MINISTRY OF ECONOMY
DEPARTMENT OF STATISTICS MALAYSIA

The Impacts of Losses and Damages by Floods: A Case Study in Klang, Selangor

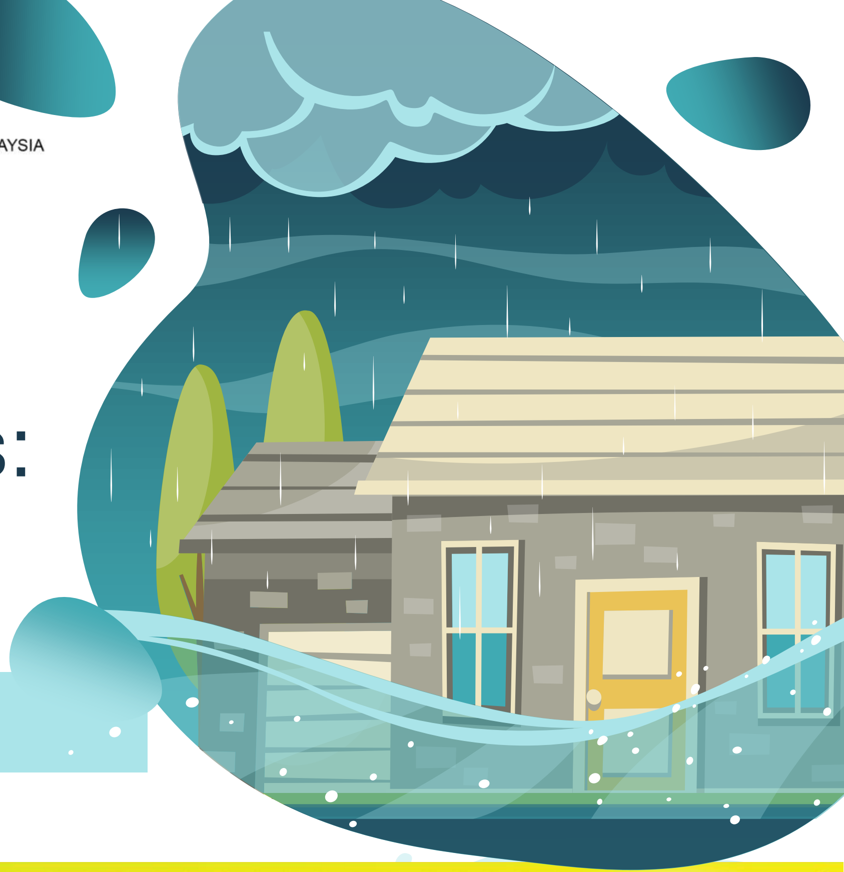

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Table of contents

Introduction

According to EM-DAT (2020), hundreds of disasters have been recorded, resulting in 11,755 deaths, affecting 95 million people, and causing US$ 103 billion in economic losses globally.

Huggel et al. (2015) emphasize that accurate information on disaster events is essential for developing effective policies and actions to reduce future risks.

Economic losses and damages are increasing worldwide, with growing exposure identified as a key factor driving this rise.

The floods in Klang completely paralyzed the local economy, and most of the road network became impassable for light vehicles.

Flash floods are common in Malaysia's capital, occurring multiple times each year. The city sits in a valley within the river basin of the Klang and Gombak rivers.

At the end of 2021, massive floods hit all districts of Klang, with the area suffering severe damage and significant property loss.

Dulawan et al. (2024) found that in Metro Manila, the decision to stay in flood-prone areas is influenced by factors such as attachment to homes, acclimatization to the environment, convenient access to amenities, livelihood dependence, economic concerns, home ownership, and the perceived safety from floods.

Introduction

Losses from disasters are typically reported as direct losses, referring to damages to physical property and infrastructure caused by floodwaters (Hammond, Chen, Djordjevic, Butler, & Mark, 2015).

Urban areas are highly vulnerable to small but frequent climatic and hazardous events. A sudden flash flood can quickly disrupt the daily routines of the city and its residents.

The field experience suggests that the residents of flood-prone areas moved to safer part of city and outside of city, but returned to their original place as soon as floodwaters were gone, when the region was hit by a historic flood disaster in the beginning of September 2014 (Wani et al., 2022)

Multiple aspects of the productive sector can be shut down or interrupted, and a significant number of assets can be at risk as well.

Increasing flood risk, exposure, and damage potential are contributing to higher levels of poverty and vulnerability. The yearly recurrence of floods has compelled residents to prepare in advance, enabling them to recover more quickly and return to their daily routines.

Safiah Yusmah et. al. (2020) showed that the participants are well aware of the causes of the vulnerability faced by them due to the flooding event.

Flash flood event can also lead to severe destruction and damage, to the particularly affecting the more vulnerable segments of the population and their assets.

This study is limited to the flood effect assessment towards the economic aspect by evaluating the level of loss faced by the individuals in Klang, Selangor.

Methodology

This study was conducted based on primary data collected through face-to-face interviews from 10th to 14th January 2022.

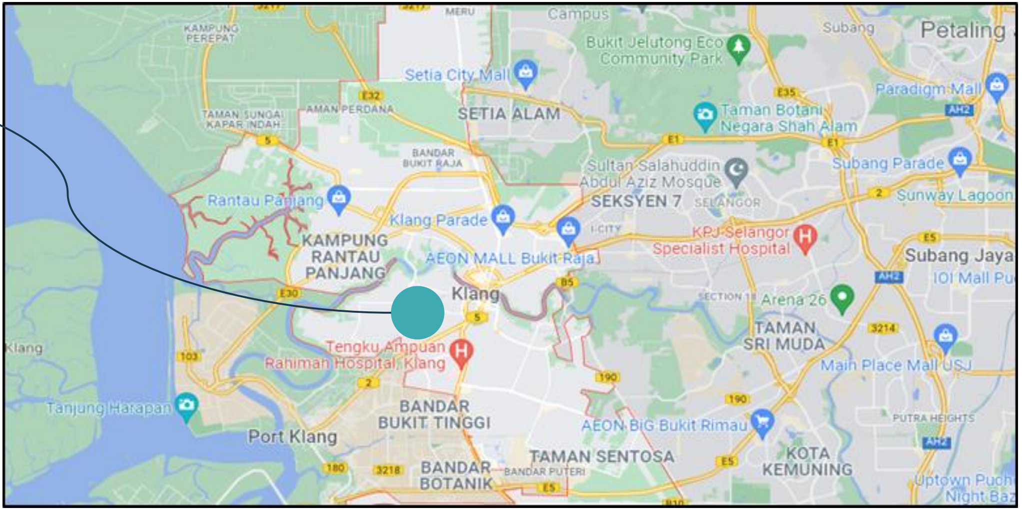
Direct face-to-face interviews are the most commonly used approach in contingent valuation studies (Carson et al., 2001; Carson et al., 1996).

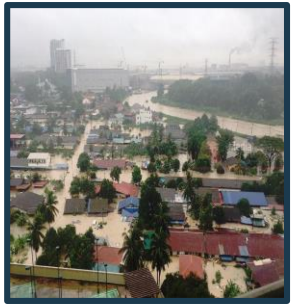
This study utilised both used descriptive and regression analysis to identify the relationship between the level willingness of the respondent living in house with losses and various physical and socioeconomic variables.

This is a map

Location

This survey is conducted to measure the impact of floods in terms of categories of damages as well as the value of damages and losses for affected areas. Klang is an administrative district located in Selangor.





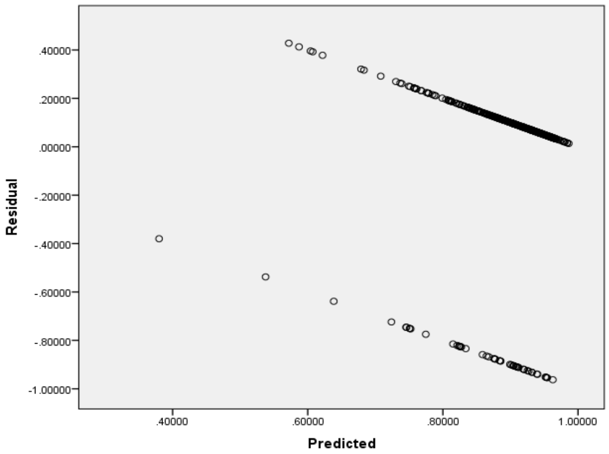
Result

Variable		Percentage, %
Gender	(1) Male	72.3
	(2) Female	27.7
Ethnic	(1) Malay	51.7
	(2) Chinese	14.4
	(3) Indian	32.1
	(4) Others	1.8
Type of Living Quarters (LQ)	(1) Rumah Sesebuah	3.4
	(2) Rumah Berkembar	0.4
	(3) Rumah Teres/ Berangkai	0.4
	(4) Rumah Berkelompok	0.6
	(5) Town House	62.3
	(6) Rumah Kedai/ Pejabat	2.6
	(7) Rumah Pangsa	9.7
	(8) Apartment	20.7
Duration of Occupancy in Living Quarters	(1) Less than 1 year	5.3
	(2) 1-3 years	12.8
	(3) 4-6 years	11.8
	(4) 7-9 years	7.7
	(5) More than 9 years	62.3
Type of House Building Materials	(1) Concrete	86.8
	(2) Wood	3.2
	(3) Mix (Concrete & Wood)	10.1
Distance between House and River	(1) 0 – 2 km	63.9
	(2) 2.1 – 5 km	21.3
	(3) 5.1 – 10 km	9.1
	(4) More than 10.0 km	5.7
Occurrence of Floods	(1) None	45.8
	(2) 1 time	12.6
	(3) 2 times	4.9
	(4) 3 times	16.2
	(5) 4 times and above	20.5
Willingness Living in House	(1) No	10.1
	(2) Yes	89.9

Type of Estimates Losses	Average (RM)
Structure of Living Quarters	7,627
Equipment, Furniture, Clothes, Electrical Appliances	7,134
Livestock/ Agriculture	1,693
Vehicles	5,355
Post-Floods Clean-Up	1,179
Overall Losses	14,058

Result

Diagnostic Residual Plots



Binary Logistic Regression

The Full Model

$$\log\left[\frac{P(Y=1)}{1-P(Y=1)}\right]=z$$

where,

$P(Y=1)$ is the probability that the respondent has willingness living in house,

$$z = 0.958 + 0.000094(Income) + 0.703(Duration_2) + 1.041(Duration_3) - 1.203(Duration_4) + 1.605(Duration_5) - 1.027(Material_2) - 0.714(Material_3) + 0.491(Occurance_2) - 0.385(Occurance_3) + 0.077(Occurance_4) - 0.072(Occurance_5) + 0.000001(Loss) - 0.000181(CleanUp) - 0.332(Distance_2) - 0.078(Distance_3) - 0.264(Distance_4)$$

The Reduce Model

Below is the reduce estimated logistics regression model:

$$\log\left[\frac{P(Y=1)}{1-P(Y=1)}\right]=z$$

where,

$P(Y=1)$ is the probability that the respondent has willingness living in house,

$$z = 0.000094(Income) + 0.703(Duration_2) + 1.605(Duration_5) - 1.027(Material_2) - 0.000181(CleanUp)$$

Result

Likelihood Ratio Test of Reduce Model Coefficients

	Chi-Square	df	p-value
Step	21.986	16	0.144
Model	21.986	16	0.144

Reduce Model of Fit

-2 Log Likelihood	Cox & Snell R Square	Nagelkerke R Square
308.965	0.042	0.089

The Hosmer-Lemeshow Test

Chi-Square	df	p-value
7.684	8	0.465

Classification Table

Observed		Predicted		
		Willingness Living in House		Percentage Correct
		No	Yes	
Willingness Living in House	No	1	50	2.0
	Yes	0	456	100.0
Overall Percentage				90.1

The Final Model

Variable	B	S.E.	Wald	p-value	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Income	0.000094	0.000075	1.595	0.207	1.000	1.000	1.000
Duration			10.838	0.028			
Duration(2)	0.703	0.592	1.412	0.235	2.020	0.633	6.440
Duration(3)	1.041	0.618	2.843	0.092	2.833	0.844	9.507
Duration(4)	1.203	0.725	2.752	0.097	3.330	0.804	13.794
Duration(5)	1.605	0.533	9.076	0.003	4.977	1.752	14.139
Material			4.180	0.124			
Material(2)	-1.027	0.693	2.198	0.138	0.358	0.092	1.392
Material(3)	-0.714	0.449	2.527	0.112	0.490	0.203	1.181
Occurance			1.321	0.858			
Occurance(2)	0.491	0.571	0.739	0.390	1.634	0.533	5.007
Occurance(3)	-0.385	0.680	0.321	0.571	0.680	0.179	2.580
Occurance(4)	0.077	0.473	0.027	0.870	1.080	0.428	2.731
Occurance(5)	-0.072	0.391	0.034	0.854	0.930	0.432	2.004
Losses	0.000001	0.000004	0.118	0.732	1.000	1.000	1.000
Clean-up	-0.000181	0.00009	4.092	0.043	0.9998	0.9996	0.9999
Distance			0.875	0.832			
Distance(2)	-0.332	0.371	0.800	0.371	0.717	0.346	1.485
Distance(3)	-0.078	0.573	0.019	0.891	0.925	0.301	2.841
Distance(4)	-0.264	0.671	0.155	0.694	0.768	0.206	2.860
Constant	0.958	0.601	3.192	0.074	2.606		

Discussion

This study identified the impact of flash flood events in Klang City through estimating the losses and damages due to flash floods.

Based on the interview session, most of respondents willing to live in the house even though has risk of flood due to the difficult in finding another house, own house, rented house, financial factors, close to work, basic facilities and family.

With reference to study of flash floods in Kuala Lumpur by Bhuiyan et al. (2018), although in a separate time frame, the numbers of fluvial flash flood days are much lower as compared to the drainage related flash flood days.

As both kinds of flash floods usually hit several parts of the city within a particular day, the numbers of affected locations are much bigger than the flash flood affected days.

The most common and highly affected elements by both types of flash foods are roads and highways, houses, and vehicles.

The number of affected vehicles is difficult to express in an exact figure in terms of fluvial flash flood. It is because, there are several incidents where the data set mentioned phrases like ‘several cars affected’, ‘several cars involved’ and ‘cars affected’.

It is important for disaster managers and risk communicators to consider social aspects of flooding to address planning and communication gaps (Wani et al., 2022)

Bari et al. (2021) shows that there are records of big floods occurring in Kajang during the years 1971, 1987, and 2011.

Discussion

Flash floods are also common with evidence of submerging houses along rivers up to the roof level (Muhamad, 2017).

In Kajang, the event in December 2011 caused damages with an estimated value of RM2.4 million. Furthermore, at least three incidences were reported in 2014 causing losses estimated at approximately RM150,000 per event (Muhamad, 2017).

When selecting a place to live, residents often prioritize daily economic concerns over potential flood risks. In Kajang, most settlements and economic activities are concentrated along the Jelok River (Muhamad, 2016).

The study assessed the level of losses experienced by traders in Kuala Krai due to the 2014 flood, identifying the highest business property losses and examining the relationship between the type of business and the extent of losses faced by the traders.

Nayan et al. (2017) found that traders in Kuala Krai suffered significant damage and losses during the 2014 flood, particularly those in the retail business. This was largely due to the extensive destruction of sale items and damage to premises, stalls, and kiosks.

Safiah Yusmah et al. (2020) highlighted several reasons for the flood occurrence, including the area's demography, the location of houses, improper and inaccurate information and evacuation plans, poor management of transit centers, and a lack of community preparedness.

The study in Kuantan, Pahang, noted that participants believed poor dissemination of early warning information and inadequate flood control infrastructure from the government and related agencies left victims with insufficient time to prepare for emergencies, ultimately slowing the recovery process (Safiah Yusmah et al., 2020).

Conclusion

This study has highlighted the significant impact of floods on the community in Klang, Selangor, particularly in terms of economic losses, infrastructural damages, and social disruptions.

The findings underscore the urgent need for more robust flood management systems and targeted policies aimed at reducing flood risks and enhancing the resilience of vulnerable areas.

To address these challenges, it is imperative that local authorities, policy makers, and stakeholders collaborate to implement sustainable flood management strategies.

Overall, this study contributes to a basic understanding of the flood impacts in Klang and provides actionable insights that can inform future flood mitigation efforts.

Acknowledgement

I would also like to extend my thanks to the Department of Statistics Malaysia, local authorities in Klang, Selangor and DOSM Selangor for their assistance in data collection and resources that made this study possible.

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Thanks

Do you have any questions?
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