. Curbing Floods: Help Bring International Day of Action for Rivers to Life, The New Straits Times, 24 March 2022.
6. Daya Tahan Hadapi Musibah: Wanita dan Risiko Bencana, Harian Metro, 28 March 2022.
7. Pastikan Saliran Lancar Elak Rumah Tenggelam Ketika Balik Kampung, Berita Harian, 28 April 2022.
8. Perubahan Iklim dan Banjir, Mingguan Malaysia, 7 Ogos 2022
9. Impak Perubahan Iklim: Bumi Dah Tunjuk Protes! Harian Metro, 15 Ogos 2022
10. Musim Banjir Belum Berakhir: Menunggu Penghujung MTL; Harian Metro; 9 January 2023
11. Sekuriti Makanan Negara: Perlu Adaptasi dan Inovasi; Harian Metro; 7 February 2023
12. Mereka Berhak Dapat Elaun Khas; Mingguan Malaysia; 5 March 2023
13. Belia and Perubahan Iklim: Apabila Cuaca Makin Kacau; Harian Metro; 7 August 2023.

Journal Articles

1. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, Noor Amira Syazwani Abd Rahman and Soon Yew, Ju (2022). Youth engagement in flood disaster management in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 12(5), 846-857- ERA Indexed Journal; Published.
2. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, Soon Yew, Ju and Noor Amira Syazwani Abd Rahman (2022). An Analysis of Malaysian Public Policy in Disaster Risk Reduction: An Endeavour of Mitigating the Impacts of Flood in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 12(7), 2006 – 2021. - ERA Indexed Journal; Published.
3. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, Soon-Yew, Ju, Noor Amira Syazwani Abd Rahman and Lai-Kuan, Kong (2022). The Disaster-Resilient Smart City in Malaysia: The Use of Technology in Flood Management. *International Journal of Academic Research in Business and Social Sciences*, 12(11), 129 – 140. - ERA Indexed Journal, Published.
4. Mohd Rozaimy Ridzuan and Jamal Rizal Razali and Soon-Yew, Ju, Noor Amira Syazwani Abd Rahman, and Lai-Kuan, Kong (2022). The Impacts of Flood Disasters on Poverty and Income Disparity in Malaysia: Fine-Tuning The Shared Prosperity Vision 2030. *International Journal of Academic Research in Business and Social Sciences*, 12(10). 2158 -2170 - ERA Indexed Journal; Published.
5. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, Soon-Yew, Ju, Noor Amira Syazwani Abd Rahman, Amirudin Mohd Zani, and Lai-Kuan, Kong (2023) The Effectiveness of the Master of Flood Preparedness (MOFP) in Elevating Malaysian Youths' Awareness of Flood Preparedness. *International Journal of Academic Research in Business and Social Sciences*, 13(6), 2483-2495 - ERA Indexed Journal; Published.
6. Mitigating Flood Risk in Malaysia Through Flood Insurance: Exploring the Feasibility of the United States and Japanese Approaches; ERA Indexed Journal; Published.
7. That is not my house? Household renters' flood preparedness intention in the East Coast Region of Malaysia; IDRIM; Scopus; Published.
8. Unveiling the Influence of Subjective Norms on Flood Preparedness among Household Renters: The Moderating Effect of Trust in Public Protection; Pertanika; Scopus and WOS; Published.
9. Do You Trust Our Public Protection? : Exploring Its Moderating Effect In The Relationship Between Perceived Susceptibility And Flood Preparedness Intention; *Journal of Sustainability Science and Management*; Scopus and WOS; Published.
10. Investigating the Link Between Past Flood Experience and Flood Preparedness Intention: Dual Mediation Via The SOR Model With Perceived Severity And Susceptibility. JONUS, WOS, Accepted.

11. Flood Preparedness Intention Among Pahang Residents: An Extension of The Theory of Planned Behavior; Journal of Academia; MyCite; Published.
12. Noor Amira Syazwani Abd Rahman, Jamal Rizal Razali, Mohd Rozaimy Ridzuan, and Soon-Yew, Ju (2022). Examining the factors influencing Malaysian parents' intention toward human papillomavirus (HPV) vaccination for children. *International Journal of Academic Research in Business and Social Sciences*, 12(5), 1809-1820. ERA Indexed Journal; Published.
13. Noor Amira Syazwani Abd Rahman, Jamal Rizal Razali, Mohd Rozaimy Ridzuan, and Soon-Yew, Ju (2022). A comparative study on childhood vaccination policy in the United States, Australia, Europe and Malaysia. *International Journal of Humanities Technology and Civilization*, 7(1), 92-96; Published.
14. Noor Amira Syazwani Abd Rahman, Ju Soon Yew, Jamal Rizal Razali, Nur Hazirah Hamdan, Mohd Rozaimy Ridzuan, and Kong Lai Kuan (2024). Post-COVID-19 Malaysian parents' views on children's vaccination: Subjective norms analysis. *International Journal of Evaluation and Research in Education (IJERE)*, 13(5). 2801-2809. Published.
15. Noor Amira Syazwani Abd Rahman, Ju Soon-Yew, Jamal Rizal Razali, Mohd Rozaimy Ridzuan, and Kong Lai-Kuan (2024). The influence of attitude, subjective norms, and perceived behavioral control on vaccination intention among teachers: The moderating role of perceived policy effectiveness. *Journal of Nusantara Studies*, 9(1). 224-244. Published.
16. Noor Amira Syazwani Abd Rahman, Nur Hazirah, Hamdan, Mohd Rozaimy Ridzuan, Ju Soon Yew, and Jamal Rizal Razali (2023). Would Malaysian young parents get their children vaccinated? Extending the theory of planned behavior to the context of social media influence effectiveness. *International Journal of Social Policy and Society (IJSPS)*, 19. 142-159. Published.
17. Deciphering the Flood Puzzle of Community Participation, Attitudes, and Flood Preparedness Intention Through the Lens of SOR Theory, Mohd Rozaimy Ridzuan, Jamal Rizal Razali, and Noor Amira Syazwani Abd Rahman. Submitted.
18. Better Safe Than Sorry: A Systematic Literature Review on Flood Preparedness Among Indigenous Peoples.

Books

1. Mohd Rozaimy Ridzuan, Jamal Rizal Razali and Noor Amira Syazwani Abd Rahman. *Menyelusuri Konsep, Peranan dan Kesiapsiagaan Rakyat Menghadapi Banjir*. Accepted.
2. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, Noor Amira Syazwani Abd Rahman, Soon-Yew, Ju, Lai-Kuan, Kong, and Amirudin Mohd Zani (2023). *Master of flood preparedness: Aware, prepare and resilient*. Tiang Press, Pekan, Pahang. ISBN 978-629-97305-4-5; Published.

3. Mohd Rozaimy Ridzuan, Jamal Rizal Razali and Noor Amira Syazwani Abd Rahman. Pendidikan Dan Komunikasi Risiko Banjir Dalam Pengurusan Bencana Banjir Di Malaysia; UMPSA Publisher; Submitted.
4. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, and Noor Amira Syazwani Abd Rahman (2023). It Takes Two to Tango: Unlocking Flood Preparedness in Malaysia Through Social Capital; MNNF Network; Published.
5. Mohd Rozaimy Ridzuan, Jamal Rizal Razali, and Noor Amira Syazwani Abd Rahman (2023). Kursus Intergriti dan anti-rasuah (KIAR). Tiang Press, Pekan, Pahang. Published.

Extended Abstract

Master of Flood Preparedness (MOFP): Game-Based Learning to Prepare Youth to be Aware, Prepared, And Resilient In Facing Floods; Published.

Proceedings

An Investigation of Perceived Flood Risk Disparities Among Insured and Non-Insured Individuals in Pahang, Malaysia: A Comparative Analysis; 2nd International Conference on Human Sciences and Civilisations (ICHSC 2023); 8-9 August 2023, UMPSA; Published.

Innovation Products

Master of Flood Preparedness (MOFP) – Won a Gold Medal at the International Exhibition and Symposium on Productivity, Innovation, Knowledge, Education, and Design (I-Spike 2023).

Master of Flood Preparedness *Elite* – Won a Gold Medal at the Virtual International Breakthrough Invention, Innovation & Design Exhibition (Vi-Biide) 2024

Grants and Awards

1. Post-Graduate Research Scheme (PGRS) UMPSA – Predictors of Flood Preparedness Among Youth in the East Coast Region, Malaysia, Project Vote: PGRS2303140, RM2500.
2. A recipient of the Holistic Incentive Scheme; Semester i 2023/2024 – Semester ii 2023/2024.

Appendix B: Post Hoc Power Analysis (Flood Preparedness Intention)

Post-hoc Statistical Power Calculator for Multiple Regression

This calculator will tell you the observed power for your multiple regression study, given the observed probability level, the number of predictors, the observed R^2 , and the sample size.

Please enter the necessary parameter values, and then click 'Calculate'.

Number of predictors: ?

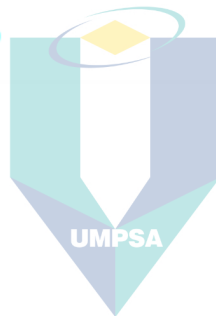
Observed R^2 : ?

Probability level: ?

Sample size: ?

Calculate!

Observed statistical power: 1.0



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Appendix C: Post Hoc Power Analysis (Flood Preparedness Behaviour)

Post-hoc Statistical Power Calculator for Multiple Regression

This calculator will tell you the observed power for your multiple regression study, given the observed probability level, the number of predictors, the observed R^2 , and the sample size.

Please enter the necessary parameter values, and then click 'Calculate'.

Number of predictors: ?

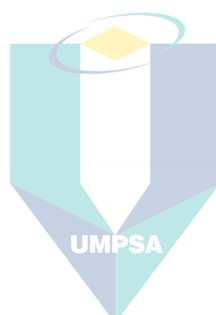
Observed R^2 : ?

Probability level: ?

Sample size: ?

Calculate!

Observed statistical power: 1.0



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Appendix D: Accepted Manuscript – Book



Penerbit
Publisher

MEMO EDARAN	
Kepada / Untuk Perhatian	U/P: Profesor Madya Dr. Jamal Rizal bin Razali
Jabatan / Fakulti	Pusat Sains Kemanusiaan
Daripada	Penerbit UMPSA
No. Rujukan	
Perkara	Pemakluman Kelulusan Penerbitan
Tarikh	4 Januari 2023

السلام عليكم ورحمة الله وبركاته

YBhg. Prof. Madya Dr.,

Dengan hormatnya perkara di atas adalah dirujuk.

2. Adalah dinyatakan melalui memo ini bahawa manuskrip Prof. Madya Dr. seperti ketetapan di bawah telah diluluskan dalam Mesyuarat Pengurusan Editorial Penerbit Kali Ke-5 Bil.1/2024:

Tajuk Manuskrip: **Bencana Banjir**
Menelusuri Konsep, Peranan dan Kesiapsiagaan Rakyat Menghadapi Banjir

3. Pada peringkat ini, Sidang Editorial buku ini akan melakukan beberapa proses penerbitan dengan menyunting dan menilai dengan lebih terperinci. Sebarang penambahbaikan dan pembetulan akan dimaklumkan oleh editor kepada penulis dari semasa ke semasa.

4. Untuk makluman pihak Prof. tarikh dan jangka masa bagi penerbitan buku adalah dalam tempoh 3 bulan daripada tarikh memo ini dikeluarkan.

5. Pihak Sidang Editorial buku ini mengucapkan ribuan terima kasih di atas sokongan yang Prof. Madya Dr. berikan untuk menerbitkan buku ini. Diharapkan kerjasama ini dapat diteruskan lagi pada masa akan datang.

Sekian, terima kasih.

"MALAYSIA MADANI"

"BERKHIDMAT UNTUK NEGARA"
"Teknologi Untuk Masyarakat"

Saya yang menjalankan amanah,

NAZRATUL ALEIYA BT SHAHARUDDIN
Pembantu Tadbir (Perkeranian/Operasi)
Penerbit UMPSA

Appendix E: Gold Award – Innovation



Appendix F: Questionnaire



Niat dan Tingkah Laku Kesiapsiagaan Menghadapi Banjir / Flood Preparedness Intention and Behaviour

Responden yang dihormati,

Saya merupakan pelajar PhD di Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA). Tujuan kajian ini dijalankan adalah untuk mengenalpasti persepsi individu terhadap tingkah laku kesiapsiagaan menghadapi banjir. Penyertaan anda dalam kajian ini adalah secara sukarela, tanpa paksaan dan identiti anda dirahsiakan. Soal selidik ini akan mengambil masa kira-kira 10-15 minit untuk dilengkapkan. Anda dikehendaki menandakan jawapan yang sesuai. Sila baca dengan teliti dan jawab semua soalan dengan jujur. Tidak ada jawapan yang betul atau salah. Maklumat yang anda berikan akan diuruskan dalam kawalan yang ketat dan digunakan hanya untuk tujuan penyelidikan. Saya berharap anda akan melengkapkan borang soal selidik ini dengan tenang. Jika anda mempunyai sebarang pertanyaan atau ingin mendapatkan maklumat lanjut, sila hubungi saya di rozaimyridzuan@yahoo.com. Terima kasih atas bantuan yang diberikan.

Dear respondents,

I am a PhD student at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA). This research aims to investigate individuals' perceptions of flood preparedness behaviour. Participation in this research is completely voluntary, non-compulsory and anonymous. The online questionnaire will take about 10-15 minutes to complete. The respondent is required to tick the appropriate box. Please read them carefully and answer all questions honestly. There are no right or wrong answers. The information you provide will be treated in the strictest confidence and used only for research purposes. I hope that you will find completing the questionnaire enjoyable. If you have any questions or would like to have further information, do not hesitate to contact me at rozaimyridzuan@yahoo.com. Thank you for your kind assistance.

Yours sincerely,

Mohd Rozaimy bin Ridzuan (0123382976)

Centre for Human Sciences, UMPSA

BAHAGIAN A / SECTION A
NIAT KESIAPSIAGAAN MENGHADAPI BANJIR / FLOOD PREPAREDNESS INTENTION

	Sangat tidak setuju / Strongly disagree	Tidak Setuju / disagree	Agak tidak setuju / Somewhat disagree	Berkecuali / Neither agree nor disagree	Agak setuju / Somewhat agree	Setuju / Agree	Sangat setuju / Strongly agree
	1	2	3	4	5	6	7
Sila nyatakan pilihan anda dengan menanda nombor yang sesuai, iaitu nombor yang paling menggambarkan perasaan anda tentang pernyataan tersebut / Please indicate your choice by ticking the appropriate number, that is, the number that best describes how you feel about the statements.							
1. Saya berharap untuk membuat persiapan menghadapi banjir / I expect to prepare for a flood.	1	2	3	4	5	6	7
2. Saya bercadang untuk membuat persiapan menghadapi banjir / I plan to prepare for a flood.	1	2	3	4	5	6	7
3. Saya akan membuat persiapan untuk menghadapi banjir / I will make preparation for a flood.	1	2	3	4	5	6	7
BAHAGIAN B / SECTION B GELAGAT KESIAPSIAGAAN BANJIR / FLOOD PREPAREDNESS BEHAVIOUR							
1. Saya sentiasa mengemaskini maklumat kecemasan berkaitan banjir / I always make myself updated on emergency information about flooding.	1	2	3	4	5	6	7
2. Saya sentiasa menghubungi orang tersayang atau rakan saya dan memberitahu mereka di mana dan dengan siapa saya berada / I always contact my loved ones or friends and let them know where I am and who am I with.	1	2	3	4	5	6	7
3. Saya selalu pergi ke kawasan yang lebih tinggi apabila banjir mula meningkat / I always go to higher grounds when the flood starts to rise.	1	2	3	4	5	6	7
4. Saya sentiasa memastikan barang dan bekalan kecemasan (iaitu, ID, Pasport, wang, air) tersedia sekiranya berlaku banjir dan pemindahan / I always keep the emergency items and supplies (i.e. ID, Passport, money, water) prepared in case of flooding and evacuation.	1	2	3	4	5	6	7
5. Saya mengamalkan dengan hanya mengambil makanan yang dimasak dengan baik dan air masak untuk mengelakkan pencemaran / I am practicing taking only well-cooked foods and boiled water to prevent contamination.	1	2	3	4	5	6	7
BAHAGIAN C / SECTION C PENYERTAAN KOMUNITI / COMMUNITY PARTICIPATION							

1.	Saya telah bekerja dengan orang lain dalam sesuatu perkara untuk meningkatkan kehidupan masyarakat / I have worked with others on something to improve community life.	1	2	3	4	5	6	7
2.	Saya mengambil bahagian dalam aktiviti atau acara tempatan (cth., festival, pesta dan pameran / I participate in local activities or events (e.g. festivals, fetes and fairs).	1	2	3	4	5	6	7
3.	Saya telah menyumbangkan wang, makanan atau pakaian untuk tujuan tempatan, badan amal dan orang lain dalam komuniti saya / I have contributed money, food or clothing to local causes, charities and others in my community.	1	2	3	4	5	6	7
4.	Saya telah menghadiri mesyuarat awam mengenai isu komuniti / I have attended public meeting on community issues.	1	2	3	4	5	6	7
5.	Saya telah terlibat dalam aktiviti sukarelawan yang bertujuan untuk memberi manfaat kepada komuniti saya (cth., mengumpul dana, hari pembersihan, membuat sistem perparitan, kumpulan tempatan dan Pengakap / I have been involved in volunteering activities intended to benefit my community (e.g. fundraising, clean-up days, making drainage systems, local groups and Scouts).	1	2	3	4	5	6	7
BAHAGIAN D / SECTION D KEYAKINAN TERHADAP PERLINDUNGAN AWAM / TRUST IN PUBLIC PROTECTION								
1.	Saya yakin penghadang banjir di sepanjang kawasan perumahan saya terjaga dengan baik / I am confident that the flood defenses along my residential area are maintained well.	1	2	3	4	5	6	7
2.	Saya mempunyai keyakinan terhadap kemahiran teknologi yang dimiliki oleh agensi yang menguruskan risiko banjir / I have confidence in the technological skills of flood risk managements.	1	2	3	4	5	6	7
3.	Saya yakin dengan kekuatan penghadang banjir di kawasan perumahan saya / I have confidence in the strength of the flood defenses in my residential area.	1	2	3	4	5	6	7
4.	Saya yakin terdapat orang yang mencukupi dan berkelayakan yang bekerja dengan pihak berkuasa pengurusan banjir / I am confident that there are sufficient and qualified people working with the flood management authorities.	1	2	3	4	5	6	7
BAHAGIAN E / SECTION E SIKAP / SECTION E: ATTITUDE								
	Sangat tidak setuju / Strongly disagree	Tidak Setuju / disagree	Berkecuali / Neither agree nor disagree	Setuju / Agree	Sangat setuju / Strongly Agree			
	1	2	3	4	5			
Sila nyatakan pilihan anda dengan menanda nombor yang sesuai, iaitu nombor yang paling menggambarkan perasaan anda tentang pernyataan tersebut / Please indicate your choice by ticking the appropriate number, that is, the number that best describes how you feel about the statements.								
1.	Sikap saya dalam membuat persediaan menghadapi banjir adalah berkesan / My attitude toward making preparation for flood is effective.	1	2	3	4	5		
2.	Sikap saya dalam membuat persediaan menghadapi banjir adalah berguna / My attitude toward making preparation for flood is useful.	1	2	3	4	5		

3.	Sikap saya dalam membuat persediaan menghadapi banjir adalah berfaedah / My attitude toward making preparation for flood is beneficial.	1	2	3	4	5
BAHAGIAN F / SECTION F NORMA SUBJEKTIF / SUBJECTIVE NORMS						
1.	Keluarga atau rakan saya berpendapat bahawa saya perlu membuat persediaan menghadapi banjir / My family or friends think that I should make preparation for flood.	1	2	3	4	5
2.	Berkenaan dengan membuat persediaan menghadapi banjir, melakukan apa yang orang fikir saya patut lakukan adalah penting / Regarding making preparation for a flood, doing what people think I should do is important.	1	2	3	4	5
3.	Saya berasa di bawah tekanan sosial untuk membuat persediaan menghadapi banjir / I feel under social pressure to make preparation for a flood.	1	2	3	4	5
BAHAGIAN G / SECTION G KAWALAN TINGKAH LAKU / PERCEIVED BEHAVIOURAL CONTROL						
1.	Saya yakin saya boleh membuat persediaan menghadapi banjir jika saya mahu / I am confident that I could prepare for a flood if I wanted to.	1	2	3	4	5
2.	Sama ada saya membuat persediaan menghadapi banjir bergantung sepenuhnya kepada saya / Whether I prepare for a flood is entirely dependent on me.	1	2	3	4	5
3.	Membuat persiapan menghadapi banjir adalah perkara yang mudah bagi saya / Preparing for a flood is an easy thing for me.	1	2	3	4	5
BAHAGIAN H / SECTION H KERENTANAN YANG DIRASAKAN / PERCEIVED SUSCEPTIBILITY						
1.	Saya rasa tempat saya tinggal terdedah kepada bencana banjir / I think the place where I am living is prone to flood disasters.	1	2	3	4	5
2.	Saya rasa rumah saya terdedah kepada bencana banjir / I think my house is prone to flood disasters.	1	2	3	4	5
3.	Saya fikir ahli keluarga saya dan saya terdedah kepada bencana banjir / I think my family members and I are prone to flood disasters.	1	2	3	4	5
4.	Saya rasa harta saya terdedah kepada bencana banjir / I think my property is prone to flood disasters.	1	2	3	4	5
5.	Saya berpendapat bekalan elektrik dan air di kawasan saya terdedah kepada bencana banjir / I think electricity and water supplies in my area are prone to flood disasters.	1	2	3	4	5
BAHAGIAN I / SECTION I KESERiusAN YANG DIRASAKAN / PERCEIVED SEVERITY						
1.	Saya rasa jika berlaku kejadian banjir besar, tempat saya tinggal boleh terjejas teruk / I think if a major flood event occurs, the place where I am living could be affected severely.	1	2	3	4	5
2.	Saya rasa jika berlaku banjir besar, rumah saya boleh rosak teruk / I think if a major flood event occurs, my home could be damaged severely.	1	2	3	4	5
3.	Saya rasa jika kejadian banjir besar berlaku, ahli keluarga saya dan saya boleh terjejas teruk (cedera	1	2	3	4	5

atau terbunuh) / I think if a major flood event occurs, my family members and I could be affected severely (injured or killed).								
4.	Saya rasa jika berlaku banjir besar, harta saya boleh rosak teruk/ I think if a major flood event occurs, my property could be damaged severely.	1	2	3	4	5		
5.	Saya fikir jika kejadian banjir besar berlaku, talian elektrik dan air boleh rosak teruk, dan bekalan boleh terganggu / I think if a major flood event occurs, electricity and water lines could be damaged severely, and supplies could be interrupted.	1	2	3	4	5		
BAHAGIAN J / SECTION J PENGALAMAN LEPAS / PAST EXPERIENCE								
1.	Saya pernah mengalami beberapa banjir besar pada masa lalu / I have experienced several heavy floods in the past.	1	2	3	4	5		
2.	Saya pernah mengalami banjir di mana penduduk di kawasan saya kehilangan tempat tinggal / I have experienced a flood where people in my area were left homeless.	1	2	3	4	5		
3.	Saya pernah mengalami banjir di mana rumah kami musnah dan rosak / I have experienced a flood where our house was destroyed and damaged.	1	2	3	4	5		
4.	Saya mempunyai pengalaman banjir di mana rumah kami ditenggelami oleh air banjir / I have experienced a flood where our house was drowned by floodwater.	1	2	3	4	5		
5.	Saya pernah mengalami banjir di mana harta dan aset kami ditenggelami air / I have experienced a flood where our properties and assets were submerged in water.	1	2	3	4	5		
6.	Saya pernah mengalami banjir yang menyebabkan saya trauma dan tidak dapat tidur / I experienced a flood that is traumatizing and I couldn't sleep.	1	2	3	4	5		
BAHAGIAN K / SECTION K BIAS KEHENDAK SOSIAL / SOCIAL DESIRABILITY BIAS								
		Sangat tidak setuju / Strongly disagree	Tidak Setuju / disagree	Agak tidak setuju / Somewhat disagree	Berkecuali / Neither agree nor disagree	Agak setuju / Somewhat agree	Setuju / Agree	Sangat setuju / Strongly Agree
		1	2	3	4	5	6	7
Sila nyatakan pilihan anda dengan menanda nombor yang sesuai, iaitu nombor yang paling menggambarkan perasaan anda tentang pernyataan tersebut / Please indicate your choice by ticking the appropriate number, that is, the number that best describes how you feel about the statements.								
1.	Ada ketikanya saya suka bergosip / I like to gossip at times.	1	2	3	4	5	6	7
2.	Terdapat keadaan di mana saya mengambil kesempatan ke atas orang lain / There are occasions where I take advantage of others.	1	2	3	4	5	6	7
3.	Selalunya saya sanggup mengaku salah ketika melakukan sebarang kesalahan / I am always willing to admit when I make any mistakes.	1	2	3	4	5	6	7
4.	Kadang-kadang saya ingin membalas perbuatan dari memaafkan dan melupakan / I sometimes try to get even rather than forgive and forget.	1	2	3	4	5	6	7
5.	Ada ketikanya, saya benar-benar berkeras untuk mendapatkan sesuatu mengikut cara saya sendiri / At times, I really insist on having things according to my	1	2	3	4	5	6	7

own way.	
6. Saya tidak pernah merasa menyampah apabila orang lain melontarkan idea yang berbeza dari saya / I have never been annoyed when people expressed ideas very different from my own.	1 2 3 4 5 6 7
7. Saya tidak pernah mempunyai niat untuk menyatakan sesuatu yang boleh menyakitkan hati seseorang / I have never had the intention to say something that might hurt someone's feelings.	1 2 3 4 5 6 7
BAHAGIAN L / SECTION L PROFIL DEMOGRAFI RESPONDEN / DEMOGRAPHIC PROFILE OF THE RESPONDENTS	
Tujuan bahagian ini adalah untuk mengumpul data profil responden. Sila tandakan (/) pada jawapan yang berkaitan dengan anda / The purpose of this section is to collect respondent profile data. Please tick (/) the answers that relate to you.	
1. Jantina / Gender	☐ 1 Lelaki / Male ☐ 2 Perempuan / Female
2. Umur / Age	☐ 1 15-20 tahun / years old ☐ 2 21-30 tahun / years old ☐ 3 31-40 tahun / years old
3. Etnik / Ethnicity	☐ 1 Melayu / Malay ☐ 2 Cina / Chinese ☐ 3 India / Indian ☐ 4 Lain-lain / Others
4. Negeri Tempat Tinggal / Living states	☐ 1 Kelantan ☐ 2 Pahang ☐ 3 Terengganu
5. Kawasan tempat tinggal / Living areas	☐ 1 Luar bandar / Rural ☐ 2 Separa bandar / Sub-urban ☐ 3 Bandar / Bandar

**TERIMA KASIH ATAS PENYERTAAN ANDA /
THANK YOU FOR YOUR PARTICIPATION.**

Appendix G: Results (Figure)

