Community-Based Flood Risk Management: Empowering Local Responses: A Case Study in Meru, Klang

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Abstract

With an expansive flood-prone region, effectively managing risks, particularly those impacting residents in flood-prone communities, poses a significant challenge for Malaysia. Regular in-depth studies are essential to enable the country to anticipate and comprehend the emerging risks that capable of causing both loss of life and damage to properties and public infrastructure. This research aimed to investigate the dynamics of flood risk management and present recommendations for stakeholders in mitigating the consequences of flood events. Employing a qualitative approach, 13 participants, all flood victims residing in Meru, Klang, were purposefully selected. The participants were divided into two groups: the first group, comprising 5 participants, engaged in a focus group interview, while the second group, consisting of 8 participants, responded to open-ended questions. Both groups answered identical structured questions in both oral and written formats. Thematic Analysis (TA) was applied to analyse the data from these exercises. The findings revealed that flood risk management comprises four components: psychological risk, improper development risk, evacuation risk, and communal risk. The study recommends the implementation of a comprehensive flood mitigation plan covering pre-, during, and post-flood phases to address the specific requirements arising during flood events. It is hoped that this research contributes valuable insights to augment the existing flood management system, benefiting not only the victims but also all stakeholders involved in managing the impacts of flood events.

Keywords: flood-prone communities, risk management, flood management, Thematic Analysis

1. Introduction

Due to the impacts of climate change, Asia has witnessed over $157 billion in losses and numerous casualties from natural disasters. These events have caused significant economic hardships in the region, and one of the primary threats to the sustainable progress of nations is floods. For instance, in Malaysia, which has a flood-prone region covering 29 000 square kilometres, major flooding events have resulted in an annual economic loss of $298.98 million and have affected over 4.82 million people (Chan, 2012; Othman et al., 2022).

In Malaysia, floods can be classified into two major categories: 'normal floods' and 'major floods.' 'Normal floods' typically occur during the seasonal monsoon period from November to March and usually stay within the stilt height of traditional Malay houses. Consequently, those residing in stilt houses in rural areas have adapted well to coping with normal floods. It is the 'major floods,' on the other hand, that prove to be exceptionally challenging. These are considered 'unusual' or 'extreme' events and stem from the same seasonal monsoon rains, albeit statistically occurring only once every few years. Major floods are characterised by their extensive, severe, and unpredictable nature, resulting in significant loss of life, damage to crops, livestock, property, and public infrastructure (Chan, 2012). Malaysia's historical archives document a significant history of major flood occurrences. For example, in 2014, an astounding 200 000 individuals were compelled to evacuate in the face of major floods that impacted several states in Peninsular Malaysia, with notable effects seen in Kelantan, Terengganu, and Pahang (Rahman et al., 2018). More recently, in 2021, Selangor witnessed a major flood incident that tragically resulted in 17 reported casualties (Berita Harian, December 21, 2021).

Flood management presents a multifaceted and formidable challenge, particularly in flood-prone nations. In the

context of Malaysia, Flood Risk Management (FRM) is viewed as a government-centric endeavour. Here, strategies for disaster mitigation are formulated at the highest levels of governance before being disseminated for on-ground implementation and execution. Whenever a flood disaster strikes, the Malaysian government promptly declares a state of emergency across the impacted regions, dispatching teams of rescue personnel and aid workers to actively participate in relief operations (Rosmadi et al., 2023).

While Malaysia is widely regarded as proficient in flood disaster management, there remain several concealed challenges that demand urgent attention. These challenges primarily revolve around communication and coordination, manpower and resource allocation, public awareness, and the authority vested in local governing bodies (Mahbawi et al., 2020; Rosmadi et al., 2023). Furthermore, there is an imperative need for an in-depth examination of the risks faced by various segments of the population, particularly those who are most vulnerable and disadvantaged [Community Relations Division (CRD) of the ASEAN Secretariat, 2021]. Conducting comprehensive risk assessments for specific groups, encompassing aspects such as psychological, communication, societal factors, and perceptions, is essential for understanding the gravity of their exposure and guiding them through effective risk management strategies.

Thus, this study aims to identify characteristics of flood risk management experienced by the selected communities and to examine the activities taken by stakeholders as part of the process to provide a suitable framework of risk management that should be implemented in the context of communities with the following research objectives and research questions:

1.1 Research Objectives

- To explore the characteristics of flood risk management experienced by the flood-prone communities in Meru, Klang.

- To provide a suggestion of risk management should be taken by the flood-prone communities in Meru, Klang.

1.2　Research Questions

The research questions in this study are:

- What are the flood risk management characteristics experienced by the flood-prone communities in Meru, Klang?

- What is the best suggestion of risk management should be taken by the flood-prone communities in Meru Klang?

2. Literature Review

Malaysia is no stranger to the challenges posed by flooding, with numerous flood-prone communities grappling with recurrent inundations. The effective management of flood risks in these communities is paramount to safeguard lives, property, and the overall socio-economic well-being of the nation. This literature review delves into the key aspects of risk management in flood-prone communities in Malaysia, shedding light on the prevailing strategies, challenges, and future prospects.

The flood management system in Malaysia follows a structured framework comprising three key phases: pre-flood, during-flood, and post-flood. This organisational approach aligns seamlessly with the Total Safety Management (TSM) model, which also consists of three essential phases focusing on safety and health—namely, plan and preparation, identification and assessment, and development and sustainability (Yusof, 2016). Before the floods, the Standard Operating Procedure (SOP) is based on the Malaysian National Security Council (NSC) directive orders to agencies such as Department of Irrigation and Drainage (DID), Public Works Department (JKR), Department of Meteorology and Local Authorities (PBT), which includes two steps, structured and unstructured measurements. The structured procedures involve frequent monitoring of the dams and dykes to control the flood flows, while the unstructured measurements involve activities such as land use planning and flood forecasting and warning systems to mitigate the effects of floods (Chan, 2012; Shafiai & Khalid, 2016).

The management during the flood is also guided by the NSC Directive 20. During this stage, the primary focus will be on assisting victims in evacuating their homes and relocating them to designated evacuation centres. The rescue agencies involved in the evacuation process are the Special Search and Rescue Team Malaysia (SMART), the Royal Malaysian Police (PDRM), the Malaysian Fire and Rescue Department (BOMBA), the Malaysian Armed Forces (ATM) and the Civil Defences Department (JPAM). After the evacuees arrive at the evacuation centre, agencies such as the Social Welfare Department (JKM), People's Volunteer Corps (RELA), the Malaysian Red Crescent (PBSM) and the Ministry of Health (KKM) will take over the tasks of aiding in terms of materials,

psychological and spiritual.

Post-flood management will engage JKM in aiding victims to regain their normal routines. The department will provide immediate relief, including food and essential supplies, to sustain them for several days. Long-term assistance will take the form of monetary aid distributed according to the National Disaster Committee (JPBP) guidelines.

Several factors influence the nature of flood risk management that communities face, including social, physical, and institutional elements (Tyler et al., 2019). These factors influence a community's flood risk and resilience. Zahari and Raja Ariffin (2013) pointed out that communication breakdowns pose formidable challenges during various stages of flood response, including evacuating flood victims, managing evacuation centres, and coordinating post-disaster relief operations. The ability of a community to withstand flooding is heavily dependent on vulnerability factors (Isa et al., 2018). As a result of new flood control developments, it is now more important than ever for flood-prone communities to assess their vulnerability and take preventative measures to build flood resilience (Rollason et al., 2018). Furthermore, post-flood risk management and resilience building are heavily reliant on flood risk management practises implemented by communities, governments, and organisations (Munawar et al., 2021).

A significant challenge emerges in the form of post-psychological trauma experienced by the victims. As underscored by Mustaffa and Khalid (2021), the major flood of 2014, particularly affecting the east coast states of Peninsular Malaysia, revealed enduring effects on the psychological well-being of informants who were also the flood victims. The study highlighted that stress, sadness, and anxiety persist as elements of negative psychological well-being, even six years after the event. The enduring psychological challenges identified by Mustaffa and Khalid following the 2014 floods in Malaysia exemplify a larger, widespread concern. Around the world, floods significantly impact mental health, frequently resulting in an increase in mental disorders among those affected. This trend is evident in the common occurrence of post-traumatic stress disorder (PTSD), depression, anxiety, and sleep disorders following such natural disasters (Kalashnikov et al., 2023)

Effective community flood risk management entails accurately defining flood risks and implementing cost-effective, long-term, socially and environmentally responsible measures to reduce community flood risks and increase resilience to future flood disasters (Tyler et al., 2021). Flood risk is caused by flood hazard, vulnerability, and exposure, and a thorough understanding of flooding and flood risk management is required for effective collaboration between flood risk management authorities and communities (Abdel-Mooty et al., 2022; Mehring et al., 2021). The trend in flood risk management is shifting from the traditional objective approach to an integrated approach that incorporates social aspects and community preparedness into community knowledge (Ahadzie et al., 2016).

Furthermore, the incorporation of community/local knowledge is critical to ensuring that local flood risk maps contain essential local information and knowledge for local understanding, reducing ineffective national assumptions (Percival et al., 2020).

The pervasive problem of improper development plan observed in numerous Malaysian cities has significantly increased the vulnerability of suburban areas to flooding. Ramli et al. (2023) highlighted the detrimental impact of 'pocket development;' a large-scale development undertaken within a confined or limited area in suburban areas, particularly in Kajang, Selangor, where it has led to drainage system issues and subsequent flash flood disasters. It underscores the pressing need for resilient urban planning.

The management of flood risks in Malaysia is a multifaceted endeavour that requires the concerted efforts of government agencies, local authorities, communities, and researchers. While significant progress has been made in recent years, addressing the evolving challenges posed by climate change and urbanization remains a priority. By adopting a proactive, community-centred, and adaptive approach, Malaysia can continue to enhance its flood risk management strategies and protect its flood-prone communities.

3. Methodology

This research utilised a qualitative study design aimed at empowering the local community to identify issues pertinent to their context and explore potential solutions. To accomplish this objective, phenomenological techniques, a component of qualitative research methodology, were employed to gather data. Subsequently, the collected data underwent analysis using the Thematic Analysis (TA) model developed by Braun and Clarke (2012) to uncover insights addressing the research questions posed in this study.

3.1 Site

The study focused on the communities residing in Meru, Klang, a town situated to the east of North Klang in

Selangor. Klang experiences a tropical monsoon climate characterized by consistent heavy rainfall throughout the year (Meteoblue, 10 April 2023). Due to rapid urban development, Meru has been consistently susceptible to flash floods and monsoon-related inundations on an annual basis (The Star, 10 November 2022). The most severe of these incidents occurred in 2021, resulting in numerous individuals being stranded, with some unable to return home and having to seek shelter in patrol stations and budget hotels. Additionally, the primary roadway connecting the town to major cities such as Klang and Shah Alam was submerged under two to three meters of water during this event (Harian Metro, 18 December 2021).

The recurrent incidence of flash floods has left members of these communities traumatized and weary. Repeated evacuations from their homes, coupled with the financial losses amounting to thousands of Ringgits due to flood-related damages, have eroded their confidence in local authorities (Astro Awani, 12 November 2022).

3.2 Research Participants and Data Collections

A total of 13 participants actively engaged in the focus group session and provided responses to the open-ended questions. Participants were chosen using the purposive sampling technique based on the following criteria: a) residency in Meru, Klang; and b) having encountered a major flood event at least once. In adherence to established data trustworthiness protocols, as outlined by Shenton (2004), which advocate for data collection diversity, the participants were allocated into two distinct groups: one comprising five individuals for the focus group interview, and the other composed of eight participants tasked with completing nine structured open-ended questions. Notably, the questions posed during the focus group interview are similar to those designed for the open-ended questions. Table 1 below explains the details:

Table 1. Research Participants

Groups	Participants		Ages	Total
	Male	Female		
Focus group	2	3	16 – 51 years old	5
Open-ended questions	1	7	38 – 57 years old	8
Total				13

The feedback from participants was recorded and carefully transcribed into the transcript verbatim for further analysis.

3.3 Ethical Consideration

Every participant willingly provided their consent to take part in the interview. Each participant was assigned a unique code name during the research report's preparation phase. Transcriptions and records were meticulously encrypted and stored in a secure file.

3.4 Data Analysis

The data obtained from both exercises underwent analysis using the TA method. This choice aligns with the research questions' objectives for this study. TA involves six iterative and reflective processes (Nowell et al., 2017). These six processes encompass: first, familiarisation; second, generating initial codes; third, identifying themes; fourth, reviewing the themes; fifth, defining and naming the themes; and finally, the sixth phase involves composing reports.

To fulfill the criteria of trustworthiness such as credibility, transferability, dependability, and confirmability as suggested by Lincoln and Guba (1985), Table 2 higlights the process of addressing the trustworthiness criteria during each phase of TA.

Table 2. Establishing Trustworthiness During Each Phase of TA

Phases of TA	Means of Establishing Trustwothiness
Phase 1: Familiarisation	Prolong engagement with data
	Store raw data in well-organised archives
Phase 2: Generating initial codes	Researcher triangulation
	Audit trail of code generation
	Documentation of all team meetings

Phase 3: Identifying themes	Rsearcher triangulation
	Diagramming to make sense of theme connections
	Documentation
Phase 4: Reviewing the themes	Researcher triangulation
	Themes vetted by an expert
Phase 5: Defining and naming the themes	Researcher triangulation
	Team consensus on themes
	Documentation
Phase 6: Composing reports	Final checking
	Report on reasons for analytical choices throughout the entire study

4. Research Findings

The data was analysed for the focus group interview and the open-ended questions. For the focus group interview, there were 5 participants involved, and for the open-ended questions, 8 participants were involved in giving their thoughts over 9 different open-ended questions. Tables 3 and 4 below summarise the participants' background:

Table 3. Background of Participants (Focus Group Interview)

Participants' identifications	Alias	Gender	Age
Informant 1	IN1	Female	26
Informant 2	IN2	Female	51
Informant 3	IN3	Female	16
Informant 4	IN4	Male	24
Informant 5	IN5	Male	22

Table 4. Background of Participants (Open-ended Questions)

Participants' identifications	Alias	Gender	Age
Participant 1	P1	Female	57
Participant 2	P2	Female	38
Participant 3	P3	Female	53
Participant 4	P4	Female	57
Participant 5	P5	Male	44
Participant 6	P6	Female	44
Participant 7	P7	Female	53
Participant 8	P8	Female	55

The audio recorded and transcribed verbatim from the focus group interview session and the responses from open-ended questions were analysed by the TA method. The process began with the researchers familiarising the data by listening to the recorded audio and reading the transcribed verbatim and the written responses multiple times to understand the content of the conversations.

The second phase of the TA method involves generating initial codes from transcribed verbatim data and written responses pertinent to the research questions. For this reason, each team member was given copies of the transcribed verbatim and the written responses to identifying the codes. The analysis was conducted by identifying recurring patterns in responses from both data collection techniques that have assisted the researchers in the assignment of appropriate code names. After a thorough discussion, several codes were constructed, and the codes for the first research question (***To explore the characteristics of flood risk management experienced by the flood-prone communities in Meru, Klang***) are:

Angry. This code was formulated in response to a statement from one of the participants during a focus group interview. When asked about her emotions during the recurrent major flood events in Meru, Klang, she provided a brief yet comprehensible response. Her statement is presented below:

More to angry (IN1)

P6 gave the same response in her written answer to the second open-ended question. She stated:

Feelings of sadness and anger

Sad. This feeling was highlighted by a few participants in the focus group interview, and it was written by a few participants when they answered the second open-ended question. To illustrate, IN2 and IN5 articulated the following statements:

It's sad. I do cry, actually. I cry… when especially when there's a big flood, yeah, I do cry (IN2)

I'm more on the sad side, especially when there was that one major flood. During that time, I couldn't do anything because I was continuing my studies. I couldn't go back home and see my family. So, I could only check in on them by phone (IN5)

P8 and P6 gave the written answers. Their answers were recorded below:

I feel tearful because I couldn't save my belongings (inside and outside of the house) I lost my car and motorcycle too (P8)

Feeling sad and upset (P6)

Anxious and worried. The sudden and unpredicted flood has caused so much trauma to the victims. IN4 has shared his experience during the flood:

I was quite anxious at that time because it was around 2-3 in the morning, and we weren't prepared for anything. Suddenly, we had to find a hotel, and many roads were closed. So, there was a feeling of fear and I feel like it wasn't safe at that moment (IN4)

P5 and P7 have described their feelings as follows:

Feelings of anxiety and trembling when facing the flood to save oneself and reach a safe place (P5)

Feelings of anxiety and disorderly (P7)

Drainage system and improper development plan. This code was formulated in response to statements made by IN2 and other participants (open-ended questions) who were asked about the factors underlying the occurrence of flash flood events in Meru, Klang.

More towards development and drainage because I have been living here since 1997. There weren't many houses back then, but as time goes by, more and more houses are being built, and the drainage system is not well-maintained. If you look at the ditch, it's full of trash, overgrown with tall grass, and so on. These are some of the main reasons why the water can't flow properly (IN2)

The drainage system and also uncontrolled development (P2)

An unplanned drainage system. Excessive development but the drainage system is not done correctly and as planned (P3)

A blocked and narrow drainage system while the population is increasing (P4)

Solid waste management. Improper garbage or waste management is one of the primary factors contributing to issues in the drainage system of Meru. The indiscriminate disposal of garbage into the drains has led to clogs and obstructed water flow, particularly during heavy rains, resulting in flash floods within the Meru area.

What's more with Meru, there are many industrial areas. Moreover, foreign workers also come here to work in the factories. So, that also contributes to the water drainage issue. The ditches in Meru can get clogged due to waste (IN5)

I think it is because of the residents' behaviour in this area might also contribute to the flooding issue. In Meru, there is a lot of litter in the ditches. Some people just throw their garbage into the ditches as they please, and it's left there for a long time, causing the ditches to become blocked (IN3)

From the written respond:

The disposal of garbage and waste is scattered and thrown into the drain (P8)

The drainage system is not maintained and is filled with garbage (P7)

During the flood. The code elucidated the initial reaction of participants upon realising that floodwaters had entered their homes. Both groups exhibited a comparable sequence of actions in response to the flood, as evident from the feedback and reactions. The first thing they will do is safeguarding their valuable possessions by elevating them and inspecting electrical appliances. A selection of these responses is detailed below:

First, make sure to move valuable items to a safe place. Second, I also have to move my car to a higher location (IN2)

Of course, the first one is the car and the second one is I'll make sure there are no open switches and electrical current because I'm afraid there might be submerged extensions (IN4)

Tidy up the important documents and store all of them (P4)

First action could be to move all important things on a higher ground and unplug all electrical items (P2)

Evacuate the homes. After ensuring all-important items were placed on higher ground, the subsequent step will involve evacuating the homes to seek shelter.

The third one is to save yourself. Usually, when the water starts entering the house, we will think about where to go for safety. Typically, we will stay at the nearest hotel to ensure our safety (IN2)

Unfortunately, we cannot use the toilet and not only the toilet we cannot even perform prayer. So, we really need to leave the house. All the facilities are completely unusable (IN2)

Ready to move to the evacuation centre (P4)

Troubles/difficulties during the floods. During the flood because the water could not move anywhere for several days, it caused difficulties for the residents to move because many roads were closed.

The water doesn't recede and still the water doesn't move within 2 to 3 days. We can't even start cleaning, just waiting for when it will recede (IN1)

To access like getting in and out of the flood area. We still need to think about where to run to. We also need to think about where to stay temporarily, and we need to see which areas are currently flooded. So, it's like that (IN5)

The main entrance is closed (P3)

Our movement is extremely limited (P5)

Other issues. Participants from both study groups brought attention to various flood-related concerns. While some issues, such as food shortages and property damage, were common, one particularly intriguing revelation was the emotional instability experienced by victims. This emotional turmoil gave rise to various problems, including disputes among neighbours and more.

I think the main problem is more about everyone's emotions. As IN2 said, the toilet cannot be used. IN1 also said, the water doesn't recede, she seems to feel disappointed, like giving up. When the feeling is like that, people will become more sensitive. So, yeah, you can't do anything and the harder I feel is at that time (IN4)

These emotions are not just within the family; these emotions also involve our neighbours. When going in and out, the water starts surging, and it enters the houses so the community will become heated. Everyone becomes selfish at that time (IN2)

Issues of personal safety and property as well as food and accommodation (P8)

Getting food supplies (P5)

Cleaning the house after the flood (P7)

Damage items such as furniture, electrical appliances, and so on (P1)

The third phase of the proses is searching for the themes. In this phase, the constructed codes were analysed and arranged in a consistent pattern to form a variety of themes.

From the second phase, 9 initial codes were constructed. The codes then were analysed, and similar codes were grouped under one theme. The researchers initiated the process by creating a diagram to decipher the codes and establish connections between themes. Through this process, four different themes were formulated. The themes are:

Psychological risk. The theme was formulated from the combination of several codes such as angry, sad, anxious and worried.

Improper development risk. This theme was formed from the combination of drainage system and improper development plan code, and solid waste management code.

Evacuation risk. The theme was constructed from two codes namely during the flood and evacuate the homes.

Communal risk. Two codes were combined namely difficulties during the flood and other issues to form this theme.
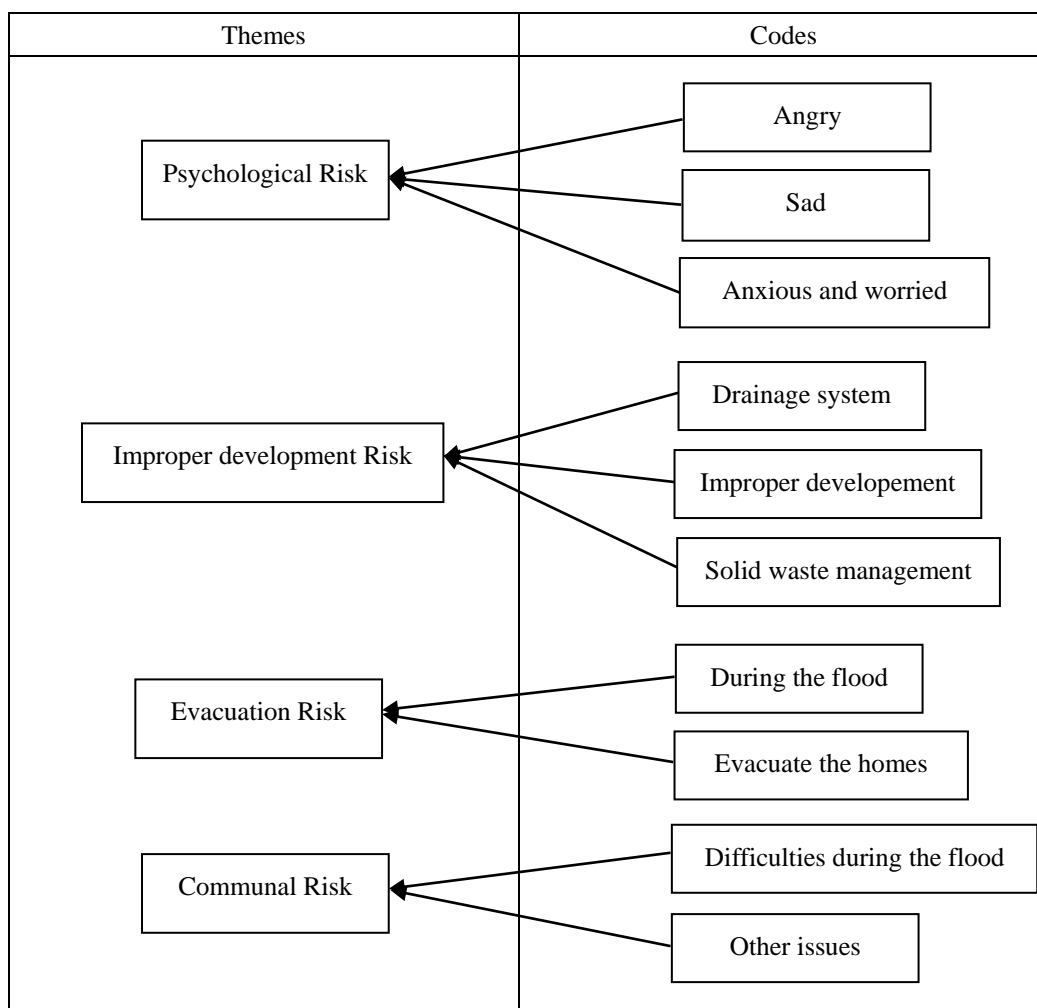
Figure 1 illustrates the formulated themes and codes.

Figure 1. The Construction of Themes (The First Research Question)

The fourth phase of the TA method entails a thorough examination of the identified themes. This phase engages in a recursive process where the initial themes are critically assessed in connection with the coded data and the entire dataset. The above themes set has been revisited to ensure that the data contained within them exhibit meaningful interrelations, and that they are distinctly and clearly differentiated from one another.

In this case, all codes and themes that were deliberated in this study were shown to an expert from the Faculty of Social Science and Humanities for comments and verification. Based on the discussion, it has been agreed that the four themes; psychological risk, improper development risk, evacuation risk and communal risk are adequate to carry out their functions in relation to the research question.

For the second research question, that is *what is the best suggestion of risk management should be taken by the flood-prone communities in Meru, Klang?* A similar procedure was deliberated as in the first research question. A few codes have been constructed. The codes are:

New flood barrier. It is in their knowledge that the authorities have built a massive flood barrier in Kampung Budiman situated a few kilometres from Meru. However, with the rapid development happening in places like

Setia Alam, Alam Budiman and its surroundings, Meru would need a new facility to manage the water that comes from these areas. IN1 and P6 had given new suggestions.

I was thinking about IN4's answer earlier about the flood retention area in Meru. Having widened the ditch alone won't have an impact on the flooding. So, maybe I would suggest another way is we can expand the flood retention areas (IN1)

Deepen and widen the nearby catchment area (P6)

Proper waste management. Geographically, Meru is surrounded by Malay villages, residential areas and small medium factories. Poor coordination between the development of industrial zones and residential areas has led to blocked water drainage, primarily caused by inadequate garbage disposal practices by both foreign workers and local residents. Urgent action from local authorities is essential to address this issue before it escalates further, a concern underscored by the following illustrative examples provided by participants.

Regular cleaning needs to be done in terms of the waste in the ditch. Actually, it's not just the waste, but there are also many plants are growing. If you walk along Jalan Kassim, you could see the condition. So that's why regular cleaning is necessary (IN5)

I agree with IN4 earlier and we already know that the Setia Alam development area is increasing rapidly. So, the authorities should have alternative solutions because this development will also cause flooding in other areas. They need to come up with alternatives that can help prevent flooding. As I mentioned earlier, there's a lot of trash in the ditches. So, we need to have common sense, like not littering everywhere (IN3)

The responsible party should monitor and manage more effectively, especially in dealing with litter that is dumped or thrown into ditches more frequently (P7)

Proper plan to mitigate the floods. Participants are concerned that the authorities are not fulfilling their responsibilities adequately. It is imperative to initiate flood preparedness planning proactively, rather than waiting for an actual flood event. Demonstrating meticulous planning is crucial to rebuilding the trust of the population.

Another thing is, if those things don't work and flooding still occurs, what facilities need to be provided for the local people? For example, at the evacuation centre on that day, if you could see, it was very chaotic, almost like a war, fighting for food, and so on. The environment was not suitable for those who were evacuated, so the necessary preparations need to be in place. They've already mentioned regarding this on television, the hot areas that will likely face flooding, especially from October until next year. It means the authorities need to be prepared early, be on high alert. It's not just about relying on external aid; those within also need to play their part. They shouldn't wait until it looks like it's about to flood that's when they get busy digging ditches and starting regular cleaning. No, they need to start it from the beginning, long-term and short-term (IN2)

In my opinion, the authorities should have a plan to address the recurring flood issues in my residence, which has been identified as a red zone. Every time there is heavy and continuous rain, flood will occur, but we still don't see any short-term action is being taken... Disappointing! (P5)

Social and psychological support. Assistance in the aftermath of a flood is of utmost importance and greatly needed by affected residents, particularly when their homes have been ravaged by the disaster. Given their fragile emotional state, timely post-flood support is imperative. While delivering aid, it is crucial for the authorities to prioritise efficient distribution to ensure it reaches the victims, and participants also express the desire for the authorities to eradicate red-tape that could hamper the effort to deliver aids to the flood victims.

Assistance during and after the flood needs to be re-evaluated. During the flood, maybe in terms of... because the emotions of those affected by the flood are really unstable, tired from cleaning, washing, muddy, and so on. So, aid in terms of food or any resources that can ease their feelings. After the flood, I hope the government that have made various promises is to fulfil them. Please make it easy for them. Simplify the way aid is delivered, don't make it difficult and don't burden them too much. They are already facing difficulties, and when times are tough, they have to wait for a long time to receive aid. Sometimes they don't get it, sometimes it's skipped, and only Allah knows how these things happen. But these things need to be reassessed (IN2)

To me, when we talk about floods, people often say, 'be patient, this is a test.' But sometimes, when those who aren't affected can't feel what we feel, it can be quite sad. So, it feels like there's a need to increase awareness among people when it comes to floods. Maybe my family is used to this. So, I hope that people can be sensitive with what their words and not to say things that can hurt others (IN4)

I agree with IN4, sometimes unaffected people try to comforts us but they may not understand our feelings. If you

look at a scene in 'Parasite,' it shows how the rich and the poor see things differently. When the poor face a flood, the rich might say, 'What a nice day today, it was raining yesterday,' but in reality, the poor's houses are flooded. So, it's like they lack common sense, so those who haven't experienced it need to have more common sense about this thing (IN3)

Assistance after the flood – provide emotional counselling (P8)

After carefully reviewing the codes generated for the study's second research question, it becomes evident that the synthesis of four key codes - new flood barriers, effective flood mitigation planning, proper waste management, and comprehensive social and psychological support - coalesce into what can be termed as **a holistic flood mitigation plan encompassing the pre, during, and post-flood phases.** Figure 2 illustrates the details.

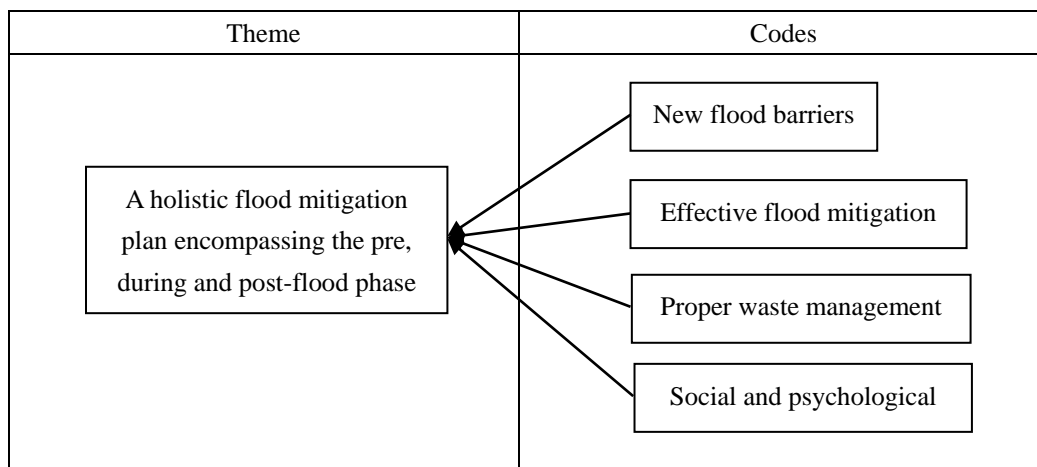| Theme	Codes
A holistic flood mitigation plan encompassing the pre, during and post-flood phase	New flood barriers
	Effective flood mitigation
	Proper waste management
	Social and psychological

Figure 2. The Construction of Themes (The Second Research Question)

Mirroring the preceding procedure, the TA model's fourth step entails a comprehensive exploration of the identified theme. In pursuit of this, the established codes and theme were subjected to a discussion with an expert from the Faculty of Social Science and Humanities at OUM. The expert's insights confirmed the relevance of the codes and theme in addressing the second research question in this study.

In the context of the TA model, the subsequent phase involves the meticulous definition of key themes. During this process, the themes originally formulated for the first and second research questions have been revisited and refined, drawing upon insights from the literature review. These refined themes have provided deeper insights into the characteristics of risk management and the practices observed among flood victims. Further elaboration on these refined themes were presented in section 5.0 (Discussion).

5. Discussion

Five themes have been developed to address the first and second research questions. For the first research question, the first theme that was composed is psychological risk. Psychological risk is a significant concern among flood victims, as they often face heightened levels of stress, anxiety, and trauma due to the loss of property, displacement, and the overall disruption of their lives. Studies for examples by Foudi et al. (2017) and Othman et al. (2022) have shown that the psychological impact of flooding can have long-term effects on mental health, and it is crucial to provide adequate support and interventions to address these issues.

Improper development practices pose a risk, potentially giving rise to pocket development risks, as elucidated by Ramli et al. (2023). Such risks may alter land use patterns, thereby playing a significant role in the occurrence of flash flood events. Additionally, poor waste management practices can exacerbate the risk of flash floods in areas prone to heavy rainfall (Samsuri et al, 2018). It is essential to consider the role of land use changes and urban development in flash flood risk management and planning.

Evacuation risk is a critical consideration for flood victims, as it involves not only the physical challenges of leaving flood-prone areas but also the potential psychological and social consequences. Studies have indicated that factors such as lack of timely warning, limited access to transportation, physical disabilities, and inadequate infrastructure can all contribute to the heightened evacuation risk faced by flood victims (Ahmadi et al., 2022;

Borowska-Stefanska et al., 2022). Furthermore, the decision to evacuate is often influenced by the type of work of the head of the household, house ownership, the number of house floors, distance of their homes from the source of flood, and the flood level (Lim et al, 2015). Understanding and addressing these complex factors is essential for improving the effectiveness and safety of flood evacuation procedures.

Communal risks affecting flood victims can have a profound impact on their well-being and recovery. Research has highlighted several key communal risk factors, including conflict and social tensions, which in some cases, floods may exacerbate pre-existing social tensions or lead to conflicts over limited resources, further endangering the affected community (Petrova, 2022). Understanding these communal risks is essential for disaster management and preparedness efforts to better address the needs of flood victims and enhance community resilience.

The second research question focuses on the mitigation strategy that should be taken by the flood-prone communities, especially those who reside in Meru, Klang. With the risks that they have to endure, a holistic flood mitigation plan encompassing the pre, during, and post-flood phases needs to be introduced. This migration plan should involve all relevant stakeholders in implementing the initiatives. In implementing the plan, it requires preparedness. Five principles of preparedness introduced by Krepp (1992) can used as the ground principles to embark on these initiatives namely preparedness and improvisation are central foundations of emergency management, preparedness is a continuous process, preparedness is an educational activity, preparedness is based on knowledge and preparedness evokes appropriate actions (Islam et al., 2016).

6. Suggestions for Implementation and Future Research

To effectively address the risks identified in this study, local authorities and related agencies must adopt a comprehensive flood mitigation plan comprising three distinct phases: pre-flood, during-flood, and post-flood. Aligning strategies with these phases can help to manage the four identified flood risks as outlined in the study. For instance, to mitigate the risk of psychological trauma and emotional distress among residents, proactive pre-mitigation measures, such as establishing community-based mental health support programmes and conducting resilience-building workshops, can equip the community with essential skills to navigate future flood events. Additionally, counselling services during and post-flood events can alleviate the emotional burden carried by victims, offering crucial support during challenging times.

An integral pre-mitigation strategy is the reinforcement and enforcement of land-use planning regulations. Concurrently, relevant agencies must proactively advocate for sustainable infrastructure and heighten awareness regarding responsible development practices, particularly in suburban areas such as Meru, Klang.

To address challenges arising during floods, including safety concerns and decisions on evacuation, the relevent stakeholders should prioritise the development and communication of clear evacuation plans. This involves improving early warning systems and bolstering community preparedness through drills and educational initiatives.

Furthermore, fostering community engagement and collaboration is essential. This can be achieved through local forums, the establishment of community-based disaster management committees, and the promotion of collective resilience-building initiatives.

In future research, it would be valuable to expand and triangulate the study's focus to include other critical stakeholders involved in aiding communities during floods, notably local authorities and Non-governmental Agencies (NGOs). Encompassing these three key participants—communities, authorities, and NGOs—will broaden the comprehension of floods and enhance the spectrum of management strategies, incorporating a diverse array of inputs and ideas.

7. Conclusion

The study's findings reveal that flood-prone communities in Meru, Klang, face risk management challenges categorised into four distinct components: psychological risk, improper development risk, evacuation risk, and communal risk. To effectively mitigate these risks, the most recommended approach involves the development of a comprehensive flood mitigation plan that spans the pre-, during-, and post-flood phases. The research findings provide invaluable insights for establishing a comprehensive framework to effectively manage flood-prone communities, ensuring they are free from unnecessary errors that may hinder communication among stakeholders, as highlighted by Zahari and Raja Ariffin (2013) in the literature review section. The implementation of the pre-during-post-flood mitigation plan, as suggested in this study, aligns seamlessly with the existing FRM policy and the TSM model. In fact, Shafiai and Khalid (2016) strongly advocate for conducting as many studies as possible to address issues related to during and post-flood management.

Furthermore, this work contributes significantly to the practical knowledge in the field of catastrophe risk management.

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Data sharing statement

No additional data are available.