FLOOD PREPAREDNESS, RESPONSE AND RECOVERY OF FLOOD AFFECTED BUSINESS OWNERS IN SHAH ALAM IN 2021

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A project report submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering (Honours) Civil Engineering

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DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

I certify that this project report entitled **"FLOOD PREPAREDNESS, RESPONSE AND RECOVERY OF FLOOD AFFECTED BUSINESS OWNERS IN SHAH ALAM IN 2021"** was prepared by **HWANG MING YUAN** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Engineering (Honours) Civil Engineering at Universiti Tunku Abdul Rahman.

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ABSTRACT

In the mid of December 2021, the central of peninsular Malaysia, especially the Shah Alam district, experienced the worst flooding disaster that caused local business owners to bear billions of Ringgit losses. They face critical challenges in the flood recovery process during the post-Covid-19 pandemic recovery. As such, this research study aims to investigate the correlation between flood impact and flood preparedness, response and recovery of Shah Alam's business owners, investigate the factors that influence flood damage and provide recommendations to mitigate floods for the business owners in Shah Alam. Quantitative research design has been selected as the research instrument of this study, while online and on-field data collecting survey methods via Google Forms are adapted. The questionnaire consists of 3 sections with a total of 24 guided response type questions to collect useful information from the targeted population, business owners affected by Shah Alam Flood 2021. In the end, a total of 122 responses were collected, but only 120 responses are qualified to be used in the following SPSS software-based analysis. The findings reached in this study show that flood preparedness has the highest negative influence on the flood impact on the business owners, followed by the flood response of business owners. However, flood recovery is statistically proven to have a moderate positive relationship with flood impact among the three independent variables. This study further determines 2 ordinal type factors that influence the damage of flood to business owners from the demographic information collected, namely "sector involved" and "year of experience". Based on the major findings and other researchers' suggestions, key recommendations to business owners in mitigating flood damage are also identified to reduce the adverse impact of flooding on their businesses. This study contributes better and more in-depth information on how decision-makers can assist business owners in Shah Alam in reducing the impact of future floods.

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LIST OF SYMBOLS / ABBREVIATIONS

Bhd.	public limited company, Berhad
DOSM	Department of Statistics Malaysia
DV	Dependent variable
GDP	Gross Domestic Product
IV	Independent variable
LLP	limited liability partnership
METMalaysia	Malaysian Meteorological Department
Sdn. Bhd.	private limited company, Sendirian Berhad
SME	small and medium enterprise
SS	sample size
ANOVA	one-way analysis of variance
C	margin of error
p	P-value of significance
P	percentage picking a choice expressed as decimal
r	Pearson's correlation coefficient
r_s	Spearman's Rho correlation coefficient
VIF	Variance Inflation Factor
Z	Z-value
α	Cronbach's alpha

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

In the history of the world's disastrous events, it can be seen that the occurrence of urban floods has become more frequent and severe with the development of human civilisation. Despite the advance improvement of the civil construction field, the mortality rate and damage to property of each urban flood has been reduced, but the impact of it to the affected area's society and economy has become more and more indisputable. According to Bir (2021), the global major flood events recorded by the Anadolu Global News agency is 54 cases, it is estimated that 5 million people will be affected adversely by flood disasters. In addition to that, most of these flooding cases are declared as "once in the century" scale flood events (Hassan, 2021).

As an indisputable fact, urban flooding has always been the adverse effect of improper or unplanned urbanisation in every developing and developed countries, and Malaysia is not an exemption. However, after the independence of Malaysia, the local government also makes various efforts to curb the occurrence of urban flooding, such as constructing SMART tunnel to separate rainwater lowering the burden of Klang Valley's sewer system and reserving raw forest as rainfall catchment area (Samsuri, et al., 2018). That aside, the government also establishes regulations and guidelines for construction industry to restrict overdevelopment that will intensify urban flooding. However, over the past decades, urban flooding is still the biggest challenge in our Malaysia's Klang Valley. According to Samsuri, et al., (2018) the type of flood happened in Malaysia can be classified as monsoon type or flash type. Meanwhile, in December 2021, a severe flooding event struck Klang Valley and drowned the land for a week resulting in tremendous property damage and few lives lost. In other researchers' studies, the factor contributing to such disastrous phenomena are reviewed widely, but no study has been conducted on the particular stakeholders such as the affected resident and small and medium enterprise's business owners. Therefore, this research

will focus on the flood preparedness, response and recovery of flood affected business owners in Shah Alam in 2021.

1.2 Importance of the Study

Undoubtedly, when talking about the natural disaster that faced by Malaysia, majority surely will agree that flooding is the first disaster comes to their mind. Flood, no matter its scale, is calamitous in nature and unquestionably will cause loss to our society both financially and environmentally. In Shah, et al., (2017)'s research, the cumulative loss caused by major flood events in Malaysia in 21 century first decade is up to 1.1 billion Ringgit. On the other hand, according to Bernama (2022), the Department of Statistics of Malaysia has recorded the highest flood induced loss from the recent peninsular Malaysia 2021 flood which is 6.5 billion Ringgit including residential damage worth 1.4 billion Ringgit, business premises' loss worth 0.6 billion Ringgit, 1.3 billion Ringgit worth of vehicle loss, loss of 2 billion Ringgit to infrastructure and also 1.2 billion Ringgit worth of damage to the manufacturing and agriculture field located mainly in Selangor. The flood not only brings financial loss to its victim but also will alter the environment such as soil mineralogy, also the victim may be suffered from post-disaster mental disorder and subsequently becoming a social problem (Shah, et al., 2017). All in all, flood can be considered as the most impactful natural disaster experienced in Malaysia.

According to Plate (2002), flood management is of utmost importance for every country as it provides a framework and guideline for stakeholders to stick with, in order to, conduct post-disaster recovery and to improve the current flood control mechanism so that the damage caused by a flood can be minimised. In the context of flood management, the post-flood quantitative questionnaire survey can be said as the most imperative element as it acts as the feedback mechanism for the decision-making level to evaluate the workability of current measures. It is also a channel for the public intellectuals to express their professional suggestion to the authority and subsequently integrate it into the new flood managing policy. That aside, Leitmann (2018) further claims that post disaster social science survey is also an indicator to illustrate the completeness of the recovery process, determine the priority of

recovery needed and strengthen the involvement of the vulnerable group in policy reviewing exercise.

1.3 Problem Statement

Referring to Fowler, et al., (2000), flood is defined as an overflow of a huge amount of water beyond its ordinary level from the artificial or natural banks in any water body. Throughout Malaysia's history, including Sarawak and Sabah, flooding can be considered an annual event that surely will happen in Malaysia's territory. When flooding happened, it will bring tremendous devasting impact on the affected population in term of financial, environmental, social and personal health. Among all the aspects, the economic damage caused by flood is the most significant and obvious, especially to the vulnerable small and medium enterprise (Merz, et al., 2010). The opinion of Merz et al., (2010) is also agreed by Nayan, et al., (2017) as in his research on the flood impact on Kelantan Kuala Krai's business also shows the same trend in the degree of financial loss. According to Bernama (2022), the estimated financial damage caused by the recent Shah Alam flood was worth almost 1.8 billion Ringgit to the affected Small and Medium Enterprise (SME) considered manufacturing, retail and service sectors. Furthermore, according to Oh (2021)'s interview with the CGS-CIMB financial analyst, the analyst estimates that the Selangor state company's Q4 2021 earnings will decline due to the Shah Alam flood 2021. The analyst believes that the effect of the flood will sustain for at least a quarter of the year as the infrastructure and traffic system are seriously disrupted by the heavy downpour. This will sabotage the manufacturing and agricultural sector in Shah Alam from logistical aspect. Meanwhile the service and retail sector like wholesales will also face loss of customers due to the fact that more citizens of Shah Alam district will move out from this flood-prone city especially the Sri Muda section. This economic problem is being pressurised by the progressively worse post pandemic business environment together with the outspoken public (Wong, 2021).

Meanwhile, the current research trend mainly concerns the flood's aftermath impact on business like (Nayan, et al., 2017; Merz, et al., 2010). The published research in Malaysia seldom focuses on the motor cognition process

of the affected population, for example, the flood preparedness, response and recovery of the flood victim. The critical feedback for developing a comprehensive flood management policy is left to be inadequate. Thus, whether the flood mitigation currently practised is efficient will remain a question to all stakeholders. Hence, it is of interest to assess the degree of flood preparedness, response and recovery of flood affected business owners in Shah Alam in 2021.

1.4 Aim and Objectives

This research aims to investigate the disaster management for Malaysia's commercial sector during the Shah Alam flood 2021 from the perspective of Shah Alam's business owner. The following objectives shall be achieved in progress to reach the aim as stated:

(i) To investigate the correlation between flood impact and flood preparedness, response, and recovery of Shah Alam's business owner.

(ii) To investigate the factors influence damage of flood.

(iii) To provide recommendations to mitigate flood for business owners in Shah Alam.

1.5 Scope and Limitation of the Study

The scope of this research focuses on measuring the disaster management and impact of the Shah Alam flood in 2021 towards the local business owner in the affected area. In this research, it is of interest to evaluate the disaster management implemented by the flood affected business owner from 3 phases namely: preparedness, response and recovery. Besides its influence towards the impact or damage caused by the flood in Shah Alam 2021 is investigated. Through quantitative statistical analysis, the relationship between the preparedness, response and recovery of flood affected business owner towards the impact of the flood in Shah Alam 2021 to affected business can then be determined.

In this survey, the limitations include: the target population is business owners of selected sectors namely: construction, consumer product and services, health cares, industrial products and services, plantation, property,

and lastly telecommunication and media in Shah Alam, Malaysia. Besides, the questionnaire survey form is designed through replicating or adopting from established survey form. In addition, the questionnaire form focuses on the quantitative statistical analysis of business owners' flood preparedness, response and recovery to the impact of the flood in Shah Alam, Malaysia 2021. The questionnaire form is prepared by using online survey application, Google Forms. The duration for the data collection is a month and the form is distributed to the target population through online and traditional on-field survey methods. At the end of data collection, a minimum of 120 usable responses needed to be achieved. After that, descriptive analysis is performed to process the sociodemographic data of respondents. Subsequently, set of pre-requested tests and inferential analysis of dependent and independent variables are executed to interpret the data relationship. All the analyses are conducted with the implementation of SPSS software. Therefore, such research can then improve understanding of the disaster management of business owner during the flood in Shah Alam 2021.

1.6 Contribution of the Study

This study presents comprehensive research on the relationship between the flood preparedness, response, recovery of flood affected business owner and the impact of flood in Shah Alam 2021. Particularly, this study emphasises that management strategies should focus on local business owners with greater importance to minimise the economical impaction of flood. Moreover, based on the survey's result, the findings reached in this study can act as a relevant resource for flood-related studies by providing first-hand useful data for decisionmakers to enhance the quality of their decisions about flood management practice in Klang Valley of Malaysia. All in all, this study is believed can act as feedback to enlighten the government in improving the flood management practices in Malaysia.

1.7 Outline of the Report

The outline of this study covers the introduction of this research followed by the literature review about the research topic, subsequently the methodology in Chapter 1, 2 and 3 respectively. After gathering sufficient

respondents' data, the interpretation and discussion of the result are included in Chapter 4. Lastly, Chapter 5 is the conclusion that reveals the outcome of this research.

Firstly, Chapter 1 consists of a general introduction followed by the importance of study and the problem statement. In response to the problem statement, specific aims and objectives of this study are developed, and its scope and limitation are introduced to constrain the range of research. Moreover, the contribution of the study and the study's outline are included to provide a brief understanding of this study to its reader.

In Chapter 2, a brief overview of the flood history in Malaysia and the recent occurrence of Shah Alam Flood 2021 is summarized based on previous researchers' findings and reliable sources. After that, the research's area of study, Shah Alam is reviewed from demographical, geographical and economical perspectives. Moreover, the targeted population, business owners in Malaysia is also studied in order to achieve a comprehensive background of study. Subsequently, the dependent variable, impact of the flood is reviewed together with the three independent variables namely preparedness, response and recovery. As such, the previous researchers' finding will be adopted in the development of this study's questionnaire form.

Next, Chapter 3 describes the quantitative statistical methodology process on research conceptual framework, research design, data collection, sampling design, research instrument, construction of measurement scale, data analysis ranging from descriptive analysis to inferential analysis and lastly the pilot test.

While Chapter 4 focuses on the results interpreted from the data collected. The descriptive analysis is performed to investigate the respondents' sociodemographic. Furthermore, the result of reliability test, normality test and inferential analyses are presented. Apart from that, a discussion of the data and the finding derived from it are displayed.

Lastly, the concluding chapter, Chapter 5 outlines the achievement of this study's objectives reached and some recommendations discovered are provided at the end.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In the mid of December 2021, central of peninsular Malaysia experienced the worst flooding disaster since the 1971 Kuala Lumpur flood due to the formation of a tropical depression which is assigned as 29W by the Joint Typhoon Warning Center (Latiff, et al., 2021). The tropical depression landed at the eastern coarse of peninsular Malaysia on 16 December 2021, it caused numerous landfalls and floods across the 8 states and 2 federal cities across the country and brought pelting rainfall throughout the whole peninsular for a week-long. The overall sabotage resulted from this serious disaster included: 54 death cases, approximately 6.5 billion Ringgit loss, cumulatively more than 100, 000 residents displaced and countless non-fatal injuries to the flood victims (Bernama, 2022). Nevertheless, prior to the extreme downpour, Malaysia National Disaster Command Centre (NDCC) had ordered the state government to prepare for the potential flood which may happen in the lowland area. In Shah Alam district of Selangor, the local flood management committee is also advised to keep track of the alert. The federal government also is instructed to release 25 % of the Klang Gates Dam's reservoir in order to maintain its water level within the safe range. Besides, SMART Tunnel is also activated to diversify the increasing rainfall from the upper stream of Klang river and subsequently reduce the surging up water level at the Klang river's downstream, Shah Alam area (Malaymail, 2021).

In spite of all efforts, the Klang valley area still suffered the most damage resulted from this week-long sustained precipitation. According to (The Guardian, 2021), nearly 30, 000 residents were displaced from their homes in this Shah Alam Flood 2021 as the flood waters in the affected district had achieved 2-4 m depth, the majority of victim being of Shah Alam and Klang district. That aside, the residents of Kajang and Salak Tinggi are also advised to evacuate to the flood shelters due to the continuous raising of the adjacent river's level. To make it worst, the stormy downpour damaged the roads and expressways like NKVE, raising the difficulty of evacuation.

Moreover, infrastructures such as electrical substations at Glenmarie section of Shah Alam exploded, inducing blackout across Shah Alam and some shelters in the district. Apart from that, the water supply in some areas of Klang valley is also interrupted due to the explosive increment runoff affecting the water body's quality.

Among all sections of Shah Alam district, the central and southern parts of Shah Alam received the most damage. For instance, Indahria Apartment at Batu Tiga of Shah Alam was declared to be structural instable after the flood caused several column failures at the ground parking level (Nair, 2021). In addition, on 20 December 2021, the first drowned death was found at Section 22 of the Shah Alam. Meanwhile, Section 25, Sri Muda suffered the most perilous loss. Total of 14 people are confirmed to be died from the flood in Sri Muda (Zolkepli, 2021). The whole section and its successive roads are flooded, stranding its residents for few days even after the flood started to recede at other sections. The flood of Sri Muda is hard to recede due to its lower topography, the authority had to use several pumps to suck out the trapped water in the section. Meanwhile the isolated Sri Muda is lack of food and clean water which subsequently causing numerous looting cases in the area. The most notorious looting case would be the Sri Muda Mydin looting case which worth million Ringgit loss (Wong, 2021).

In this incident, the state and federal governments are criticised for failing to obligate their job in providing accurate disaster forecasts and managing up-to-bar rescuing operations to save the flood victim. In this context, there is lack of research to investigate the feedback of the Shah Alam flood victim towards the flood managing work. Therefore, in this Chapter 2, the relevant research and paper will be reviewed to provide a clearer image of the incident and also to outline the dependent and independent variables of this research.

2.2 History of Flood in Malaysia after 1957

Malaysia is a country located in the southern east of Asia, it lies between the latitude 2 °N and 7 °N of the equator and longitude 99.5 °E and 120 °E. Due to fact of locating near to equator, Malaysia's climate is categorised as equatorial climate, which being humid with an average rainfall of 2000 to 4000 mm per

year and hot (24 to 34 °C) throughout the year (Hock, 2007). The climate of the peninsular Malaysia, Sabah and Sarawak are directly affected by 2 different monsoons originating from Asia mainland and Australia. According to Cavendish (2006), the Southwest Monsoon from Australia is a seasonal wind that occurs from late of May until September, while the Northeast Monsoon from mainland Asia is a monsoon that happens from October until the coming year's March. The Northeast Monsoon brings in more rainfall compared to the Southwest Monsoon, as the Northwest Monsoon passes through north Pacific Ocean bringing considerable quantity of water. In contrast, the Southwest Monsoon brings less water due to the shielding effect of Sumatra Island of Indonesia (Suhaila, et al., 2010).

Referring to Samsuri, et al., (2018), flooding in Malaysia can be categorised into 2 types, namely monsoon type and flash type. The monsoon type flood normally refers to the Northeast Monsoon which strikes the east coast (Terengganu, Kelantan, Pahang) and central part (Perak, Kuala Lumpur, Selangor, Negeri Sembilan) of Peninsula Malaysia, the northern part of Sabah as well as mountainous terrain of Sarawak state. From the Peninsular Malaysia perspective, Northwest monsoon will bring continuous stormy downpours from the east coast to the west coast and the volume of water is believed intensifying by El Nino effect (Tangang, et al., 2017) due to the fact of increasing flood affected area since 2014 Malaysia Flood (Buslima, et al., 2018). On the other hand, flash flood normally refers to the flood that happens in urban area with a short life cycle. Flash flood is normally caused by the convective rain or monsoon rain when drainage system is insufficient to convey the precipitation. Thus, the features of flash flood include rapid rise in water level, occur in urban or river basin zone, and carry large amount of debris (Pereira, 2018). Flash flooding in Klang valley is a common yet increasingly severe issue due to land development that converting raw land into cement and mortar that increase rainfall runoff.

All the major flooding events happened in Malaysia after 1957 with its estimated traceable financial loss are tabulated in the Table 2.1.

Table 2.1: Floods History in Malaysia

Number	Flood Incidence	Estimated Financial Loss
1	1971 Kuala Lumpur Flash Flood	USD 60 million
2	1996 Tropical Storm Greg in Sabah	USD 300 million
3	2000 Kelantan and Terengganu Flood	USD 7.8 million
4	2001 East Coarse Flood by Tropical Storm Vamei	USD 3.6 million
5	2004 Asian Tsunami	USD 2 million
6	2006 Flood in Johor	USD 489 million
7	2008 Flood in Johor	USD 21.19 million
8	2010 Flood in Kedah and Perlis	USD 28.48 million
9	2013 Mud Flash Flood in Cameron Highland	USD 18 million
10	2014 Peninsular Malaysia Flood	RM 1 billion
11	2016 Kuala Lumpur Flash Flood	RM 3.5 billion
12	2021 Peninsular Malaysia Flood by 29W	RM 6.5 billion

Source: (Abdullahi, M.G., 2014); (Akasah, Z.A. and Doraisamy, S.V., 2015); (Buslima, F.S., Omar, R.C., Jamaluddin, T.A. and Taha, H., 2018); (Bernama, 2022)

According to Buslima, et al., (2018) Selangor and Kuala Lumpur especially the Klang Valley region is the most hazardous flood-prone region due to fact that the region is highly developed, surrounded by Klang and

Gombak rivers, and also it is located in the sphere of influence of Northeast monsoon storm. His argument is further agreed upon and validated in Pereira (2018) Kuala Lumpur flooding research. Hence, the flooding history of Klang valley will be introduced in the following subchapter.

2.2.1 History of Flood in Klang valley, Malaysia

Klang valley usually refers to the Great Kuala Lumpur metropolitan area, including developed townships in Kuala Lumpur, Sri Petaling, Rawang, Sepang and Putrajaya area. In fact, it represents the river basin region of the principal river, Klang river which originated from the Klang Gate Quartz Ridge in Gombak district and flows into the Strait of Malacca in Port Klang (Bunnel, et al., 2004). The Klang valley can be considered as the heart of Malaysia as the capital of Malaysia is located in it, apart from that, the industrial and commercial zone of Selangor state is also part of Klang valley. According to (Oxford Business Group, 2020), the Klang valley's Gross Domestic Product (GDP) contribution is up to 37% and the estimated population lives in Klang valley in 2020 is 10 million people with growth rate of 2.9%. On the other hand, the overpopulation together with unplanned urbanisation process have turned the Klang valley into highly flood-prone region particularly during the Northeast Monsoon season. According to Lee, et al., (2014), the national expenditure allocated for Klang Valley flood prevention and flood alleviation has up to 5 billion Ringgit in the 10th Malaysia Plan as the Klang valley flooding impact is believed to be much higher than the national budget given.

In actual fact, apart from the Northeast Monsoon flood, flash flooding is also not a stranger to the Klang valley. The earliest flooding record of Klang valley that is referable happened in 1926 when the British colonial government started to develop the Kuala Lumpur but ignored the insufficient of drainage development for the city (Williamson, 2016). After the 1957 independence, another major flood event struck Klang valley in 1971, whereby the Northeast monsoonal downpour sustained for a week and caused destructive sabotage to both public infrastructure and private properties. Sulaiman (2009) indicates that the Kuala Lumpur 1971 Flood's maximum flood level was recorded as up to 2m, causing an estimated premise financial loss worth RM36 million by the

time. Despite numerous flood mitigation project has been proposed and constructed by government to address the flooding issue in urban area, yet the drastic increase of new people in Klang valley due to the sweeping development of Malaysia in the 1990s has further enlarged the flood prone area from Kuala Lumpur to the downstream of Klang river namely Shah Alam area.

The downstream area of Klang river, mainly Shah Alam district experienced flood frequently although its development expansion is well-planned compared to Kuala Lumpur city (Majlis Bandaraya Shah Alam, 2010). Since 2000, Shah Alam area has experienced series of perennial floods. Most of the flooding event occurs at the Damansara riverine area of central and southern part of Shah Alam during the Northeast Monsoon season (October to April) (Abdullahi, M.G., 2014). The Damansara river is the tributary of Klang river that carries 70% of the volume of its principal river. Damansara river passes through the Taman Sri Muda (Section 25), Section 4, 9 and 10 of Shah Alam, therefore making the aforementioned areas become a notorious flood-prone hazardous zone (Zulkifli, 2021). Although the state government took numerous approaches like deepening the river and constructing river embankment for the Damansara river since 2000s, flash floods and monsoon floods still frequently occur (Mohd, F.M., 2013). The recent catastrophic flooding disaster will be the once in hundred-year Shah Alam 2021 flood especially in Sri Muda Section.

2.2.2 Flooding Scenario of Shah Alam in 2021

On 16 December 2021 a tropical depression named 29W which formed at South China Sea landed on the east coast region of Peninsular Malaysia causing a catastrophic flood disaster to almost whole Peninsular Malaysia that lasted for week-long (Latiff, et al., 2021). On the same day, the landing of 29W also prompted Malaysian Meteorological Department (METMalaysia) to issue ‘continuous heavy raining alert’ (yellow level) to Kelantan and Terengganu. However, the torrential rainfall brought by 29W had overspread across the Peninsular Malaysia. Subsequently METMalaysia announced amber level warning for continuous raining throughout the Klang Valley. The authorities immediately organised flooding preparation works, for instance,

activating the SMART Tunnel to convey the overflow downpour to prevent flood in lowland areas, setting up temporary shelter for flood victim and releasing 25% of Klang Gates Dam's water storage to prevent dam failure (Ong, 2021).

According to (METMalaysia, 2021) rainfall monitoring webpage, the raining in Klang Valley started since the evening of 16 December 2021 and continued from time to time. While the magnitude and duration of rain at Klang valley started to increase drastically at 1 a.m. of 18 December 2021 triggered the system to issue 'continuous heavy raining alert' (yellow level) and the warning further upgraded to the highest, red level 'dangerous continuous heavy rain warning' on 2 p.m. of the same day for whole Klang valley. The red alert only relieved at 11.30 a.m. of 19 December 2021. However, flooding had already happened at the lowland region (Hulu Langat, Chow Kit area, Klang, Shah Alam, Sepang) of Klang Valley since 17 December 2022 (Nadma, 2021). Although the flood at most of the Shah Alam area started to recede on 20 December 2021, due to the topography factor, the Shah Alam's Section 25, Taman Sri Muda still suffered from flood caused isolation until 24 December 2021(Zanina, 2021).

To make the situation worst, the electrical substations at Glenmarie section of Shah Alam exploded at the late night of 18 December, inducing blackout across Shah Alam and some shelters at the district for a day. Apart from that, the water supply station at Hulu Langat was forced to due to the explosive increment runoff affected the water body's quality. This had worsened the living standard of victims in the temporary shelter as water is necessary to keep good hygiene status against the spread of COVID-19. The central and southern part of the Shah Alam received the most damage. For instance, the instability of ground columns of Indahria Apartment at Batu Tiga of Shah Alam caused three hundreds of residents evacuated from the apartment until further announcement from the MBSA authorities (Nair, 2021). In addition, on 20 December 2021, the first drowned death was found at the parking area of an apartment located at Section 22 of the Shah Alam. According to Zanina (2021), since 18 December, the road connections around Taman Sri Muda are flooded with depth of 2 to 3m and the government had to send rescue boat to the flooded region to evacuate victim. Meanwhile the

number of boats is insufficient to evacuate every victim, resulting in 31 looting crimes happened in between 18 December to 23 December due to hunger and desperation. One of the notable looting cases is the Sri Muda Mydin outlet looting case that involved hundreds of flood victims and the financial loss worth million Ringgit (Wong, 2021). That aside, 14 bodies are found throughout the Sri Muda flooding event (Zolkepli, 2021). The water finally receded on 24 December with the aid of 16 pumps, non-government organisation's volunteers and local residents to accelerate the withdrawing process.

From the aforementioned facts and statistics, it is clear that Shah Alam district can be considered as the most severe flood affected area. In the next subchapter, the study area, Shah Alam will be introduced in detail.

2.3 Shah Alam, Selangor

Shah Alam district is named after the late Selangor Sultan Alam Shah by the late Selangor Sultan Salahuddin Abdul Aziz Shahin 1963. Shah Alam previously called as Sungai Renggam, it was a rubber and palm tree estate, however, in 1963, it was chosen to be developed into a city due to its strategic position in betweee Kuala Lumpur and port Klang. The township planning is in charged by Vlado Antolic, a city planner assigned by United Nation. The city layout of Shah Alam is same as its neighbouring Petaling district, which is designed as a mix of commercial and residential urban area. The commercial zone is scattered by the section under the district. While in 1974, Shah Alam was selected to be the Selangor state capital city after the cession of Kuala Lumpur into Federal's Territories. Subsequently, the city is expanded 3 times due to the tremendous development of Klang valley in 1980s, until now the whole Shah Alam district has 54 sections with a total area of 290.3 km^2. Generally, the Shah Alam can be divided into 3 parts based on its geographic position and degree of development. The northern part which is less developed due to hilly topography; the central part where the Klang river flows through and the state administrative and legislative bodies situated and the southern part where is mostly residential and commercial area also is well-developed as the central zone (Majlis Bandaraya Shah Alam, 2010; MBSA, 2019).

2.3.1 Geography of Shah Alam

Referring to (Zwiefelhofer, 2008) and also satellite image generated by (Google.Co), the accurate latitude and longitude coordination of the centre of Sri Muda town is (N 3° 2.9038', E 101° 31.0905'). The map of the Shah Alam District can refer to Figure 2.1.

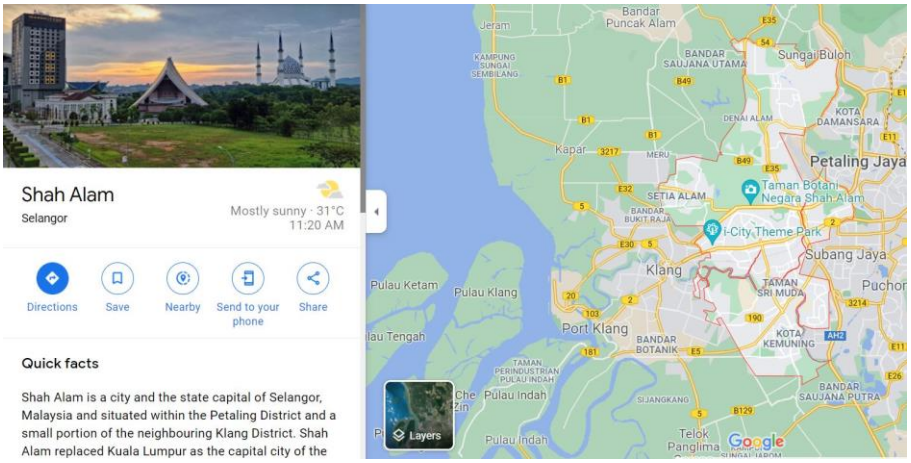

Figure 2.1: Map of Shah Alam. (Google.Co, 2022)

From the Figure 2.1 and the study of (Tikkanen, 2017), it is clearly illustrated that the northern boundary of the Shah Alam is connected with Kuala Selangor and Selayang districts, while its west side is Klang district, meanwhile its east side is bordered by Petaling district. Lastly, its south side is Kuala Langat district. The Klang river that carries torrential water from upstream area cut through the Shah Alam district at its central region where Section 22, 23, 24, 25 and 17 situated. That aside, there is a tributary of Klang river, Damansara river flows from the northern east direction of the district and meets with the mainstream in northern part of Sri Muda, Section 25. Hence, the map has indicated that the central region of Shah Alam is a dangerous flood-prone region due to its surrounding environment. The geological factors contributed to the flood are validated in (Reda, 2022)'s interview with geological engineer Dr. Nor M. Nazer. In the interview, the geographical hazard, overdevelopment that lower the land permeability together with lack of drainage management contribute to the constant flash flood in the Taman Sri Muda and Section 22.

In term of topography, (Mokhtar, 2022) and (Reda, 2022)'s interview with geology expert and the officer from Selangor State Water Resources Management and Hydrology Division further revealed that the average topographic elevation of the central region of Shah Alam is mere 1 to 1.5 m above sea level even developed the ground level just reached 3m in average. While in the monsoon season, the water level of Klang river can easily exceed 3 m and in the 2021 flood, it reached a record of 4 m for 3 days. The topographic map of Shah Alam can refer to Figure 2.2.

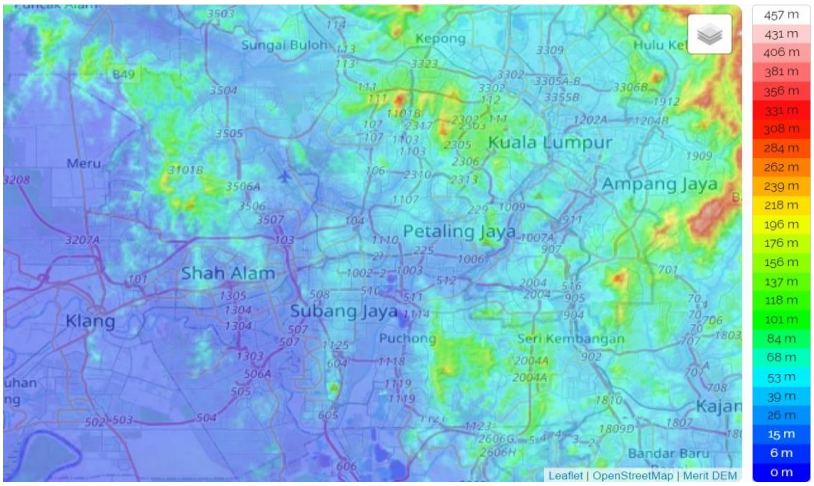

Figure 2.2: Topographic map of Shah Alam. (Topographic-map.com, 2022)

According to the GIS system of (Topographic-map.com, 2022), it illustrates the surrounding topographic elevation of Shah Alam. As can be seen, the north part of Shah Alam is hilly region while the other part of it is plain with an elevation around 6m. The Shah Alam's east side is the upstream area with elevation higher than it. Thus, when flood occurred, the water can only recede to south or west direction of the district, it is undoubtedly that the flood of Shah Alam takes longer time to recede than other area. (Zolkepli, 2021).

2.3.2 Population of Shah Alam

According to MBSA, (2019), in the population census 2017, the whole Shah Alam city recorded 740 750 citizens. While in 2021 Q3 Selangor State pocket statistics published by (DOSM, 2021), the demography of Selangor based on administrative region shows the district consists of 55.8 % of the citizen is Malay, 24.1 % portion is Chinese, 11.2 % is Indian and merely 0.8 % of other

ethnic group respectively. In term of gender, 52 % of the resident is male while the remaining 48 % is female. The number of actual populations in 2022 is believed to be higher than the 2017's value due to a positive rate of natural increase of 10.4 computed in the recent @Glance publisher's Selangor state population statistics report that is applicable to whole Selangor (DOSM, 2021).

2.3.3 Economy of Shah Alam

In general, manufacturing sector is the backbone of the district followed by the servicing sector (Majlis Bandaraya Shah Alam, 2010). Most of the manufacturing plants set up at Shah Alam due to its strategic position in between the international trading port, Port Klang and the centre of domestic commerce, Kuala Lumpur. As such, the national GDP contribution of the Shah Alam district rocketed since its establishment and finally reached 26.7 % in 2017 (May, 2017).

According to Waeldin, (2022), the number of manufacturing plants established in Shah Alam in 2020 is 324 and providing 19 950 vacancy opportunities to the citizen. Besides, the booklet published by Invest Selangor Berhad reveals that the investment on the Shah Alam industrial zone by foreign countries like China and Japan reached 235.4 million Ringgit in 2017. The factors contribute to the flourishing of the district's economic development are: comprehensive infrastructure provided by the state government, large amount of competent labour force produced upon SMART Selangor programme, commercially-friendly policy enacted by state government and strategic position across the country (Joo, 2017).

In term of consumer products and services and other sector, Shah Alam has over 3000 SMEs operate all over the district (SME CORP, 2013). The large population of the Shah Alam district forms a huge market for the local company to venture into. According to 2021 Q3 Selangor State pocket statistics published by DOSM. The average salary of Selangor citizen is the second highest among states. Thus, the purchasing and consuming ability of Shah Alam citizen is unignorable. That aside, the sweepingly development of the E-commerce together with the incentive from state government act as catalysts to spur the growth of the SMEs (DOSM, 2021).

2.4 Business Category in Malaysia

A business entity can be defined as a voluntary enterprising body formed aiming to get profit from performing any sort of legal activities for its customer (Sharma, et al., 2021). The business can be categorised based on its scale, entity registration and also sector engaged in, meanwhile the definition for each category varies from country to country. In Malaysia, all business entities can be categorised into 5 subgroups in term of business entity registration; 4 subgroups in term of business size; and 20 main subgroups in term of sector classification.

In the aspect of business entity registration, the 5 types of business are: sole proprietorship, partnership, limited liability partnership (LLP), private limited company (Sdn. Bhd.) and public limited company (Bhd.) (SSM Admin, 2018). Firstly, sole proprietorship business is a type of business fully owned by a single individual. The owner is obligated of all liability and legal entity. While the tax is charged based on personal income tax mechanism. Next, the partnership is business that owned by 2 to 20 partners. However, the legal entity of corporation is not separable, thus the liabilities are shared based on the shares portion of partners. The tax is also charged in accordance with income tax rule. Thirdly, Sdn. Bhd. type, it is owned by 1 to maximum of 50 shareholders of the company, the company has a separate legal entity, thus the liability is bear by the corporation. The tax rate is governed by Tax Act 1967. Subsequently, LLP is a relatively new business organisation governed by the Limited Liability Partnership Act 2012. Its feature is same as Sdn. Bhd. just the ownership is liaised with specific partnership agreement. Lastly, the Bhd. type business company, it shares same characteristics as Sdn. Bhd. just the number of shareholders can be unlimited (Kumaran, 2020; Tem, 2022; SSM Admin, 2018).

In term of business scale, (SME CORP, 2013) draws a line to define it based on the annual sales turnover and the full-time employee of the company. The detail of the rule for classifying Small-And-Medium Enterprise (SME) is tabulated in Table 2.2.

Table 2.2: Definition of SME in Malaysia

Scale	Manufacturing sector	Services or other sectors
Micro	Sales turnover < RM 300, 000 or Employee <5	
Small	Sales turnover < RM 15, 000, 000 or Employee <75	Sales turnover < RM 3, 000, 000 or Employee <30
Medium	Sales turnover < RM 50, 000, 000 or Employee <200	Sales turnover < RM 20, 000, 000 or Employee <75
Big	Sales turnover > RM 50, 000, 000 or Employee >200	Sales turnover > RM 20, 000, 000 or Employee >75

Source: (SME CORP, 2013)

The SME Corporation agency further establishes 2 different rules in classifying the corporation based on the sector involved. Khalique, et al., (2011) outline that almost the whole nation business activities involve SMEs. In fact, 97.2 % of the business company is categorised as SME in Yuen, et al., (2021)'s research. Moreover, the GDP contribution of SMEs is up to 48 % in 2010, not to mention that SMEs create millions of job opportunities for Malaysians.

Last but not least, the business company in Malaysia can also be categorised based on the industry ventured into. According to (BURSA Malaysia, 2018), there is total of 20 main subgroups of business sector in Malaysia. 7 of it is the financial products like bonds and funds related, while the remaining 13 sectors are: construction, consumer product and services, energy, financial services, health cares, industrial products and services, plantation, real estate investment trust, property, technology, telecommunication and media, utilities and lastly transportation and logistics.

In Yuen, et al., (2021)'s research, he urges the government to provide aid to the SMEs to boost their declining performance due to the impact of Covid-19 pandemic. Meanwhile, Khalique, et al., (2011) also presses on the need of close monitoring of the SMEs as the SMEs play imperative role in the nation's development yet this body is also easily influenced by every incident happened. Hence, it is of interest to adopt the business owner at the flooded Shah Alam 2021 as this study's targeted population as they are the backbone of the economy.

2.5 Dependent Variable: Impact of Flood to Business Owner

The dependent variable or the corresponding variable of this study is the impact of flood to business owner. According to Merz, et al., (2010), the adverse effect of flood can be categorised based on its tangibility and causation factor. In terms of time factor, impact of flood can be divided into direct and indirect. The direct impact can be said as the on-the-spot effect that can be observed, it normally refers to the damage reflects on the object that encountered flood. Its examples are loss of life and damage to any item. While the indirect impact can be interpreted as the effect that takes time to appear, it can be either long term or short term effect. For instance, drop of property price and trauma of the victim. In tangibility aspect, the tangible impact of flood refers to damage on any object that is quantifiable or measurable like financial loss. On the other hand, the intangible effect of flood is the incorporeal damage that is hard to be expressed in mathematical form, for examples, severity of the injury or psychological damage experienced (Nayan, et al., 2017).

In Asgary, et al., (2012)'s survey, the commercial loss faced by the SME owners is mainly direct tangible impact. Researchers such as Samantha, (2018), Zaman, (2012) further explain that the commercial loss can be classified into 4 main aspects namely, infrastructural, manforce, market and capital perspectives.

The infrastructural impact is mostly referring to the damage to the basic facilities provided by government or property developer such as electrical and water supply system, telecommunication tower, public transportation system like bus or road. The sabotage of the infrastructures will

directly influence the daily operation of business. For example, food producing business that heavily relies on water can not yield any product once the water is cut off. Plants can not produce anything without electricity and raw material. In this context, the disruption of supply chain is a severe consequence under the infrastructural impact of flood to all business as the accessibility of a product or service to the consumer is obstructed (Samantha, 2018).

Manforce shortage will be another impulsive drawback associated with any disaster. (Asgary, et al., 2012)'s survey indicates the loss of lives in flood of Pakistan results in the devasting damage to manufacturing sector requires thousands of skilful and competent labours. The continuity of small business is also influenced as the injury of the sole proprietor leaves nobody to conduct daily operation. That aside, people tend to move out from the disaster-prone region, the relationship between the severity of the disaster and the number of victim displacement from the region is increasingly proportional shown in cross research of Japan and USA. The reasons short listed include psychological effects, ineffective and inefficient community resilience and post disaster unemployment (Yabe, 2020).

Meanwhile, the reduction of population in an area also indicates the market of the area shrinks. The lesser people represent weaker demand and thus, the sales turnover will drop drastically. In Zaman, (2012)'s study, the loss of property of flood victim turns them to be stingy. The down of economics after disaster further deteriorates the situation as people will only buy the necessities and thus non necessities sectors cannot get any revenue from the purchasers and the financial imbalance caused them to cease the business. This will cause job loss and form a vicious cycle on the community economy in the long run. (Samantha, 2018).

Last but not least, the loss of capital or asset of business owner. In Nayan et al., (2017)'s survey, the financial loss suffered by the retailing sector is the highest among the tertiary sector of economic activities which is up to 13.6 million Ringgit in Kuala Krai. The loss included premises, shelf items, machineries, facilities and cash. The company's intangible assets like accounting record, customer information or any intellectual properties saved in the server that destroyed in disaster is also considered as part of financial loss can be claimed for compensation in India (Illiyas, et al., 2014).

2.6 Independent Variables

In term of data analysis statistics, independent variable can be defined as a manipulated aspect that will pose effect on the dependent variable (Miller, 2005). It is the variable input by the target population in questionnaire survey. That aside, each independent variables will not be influenced by other aspects or even other independent variables in the research's experiment. In this subchapter, 3 independent variables will be studied, and the survey's questions will be developed based on the understanding derived from other researchers.

2.6.1 Flood Preparedness of Affected Business Owners

According to Sutton, et al., (2006), any disaster preparedness can be explained as the capability of taking immediate response to deal with the disaster in an efficient and effective way. It means that the person is having a positive attitude which constitutes a framework that relates the fruitful preparedness to efficient response towards the disaster. Paton, (2003) further explains that the disaster preparedness is aimed at enhancing life safety together with property protection. Both Sutton, et al., (2006) and Paton (2003) also agree that mitigation, preparedness, response and recovery are the 4 important elements to be studied in every hazard related study. The preparedness phase is a phase conducted throughout the occurrence of disaster, it includes preparations aim at lowering the disaster adverse effect to be performed prior to the occurrence of the disaster and also the efforts taken for ensuring smoothness of post-disaster related tasks. The concept of disaster preparedness is somehow similar to the disaster mitigation. However, mitigation focuses more on eliminating or reducing the disaster damage and normally refers to measures designed for long term and workable during the disaster strikes. While the disaster preparedness is the framework designed to support the mitigation during and after the disaster occurs. The disaster preparedness is generally associated with pre- and post- disaster planning to coordinate with disaster recovery programme (Sutton, et al., 2006; Hudson, et al., 2019).

As suggested by Rattanakanlaya et al., (2016), the flood preparedness of organisations can be derived into 4 parts namely, planning, organising, exercising and training. The planning refers to establishment of set of

standards to work with during the flood. It measures the comprehensiveness of the organisation's command and control system with regard to manage unexpected affairs induced by flood. While in Gissing, et al., (2005)'s handbook, the organising of flood preparedness includes developing disaster supply line like stockpiling resources for urgent response and also adopting flood countermeasure on the vulnerable part of business, like installing water proofing cover for expensive machinery, placing the shelf item at higher place, backup data at other place. Meanwhile the exercise and training part measure the level of readiness and proficiency of the employee to cope with the flood during business operation (Rattanakanlaya et al., 2016).

While Paton, (2003) reviews that the exercising standard of disaster preparedness is more concerning on approach taken by the person to improve his or her life safety. In his study, it measures the frequency of the person to attend any disaster related activities, monitor the completeness of his or her flood planning.

Besides, the survey performed by Hudson et al., (2019) investigated the flood preparation activities implemented by the business owner to assess their preparedness from mental and physical perspectives. Those activities are either government-leading or self-motivated. It ranged from subscribing to authorities' flood forecasting channel to purchasing flood insurance to cover the loss. In short, all aforementioned standards of flood preparedness are suitable to be adopted in this study.

2.6.2 Flood Response of Affected Business Owners

O'Neill, (2005) interprets disaster response of a community is the aggregates of the decision and reaction made by the community to safeguard life and property during disastrous event. In the article of Sutton, et al., (2006), the disaster response is the third phase of disaster management. This phase involved every flood affected party in the event of disaster strike and its ultimate goal is to minimise the implication of the disaster within a short time interval.

As suggested by Patterson, et al., (2010), the standards of disaster response include the time taken for the emergency reaction to be performed, the coverage of involvement of every community in the action and also the

accessibility of the disaster warning to the public. As mentioned before, the response is a reaction made to certain event, as such, the circulation of the information plays an imperative role in this context as without receiving the information about occurrence of the incident, the performance of its response is null. This finding is also accepted by Bodoque, et al., (2019), as in his survey questionnaire. The spread of the flood warning is considered as part of the flood response of the community.

Meanwhile, according to Thieken, et al., (2007), the effectiveness of the response should also be treated as part of the measurement of flood response aspect. The workability of the measure against the flood reflects the correctness of the reaction of flood affected residents towards the urgent situation. Besides, Bodoque, et al., (2019) and Thieken et al., (2007) further reveal that response is also the action adopted based on the knowledge of the community on that particular incident. Thus, the process of acquiring suitable response towards the flood should also be measured in this study.

2.6.3 Flood Recovery of Affected Business Owners

In emergency management field, recovery phase is the last stage of a disaster management cycle (Paton, 2003). The start of disaster recovery right after the end of the devasting activity. Disaster recovery refers to set of procedures implemented to restore or rebuild all systems back to normal as possible. It is a complex long-lasting process required huge resources and duration of time (Gissing, et al., 2005). According to Marshall, et al., (2014), the disaster recovery of business is a comprehensive rehabilitation of an organisation to sustain the continuity of a business during the disaster and immediate afterwards. One should be aware that the recovery of business is actually a sub stream in the context of continuity of business. The continuity of a business is a proactive agenda to be proposed and monitored by the top management of a business to identify and eliminate any hazard that will adversely affect the continuousness of a business. It aims to ensure the business's endurance under every circumstance. While the business recovery is a reactive procedure to restore the functionability of the organisation to carry out its task as usual after disastrous event (Nollau, 2009).

Referring to Thieken, et al., (2007), the scope of disaster recovery can be categorised into financial recovery, human resource recovery and environmental recovery. In their study, the damage of property caused by flood and the dynamic displacement of the victim are evaluated statistically to estimate the recovery of the local community as well as the population after flood. Besides, the environmental rehabilitation like the recovery of water level and quality of water body are also measured due to fact that external environmental circumstance will closely affect human activities. For instance, if the contamination caused by the flood is high, the local residents are unable to make use of the water, this will increase their cost of living and affect the water-relying industry like food services sector.

On the other hand, Meyer, et al., (2021)'s questionnaire survey set up a different standard of business recovery. They measure the business recovery of an organisation from the disaster recovery team, capital restoration and post disaster hazard identification. In the context of disaster recovery team, the involvement of other stakeholder like authorities to address the structural damage is assessed to evaluate whether the restoration plan is comprehensive. In addition, the assistance service applied by the business is also evaluated for ensuring sufficient fund and resource are provided for the reinstatement of the business. Meanwhile, Meyer, et al., (2021) further stresses on the hazard identification issue that arose after the disaster. The explanation is that, without a proper methodology to quantify the loss and preciously describe the loss, the management team will not be able to come out an effective way to address it and also some problems may be ignored due to considerable amount of work need to be proceeded after disaster occurred.

Meyer, et al., (2021)'s questionnaire is similar to Lee, (2019). Lee also focuses on the involvement of various parties in the business recovery, detective measure of the loss. He particularly stresses on the evaluation of the business resilience like the recovery of supply chain and the repairment of infrastructure as well as the regaining of the labour force. This may due to his target population is the manufacturing sector which heavily depends on utilities, human resource and logistics. However, both Meyer, et al., (2021) and Lee (2019) do not assess the time taken by recovery process, this is affiliated with the finding of Nollau (2009), that define business recovery

process as a long term restoration process needs considerable amount of time to conduct. In short, the eligible question proposed by Meyer, et al., (2021), Lee (2019) as well as Thieken, et al., (2007) will also be adopted in this study.

2.7 Summary

All in all, after reviewing different researchers' thesis and study, it is undoubtedly that the impact of flooding on the nation and its people is devasting. While flipping through our country's disaster history, the damage caused by flood shows an increasing trend although many researchers have shown that the government has taken numerous flood mitigations to tackle it. Meanwhile, the heart of our country's economy, Klang valley is a hazardous flood-prone region that potentially faced both flash flood and monsoon flood due to its geographical feature and improper urbanisation. Thus, the authorities have to spend a considerable fund for flood mitigation while the citizens have to compromise their safety while living in Klang valley. However, the recent Shah Alam flood 2021 further recorded the highest fatality and the various parties especially local business owner suffered from huge financial loss in the nation's flood history. Shah Alam can be said as the place subjected to the greatest scale of damage as the whole district suffered from billions of financial losses and 34 deaths in the flood. Although the authorities claim that the flood is caused by 'once in hundred years' extreme climate phenomena named 29W, victims still heavily criticised the government for their ill-preparedness and tardy response in flood management. In the line of this incident, the Shah Alam section is then introduced in term of geography, demographic and economic. Subsequently the type of business in Malaysia is then reviewed as the commercial business activities can be said as the backbone of the country economy and it is also vulnerable in front of natural disaster. In this context, the impact of the flood affected business owner is crucial to be investigated because it is important to make use of lesson learnt from past incident in future flood preparation. As such, it is feasible to conduct a post-flood quantitative questionnaire survey focused on the flood affected business owner in Shah Alam. The survey will be developed in accordance with the preparedness, response, and recovery aspects.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

In this chapter, the methodology that adopted to determine the flood preparedness, response, and recovery of flood affected business owners in Shah Alam will be discussed in detail. As a known fact, methodology can be defined as a way of synthesising, systematising and analysing a set of data in any research. However, according to Lehaney and Vinten (1994), methodology can also be explained as a way to choose suitable technique for addressing a particular problem, it has a goal of making a hypothesis becomes a theory. Thus, this chapter will be divided into several subchapters to explain in detail of the important element of methodology. The research design will be introduced to explain the relation between dependent variable and independent variables. Next, it will be followed with data collection, sampling design, research instrument implemented and also construct measurement scale. These few subchapters will focus on the approach to set up the questionnaire survey form for the research hypothesises. Moreover, the methods of analysing the numerical data will be elaborated in the data analysis part, for instance, descriptive analysis, and inferential analysis. Subsequently, the pilot test and its result will also be interpreted to verify the reliability of the questionnaire before running the formal data collection. Lastly, a short summary will be provided as a recap of this whole chapter.

3.2 Research Design

The research design is the master plan of an overall proposed project. It is also a bridge that links all the essential element and information together in order to analyse them systematically. Research design is important as the most suitable research procedures can be planned if the design is well-organized, thereby maximum information with a minimum expenditure of effort, time are needed and lastly the objective of the study can be achieved (Akhtar, 2016.).

There are mainly 2 types of research design, namely qualitative and quantitative research design. Qualitative Research is mainly suitable for exploratory research. Its aim is to gain an understanding of a factor or opinion to develop an objective or hypothesis for quantitative research. Unstructured or semi-structured techniques, for instance, individual interview is used to collect the data. The sample size is typically small, and non-representative whole population. On the other hand, quantitative research is more suitable for correlational and experimental design research. Its aim is to quantify a problem through collecting measurable data to formulate the pattern of the problem through statistical analysis and lastly test the validation of the study. Structured techniques like on field survey and online survey are adopted to gather the data. The sample size is normally large enough to represent a population (Sirkin, 2005).

In this research, the quantitative research design is implemented as the aim of this research is to evaluate the statistical relationship between the independent and dependent variables, an experimental design research. Apart from that, Meyer, et al., (2021) also conduct a quantitative survey to measure the level of impact of extreme events on the business's continuity that is quite related to the topic of this research. The questionnaire is designed to gather the desired information of this research from target respondents. After data collection is satisfied, the independent and dependent variables will be analysed by using the statistical software SPSS to figure out the validation of the hypothesises and also the correlation of the variables.

3.3 Data Collection

Data collection has an aim to obtain the desired amount of data set from the target population. According to Kabir (2016), data collection is the process of obtaining data that suits the variable in a systematic mean to answer the research hypothesis. It is critical as it is the key process as it has a direct effect on the result of any research, regardless it is either qualitative or quantitative research type. The data generally can be classified into 2 category which is primary and secondary data type (Grix, 2018). In this research, both primary and secondary data are planned to be used to reduce the bias of collected data and increase the overall reliability of this research.

3.3.1 Primary Data and Secondary Data

Data without processed that collected directly from the target respondents or experiment can be considered as primary data. It is the firsthand data that has not been altered by other, therefore it is more reliable than secondary data. The primary data can be collected by using laboratory test, on-field investigation and the list goes on (Kabir, 2016). In this research, the primary data refers to the data from the traditional on field data gathering and online questionnaires which sent to target population via Email, Whatsapp link. Online questionnaire is preferred because online questionnaires are easier for researcher to design, reduce research cost and able to reach large amount of respondents in little time and also the data is easier to be transferred into SPSS software for analysing. Moreover, contactless data collection practice is promoted in this post-pandemic era to reduce the transmission of COVID-19.

The processed data, or any published data by a reliable publisher in any form can be classified as secondary data. For instance, any quote, graph or equation that is sourced from any encyclopaedia, report or electronic journal publisher (Grix, 2018). The secondary data is generally easier to be collected and more cost effective than primary data. However, its reliability is relatively less than primary data due to the risk of misinterpretation by the author and validation of the data after a time of period. In this research, the secondary data will refer to the data obtained from reliable publisher either government agencies like Malaysia Statistics Department or online database, for example ResearchGate and ScienceDirect. That aside, data from local newspaper like SinChew, The Star will also be adopted to prove up to date information. Those secondary data will be reviewed to prevent adopting invalid secondary data in this research.

3.3.2 Target Population

Target population can be explained as the desired group or set of elements that represents an entire population which the required information comes from. The target population needs to be well-defined before proceeding to the sampling design as these 2 elements are interrelated and to prevent collecting

the data from irrelevant population (Akhtar, 2016). For detailed explanation, targeted population in this research is limited to business owner in Shah Alam, Malaysia that affected by Shah Alam Flood 2021.

3.4 Sampling Design

According to Kabir (2016) and Jawale (2012), sampling design is a crucial process of determining the way of collecting data and number of primary data needed from the target population. It is vital due to the fact that it is impossible to obtain the feedback from every individual of the target population. Sample is defined as a group of individuals chosen from the target population that provides data for the research. The aim of using sample is to save cost while gather enough number of data set for maintaining the reliability of the research. Hence, in this subchapter, the sampling size and the method of selecting the sample will be introduced in detail.

3.4.1 Sampling Size

Without any doubt, the larger the sampling size, the more accurate the data represents the target population. However, the target population in this research is business owner. In term of consumer products and services and other sector, Shah Alam has over 3000 SMEs operate all over the district (SME CORP, 2013). Meanwhile, this is just a data published for more than 9 years and merely focused on SME, the actual number of business owner in Shah Alam is believed to be more than that due to continuous increase of population and GDP. For an undefined population, the Cochran's sampling method suggested by Enshassi and Al Swaity (2015) is adopted to determine the sample size in this research. The sample size equation is shown as below.

$$S = \frac{Z^2 \times P\,(1-P)}{C^2} \qquad (3.1)$$

$$S = \frac{1.96^2 \times 0.5\,(1-0.5)}{0.09^2} \approx 119$$

Where,

S = sample size

Z = Z value based on confidence level (1.96 for 95% confidence level)

P = percentage picking a choice expressed as decimal (0.5 is used)
C = Margin of error (9% is used)

The margin of error is checked using the formula recommended by Enshassi and Al Swaity (2015) as shown below.

$$Maximum\ marginal\ error \approx \frac{1.96}{\sqrt{SS}} = \frac{1.96}{\sqrt{119}} = 0.18 > 0.09\ (C\ value)$$

From the formula, the minimum sampling size for this research is approximately 120 individuals. While this Cochran's sampling method is also implemented in Teng, et al., (2013) social science quantitative survey conducted by University Putra Malaysia. So as another social science quantitative survey that conducted in Malaysia, it is desirable to adopt the same method in computing sample size.

3.4.2 Sampling Method

Generally, any way of selecting sample or participant from the target population is defined as sampling method. It can be categorised into probability sampling which randomly selects participant and everyone in the population has the same chance to be selected and non-probability sampling which purposely selects participant and not everyone in the population will have the chance to be selected (Kabir, 2016). Scribbr (2019) suggests that probability sampling should be implemented for quantitative survey as the fairness and openness of the survey is ensured and survey bias is prevented although probability sampling is more time-consuming than non-probability sampling. The probability sampling can then be subcategorised into simple random sample, systematic sample, stratified sample and cluster sample. The procedure of selection of random sample fully dependents on tools such as random number generator and roulette wheel. While the systematic sample is a selection based on a constant interval pattern. Next, cluster sample is a mean of randomly grouping the individual for selection rather than selecting individual randomly as the sample. Lastly, stratified sample is a technique stratifies the population into a number of non-overlapping subgroup based on

certain characteristics and the sample in the subgroup is selected either using random sampling or systematic sampling (Jawale, 2012).

In this research, simple random sampling is used as the sampling method. This is because providing equal chance to the selected population responding to this survey can increase the credibility of this survey in representing the perception of the target population towards the topic investigated, as such, random sampling method is recommended by Jawale (2012).

3.5 Measurement Scale

According to Sirkin (2005), measurement carries a meaning of assessing the quantity of a dimension in a fruitful way. In the journal published by Jo (2007) states that there are 4 type of measurement scales in statistical analysis namely interval scale, ratio scale, ordinal scale and lastly nominal scale. Each of the scale has different properties and uses. In short, nominal scale is used to act as identifier that represents the order of quantity, however it does not represent the degree of the quantity. Next, ordinal scale is implemented to classify the degree of an quantity in an unequal interval ordered relationship. Apart from that, interval scale and ratio scale are generally used in scientific field as both of them indicate the degree of a quantity in equal unit just the ratio scale has an absolutely zero while interval scale lacks a true zero.

For this research, due to the natural of the expected data obtained sections A, B and C are not similar, the nominal and ordinal scale will be applied in section A's questions while interval scale will be adopted to assess the degree of dependent and independent variables in section B and C.

3.5.1 Nominal Scale and Ordinal Scale

The nominal scale utilised in this research is solely to differentiate the demographic profile of the respondents. The use of nominal scale in demographic profile is also supported by Dalati (2018) as this information is not an indication of a chronological order of quantities. In the questionnaire form of this research, the Section A's questions 1, 2, 4 and 6 are measured via nominal scale. The question 1 categorised respondents by gender, question 2 recorded their ethnic, question 4 classified respondents based on the sector

they involved in and question 6 divided respondents through their business entity.

While the ordinal scale is applied in Section A's questions 3 and 5. The question 3 asked for the scale of business while 5 recorded the range of years of experience in owning the business. As aforementioned by Jo (2007), the gap between the rank of ordinal scale is not equal interval, thus, it is suitable to be used for measuring range of year and also the scale of business which is not categorised by consistently fixed interval.

3.5.2 Interval Scale – 5 Degree Likert Scale

Interval scale that applied in the sections B and C has the purpose of classifying the degree of a value in an equal way. However, it is popular to use nominal scale to determine the degree of dependent and independent variables in social science as these variables are non-quantifiable in natural (Sirkin, 2005). Meanwhile, Kabir (2016), further explains that interval scale is also applicable to investigate the association of dependent and independent variables that need to be having distinct relationship but mutually exhaustive and

exclusive. In this questionnaire the interval scale is set to be 5 degree Likert scale which suggested by Dalati (2018). The 5 degree Likert scale adopted in this research consists of 5 agreements (Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree). The 5 degree Likert scale is modified from 7 point Likert scale, but 5 degree Likert scale is much more prevalent than 7 point Likert scale, as lesser choices can reduce the possibility of misunderstanding and confusion of respondents. Besides, it can increase response rate for large population in a limited time (Ho, 2016).

3.6 Research instrument

According to Hagan (2014), research instrument can be elaborated as medium used in a research study to gather and analyse the data from target population. The general research instruments in social science field include: survey, interview and experiment or test. The criterions of choosing the research instrument include: able to measure the relevant variables of the research to test the hypotheses, suits for the conceptual framework of study and also free

of bias, has high reliability and validity. After developing the questionnaire form, Rattray and Jones, (2007) advise that it is feasible to conduct a pilot test to examine whether the questionnaire is practical or not.

After taking all the mentioned criterions into consideration, the most suitable research instrument for this research is online questionnaire survey as the questionnaire can be designed based on the researcher's interested variables and also the questionnaire can be sent to the target population in a cost and time effective way also not to mention the data can be gathered easily and can be transferred into the SPSS software instantly.

3.6.1 Quantitative Questionnaire Survey

The quantitative questionnaire can be defined as data collecting document filled by the target population. The questionnaire is well-designed to obtain the perception of survey participant towards the research topic. The questions can either be open-ended type or guided response type which normally is multiple-choice question (Grix, 2018.). In this research, most of the question will be set as guided response type, as (Kabir, 2016) suggests that guided response type question is more suitable for quantitative survey and easier to be manipulated.

3.6.2 Questionnaire Design and Measuring Preparedness, Response and Recovery

The questionnaire must be designed wisely so that the participant will not misunderstand the question. Questionnaire formation must be supported with logical and systematic approach. The essential elements must be considered during questionnaire development include: layout of the questionnaire, variables or questions to be measured and lastly the expected response style. The questions to be measured can either be constructed by the surveyor to suit with the hypothesised domain or adopted from past researchers or guidelines. (Furze, et al., 2001.)

To begin with, at the first page of the survey form, a simple screening question is designed to categorise the sample into 2 groups based on whether the business owners are affected by the flood in Shah Alam 2021. For this research, only the feedbacks from the target population, flood affected business owner will be accepted as sample.

In this research, the questions stated in the questionnaire are adapted from previous researchers. The questions are rephrased so that it is suited to the scenario invested, namely Shah Alam Flood 2021. Besides, the questions are rephrased to be short but easy to understand for avoiding misinterpretation of the questions. The questionnaire form is divided into 3 sections namely A, B and C. The A section consists of 6 questions that designed to collect the survey respondents' demographic profile such as gender, ethnic and the list goes on. While the section B is used to measure the three independent variables which are the flood preparedness, response, and recovery which are defined in the end of this subchapter. The section B consists of 13 questions. The last section, section C, consists of 5 questions adapted based on the impact of flood on business owners. The survey questionnaire form can be referred at Appendix Section of this report.

Independent variables

IV1: Flood preparedness

Flood preparedness is measured as the capability to implement flood management measures to secure my business, including training and setting standards of command and control for business operation and preparing emergency supplies (i.e. emergency water, fuel, and fund).

IV2: Flood response

Flood response is measured by the decision and reaction made by the individual to safeguard life and properties during a disastrous event.

IV3: Flood recovery

Flood recovery is measured by the ability to sustain a business's continuity during and immediately afterwards through financial aid and restoration of service interruptions such as electricity, materials and supplies.

3.7 Data Analysis

Data analysis is a systematic approach of applying statistical technique to derive the useful information from a large chunk of data. Before analysing the

data, the raw data that gathered from target population need to be screened to ensure the validation of data, after that the data is coded into suitable computer language for data analysis (Ong and Puteh, 2017). In this research, all the data will be analysed by applying SPSS software, the SPSS software is a powerful and prevalent statistical analysing software in current market, it has various functions such as descriptive analysis, inferential analysis and the list goes on (Bryman and Cramer, 2011). The analyses that will be performed in this research include descriptive analysis, reliability test, normality test, and inferential analysis.

3.7.1 Reliability Test

Reliability test is a way to assess the internal consistency of a group of objects. The common method to examine the reliability in SPSS is computing the Cronbach's alpha for the set of objects (Bryman and Cramer, 2011). Referring to Rattray and Jones (2007), it is a must to test the reliability during the pilot test and the actual test for setting a good questionnaire and the way of determining an acceptable reliability is based on the Cronbach's alpha value. According to Ursachi, et al., (2015) the Cronbach's alpha is established by Lee Cronbach in 1951 to test the reliability of a test or scale. After years of implementation, researchers have developed a standard to classify the degree of reliability based on the value of Cronbach's alpha, summarised in the table below.

Table 3.1: Range of alpha and reliability

Cronbach's alpha, α	Degree of reliability
0.90-1.00	Excellent
0.80-0.89	Good
0.70-0.79	Acceptable
0.60-0.69	Questionable
0.50-0.59	Poor
Less than 0.50	Unacceptable

Source: (Ursachi, et al., 2015)

In short, the Cronbach alpha must be larger than 0.7 to fulfil this research's requirement. Thus, 0.7 will be the minimum requirement needed to be achieved in this study, otherwise the following statistical analyses can not be conducted.

3.7.2 Descriptive Analysis

Descriptive analysis is the most commonly applied statistical analysis in every questionnaire research. It is used to illustrate the pattern or the feature of the data without drawing a conclusion that extends beyond what shown by the data (Bryman and Cramer, 2011). Some of the well-known statistical terms need to be determined in this analysis are the data's largest selected value, mode, the variance between each choice provided and so on. All of it are the fundamental element under descriptive analysis. In addition, descriptive analysis is also famous in providing a good data visualisation by using the frequency table, cumulative frequency table to compute histogram and Ogive diagram for better understanding of data distribution (Sirkin, 2005).

The descriptive analysis in this research is implemented to describe the section A, demographic profile of the respondents through frequency table and also pie chart. Apart from that, this analysis will be adopted to compute the mean, standard deviation, frequency and forming histogram, cumulative frequency table for the questions related to dependent and independent variables in sections B and C. All these analyses and graphs are processed by using SPSS software.

3.7.3 Normality Test

Normality test is utilised to test whether the data set can be considered as normally distributed or not. This test is a prerequisite for many other statistical tests such as inferential analysis as it will affect the selection of method applied to assess the data. That aside, the normal distributed data is the basic assumption for many tests. There are 2 ways to determine the data's normality namely, visual graph method such as Q-Q plot, histogram and so on, another way is normality test like Kolmogorov-Smirnov test and Skewness and Kurtosis tests (Ghasemi and Zahediasl, 2012).

In this research, the normality test is adopted to determine the normality of the data. Due to fact that the data is interval scale type, Skewness and Kurtosis tests will be used to compute the normality value. Both of the tests are developed for calculating the normality of parametric data such as interval scale data (Bryman and Cramer, 2011). After conducting the tests in SPSS if the absolute value of data is less than 10 and 3 for Skewness and Kurtosis respectively, then it is classified as normally distributed and if greater than the mentioned value, then the data is non-normally distributed (SPSS, 2018).

3.7.4 Multicollinearity Test

Bryman and Cramer (2011) state that the multicollinearity test must be conducted on the independent variables to eliminate the possibility of intercorrelation among independent variables, which may lead to research failure. The term multicollinearity means the degree of inter association among the independent variables which causes those variables to become dependent on each other. Dummy variable and inclusive variable are the common factors of high multicollinearity. The sign of high multicollinearity is shown by the reciprocal of tolerance called Variance Inflation Factor, VIF. If the VIF is equal to or greater than 10, it means multicollinearity is problematic and if VIF is smaller than 10, the effect of multicollinearity is neglectable (O'brien, 2007).

3.8 Inferential Analysis

Inferential analysis is an analysis to make a judgement or a prediction of the trend of the target population based on the sampling's data. It should be beared in mind that the inferential analysis is trying to draw a conclusion about the target population's thought beyond the extent of immediate data (Trochim, 2020). According to Bhandari (2020), the governing factor that influences the accuracy of the inferential analysis is the sampling size. The insufficient sampling size will create bias of data and also sampling error which is the difference between target population and sampling group. Hence, the sampling design is of utmost importance in every questionnaire survey.

According to Trochim (2020), the inferential analysis consists of correlation testing, hypothesis testing, regression testing and so on. While in this research, the Spearman's or Pearson's correlation test and multi-linear regression test will be conducted with the aid of SPSS, then the result will be used to determine the strength of association of variables.

3.8.1 Correlation Analysis

According to Franzese, et al., (2019), correlation analysis can be explained as a process of assessing two variables' association and trend of relationship statistically. In the context of correlation analysis, Pearson's Correlation and Spearman's Rho Correlation analyses are the most prevalent used formulas in social science study. The similarity between these 2 correlation analyses is that both of their coefficients ranged from -1 to 1 where 0 means the variables have no relationship. Meanwhile, when the correlation coefficient is -1 to 1, it means the variables are either negatively or positively correlated. Generally, the greater the value of the absolute of coefficient, the stronger the relationship. On the other hand, Sarmento (2020) reveals that the normality of collected data will restrict the use of the type of correlation analysis. In the scenario that, data collected follows bivariate normal distribution (linear association) or there is no extreme value, then Pearson's correlation analysis is applicable. Whereas the data gathered distributed non-normally continuous (non-linear association) or there is extreme value, thus, Spearman's Rho coefficient is preferable. Hence, performing normality test is a pre-requirement for adopting the suitable correlation test in this study. Other than that, the p-value, p is also important to be measured in every inferential analysis. If $p < 0.05$, then the independent variable is statistically significant related to the dependent variable (Bhandari, 2020).

3.8.1.1 Kruskal-Wallis H Test

According to McKight, et al., (2010), it is a single way analysis of variance proposed in 1952 for non-parametric inferential analysis. This test is categorised as non-parametric test to assess the statistically significant difference of groups of independent variables on a dependent variable, in other words, to determine whether the dependent variable is influenced by the

independent variable. This test is widely used as the normality of variables is not a prerequisite compared with other ANOVA tests. Meanwhile, there are still 3 basic assumptions that need to be fulfilled before conducting the test. Firstly, there is only 1 dependent variable, and it can be ordinary, ratio or interval scale. Secondly, the independent variable can be sub-divided into at least 2 independent groups, for example, independent variable is ethnic, and it can be sub-divided into Malays, Chinese and Indian. Lastly, the data is collected under independent observation condition, which means the data is collected at a single point of time from non-repeated respondent so that each data is independent of other. After running the test in SPSS, the software will compute the test model diagram of independent variables to dependent variable and a conclusion can be drawn based on the magnitude of significant P value, if the P value is less than 0.05, then there is a significant difference between independent and dependent variables (Singh, et al., 2013).

3.8.1.2 Pearson's Correlation Analysis

As stated by Hauke, et al., (2011) and Schober, et al., (2018), Karl Pearson is the founder of the Pearson's correlation coefficient, r in 1896 to describe the degree of linear relationship between two variables. It is applicable only if the following conditions are satisfied: the data is gathered through reliable sampling method, there is no extreme value among the data, the variables measured are normally continuous distributed and the pair of variables are measured independently. While its limitation is that it can only determine the linear relationship between 2 variables

Schober, et al., (2018) provide a guideline for the relationship between the magnitude of r, and the degree of correlation. It is summarised in the table below.

Table 3.2: Pearson's correlation coefficient and correlation

Pearson's correlation coefficient, r	Degree of correlation
±0.90-1.00	Very strong
±0.70-0.89	Strong
±0.40-0.69	Moderate

±0.10-0.39	Weak
Less than ±0.10	Very weak

Source: (Schober, P., Boer, C., and Schwarte, L. A., 2018.)

3.8.1.3 Spearman's Rho Correlation Analysis

In the textbook, published by Dodge (2008), he introduces that the Spearman's Rho correlation test created by Spearman Charles in 1904. The assumptions need to be fulfilled before using this Spearman's Rho correlation test include: the tested variables must be measured in ordinal, ratio or interval scale. Next, the variables to be tested must be in paired observation which means a single set independent variable and dependent variable's data must be coming from the same respondent. Lastly, this test is adopted to determine the monotonic relationship between 2 variables. Referring to Kudryavtsev and Theorem (2001), the monotonic relationship can be explained as when the independent variable increases the dependent variable will never increase or never decrease vice versa. Due to the limitation of monotonic relationship, Bryman and Cramer (2011) do not recommend using the Spearman's Rho Correlation test if a clearer relationship is required.

Combining the explanation of Bryman and Cramer (2011) and Dodge (2008), the indicator of the monotonic relationship between the variables is the Spearman's correlation coefficient, r_s. While the relationship between the magnitude of r_s, and the degree of correlation is summarised in the table below.

Table 3.3: Spearman's Rho correlation coefficient and correlation

Spearman correlation coefficient, r_s	Degree of correlation
±0.80-1.00	Very strong
±0.60-0.79	Strong
±0.40-0.59	Moderate
±0.20-0.39	Weak
Less than ±0.20	Very weak

Source: (Dodge, 2008)

3.8.2 Regression Analysis

In term of regression analysis, Kabir (2016) states that it is an approach to express the relationship between independent and dependent variables in mathematical equation form. It is essential to conduct regression analysis as the correlation analysis just assesses the statistical relationship between an independent and dependent variable. On the other hand, regression analysis can determine the relationship of all independent and dependent variables and express it in accurate mathematical way. As such Bhandari (2020) suggests conducting both type of analyses for computing the overall relationship of variables and relative influence of the independent variable to the dependent variable so that a holistic relationship can be concluded.

In the textbook of Marill, (2004), there are 3 type of regressions namely simple linear, multi-linear and non-linear regression. If the data is distributed normally then simple or multi-linear regression can be performed. If the data is distributed non-normally then non-linear regression is preferable to describe the data's regression. Meanwhile, simple linear relationship can only represent the relationship of a single independent variable and dependent variable. Thus, multi-linear regression analysis is much favourable to be applied in this social science study as suggested by Luu, et al., (2019).

3.8.2.1 Multi-linear Regression

As stated in Marill, (2004)'s textbook, the general form of multi-linear regression equation is shown in the Figure 3.2.

$$Y = b_0 + b_1X_1 + \cdots + b_nX_n$$

Where:

Y is dependent variable

X is independent variable

b_0 is the y intercept

b is the slope of the line

n is the total number of independent variables

Figure 3.1: General form of Multi-linear Equation. (Marill, 2004)

As aforementioned, the multi-linear regression analysis is able to determine the association of multiple independent variables and the dependent variable. Meanwhile, there are several constraints need to be fulfilled when adopting this multi-linear regression. The conditions include there is only a single dependent variable, the data collected is normally distributed, constant or no variance in the data, absence of multicollinearity in the data and the relationship between independent variables and dependent variable is constant before conducting the regression test (Kabir, 2016; Marill, 2004).

In the SPSS software, Bryman and Cramer (2011) state that the computed result needed include the mathematical equation, correlation coefficient, r and the coefficient of determination, r^2. The r value represents the strength of correlation between variables. The greater the r, the stronger the association, which ranged from -1 to 1. While its square, r^2, represents how well the mathematical equation explains the relationship between independent and dependent variables linearly.

3.9 Pilot Test

Referring to Rattray and Jones (2007), pilot test is the pre-requirement for any questionnaire survey as it has the aim of assessing the workability of the questionnaire and the questions' reliability. Besides, the data from the pilot test can be used to check whether the questions are well-designed and arranged or not. This can be done by testing the Cronbach alpha of every variable. If the Cronbach alpha, $\alpha > 0.7$ that means the grouped questions are measuring the same domain or variable. According to Whitehead, et al., (2016), the number of respondents for a pilot test is good to be controlled around 20 to 40 individuals for time and cost saving purposes.

In this research, the pilot test will be done by 40 Malaysian business owners in Shah Alam district. After that, the collected data will undergo SPSS's reliability test and the minimum requirement for the test is achieving Cronbach alpha value more or equal to 0.7 to show that it is of good questionnaire survey standard. The result of the pilot test is shown in the following Table 3.4.

Table 3.4: Result of pilot test

No.	Variables	Number of questions	Number of respondents	Cronbach alpha
1	DV-Impact	5	40	0.837
2	IV1-Preparedness	5	40	0.881
3	IV2-Response	4	40	0.851
4	IV3-Recovery	4	40	0.808

As shown in the Table 3.4, the Cronbach alpha's values of all variables are more than 0.7, which mean the questionnaire form developed is reliable to be adopted and considered as 'Good' grade in the standard set by Ursachi, et al., (2015). Hence, this questionnaire form will continue be used in the formal data collection stage.

3.10 Summary

In a nutshell, this study is a quantitative survey research. This research's design is clearly defined at the beginning of the chapter. Next, the target population is clarified to be Shah Alam Flood 2021 affected business owner. For sampling design part, simple random sampling is adopted, and the target sampling size is 120 usable samples computed by Cochran formula. The research instrument used is questionnaire survey form developed through Google Form. That aside, the questionnaire's questions are also clarified and shown in Appendix. While the nominal, ordinal and interval (5-degree Likert scale) measurement scales used in the survey form are also introduced. Subsequently, the data analyses that will be practised in Chapter 4 such as descriptive analysis, reliability test, normality test, and inferential analyses are also discussed and explained in detail. Last but not least, the pilot test is introduced, and the result of this report's pilot test is also discussed at the end of the chapter before proceeding to the formal data processing stage.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

After conducting data collection for a duration of one month period, total number of 122 completed surveys from respondents are collected. However, 2 sets of inappropriate data from irrelevant population are discovered during data screening. Hence, excluding the invalid or missing data, there are 120 sets of applicable data from the targeted population, and the information of gathered data is summarised in Table 4.1.

Table 4.1: Information of gathered data.

Total collected data	Screened data	Missing data	Total usable data
122	2	0	120

Based on the Table 4.1, the remaining usable data collected fulfils the minimum required sample size of 120 people that determined through Enshassi and Al Swaity (2015)'s method. Thus, the data collection process is successful, and the collected data will be analysed and interpreted based on the mentioned analyses in Chapter 3. After that, a discussion on the findings will be presented together with the recommendations reached from analyses to mitigate flood for business owner.

4.2 Descriptive Analysis of Demographic Information

In this sub-chapter, collected information such as demographic profile of respondents from Section A of the survey questionnaire is used for descriptive study. The demographic information includes: gender, ethnic, scale of business, sector involved, business operating experience in Shah Alam and the business entity.

4.2.1 Descriptive Study for Gender

To begin with, the Figure 4.1 shows the gender of respondents. As illustrated in the pie chart, the majority of the respondents are male.

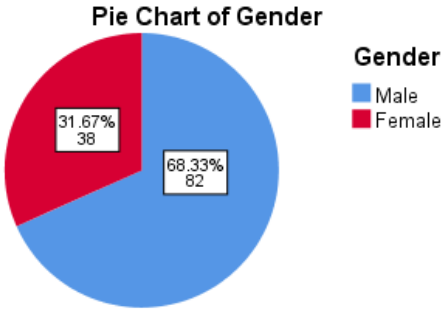

Figure 4.1: Gender of respondents

Out of 120 respondents, 82 (68.33%) are male and the remaining 38 (31.67%) are female. The imbalance in gender distribution can be explained by adopting DOSM (2021)'s population report. In the report, 48% of Shah Alam's citizens are female and the majority of them are housewives. Therefore, the collected data is expected to have higher portion of male respondents.

4.2.2 Descriptive Study for Ethnic

The following Figure 4.2 shows the ethnic of respondents. 4 common groups of ethnic namely: Malay, Chinese, Indian and Bumiputera other than Malay and "other ethnic" are provided as choices to respondents.

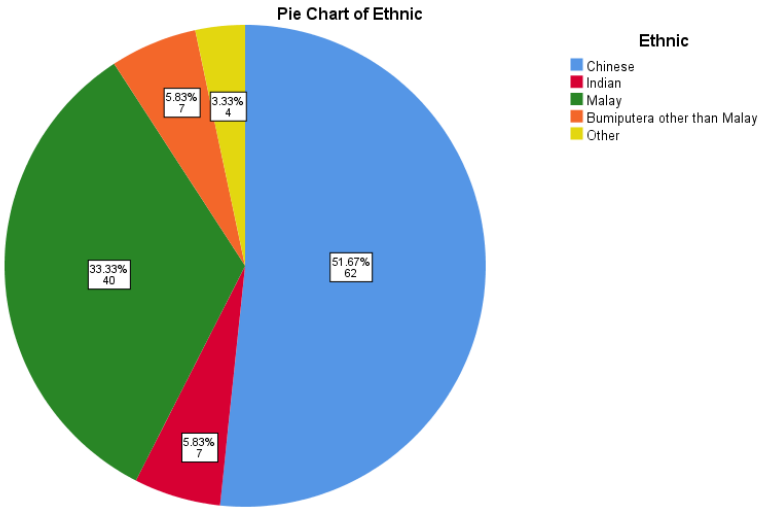

Figure 4.2: Ethnic of respondents

In this research, 62 (51.67%) respondents are Chinese which is the largest ethnic collected, the second largest ethnic collected is Malay with 40 (33.33%) respondents. While the number of respondents from Indian or Bumiputera other than Malay is same, which are 7 (5.83%) respondents respectively. Meanwhile, 4 (3.33%) respondents are from "Other" ethnic. The pattern of ethnic distribution is similar to Yuen, et al., (2021)'s finding that shows majority of Selangor SME's owners are Chinese.

4.2.3 Descriptive Study for Scale (Big, Medium, Small or Micro Scale) of Business

Figure 4.3 shows the distribution of scale of collected Shah Alam business owner's business size. The size is categorised based on SME CORP (2013) business scale classification: micro, small, medium and big.

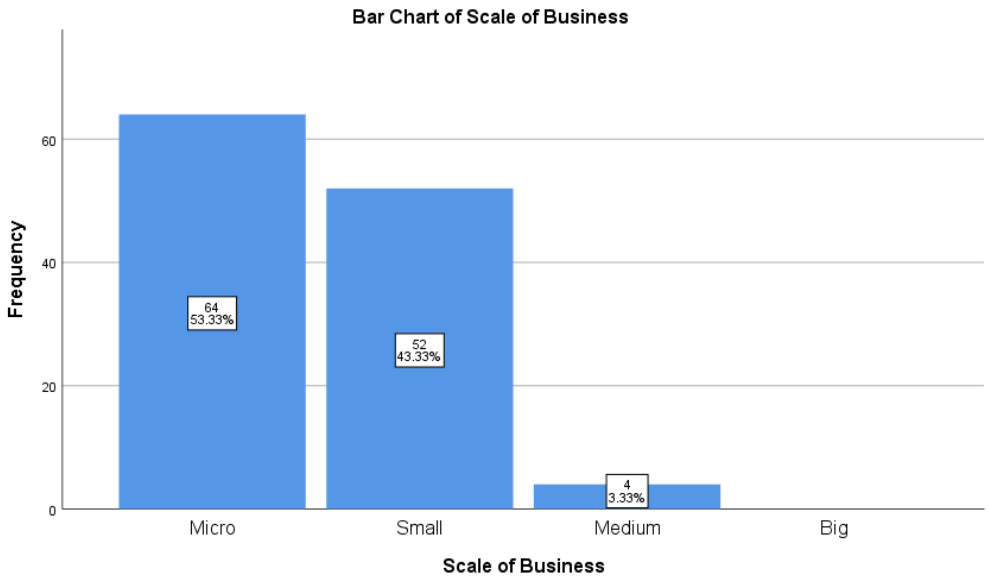

Figure 4.3: Distribution of business scale of respondents.

As shown in the Figure 4.3, there is no respondent owns business scaled as "Big". On the other hand, "Micro" scale business owner is the largest group with 64 (53.33%) respondents, followed by 52 (43.33%) "Small" scale business owners and subsequently, 4 (3.33%) "Medium" scale business owners. According to Yuen, et al., (2021) and SME CORP (2013), such distribution is valid as 97% of business organisation in Malaysia is SME scale. While the remaining 3% "Big" scale mostly refers to international companies or listed companies that rarely will take part in Degree Level survey study. Among the SME, about 95% of business organisation is categorised as "Micro" and "Small" due to their annual sales turnover and the full-time employee of the company can not fulfil "Medium" scale's requirement set by SME CORP (2013).

4.2.4 Descriptive Study for Sector Involved

Figure 4.4 shows the sector involved by respondents. According to BURSA Malaysia (2018), there is total of 20 fields in Malaysia and among the 20 fields, 7 largest fields (Construction, Consumer related, Health cares, Industrial related, Plantation, Property and Telecommunication) are selected together with additional "Other field" to be provided as a choice in the survey questionnaire.

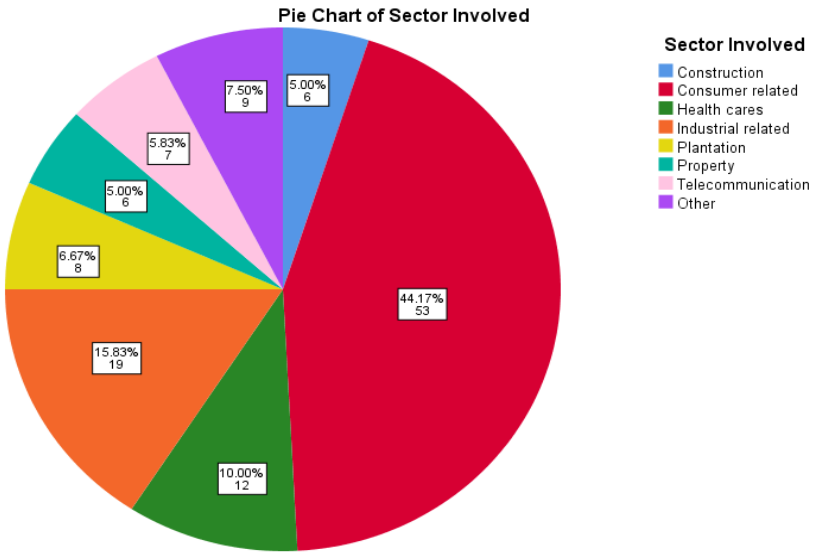

Figure 4.4: Sector involved of respondents.

In this study, 53 (44.17%) of respondents involved in Consumer related field which is the largest field recorded, followed by Industrial related field with 19 (15.83%) respondents, Health care field with 12 (10%) respondents, "Other" field with 9 (7.5%) respondents, Plantation field with 8 (6.67%) respondents, Telecommunication field with 7 (5.83%) respondents and lastly Property and Construction field which both recorded 6 (5%) respondents respectively. Such imbalance in sector involved can be explained through May (2017)'s report that reveals majority of Shah Alam's GDP contribution are from Consumer and Industrial manufacturing sectors.

4.2.5 Descriptive Study for Business Operating Experience

Next, Figure 4.5 represents the respondent's business operating experience in Shah Alam. The range of business operating experience is divided into 4 groups, starting from newly operating (less than 3 years), with an interval of 3 years' experience until 10 years' experience. The last group is designed for veteran business owner in Shah Alam with experience more than 10 years.

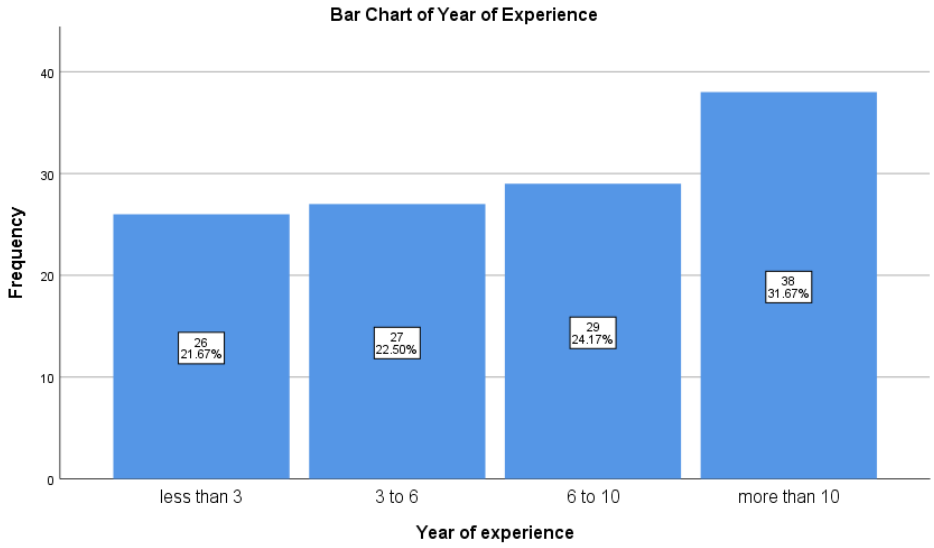

Figure 4.5: Distribution of business operating experience of respondents.

There are 38 (31.67%) respondents can be categorised as veteran business owner with more than 10 years' experience. While 29 (24.17%) respondents have 6 to 10 years of business operating experience in Shah Alam. Subsequently, 27 (22.5%) respondents have 3 to 6 years of business operating experience in Shah Alam. Lastly, 26 (21.67%) respondents are considered as newly starting business in Shah Alam with limited experience.

4.2.6 Descriptive Study for Business Entity

The following Figure 4.6 shows the business entity of respondents. The classification of business entity is based on SSM Admin (2018)'s Malaysia business entity with 5 major types namely: Sole proprietorship, Partnership, LLP, Sdn. Bhd., and Bhd..

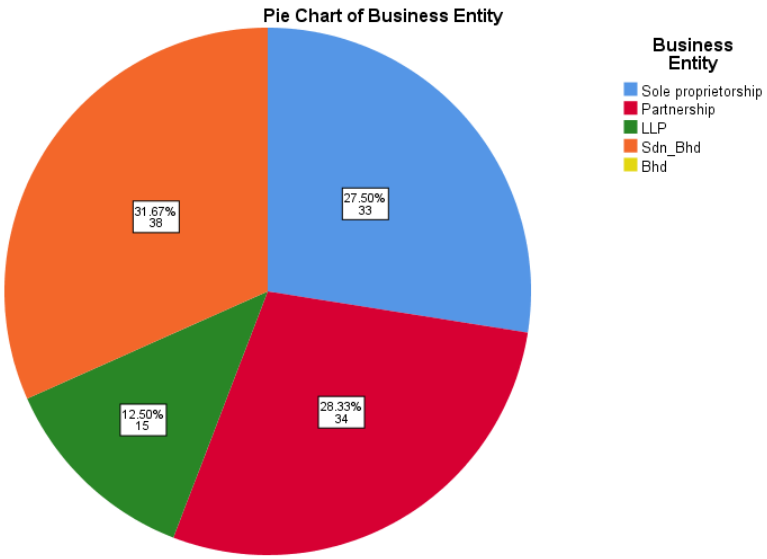

Figure 4.6: Business entity of respondents.

The ranking of prevalence of business entities arranged in descending order is: Sdn. Bhd. type with 38 (31.67%) respondents, Partnership with 34 (28.33%) respondents, Sole proprietorship with 33 (27.5%) respondents, LLP type with 15 (12.5%) respondents and lastly Bhd. type with no respondent. The explanation for such tremendous imbalance is that, Bhd. type business entity is normally registered by listed company in share market that normally categorised as "Big" scale in scale of business. As stated in Sub-chapter 4.2.3, there is no respondents can be classified as "Big" scale, as such, there should be no respondent with business entity of Bhd..

4.3 Kruskal-Wallis H Test

In order to determine the potential factors that influence the damage of flood other than the mentioned 3 independent variables. Kruskal-Wallis H Test is used to assess whether the demographic information collected may be the potential factors. Based on Lehaney and Vinten (1994), gender and ethnic normally will not be used as any factors in social science to avoid prejudice. Thus, gender and ethnic are excluded from undergoing Kruskal-Wallis H Test. The result of the test is shown in Figure 4.7.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of DV is the same across categories of Scale_of_business.	Independent-Samples Kruskal-Wallis Test	.530	Retain the null hypothesis.
2	The distribution of DV is the same across categories of Sector_Involved.	Independent-Samples Kruskal-Wallis Test	.017	Reject the null hypothesis.
3	The distribution of DV is the same across categories of Year_of_experience.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
4	The distribution of DV is the same across categories of Business_entity.	Independent-Samples Kruskal-Wallis Test	.578	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Figure 4.7: Kruskal-Wallis test summary.

From Figure 4.7, it is clearly stated that “Sector involved” and “Year of experience in operating business” are the 2 factors that will influence the damage of flood to business owner. This is because, the aforementioned 2 aspects achieve significant P value that is less than 0.05, and that indicates there is a significant difference between independent and dependent variables (Singh, et al., 2013).

While the influence of "Sector involved" (independent variable) to damage of flood to business owner (dependent variable) is shown in Figure 4.8.

Independent-Samples Kruskal-Wallis Test Summary

Total N	120
Test Statistic	17.103[a]
Degree Of Freedom	7
Asymptotic Sig.(2-sided test)	.017

a. The test statistic is adjusted for ties.

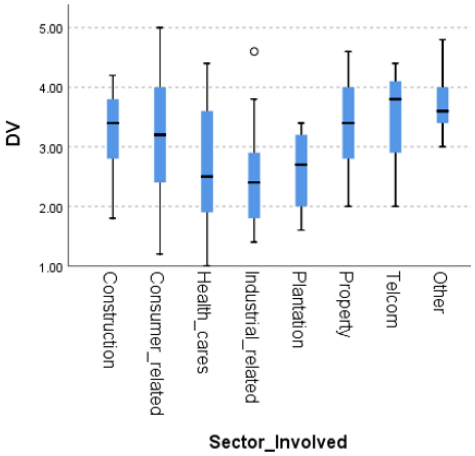

Figure 4.8: Kruskal-Wallis H Test model diagram of damage of flood across sector involved.

As previously mentioned in Chapter 3, the value of 3 represents "Neutral" rating in classification of seriousness of damage of flood. As such, taking Y-axis value 3 as the boundary line, above of it is considered as sector recorded much damage from flood while below of it is considered as sector recorded less damage from flood. The result shows that Health cares, Plantation and Industrial related field are the only 3 fields that recorded less damage of flood compared with other fields. The possible explanation for such phenomenon is that Health cares and Industrial related sector are located at area with better drainage design system, this explanation is in line with Joo (2017)'s industrial park review. While Plantation sector normally located at rural place with high vegetation cover that can reduce the effect of flooding on land and agricultural product (Machadon, et al., 2019).

Next, the trend of "Year of experience" (independent variable) to damage of flood to business owner (dependent variable) is shown in Figure 4.9.

Independent-Samples Kruskal-Wallis Test Summary

Total N	120
Test Statistic	44.674[a]
Degree Of Freedom	3
Asymptotic Sig.(2-sided test)	.000

a. The test statistic is adjusted for ties.

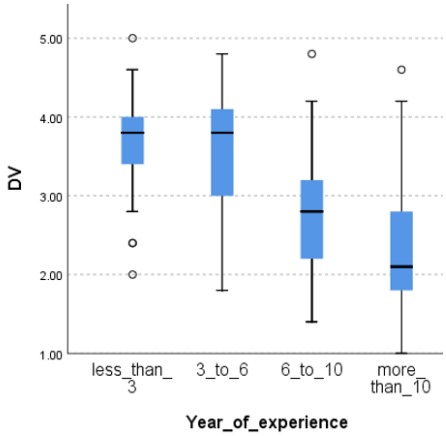

Figure 4.9: Kruskal-Wallis H Test model diagram of damage of flood across year of experience.

The concept of interpreting the association between the damage of flood and year of experience is same as the aforementioned "Sector involved" factor. Using value 3 as the boundary line, above of it is classified as respondent recorded much damage from flood and below of it is categorised as respondent recorded less damage from flood. It can be easily observed that, when the experience of operating business in Shah Alam increases, the damage from flood to the business decreases. In both Sutton, et al., (2006) and Paton (2003)'s disaster management textbook, experience is one of the important factors that positively influence disaster management skill and performance. Besides, flooding is an annual event in Shah Alam, thus, the veteran business owner that operates in Shah Alam for more years is believed to have much experience in minimising flooding damage to their business.

4.4 Reliability Test

Reliability test is a must in questionnaire survey study as it indicates whether the workability of questionnaire is assured (Rattray and Jones, 2007). The result of reliability test for pilot test is tabulated in Table 3.4 in Subchapter 3.9, while the result of the reliability test for the official survey is tabulated in the following Table 4.2.

Table 4.2: Official survey reliability test's result.

Variable	Number of items	Cronbach's Alpha	Degree of reliability
Independent Variable			
Flood Preparedness	5	0.926	Excellent
Flood Response	4	0.914	Excellent
Flood Recovery	4	0.878	Good
Dependent Variable			
Impact of flood to business owner in Shah Alam	5	0.874	Good

Table 4.2 shows that the Cronbach's Alpha of all variables is ranged above 0.7, such result satisfies the standard set by Rattray and Jones, (2007) and can be further classified as "Good" and "Excellent" in Ursachi, et al., (2015)'s standard. Thus, the survey's questionnaire can be considered as having good standard of internal consistency and is reliable to be used in the following analyses.

4.5 Normality Test

The normality test is performed in accordance with Kurtosis and Skewness method. The following Table 4.3 shows the Kurtosis and Skewness values for 5 items from independent variable 1 (Flood Preparedness), 4 items from independent variable 2 (Flood Response), 4 items from independent variable 3 (Flood Recovery) and lastly 5 items from dependent variable (Flood Impact to business owner).

Table 4.3: Result of normality test.

Items	Skewness	Kurtosis
Flood Preparedness 1	0.272	-0.637
Flood Preparedness 2	0.253	-0.576
Flood Preparedness 3	0.217	-0.525
Flood Preparedness 4	0.296	-0.640
Flood Preparedness 5	0.150	-0.730
Flood Response 1	0.447	-0.577
Flood Response 2	0.423	-0.449
Flood Response 3	0.306	-0.499
Flood Response 4	0.396	-0.530
Flood Recovery 1	-0.122	-0.326
Flood Recovery 2	0.082	-0.460
Flood Recovery 3	0.081	-0.882
Flood Recovery 4	0.052	-0.221
Flood Impact 1	-0.191	-0.794
Flood Impact 2	0.087	-0.630
Flood Impact 3	-0.003	-0.877
Flood Impact 4	0.102	-0.714
Flood Impact 5	0.201	-0.601
Minimum Value	-0.191	-0.882
Maximum Value	0.447	-0.221

The results of both Skewness and Kurtosis ‘s normality tests are summarised in the Table 4.3. After that, Bryman and Cramer, (2011) suggest comparing the absolute value of both tests to the respective threshold value.

From the table, the values of Skewness method are ranged from -0.191 to 0.447, its absolute value is lesser than 10. Hence, the data is normally distributed according to Skewness method. On the other hand, the values of Kurtosis method obtained are ranged from -0.221 to -0.882, which its absolute value is lesser than 3. Hence, the data is normally distributed according to Kurtosis method. As both tests show the same result, hence the data is assured to be normally distributed.

4.6 Multicollinearity Test

According to O'brien (2007), the indicator of multicollinearity test is the reciprocal of the tolerance, denoted as VIF. The result of SPSS collinearity diagnostics is tabulated in Table 4.4.

Table 4.4: Result of multicollinearity test.

Independent variable	Tolerance	VIF
Flood Preparedness	0.404	2.474
Flood Response	0.469	2.131
Flood Recovery	0.804	1.244

As been stated in O'brien (2007)'s paper, the tolerance of independent variables needs to be greater than 0.1 to avoid potential intercorrelation among independent variables. In other words, the VIF value needs to be smaller than 10 to pass the multicollinearity test. Referring to Table 4.4, 3 independent variables' VIFs are lesser than 10, therefore, it is clear that all independent variables are not inter-related and represent distinct measurements to the dependent variable.

4.7 Pearson's Correlation Analysis

Due to the fact that the data is normally distributed and non-multicollinearity, it fulfils the requirement of Pearson's correlation test (Hauke, et al., 2011). After computing the test in SPSS, the result of Pearson's correlation analysis is tabulated in Table 4.5.

Table 4.5: Result of Pearson's correlation analysis.

Independent Variable	Pearson's correlation coefficient, r (Significant P-value)	Degree of correlation
Flood Preparedness	-0.549 (0.000)	Negatively moderate
Flood Response	-0.382 (0.000)	Negatively weak
Flood Recovery	0.616 (0.000)	Positively moderate

According to the above table, it shows that flood preparedness and flood response are negatively related to the impact of flood to business owner. In contrast, flood recovery is positively related to the impact of flood to business owner. Furthermore, adopting the standard of association developed by Schober et al., (2018), flood preparedness ranks moderate which is higher than flood response which ranks weak in term of negatively influencing the impact of flood. On the other hand, flood recovery is positively associated with impact of flood, such result is acceptable as it also shows a similar trend in Lee (2019)'s study. According to Lee (2019)'s result, short term recovery tends to be positively related to the degree of damage caused by disaster as recovery process is performed after the occurrence of disaster, thus, it is influenced by the severeness of disaster. A further explanation for the sign convention is the greater the impact to business, the greater effort will be put by the business owner in rehabilitating the business. However, it appears to be positively related in short period of time as over a long time, the recovery process's effect will exceed the disaster's impact and become negatively related (Chang, et al., 2012; Watson, et al., 2020).

Moreover, all the significant P-value obtained from Table 4.5 are 0.000 which is less than 0.01, as such, the null hypotheses are rejected (Hauke, et al., 2011; Bhandari, 2020). In conclusion, the flood preparedness is negatively related to impact of flood to business owner in a moderate degree. While flood response is negatively related to impact of flood to business owner in weak degree. Lastly, flood recovery is positively related to impact of flood to business owner in a moderate degree.

4.8 Multiple Linear Regression Analysis

Table 4.6 shows the model summary of multiple linear regression analysis between the Shah Alam business owner's flood preparedness, response and recovery and the impact of Shah Alam 2021 flood to the business computed from SPSS.

Table 4.6: Multiple linear regression's model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.694	0.482	0.468	0.69770

Based on Table 4.6, the R value represents the degree of correlation between the three independent variables and dependent variable. The obtained correlation coefficient, R is 0.694 which indicate moderate correlation between the Shah Alam business owner's flood preparedness, response and recovery and the impact of Shah Alam 2021 flood to the business (Bryman and Cramer, 2011). Besides, from Table 4.6, the coefficient of determination, R square is 0.482. It means that the three independent variables can explain only 48.2% of the dependent variable's trend. The remaining 51.8% is still unexplainable and can be explained by other important factors or variables that have not been measured in this research, for example, mitigation which is another important element in disaster management (Paton, 2003).

Next, Table 4.7 shows the coefficients of multiple linear equation of the relationship between the Shah Alam business owner's flood preparedness, response and recovery and the impact of Shah Alam 2021 flood to the business.

Table 4.7: Multiple linear equation's coefficient.

Model	Unstandardized B	Coefficient Std. Error	Standardized Beta
Constant	2.519	0.362	-
Flood Preparedness	-0.299	0.101	-0.310
Flood Response	-0.049	0.090	-0.053
Flood Recovery	0.489	0.077	0.473

Referring to the "Unstandardized B"'s column in Table 4.7, the multiple linear regression equation can be formed as the following Equation 4.1

$$DV = 2.519 - 0.299\ IV1 - 0.049\ IV2 + 0.489\ IV3 \quad (4.1)$$

Where,
DV is Impact of Shah Alam 2021 Flood to business owner in Shah Alam
IV1 is Flood preparedness of Shah Alam business owner
IV2 is Flood response of Shah Alam business owner
IV3 is Flood recovery of Shah Alam business owner

Equation 4.1 implies that the flood preparedness is the independent variable that poses the greatest negative effect to the impact of Shah Alam 2021 Flood to business owner in Shah Alam because its B coefficient is the highest with -0.299. Therefore, with every unit increment in flood preparedness, it will result in lowering 0.299 unit of impact of Shah Alam 2021 Flood to business owner in Shah Alam, provided that all other variables remain constant.

The second variable negatively affects the dependent variable is the flood response with a B coefficient of -0.049. Hence, with every unit increment in flood response, it will result in lowering 0.049 unit of impact of Shah Alam 2021 Flood to business owner in Shah Alam, provided that all other variables remain constant.

Flood recovery is the independent variable that poses positive effect to the impact of Shah Alam 2021 Flood to business owner in Shah Alam as its B coefficient is 0.489. However, the correct sequence is flood recovery happens after the occurrence of disaster (Paton, 2003; Thieken, et al., 2007). Thus, that means with every increase of 0.489 unit of impact of Shah Alam 2021 Flood to business owner in Shah Alam, unit increment in flood recovery will happen, provided that all other variables remain constant.

Lastly, the constant value of 2.519 represents the y-intercept of the regression line when all the independent variables are equal to 0.

4.9 Discussion of Finding

In this study, descriptive analysis is performed to analyse the demographic profile of the respondents and the result is compared with government released documents. Though comparing the result, bias of data can be reduced, and the reliability of the study is ensured as the study's result is in line with government-led social statistical study. As been mentioned in Sub-chapter 4.2, the demographic information gathered in this study is proved to be tallied with the Shah Alam's population report published by DOSM (2021) and other researchers like Yuen, et al., (2021) and May (2017). Thus, the data collected is valid.

Besides, in order to achieve the objective of this study, namely, to investigate the factors influence damage of flood, Kruskal-Wallis H test is performed on 4 potential factors. Those factors are: scale of business, sector involved, year of experience and business entity of Shah Alam business owner. The result of this test shows that sector involved and year of experience are the factors that will affect the damage of flood to business owner. Referring to Subchapter 4.3, in the context of sector involved, health cares, plantation and industrial related field are less influenced by flood. The possible explanation for such phenomenon is that Health cares and Industrial related sector are

located at area with better drainage design system, this explanation is in line with Joo (2017)'s industrial park review. At the same time, Plantation sector is normally located at rural places with high vegetation cover that can reduce the effect of flooding on land and agricultural products (Machado, et al., 2019). On the other hand, on the subject of year of experience, the veteran business owner with more years of operating business in Shah Alam, typically more than 6 years, is less influenced by flood. In both Sutton, et al., (2006) and Paton (2003)'s disaster management textbook, experience is one of the important factors that positively influences on disaster management skill and performance. Besides, flooding is an annual event in Shah Alam, thus, the veteran business owner that operates in Shah Alam for more years is believed to have much experience in minimising flooding damage to their business.

Moreover, reliability test is conducted again to ensure that the questionnaire form is reliable to collect workable data from respondents. The overall Cronbach's alphas of all variables are above 0.7 which mean the questionnaire is well arranged and data collected is applicable for following test.

The following objective to be achieved is to investigate the correlation between flood impact and flood preparedness, response and recovery of Shah Alam's business owner. In order to determine the correlation between the independent and dependent variables, inferential analysis is performed. However, there are 2 types of tests can be chosen namely Pearson and Spearman's correlation tests. As such, Normality and Multicollinearity test become the prerequisite of determining which test to be applied. The result of Normality and Multicollinearity test show that the data collected distributed normally and has no collinearity among the independent variables. Hence, it fulfils the requirement of applying Pearson's correlation test. The Pearson's correlation test's result shows that the flood preparedness is negatively related to impact of flood to business owner in a moderate degree. While flood response is negatively related to impact of flood to business owner in weak degree. Lastly, flood recovery is positively related to impact of flood to business owner in a moderate degree. All significant p-value of the mentioned 3 hypotheses are 0.000 which are less than 0.01, hence, these hypotheses are statistically proved.

It is easy to understand that with more preparation work and appropriate response on handling flood, the damage caused by flood can be minimised. However, the positive correlation between impact of flood and flood recovery needs to be explained through Chang, et al., (2012) and Watson, et al., (2020)'s paper on economic recovery. In their point of view, disaster recovery process is conducted after the occurrence of disaster, in this causation, the intensity of disaster recovery process is governed by the seriousness of disaster. Provided that the capital needed for start-up a new business in a new place is higher than rehabilitating the existing business, effort will be put by the business owner into rehabilitating the business. However, it appears to be positively related in short period of time as over a long time, the recovery process's effect will exceed the disaster's impact and become negatively related.

Apart from Pearson's correlation test, multiple linear regression is applied to express the relationship between dependent and independent variables in mathematical form. The resultant equation is shown in Sub-chapter 4.8's Equation 4.1. Moreover, through SPSS software, the coefficient of determination, R square can be determined and the value is 0.482. It means that the three independent variables can explain only 48.2% of the dependent variable's trend. The remaining 51.8% is still unexplainable and can be explained by other important factors or variables that have not been measured in this research, for example, mitigation which is another important element in disaster management (Paton, 2003).

4.9.1 Recommendations of Flood Mitigation

Another objective of this study is to provide recommendations to mitigate flood for business owner in Shah Alam. Thus, in this subchapter, appropriate recommendation of flood mitigation is suggested based on the aforementioned findings reached. Based on the findings, preparedness, response are the 2 variables that negatively influence the impact of flood. While year of experience and sector involved are the 2 other factors govern the degree of damage of flood.

According to Luna (2001) and Ahsan, et al., (2020), community-based disaster management is a practical method can be adopted by business owners

in Shah Alam. In this disaster management method, business owners themselves are the ones constituting the organisation. The newly start-up business owners are given the chance to learn from veteran business owners in tackling the flood damage in this organisation. Meanwhile, the veteran business owners can also exchange their opinion on dealing with flood freely. Through learning from each other, an optimum strategy for minimising flood damage can be developed and shared among the community. As been mentioned in Sutton, et al., (2006)'s textbook, the comprehensiveness of disaster preparedness is influenced by knowledge and experience. Hence, through actively involving in community-based disaster organisation's sessions, business owner with little experience in operating business in Shah Alam can also foster adequate techniques and strategies to minimise the damage of flood.

Furthermore, in Sub-chapter 4.3, the importance of drainage system in reducing flooding effect is highlighted when reviewing the industrial related sector recorded less damage of flood than other sectors. Although commercial area's drainage system is managed by authority, business owners still play an important role in maintaining the inlet around their premise and practise good solid waste management. Lamond, et al., (2012) place great emphasis on the correlation between behavioural dumping and urban flooding in Jakarta, Indonesia. As a known fact, Jakarta is a capital city with topographic elevation below sea level and equatorial climate. In this scenario, Shah Alam shares similar features of low topographic elevation and high rain intensity due to equatorial climate. Lamond's paper further elaborates that behavioural dumping of Indonesian reduces the drainage capacity in taking more rainfall which indirectly reduce the buffer time for Indonesian to respond against flood. Tingsanchali (2012) also reveals the economic contribution of solid waste management and the role of every citizen in protecting drainage from clogging. Thus, business owners in Shah Alam should practise good solid waste management to prevent drainage clogging.

Moreover, business owners in Shah Alam should emphasise the need for regular flood training exercise. This is because preparedness and response are the 2 independent variables that can reduce the impact of flood to business owner. According to Thieken, et al., (2007) and Rattanakanlaya et al., (2016),

the effectiveness of disaster preparedness and response can be increased through regular training. Sutton, et al., (2006) encourage the application of manoeuvre so that people can keep calm and mentally prepared when disaster takes place. In fact, Zanina (2021) unravels that most of the residents and business owners were ill-prepared and indifferent when the METMalaysia released the yellow warning of heavy downpour. This shows that most of the business owners have inadequate knowledge and risk awareness of the impact of flood to their business. Hence, regular flood training is necessary to be imposed.

4.10 Summary

All in all, the data is processed and analysed with SPSS. The status of hypotheses developed in line with the study objectives are summarised in Table 4.8 below. The denotation used in Table 4.8 is same as Equation 4.1

Table 4.8: Summary of hypotheses.

Hypothesis	Sig (2 tailed)		Result
	Kruskal-Wallis H Test	Pearson's correlation test (r value)	
The distribution of DV is same across categories of scale of business	0.530	-	Retain the hypothesis
The distribution of DV is same across categories of sector involved	0.017	-	Reject the hypothesis
The distribution of DV is same across categories of year of experience	0.000	-	Reject the hypothesis
The distribution of	0.578	-	Retain the

DV is same across categories of business entity			hypothesis
There is a relationship between IV1 and DV	-	0.000 (-0.549)	Retain the hypothesis with negative correlation
There is a relationship between IV2 and DV	-	0.000 (-0.382)	Retain the hypothesis with negative correlation
There is a relationship between IV3 and DV	-	0.000 (0.616)	Retain the hypothesis with positive correlation

The analyses' outcome is then discussed and used in providing appropriate recommendations in mitigating flood damage to business owner which outlined in this chapter too.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes and summarises the findings from the preceding chapters. Moreover, this chapter also includes the conclusion that relates to the objectives of this research. In the end, several recommendations for future study are outlined as well.

5.2 Conclusions

In this study, the aims are to investigate the relationship between impact of flood and flood preparedness, response and recovery of flood affected business owner in Shah Alam, to determine the factors influence flood damage and to provide recommendations based on the result obtained to business owners. All objectives are achieved and statistically proved in Chapter 4. The data collected fulfils the minimum requirement of this study which is 120 people of flood affected Shah Alam business owners. The demographic information of respondents is analysed descriptively and compared with government data to avoid bias of data.

After that, Kruskal-Wallis H test is used to determine 4 factors that potentially influence damage of flood to business owner. Among it, “Sector involved” and “Year of experience” are the 2 factors that will influence damage of flood to business owner. Health cares, plantation and industrial related sectors are the 3 sectors less influenced by flood, meanwhile, when the experience of operating business in Shah Alam exceeds 6 years, the influence of flood to business owner will also decrease.

Subsequently, reliability test, normality test and multicollinearity test are conducted to identify which inferential test to be adopted afterward. The data is proved to be statistically reliable as all variables’ Cronbach Alpha exceed the minimum requirement value, 0.7. In Skewness and Kurtosis normality tests, data is further verified to be distributed normally as absolute values of all variables’ Skewness and Kurtosis coefficients are less than 10 and

3 respectively. While in multicollinearity test, the VIF value of independent variables are all less than 10 to ensure that they are not inter-related. All of the tests show that the data fulfils the criteria of applying Pearson's correlation test in inferential analysis.

After performing Pearson's correlation test, it shows that the flood preparedness is negatively related to impact of flood to business owner in a moderate degree. While flood response is negatively related to impact of flood to business owner in weak degree. Lastly, flood recovery is positively related to impact of flood to business owner in a moderate degree. The significant p-value of the mentioned 3 hypotheses is 0.000 which less than 0.01, hence, these hypotheses are statistically proved. Furthermore, multiple linear regression is applied to express the relationship between dependent and independent variables in Equation 4.1. The coefficient of determination of the linear equation is 0.482. It means that only 48.2% of the dependent variable can be explained by the three independent variables linearly.

Last but not least, 3 recommendations cited from other researchers are outlined based on the analysis's result to business owner in Shah Alam. The recommendations are to establish and actively involved in community-based flood disaster management organisation, to practise good solid waste management and avoid behavioural dumping and lastly, to perform regular flood training exercise.

5.3 Recommendations of Study

A few recommendations that discovered are suggested at the end of this chapter. In order to further enhance the comprehensiveness of this type of topic, the short-listed recommendations can be implemented in future research.

To begin with, the target population can be further expanded from flood affected business owner to all of its stakeholders such as authorities. This is because flooding damage is a socio-economical affair involving parties from every societal aspect. Thus, it is feasible to investigate the flooding management strategy from the perspective of other relevant parties.

Next, the nature of survey can change to qualitative type questionnaire survey which including a short interview session after the respondents finish

filling open-ended type questionnaire, so that to a more accurate results can be obtained as respondents are given the chance to unravel any important information to the researcher. That aside, interview session also helps to enlighten the misunderstandings about the questions that come across in the questionnaire form.

Moreover, other inferential method such as probit regression, nonlinear regression can be used to determine the correlation between impact of flood and flood preparedness, response and recovery of flood affected business owner. This is because the relationship between these variables is not necessary to be linear. In this study, the multiple linear regression is just able to achieve coefficient of determination of 0.482. It means that the three independent variables can explain only 48.2% of the dependent variable. The remaining 51.8% is still unexplainable and may be explained by using other inferential method.

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APPENDICES

APPENDIX A: Survey's Questionnaire Form

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Universiti Tunku Abdul Rahman

Dear Respondents,

I am a student who pursuing Bachelor of Engineering (Honours) Civil Engineering from Universiti Tunku Abdul Rahman (UTAR), Sungai Long campus. I am currently doing my Final Year Project with title "**Flood preparedness, response and recovery of flood affected business owner in Shah Alam in 2021**".

This research aims to examine the relationship between the independent variables, preparedness, response and recovery, and the dependent variable, impact of flood in Shah Alam 2021 to business owner. For the purpose, I have prepared a very short survey, which will take you 3 to 4 minutes to complete.

The questionnaire consists of 3 sections. Section A is the general information or demographics of respondents, section B is about the measurement of three independent variables (preparedness, response, and recovery) and section C is the measurement of dependent variable that will contribute to research topic.

Finally, I would like to thank you for taking part in recruitment. Please read the instructions carefully before answering the question. The survey is completely anonymous, and your responses will be kept confidential and be used solely for academic purpose. If you have questions or concerns about your role and rights as a research respondent or would like to

obtain information or offer additional input, you may contact Hwang Ming Yuan. (Email: mingyuan120506@1utar.my)

Please select the appropriate answer by choosing (✓) only 1 (one) answer.

Are you a business owner in Shah Alam that are affected by the Shah Alam Flood 2021:

( ) Yes, please continue to fill up the form

( ) No, the survey is end, thank you.

Section A: General Information / Demographics

Please select the appropriate answer by choosing (✓) only 1 (one) answer.

1. Gender:

   ( ) Male

   ( ) Female

2. Ethnic:

   ( ) Chinese

   ( ) Indian

   ( ) Malay

   ( ) Bumi putera other than Malay

   ( ) Other

3. Scale of business

   ( ) Micro scale business (Sales turnover < RM 300, 000 or Employee <5)

   ( ) Small scale business (Sales turnover < RM 15, 000, 000 or Employee <75)

   ( ) Medium scale business (Sales turnover < RM 50, 000, 000 or Employee <200)

   ( ) Big scale business (Sales turnover > RM 50, 000, 000 or Employee >200)

4. Sector involved:

   ( ) Construction

( ) Consumer product and services
( ) Health cares
( ) Industrial products and services
( ) Plantation
( ) Property
( ) Telecommunication and media
( ) Other

5. Year of experience in owning business in Shah Alam:
   ( ) < 3 years
   ( ) 3 - 6 years
   ( ) 6 - 10 years
   ( ) > 10 years

6. Business entity:
   ( ) Sole proprietorship
   ( ) Partnership
   ( ) Limited liability partnership (LLP)
   ( ) Private limited company (Sdn. Bhd.)
   ( ) Public limited company (Bhd.)

Section B: Independent Variables

Please answer all the questions by selecting the number that best reflects your opinion about the statement. Select only 1 (one) answer for each question.

1 ─ Strongly Disagree (SD)
2 ─ Disagree (D)
3 ─ Neutral (N)
4 ─ Agree (A)
5 ─ Strongly Agree (SA)

Flood preparedness

Preparedness is capability of taking immediate response to deal with the disaster in an efficient and effective way, please select the answer based on how you prepared for the flood during Shah Alam Flood 2021.

No.	Statement	SD	D	N	A	SA
1	During the Shah Alam Flood 2021, I felt that my flood planning was practical in safeguard my business.	1	2	3	4	5
2	During the Shah Alam Flood 2021, I felt that I had taken sufficient flood management measure to secure my business.	1	2	3	4	5
3	During the Shah Alam Flood 2021, I had set up set of standards of command and control for business operation.	1	2	3	4	5
4	During the Shah Alam Flood 2021, I had developed emergency supply (ie. Emergency water, fuel, fund) for business to continue even after flood occurred.	1	2	3	4	5
5	During the Shah Alam Flood 2021, I had previously trained my employees to respond to flood.	1	2	3	4	5

Adapted from: Rattanakanlaya, K., Sukonthasarn, A., Wangsrikhun, S. and Chanprasit, C., 2016. A survey of flood disaster preparedness among hospitals in the central region of Thailand. *Australasian emergency nursing journal*, *19*(4), pp.191-197.

Flood response

Flood response is the aggregates of the decision and reaction made by the individual to safeguard life and property during disastrous event, please select

the answer based on how you respond to the flood during Shah Alam Flood 2021.

No.	Statement	SD	D	N	A	SA
1	During the Shah Alam Flood 2021, I was able to make use of flood info services provided by government to protect my business.	1	2	3	4	5
2	During the Shah Alam Flood 2021, I was able to make proper emergency decision to protect my business once flood happened.	1	2	3	4	5
3	During the Shah Alam Flood 2021, I was able to safeguard business's valuables from flood.	1	2	3	4	5
4	During the Shah Alam Flood 2021, I was able to protect business's premise against inflowing water	1	2	3	4	5

Adapted From: Thieken, A.H., Kreibich, H., Müller, M. and Merz, B., 2007. Coping with floods: preparedness, response and recovery of flood-affected residents in Germany in 2002. *Hydrological Sciences Journal*, *52*(5), pp.1016-1037.

Flood recovery

Flood recovery of a business is a comprehensive rehabilitation of an organisation to sustain the continuity of a business during the flood and immediate afterwards. Upon Shah Alam Flood 2021, please select the answer based on your business recovery plan.

No.	Statement	SD	D	N	A	SA
1	Since Shah Alam Flood 2021, I was able to receive materials, utilities, and services immediately for my business to continue.	1	2	3	4	5

2	Since Shah Alam Flood 2021, I was able to come out with measure and resource to resume my business from its impact.	1	2	3	4	5
3	Since Shah Alam Flood 2021, I was familiar with flood relief application provided by government.	1	2	3	4	5
4	Since Shah Alam Flood 2021, I was acquainted in claiming flood recovery fund from insurance or any financial assistance organisation.	1	2	3	4	5

Adapted From: Lee, J., 2019. Business recovery from hurricane Harvey. International journal of disaster risk reduction, 34, pp.305-315.

Section C: Dependent Variable

Impact of flood to business in Shah Alam Flood 2021

Upon Shah Alam Flood 2021, please select the answer based on the flood impact to your business.

No.	Statement	SD	D	N	A	SA
1	Upon Shah Alam Flood 2021, my business's utilities (ie. Water, electricity, internet access) are seriously damaged.	1	2	3	4	5
2	Upon Shah Alam Flood 2021, my business's chain of supply is seriously disrupted.	1	2	3	4	5
3	Upon Shah Alam Flood 2021, my business's sales turnover is adversely affected.	1	2	3	4	5
4	Upon Shah Alam Flood 2021, my business's assets (ie. Machineries, shelf items) are lost or damaged.	1	2	3	4	5

5	Upon Shah Alam Flood 2021, my business's labour resource is disrupted.	1	2	3	4	5

Adapted From: Asgary, A., Anjum, M.I. and Azimi, N., 2012. Disaster recovery and business continuity after the 2010 flood in Pakistan: Case of small businesses. *International journal of disaster risk reduction, 2*, pp.46-56.

Finally, I would like to thank you for taking part in this survey. The survey is completely anonymous, and your responses will be kept confidential and be used solely for academic purpose.