MITIGATION & ADAPTATION TO FLOODS IN MALAYSIA

A study on community perceptions and responses to urban flooding in Segamat

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INTRODUCTION

In 2006 the Malaysian town of Segamat experienced one of its most severe cases of flooding in decades. This event was followed by another extreme flooding occurrence in 2011 and most recently in 2017 (Reza et al. 2017, p.167). Despite floods making up the majority of natural disasters that occur in Malaysia, there is still insufficient planning and management in mitigating the risks and adapting to the effects of flooding (Karki 2016, p.1). These inadequacies can be attributed to the lack of participatory involvement of local communities in program planning, as disaster management policies and procedures are mainly organized and directed by government agencies who fail to incorporate local perspective or knowledge (Karki 2016, p.2).

The purpose of this research is to gain a greater understanding of local people's perception of flooding and the various strategies they implement to cope with the impact of floods in Segamat. It is hoped that the data generated from this research will further contribute to the discussion of disaster risk reduction and be of use in designing a more inclusive, sustainable and effective program that enhances people's resilience to floods and other related environmental hazards.

RESEARCH AIMS & OBJECTIVES

Aims

The aim of this research is to investigate local people's perceptions and attitudes to urban flooding in Segamat. This research will study the impact of floods on the town, the community's actions and responses, their opinion on government initiatives (pre and post disaster) and how disaster management can be improved.

Objectives

- Understand the perceived causes, the impacts and challenges faced by the residents of Segamat due to the flooding.
- Examine the community's adaptability and resilience to flood disaster and hazards through the actions taken by locals during all stages of a flooding event.
- Identify key factors that influenced people's access to immediate flood relief and long-term support.
- Examine disaster management procedures within national, district and local levels to determine gaps in planning.
- Propose recommendations for local level participation in flooding policy and program development so as to improve flood management practices.

BACKGROUND

According to the Malaysian Department of Irrigation and Drainage (2009, p.26), flooding has become a yearly event since 1963, affecting more than 4.82 million people a year and inflicting annual damages of 915 million RM. In fact, floods account for about 90% of all natural disaster-related damages in Malaysia (Pradhan 2009, p.1).

A series of flood disasters ravaged the Malaysian Peninsular town of Segamat in Johor state in 2006, 2011 and 2017. Deemed the worst flood disaster in 100 years (Tengku Asmara & Muhamed Ludin 2014, p.1), the December 2006 and January 2007 floods caused substantial loss of lives and property and over 1.5 billion RM in damages (Reza et al 2017, p.167). The most recent flooding occurred in January 2017, affecting many regions of Malaysia, with Johor being one of the worst hit states (IFRC 2017, p.1).

Flood disaster management in Malaysia is governed by three agencies: The National Disaster Management and Relief Committee, the State Disaster Management and Relief Committee, and the District Disaster Management and Relief Committee. These three committees operate in unison under the umbrella of the National Security Council in order to achieve maximum efficiency in responding to any and all forms of natural disasters. It has also been noted that coordination between these committees is weak which often leads to the mismanagement of valuable resources, further endangerment of lives and delayment of reconstruction (Karki 2016, p.7).

The main purpose of these committees is to reduce economic damage and minimize flood impacts on human life and infrastructure (Shafiai & Khalid 2016, p.52). Several strategies are used in Segamat to achieve this goal which includes activating early warning systems which alert the public and government agencies (army, police and civil defence) of rising water levels and severe weather conditions which may cause flooding (Karki 2016, p.12). Despite having such measures in place the system is not very effective and its impact on flood preparedness is minimal as the warnings do not reach the entire community (Karki, 2016; Shafiai & Khalid, 2016).

Evacuation, rescue and post-flooding responses by the government were also criticized by residents as it failed to meet their basic needs. Research on the 2006 floods found that search

and rescue operations were hampered due to shortage of rescue personnel and equipment (Karki 2016, p.12). Shelter, clothes and food were provided at evacuation centres but were unequally distributed, with some claiming that aid and supplies were given to families or friends of local officials and helpers first.

Studies has found that most local residents contended with the flooding individually; they did not seek help from their neighbours nor did they discuss and plan ahead with their neighbours about best response practice (Karki, 2016). There were mixed responses in that some stayed in their homes, refusing to leave and believing that the flood levels would not reach dangerous levels. Others sought refuge in tall buildings, schools and shelters erected by the government and NGOs. There was little by way of community mobilization or rescue efforts at the neighbourhood level (Karki, 2016).

Existing studies on flooding in Segamat have clearly shown that public perceptions are crucial in how the local residents prepare for and respond to flood disasters. Reza, Choy and Pereira (2018) explain that the Segamat public believed that the 2006 flood was caused by improper management and release of Bekok Dam upstream (p.172), the development projects which hampered drainage systems (p.176) and inadequate river maintenance by the Department of Irrigation and Drainage (p.176). Residents recognized that despite the focus on structural engineering as mitigation, factors such as a lack of zoning regulations and river maintenance (which allowed a build up of silt, thus elevating the river levels) all suggest incompetency on the government's part to protect their town (Reza, Choy & Pereira 2018, p.182). In contrast to this, Razak et al. (2016) found that the flooding events have primarily been due to extraordinary amounts of rainfall and the low-lying topography of Segamat, suggesting there is a gap in public knowledge of the drivers of flooding and the consequent perceptions held

Lack of communication between locals and government also played a role in obstructing flood preparation and response efforts which leads to slow recovery. This top-down approach is very common in national planning as many policies and programs are created and implemented by the government with little or no contribution from the local populace. A top-down approach fails to consider local knowledge and traditions which could aid in the creation of more efficient policies and plans. Shaifiai and Khalid (2016) found that policy and procedures are more effective when designed by the locals and victims of flooding because residents are more informed of the factors that influence their vulnerabilities to flood risks and hazards.

In light of these responses, there were a multitude of lessons learnt as a result. It was found that most of Segamat's residents were unaware of the risks associated with rapid urbanization around riverbanks and coastal areas which is fast becoming a characteristic of the town's development (Karki 2016, p.3). The 2006 flood event sparked heightened awareness and called for greater training and education on urban flooding mitigation and response (Tengku Asmara & Muhamed Ludin, 2014). Residents have also taken to 'living with flood' adaptation mechanisms like raising flood levels in their houses (Tengku Asmara & Muhamed Ludin 2014, p.4) and keeping valuable assets further above ground (or relocating entirely to higher ground). However, as Reza, Choy and Pereira (2018) point out, while many of the affected people with sufficient wealth have built themselves alternative infrastructures, the same cannot be said of most of Segamat's inhabitants, who have low levels of income and still strive to meet basic needs, thus making the adaptation of their houses an expensive and difficult venture to achieve independently (p. 178).

Overall, the government's response to the events and subsequent steps taken to prepare for future disasters has largely been inadequate and improvements are recommended. Studies so far suggests that future planning would benefit by incorporating the perspectives of all groups during the planning process, specifically those who are most vulnerable to the effects of flooding (Reza et al. 2017; Karki 2016 and Shafiai & Khalid 2016). Local and traditional knowledge should also be taken into consideration and the disaster management framework needs to view flood affected populations not just as "victims" but as active participants in policy and planning design. Additionally, disaster planning requires greater attention on strengthening community capacity and networks as studies have shown that community engagement with the government, NGOs and other social institutions is a key factor in building resilience to flooding (Chan 2018, p.15 and Khailani & Perera 2013, p.626).

METHODOLOGY

This research project employed a qualitative study design, drawing on several Participatory Rural Appraisal (PRA) methodologies. The research encouraged the local community to identify problems relevant to them and evaluate options for solving these problems, with minimal external input or influence. As researchers and "outsiders" we endeavoured to be mindful of our positionality and the power relations that exist in the research process, hence we tried to ensure participant-led input and outcomes.

Our analytical framework (Gale et al., 2013) helped us understand the qualitative data which was collected; the community perspectives and the participant-led findings. An analytical framework allows us to code and organise data which is collected. We wanted to especially analyse themes which were discussed and mentioned by the community.

Participants

Participants were selected by Southeast Asia Community Observatory (SEACO) via purposive sampling and had experienced or been affected by one or more floods in Segamat. The selection process was supported by the Community Engagement Committee (CEC), which consists of individuals in positions of authority such as village leaders. CEC and SEACO worked in collaboration to identify suitable individuals who met the necessary criteria. The study had a total of 71 participants, consisting primarily of middle-aged to elderly men and women, the breakdown of which is detailed in Table 1.

		Kampung (Village) *Mukim (District)*	Number of participants		Ethnicity
			Male	Female	
Day 1	AM	Kampung Jawa *Mukim Sungai Segamat*	4	6	Malay
	PM		4	6	
Day 2	AM	Kampung Seberang Batu Badak *Mukim Gemereh*	6	4	Malay
	PM	Kampung Jabi 1 *Mukim Jabi*	6	1	Malay
Day 3	AM	Kampung Abdullah	1	9	Chinese

	PM	*Mukim Sungai Segamat*	1	9	
Day 4	**AM**	Kampung Tunku Tiga *Mukim Sungai Segamat*	0	8	Malay
	PM	Kampung Tengah *Mukim Sungai Segamat*	0	6	Malay

Table 1: Breakdown of participants by location, gender and ethnicity

Location

The *Kampungs* (villages) were selected based on the severity of flooding that had occurred in that location. The participants came from six *kampungs* across three different *mukim* (districts) in Segamat: Mukim Sungai Segamat, Mukim Gemerah and Mukim Jabi. The six kampungs are situated along the Segamat and Kenamar Rivers as well as near swamp areas, making them particularly vulnerable to flooding.

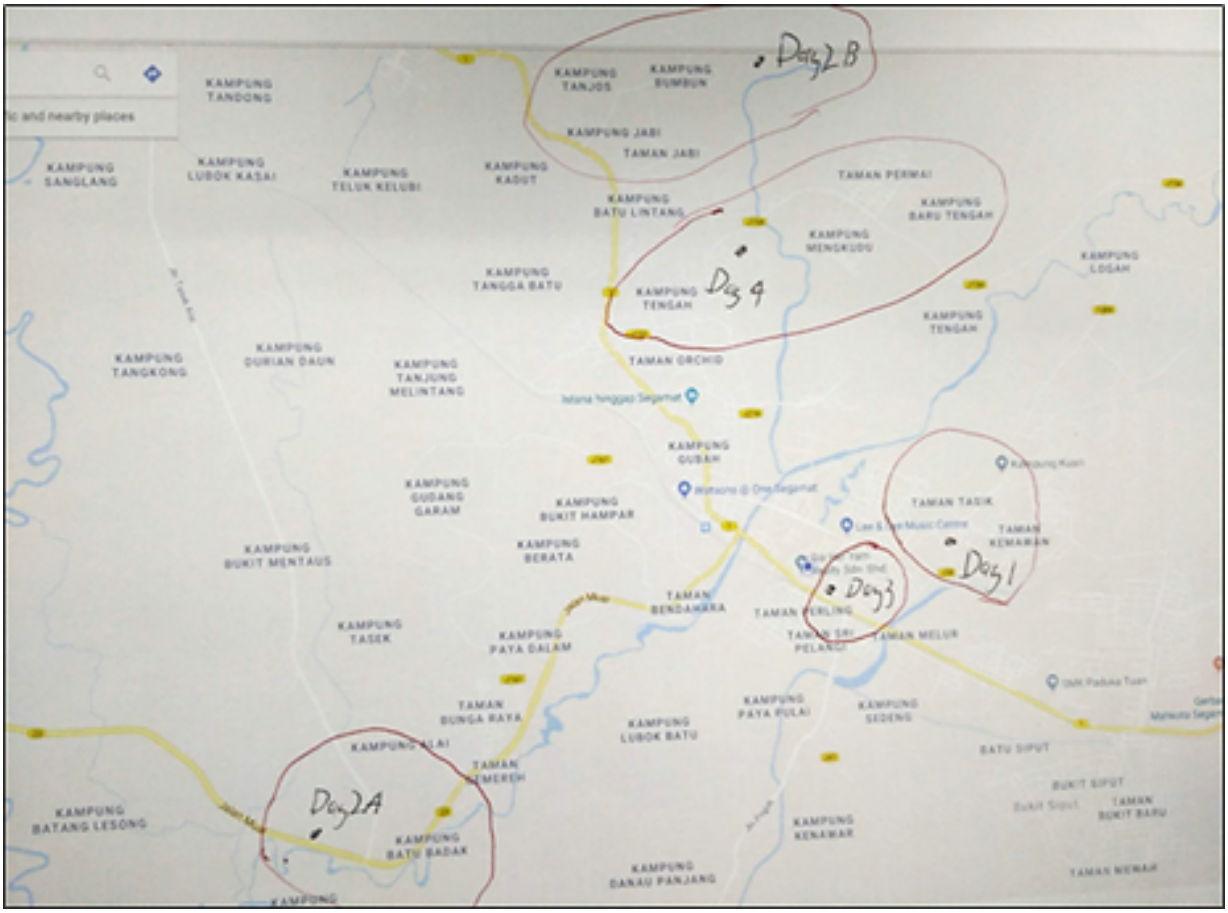

Figure 1: Map of Segamat district. Black dots indicate the community centres where data was collected. The red circles around the black dots specify areas where participants from that session come from. (Source: Google Maps, 2018)

Data Collection

The research utilised the following methods for data collection: interviews, focus group discussions (FGDs) and observation walks. All data collection with the participants was carried out primarily in Bahasa Melayu with some interviews being conducted in Chinese and English. The researchers were assisted by four facilitators from SEACO who aided in translation. There were a total of eight sessions over four days with a maximum of ten participants per session. Each session lasted for two and a half hours.

Focus Group Discussions (FGDs)

FGDs were chosen as one of the main research tools as it is effective in "getting an initial sense of the dimensions that are of particular relevance to a topic and set of respondents" (Sofaer 1999, p. 1108). The use of FGDs enabled us to develop a better understanding of the common concerns and perceptions of flooding that existed among the community members, thus providing a foundation from which we were able to further refine our research.

FGDs were conducted on the first and second day. After our first initial session we found that the allocated group size was too large which resulted in some participants being unable to fully contribute to the discussions. Subsequent FGDs were carried out in two smaller groups per session to ensure that there was sufficient time for all participants to voice their opinions and perceptions. The FGDs consisted of four main questions addressing basic issues regarding flooding that were identified in existing literature (Refer to Appendix A for the FGD question line). There were three activities used during the FGDs: free-listing, ranking and community mapping. These activities encouraged participants to brainstorm and develop ideas together which revealed new information and perspectives that did not arise from our preliminary research. The output of these activities were lists and annotated maps, examples of which can be seen in Appendix B.

Interviews

Interviews were carried out on the third and fourth day. One-on-one interviews provided a more comfortable setting for participants to discuss topics that were potentially sensitive and that may not be appropriate for larger group discussions, such as trauma experienced or critiques of the government. This issue was highlighted during the FGDs where some participants were less willing to share their opinions about the government in large group settings

The interviews were semi-structured with open-ended questions to allow participants to provide in-depth answers regarding their perceptions of flooding-related issues in Segamat. A list of questions was prepared based on our preliminary research and was subsequently refined once common ideas and themes were identified through the FGDs. This enabled us to narrow on important issues and explore them further with the participants (see Appendix B for the interview question line).

Observation Walks

The study also used observation walks to provide further context and enhance the data already collected from interviews and FGDs. These walks were participant-led around the *Kampung*, enabling us to examine structures and notable areas which they perceived to be of importance in their experience with floods, such as early warning systems, evacuation centres and draining systems (see Appendix C for examples). Additionally, observation walks prompted us to ask questions that we may not have necessarily thought to asked had we not viewed the sites first-hand, thereby improving the quality of data collected.

Data Analysis

Debriefing sessions were held every day after field research to summarise the findings and identify any potential new areas of interest to be covered the following day. Data collected during the four days of field research was compiled primarily through the use of mindmaps. Raw data was drawn out and grouped into codes by using the ranked lists as well as field notes and maps generated from the FGDs. These codes were then further refined into several key themes and organised by mindmaps.

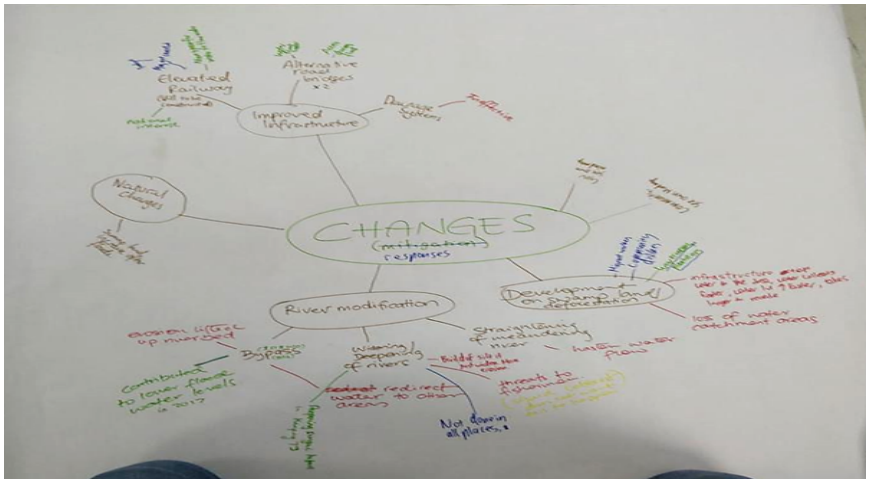

Figure 2: Mindmap of key subthemes identified in causes of flooding in Segamat. Similar mindmaps were created for other key themes such as community and government response to flooding in Segamat (refer to Appendix D).

Several data analysis techniques were used to identify key themes and areas of focus that emerged from the study. Repetition was used to identify common ideas and issues as "some of the most obvious themes in a corpus of data are those topics that occur and reoccur" (Ryan and Bernard 2003, p.89). Once the themes were identified they were arranged into mindmaps (refer to Appendix D).

Another key method used to analyse our themes was that of indigenous typologies, which involved looking out for "local terms that may sound unfamiliar" (Ryan and Bernard, p.89) and are frequently referred to by the participants. One such term that was identified through this method was the concept of *Gotong Royong*, which was prevalent during discussion of community actions and responses and refers to community cooperation and mutual aid.

Ethical considerations

It is of utmost importance that the research undertaken with participants meet ethical standards (Australian Research Council, 2007). Our research respects the integrity of the participants whilst providing them with full autonomy to make their own choices. The nature of our research study entailed enquiries into potentially sensitive topics extending from opinions of the government to the loss of loved ones as a result of floods and may lead to participants feeling uncomfortable or apprehensive when discussing these topics. Therefore, our research was guided by the ethical principle that participation is voluntary and participants can withdraw or refuse to partake in any discussion should they feel uncomfortable. The recent elections and arrest of the former Malaysian Prime Minister impacted how some participants reacted to questions about the government. To help negate this issue we assured participants that they could speak freely and privately during one-on-one interviews rather than discussing it in FGDs.

Furthermore, some participants did not want to discuss certain topics due to worries about backlash should their identities be revealed. As such, it was ensured that their personal details and information are kept confidential and any references made to comments from participants were kept anonymous. All participants were briefed about this at the start of each session and permission was also sought to take visual and voice recordings of the sessions.

FINDINGS AND DISCUSSIONS

CAUSES OF FLOODS

Urbanisation

Participants from all *kampungs* indicated that urbanisation on low-lying areas was the primary cause of flooding in Segamat. The construction of homes and businesses on low-lying lands has not been regulated by the government and planning were done haphazardly which increases the risk of flooding. Although previous research suggested that residents of Segamat were unaware that the rapid urbanisation taking place contributed to the flooding (Karki 2016) participants from our research showed extensive knowledge of the increasing impact of urbanisation and its direct relationship with flood risk. This is suggested by the topographic map that was completed by participants during the FGDs (see Figures 3 & 4). By creating the maps participants were able to provide detailed information on areas of urbanization and low-lying lands and explained that flooding was attributed to more than just low-lying lands and heavy rainfalls as suggested from other studies (Ab Razak et al., 2016). This demonstrates that locals do have a deep knowledge and understanding of the complex system that contributes to flooding.

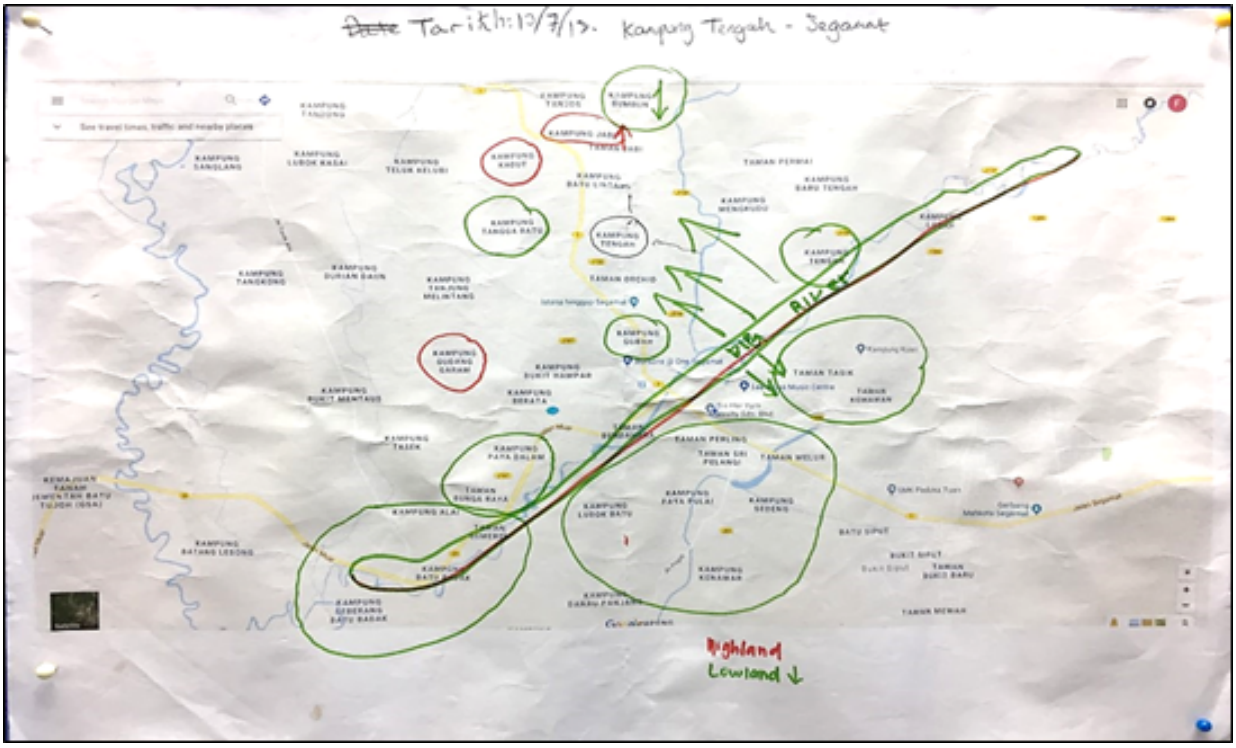

Figure 3: Map of low-lying areas in Segamat District; green circles and highlights indicate low-lying land, red circles indicate high-lands. (Source: Google Maps, 2018)

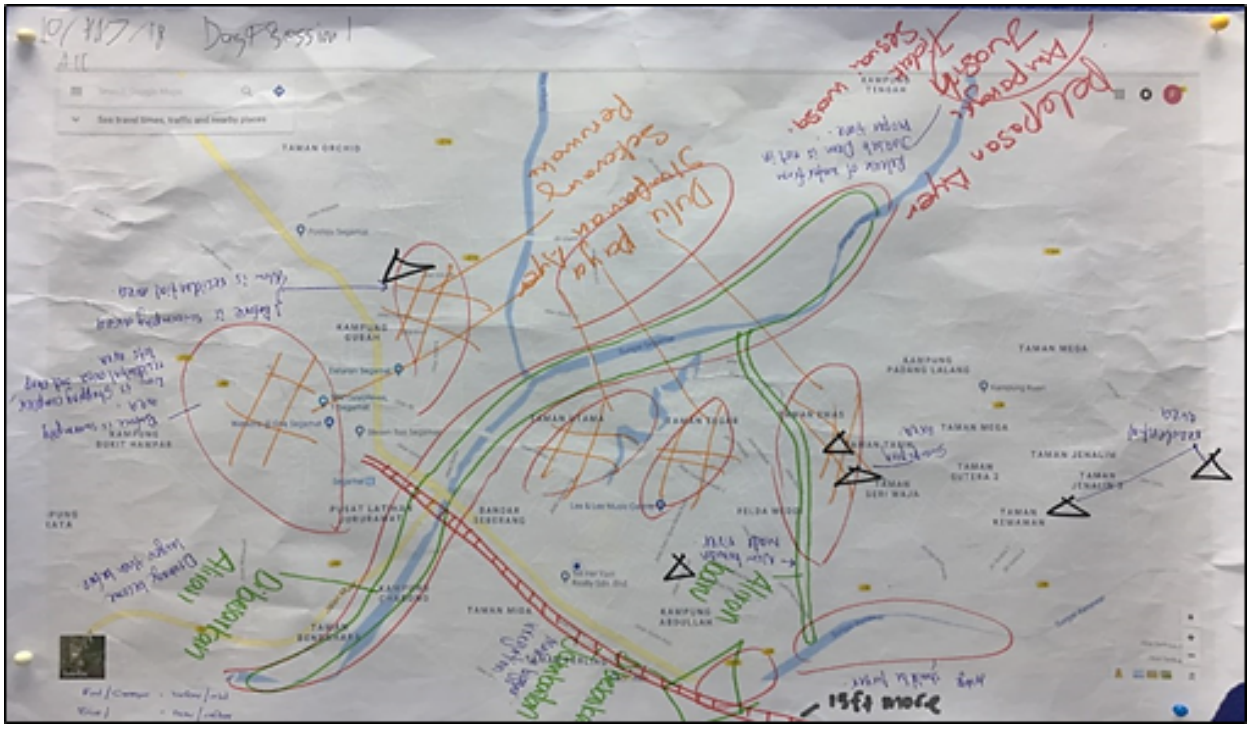

Figure 4: Areas of urbanisation and development in Segamat District (orange hashtags within red circles). (Source: Google Maps, 2018)

Drainage system

The increased urbanisation in Segamat also leads to inadequate drainage systems which are unable to combat heavy-rainfall. All *kampungs* stated that the ineffective drainage systems combined with rubbish and waste were blocking the flow of water through the drains during flooding periods. Participants reported that residents often disposed of their rubbish into the open drainage system which exacerbates the problem. Both the Chinese community of *Kampung* Abdullah and the Malay communities believed that drainage maintenance was a community-based responsibility.

Dams

The improper release of water from overflowing dams was also considered as one of the causes of flooding. Previous works by Reza, Choy and Pereira (2018) found that the public believed the release of water from the Bekok Dam was the source for the rapid rise in flood waters. Contrary to this, participants from *Kampung* Batu Badak stated that irregular and improper release of water from the Juasseh Dam coupled with *Air Pasang* was the cause of flooding in Segamat. *Air Pasang* is the tide of the river which causes water to flow back towards Segamat. When this collides with the oncoming dam water it causes deluge in the

intersecting areas. While some studies suggest that early discharge of water from dams in Malaysia is an appropriate flood mitigation technique, participants hope that in future flood occurrences the government would consider all possible consequences prior to releasing the waters as it can aggravate flooding.

River Modifications

Participants identified the government's decision to modify the river as one of the numerous causes of flooding. River modification comprises of the changing of the river's ecosystem which would naturally mitigate floods from occurring. Participants understood that rivers naturally mitigate floods through meandering which slows down the river flow. The straightening of the rivers therefore resulted in more intense and larger volumes of water flowing towards Segamat. Furthermore, these large volumes of water would then collide with down-stream infrastructure such as the railway bridge which causes a build-up of water resulting in flooding. Additionally, the government's economic decision to cut down trees next to Segamat River and Kenawar River further increase flooding as it reduces the floodplains' ability to absorb water.

IMPACTS OF FLOODING

The effect of the floods was experienced in many different ways depending on various factors such as socio-economic status, occupation, gender, location, age and ethnicity. Table 2 provides is a summary of how the participants were impacted by the floods.

Disruption of Daily Life	Loss of Assets	Mental and Physical Health
Inability to work and loss of income	House and Property	Mosquito-borne diseases
Time focused on clean up	Vehicles	Death and Injuries
Effort directed towards floods	Furniture and household goods	Diseases caused by poor water and sanitation
Loss of services (Water, electric and communication)	Important Documents (Passports, ID card, Birth certificates etc.)	Stress, anxiety and depression
Inability to attend school	Infrastructure of Businesses	Phobia of rain resulting in sleeplessness during periods of heavy rain

Table 2: Perceived primary impacts of flooding in Segamat.

It has been well established that lower socio-economic communities are more vulnerable to the impacts of flooding (Hjerpe & Glass, 2012). The loss of income due to the destruction of livelihoods and the inability to work during and after the floods had a greater impact on poorer communities, such as *Kampung* Tengah and *Kampung* Jabi, compared to more affluent communities. This hindered their recovery and ability to rebuild their lives post-flood. In *Kampung* Tengah and *Kampung* Jabi where the majority of people work as fishermen or in the oil palm and rubber plantations, generating income and restoring livelihoods was delayed as the plantations are located on flat low-lying land and therefore rebuilding required extra time. In relatively wealthier communities such as *Kampung* Abdullah the inability to work also impacted them but to a lesser extent as they had better opportunities and resources to counteract the loss of income and employment.

Another impact caused by flooding is the loss of assets and property for both home and businesses. Communities were able to lessen the impacts on property depending on their socio-economic positions. Poorer communities showed signs of resilience and adaptability through different innovative means and social support. However, poorer communities often experienced greater loss of property compared to wealthier communities. Wealthier participants were able to establish infrastructure such as water tanks and glass walls which protected their property from the impacts of flooding.

Mental and physical health was considered by all communities as a major impact. Participants stated that there was an increase in mosquito-borne diseases, particularly dengue and malaria, however this was not extreme and as such participants put less emphasis for this impact. The normalisation and frequency of mosquito-borne disease in Malaysia may provide an answer to the lack of stress and attention this impact received. Malay communities in *Kampung* Tengah and *Kampung* Batu Badak found drinking water hard to source during floods which led to diseases like *cirit-birit* (diarrhoea). On the other hand, *Kampung* Abdullah participants mentioned that they had water tanks which provided safe drinking water during floods. Mental health was discussed by participants as being a severe impact on all individuals. Participants indicated that after two days of rainfall, they would suffer from anxiety, stress and sleeplessness as they fear that this will lead to another major flood. Mental health impacts were seen in all communities despite difference in ethnicity and socio-economic livelihoods.

GOVERNMENT RESPONSES TO FLOODING

Various levels of government play a key role in mitigating the causes and impacts of flooding. Through our investigation, we discovered that participants perceived that top-down governance meant that their views were not being heard, resulting in the government failing to address some of these long-term issues.

The large amounts of infrastructure allocated to Segamat district by the state government was perceived as being effective (Reza, Choy & Pereira 2018, p.172). Participants expressed how the water levels during recent floods had not reached the same height as they did prior to the new infrastructure, and they were quite satisfied with the work that the government has done to reduce flood risk. Notable projects include the 'Bypass' (see Image 1) which is a canal that passes through the centre of Segamat town and redirects water away from the Segamat River towards the Kenawar River.

Image 1: The 'Bypass' in *Kampung* Jawa. (Source: Authors).

With these projects however, participants claim to have had little to no opportunity to provide feedback and influence future work. It appears that locals were not consulted about government projects and whether the causes of flooding had been addressed. This confirmed previous literature that suggested that the government operated in a top-down fashion. This was particularly concerning as community engagement is required for effective flood response (Ludlin, 2014; Shafiai & Khalid, 2016). In addition to this lack of consultation, participants identified issues of engagement at numerous levels of government, which have been summarised in Table 3.

Level of Government	Key Responsibilities	Issues expressed by participants
National	Immediate disaster response though agencies like JPAM, funding for compensation	Uncertainty with how the new government will influence flood management
State	Projects to mitigate flooding, large scale regulation of natural resources	Inadequate regulation of urbanization and developments, Inefficient distribution of compensation
District	Drainage, urban planning, regulation, clear drains, river maintenance, smaller scale natural resource reg.	Committees may not respond to complaints, difficulties maintaining rivers and drains
Village head	Distribute aid, hear complaints, keep up to date with locals about their situation and needs	Some communities unaware of who their leader is; Leader is hard to meet with

Table 3: Key responsibilities and issues associated with each level of government.

Participants faced difficulties in relaying their concerns to the village head as some were not aware of who that figure was, and those who did know struggled to meet with them for a variety of reasons. There were occasional mentions of patronage politics, or cronyism, at these lowest levels of government that were most evident in the distribution of aid following a flood.

It was identified that committees responsible for maintenance and natural resource management failed to respond to complaints. The lack of action from district committees resulted in poor drainage upkeep and urbanization of flood prone sites, both seen as important causes for flooding. Due to community complaints not being transmitted across the

levels of government, the state government fails to regulate the work of the district. Failure to include the views of local citizens resulted in the state government not taking action to address the main causes of flooding, which was different from Shafial and Khalid's (2016) main finding that top-down government led to slow flood recovery and response. The work of the government could therefore be seen as counterproductive as the major infrastructure projects of the state government fail to stop unsustainable developments across the district.

An example of this is a property development project on the east of the Kenawar River (see Figure 5). It was previously a forested area, but has now been replaced with an estate of low-quality housing. Urbanization was perceived as a significant cause for flooding and thus participants did not see how this issue was being addressed by the government. Our findings suggest that disaster risk reduction policy and planning can be more effective if the government acknowledged the opinions of local people.

Figure 5: The housing development can be seen at the bottom right. (Source: Google Maps, 2018 CNES / Airbus)

Image 2: House on new housing estate next to Kenawar River (Source: authors)

COMMUNITY RESPONSES TO FLOODING

Whilst the government plays a significant role in the flood management procedures in a largely 'top-down' fashion, bottom up approaches were also prevalent from our findings, many of which were in contrast to conclusions derived from Karki et al. (2016) who found that, to a large extent, Segamat residents contended with the flooding individually rather than collectively.

The key form of bottom-up mitigation and adaptation to flooding that arose from both interviews and FGDs, was *Gotong Royong.* Defined as mutual assistance and reciprocal exchange (Bowen 1986, p. 545), this community ethos is driven by selflessness and concern for the common good (p. 546). This phrase was commonly used by our participants and has been highlighted as a driving force in building resilience to flooding in Segamat, as well as in accepting a sense of responsibility for minimizing some of the causes and impacts for flooding in the *kampungs* of Segamat, examples of which can be found in Table 4.

Before	During	After
Regular rubbish pick-ups to clear the drains	Communication: WhatsApp groups, Facebook pages	Emotional support
Stocking the shelters and community centres with emergency supplies (Image 3 and 4)	Shelters: sharing of supplies, cooking together (Image 4 and 5)	Clean up of public areas and individuals' properties
Sharing information such as warnings and alerts	Community notice board (Image 6)	
Sharing preparation techniques such as raising a floor in the house and sandbagging	Role of religious groups i.e. Buddhist societies and mosque staff and volunteers	

Table 4: Examples of *Gotong Royong* in flood mitigation and adaptation, emergency response and recovery.

The images below were provided to us by the participants which, with their permission, we have used to help demonstrate various expressions of *Gotong Royong*.

Image 3: Two schools next to the bypass that were used as evacuation centres for nearby houses on lower-lying land.

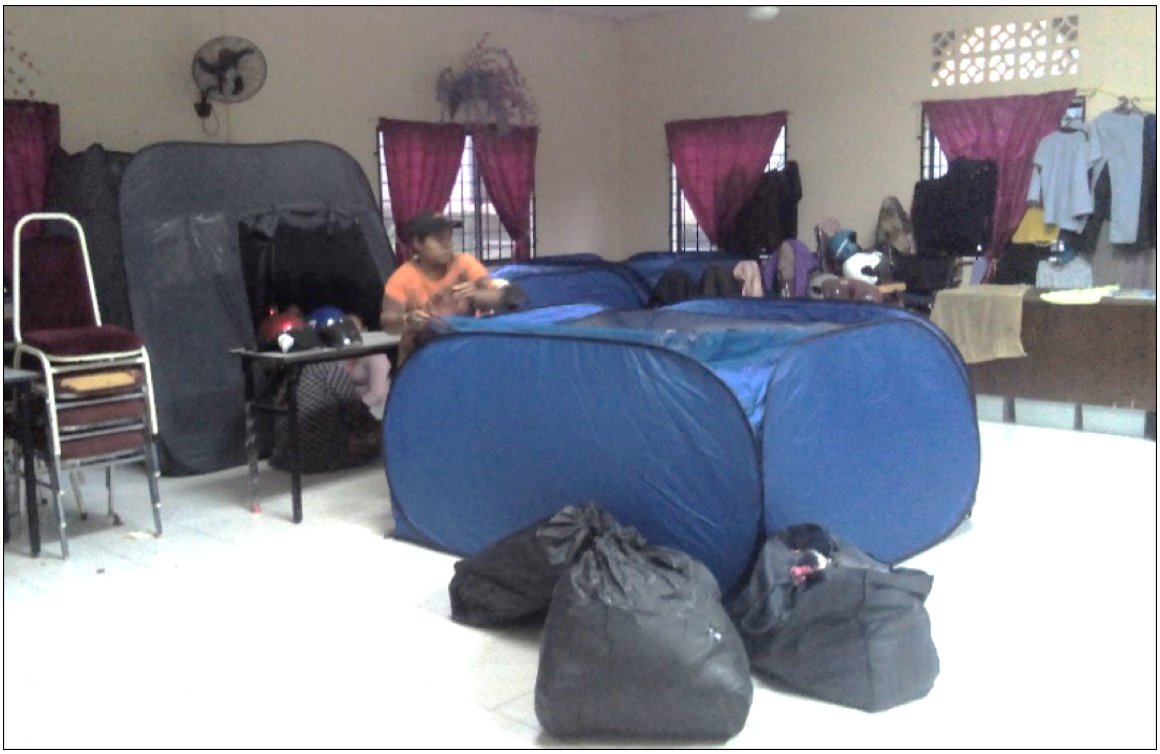

Image 4: Setting up the shelters with supplies.

Image 5: Cooking together in the shelter.

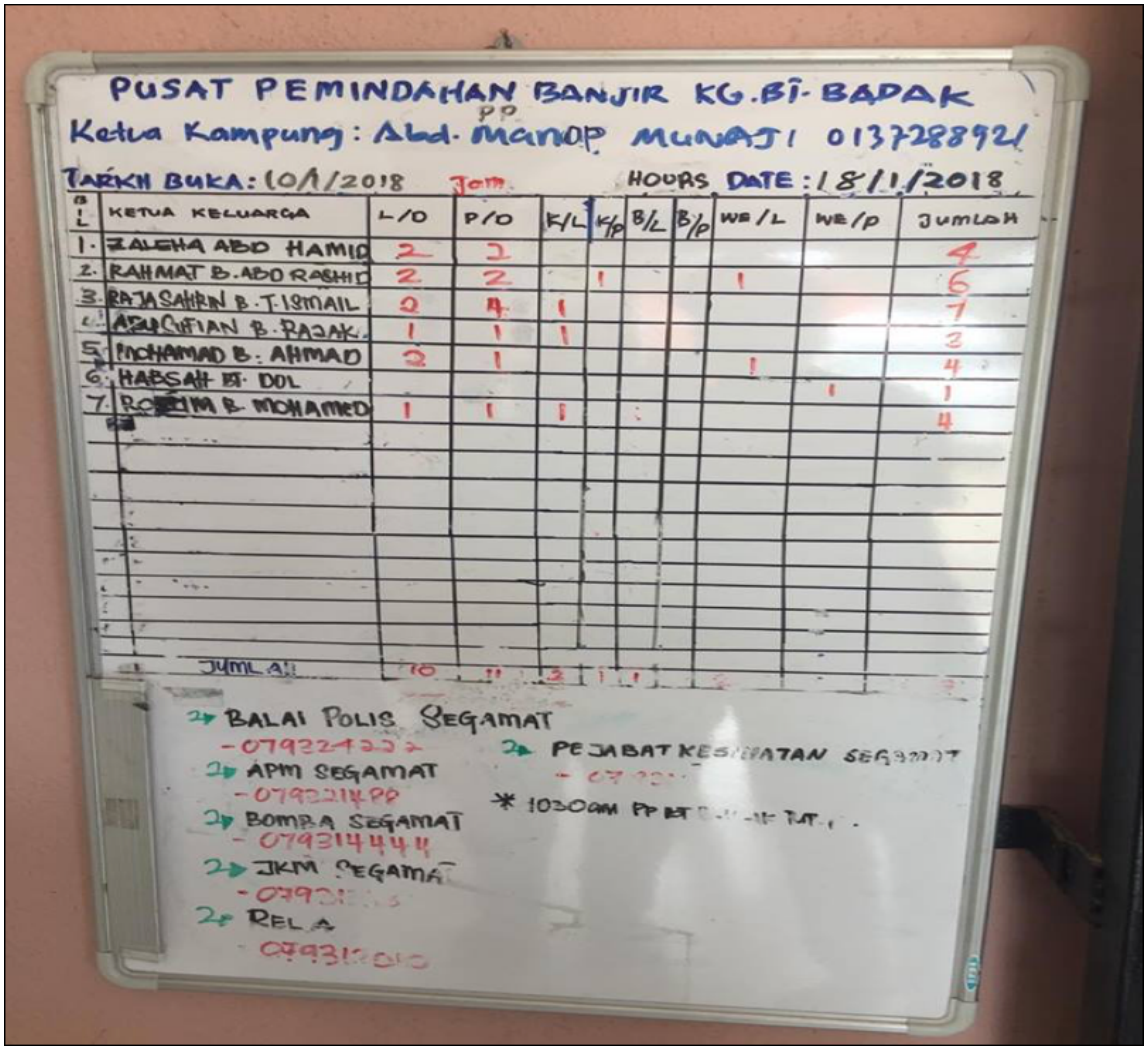

Image 6: Notice board in *Kampung* Batu Badak to record household members and share phone numbers of Police, Fire Department and RELA (volunteer services).

“If I don’t do something, I don’t think I can get through this” expressed one of the participants from *Kampung* Jabi, using the example of cooking together to emphasise the community spirit. For this participant, *Gotong Royong* was a means of being empowered and mobilized; to persevere and grow in resilience to the floods.

In analysing *Gotong Royong* as a principle and practice of resilience and capacity building, it is crucial we consider the role of human agency (Structuration Theory – Giddens, 1984). Individuals have agency to choose whether, and to what extent, they engage with their community and other social structures. For example, the principle of a large school in *Kampung* Tungku Tiga withheld permission for their building to be used as an evacuation centre, despite its relative elevation and proximity to residents in flood-prone areas. Individual autonomy in decision-making shows that *Gotong Royong* cannot necessitate accountability for human actions/inactions which may in fact exacerbate the risks or impacts of flood events at the community level.

Similarly, we found discrepancies between *kampungs* regarding the extent to which *Gotong Royong* was practiced based on socio-economic and cultural factors; *kampungs* which are heavily Chinese-populated (i.e. *Kampung* Abdullah) practiced *Gotong Royong* considerably less than predominantly Malay *kampungs*. In understanding the various impacts of the floods felt by *kampungs* in light of ethnicity, we found that Chinese participants generally had less physical damage to assets, businesses and property due to their capacity to better prepare for the floods, through access to greater resources and higher quality protection (similar findings to Reza, Choy & Pereira 2018, p. 178). A positive correlation could be made between the ethnic and socio-economic factors with regards to the impacts felt and the perceived need to practice *Gotong Royong.*

PARTICIPANTS' RECOMMENDATIONS FOR FUTURE PLANNING

A key aspect of our research was to learn from participants about the changes and improvements they want implemented in flood management and planning so that they and their community can better respond to future floods. The key recommendations are as follows:

Government Level

- To visit communities and listen to local opinions regarding flood management and to observe first-hand how it had impacted them. This would allow the government to gain a better understanding on how best to help flood victims recover and prepare for future floods and disasters

- Further development of rivers by deepening and widening them so that it may hold more water during periods of high rain falls

- Regular maintenance of drainage system and bypass so that water flow is not blocked by rubbish, agricultural waste or vegetation in times of floods

- Increase provision of training and education programs for communities on how best to prepare and respond to floods – this should also be extended to schools

- Increase the number of rescue workers and provide them with better training and resources so that they are able to respond efficiently to people in crisis

Community Level

- More transparency from village leaders

- Local community to develop better practices and become more responsible in rubbish and waste management so that it does not create blockages in the drainage system when a flood occurs

From the above proposals, we can see that communities strongly rely on national and state government to provide assistance in large scale projects in coping with floods, such as the development and maintenance of rivers, bypass and drainage system as it requires large amount of funding and resources. However, they also believe that the community should play a bigger part in flood disaster management and have expressed their desire for more participatory involvement in this area. As previously mentioned, disaster management and planning in Malaysia is heavily top-down and this needs to be revised to include local voices. The Sendai Framework for Disaster Risk Reduction (2015 - 2030), in which Malaysia is committed to, advocates for governments to strongly engage with people at the community level during the process of design and planning, and argue that lack of community participation often leads to ineffective policies and programs (UNISDR 2015, p.10). Greater community participation also allows for the inclusion of local and traditional knowledge and expertise which is invaluable in building community empowerment and resilience (Raman et al 2015, p.1178).

At the community level, participants from half of the *kampungs* we visited voiced their concerns about the acts of fraud and dishonesty by village leaders during the response and post-recovery phase. This has created a culture of mistrust between community members and village leaders. According to other studies, this form of corruption is not uncommon and occurs in all stages of flood disaster management and response (Mohd Nordin et al. 2018, p.2). Transparency and accountability from those in power and leadership roles is required to ensure that disaster management processes achieve maximum outcomes (Mohd Nordin et al. 2018, p.6).

CONCLUSION

This research from Segamat has provided greater insight into the perceptions of local people regarding various flood-related issues such as the causes and impacts of floods, government and community-level mitigation and adaptation measures, as well as recommendations for what could be improved to make the *kampungs* more resilient to these disaster events. Participants primarily perceive government approaches to flood mitigation and adaptation to be top-down in nature. Despite large infrastructure projects being implemented, there is still considerable lack of community engagement in consulting and active inclusion of the local residents' opinions. *Gotong Royong* was found to be a powerful tool for building resilience within communities when the government failed to meet their needs. The top-down approach has major weaknesses, and there is a need for greater collaboration between communities and the government regarding policy and infrastructure implementations. Furthermore, the lack of cooperation between communities and government has caused individuals and communities to create their own resilience and capacity-building techniques.

Future research may consider how the new government of Malaysia changes its approach towards policy and planning implementations. For this we emphasise that topics of community-based disaster risk reduction in the light of the new government be closely researched.

WORD COUNT: 5214

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APPENDICES

Appendix A: Focus Group Discussion question line

Programme	Questions to be asked/Things to be said/Script	Translation
Greetings	Good morning/afternoon! Thank you very much for coming today and agreeing to take part in this discussion!	Selamat pagi/petang! Terima kasih banyak-banyak untuk datang and setuju menyertai dalam perbincangan ini.
Self-introduction	I am (name) and I will be leading this discussion today, and these are my group mates. (Introduction by group mates) We are students from Monash University in Melbourne, Australia, and we are doing a research project in collaboration with SEACO.	Nama saya (name) dan saya akan mengetuai perbincangan pada hari ini, dan ini ada ahli kumpulan kami.(Pengenalan dari ahli kumpulan) Kami pelajar dari Universiti Monash di Melbourne, Australia and kami sedang jalankan projek penyelidikan dengan kerjasama SEACO.
Explain project aims	The aim of our research project is to find out more about local opinions and thoughts on issues related to flooding in Segamat. We hope that today's discussion will help us learn more about that from all of you.	Matlamat kajian kami adalah untuk mengetahui lebih banyak pendapat dan cadangan pada isu yang berkaitan banjir di Segamat. Kami harap perbincangan hari ini akan menolong kami belajar lebih banyak dari anda semua.
Ethical guidelines	Before we begin, we would like to assure you that everything that we discuss today will be kept between us and you. We will also ensure that all of you will remain anonymous in our research project.	Sebelum kita mula, kami memberi jaminan bahawa segala perbincangan pada hari ini akan disimpan antara kami dan anda semua. Kami akan memastikan bahawa nama anda tidak diketahui dalam projek penyelidikan kami.

Permission to record data	During this conversation, we will be recording the discussion and taking some photos. We will also be using what is discussed today to help us in our research. As such, we would like to ask for your permission to allow us to do so. Do any of you have any objections or issues? (pause)	Semasa perbincangan, kami akan rekod audio dan mengambil beberapa gambar. Kami jugak akan gunakan segala info dalam perbincangan harini untuk membantu dalam penyelidikan kami. Kami akan meminta keizinan dari anda semua untuk (merekod audio/mengambil gambar). Ada apa-apa bantahan atau isu ?
Sensitive issues	Lastly, our discussion today may include potentially sensitive issues such as opinions on the effectiveness of flooding management measures by the government and other relevant authorities. If any of you are not comfortable with that, or do not feel comfortable any time during the discussion, you may choose to leave the discussion. Thank you, and we hope that you will have a good discussion today!	Yang terakhir, perbincangan kami hari ini kemungkinan akan ada potensi tentang isu sensitif seperti pendapat tahap keberkesanan pengurusan banjir dari pihak kerajaan dan dari pihak berkuasa lain. Jika anda tidak selesa/berminat, dengan ini anda boleh pilih untuk menarik diri dari perbincangan ini. Terima kasih dan kami berharap anda mempunyai perbincagan secara sihat (okay).
Question 1	What do you think are the primary causes and impacts of flooding in Segamat?	Apakah yang anda fikir penyebab utama dan kesan banjir di Segamat?
Question 2	Have there been changes made regarding flood mitigation measures in Segamat?	Adakah terdapat perubahan yang dilakukan untuk mengurangkan risiko banjir di Segamat?
Question 3	Are you satisfied with current flood mitigation measures in place?	Adakah anda berpuas hati dengan langkah-langkah yang diambil untuk mengurangkan risiko banjir
Question 4	Would you like to see yourself and the community play a bigger role in the planning of flood management in Segamat?	Adakah anda ingin melihat diri anda dan komuniti/masyarakat memainkan peranan yang penting dalam perancangan pengurusan banjir di Segamat?
Question 5	Is there something we might have missed/not covered that you would like to speak about?	Ada yang apa-apa kami terlepas/tidak disentuh yang anda ingin ditambah?

Conclusion	Thank you for the good discussion today. I will briefly summarise what has been spoken about today. Please let me know if there is anything important that I missed out on. (summarise key discussion points) If there are no (other) comments, before we end this session, we would need all of you to fill up this consent form giving your permission for photos and recordings taken of you to be used for our research. Please be reassured once again that what has been discussed today will remain confidential. (distribute and fill out forms) We have now come to the end of today's session. Thank you once again for taking time out of your schedules to join us.	Terima kasih diatas perbincangan pada hari ini. Saya akan ringkaskan apa yang telah kita bincangkan pada hari ini. Sila beritahu saya jika ada info penting yang saya tertinggal. (ringkasan kunci/isi utama perbincangan) Jika tiada sebarang komen, sebelum kami akhiri perbincangan ini, kami ingin meminta anda semua untuk mengisi borang kebenaran berkenaan mengambil gambar dan rakaman audio yang telah diambil untuk kegunaan penyelidikan kami. Sila ambil perhatian sekali lagi bahawa segala perbincangan pada hari ini kami akan kekal selamat/sulit. (edar dan isi borang kebenaran) Kita sekarang berada di penghujung sesi pada hari ini. Terima kasih sekali lagi diatas masa yang ada luangkan bersama kami.

Appendix B: Interview question line

Introduction
1. Greetings – introduce self (names, where from, student doing research). Explain the project briefly. 2. Ethical guidelines (confidentiality, withdraw, sensitive topics, anonymity). This discussion may bring up some sensitive topics like things that you lost because of the floods, and thoughts about actions of the authorities. If you don't wish to answer them when the questions arise that is fine. 3. Thank again for time, participating, contributing, is very valuable for our understanding. 4. Fill in consent form. Bolehkah kami record perbualan ini dan mengambil gambar? (consent for recording visually and audio)
Preliminary Questions
1. What is your name? 2. What is your age? 3. What is your marriage status? 4. What is your occupation? 5. How long (years) have you been living in Segamat? 6. Which flooding events did you experience? (2006/ 2011/ 2017)
Questions about themselves: Individual
1. Who do you think is responsible for flood mitigation? 2. How do you receive information/warnings about flooding?

3. Did *you* do anything before the floods to prepare, to protect yourself/family/business etc?
4. If so, what? If not, why not?
5. What do you think were the two mains causes for the flood events (can separate into each event)?
6. What happened to you during the flood?
7. What time frame did you have to act?
8. Did you move? Forced or voluntary? Where did you go?
9. What did you feel/emotions regarding the flood?
10. Did your emotions change from before, during and after the flood?
11. Did you consider any potential dangers of the floods (e.g. drowning, animals, debris/health etc.) and did that influence any of your decisions?
12. What were the two main impacts for you/your family/business?
13. What important items did you try to protect/bring with you when evacuating?
14. What were the main challenges you faced when dealing with the flood? (racial discrimination, loss of personal valuable items/documents, no warning, threat of theft/other dilemmas etc.)
15. Did you play any role in the evacuation/response efforts?
16. Did you receive any help from the community/NGOs/government?
17. If yes, what kind? If not, why not?
18. After the floods, did you do anything to change the way you prepare for floods?
19. How do you try to protect your valuables/assets now for future flood preparations?
20. Would you like to be more involved in planning and protecting your community?

Questions about their perceptions of government actions/inactions – kerajaan

1. REMIND THEM WE KNOW THIS MAY BE SENSITIVE BUT WE REALLY APPRECIATE THEIR INSIGHT AND ANSWERS WILL REMAIN ANONYMOUS
2. How do you think the government prepared for the floods?
3. Were you satisfied with these measures?
4. How did the government respond during the flood events? (rescue)

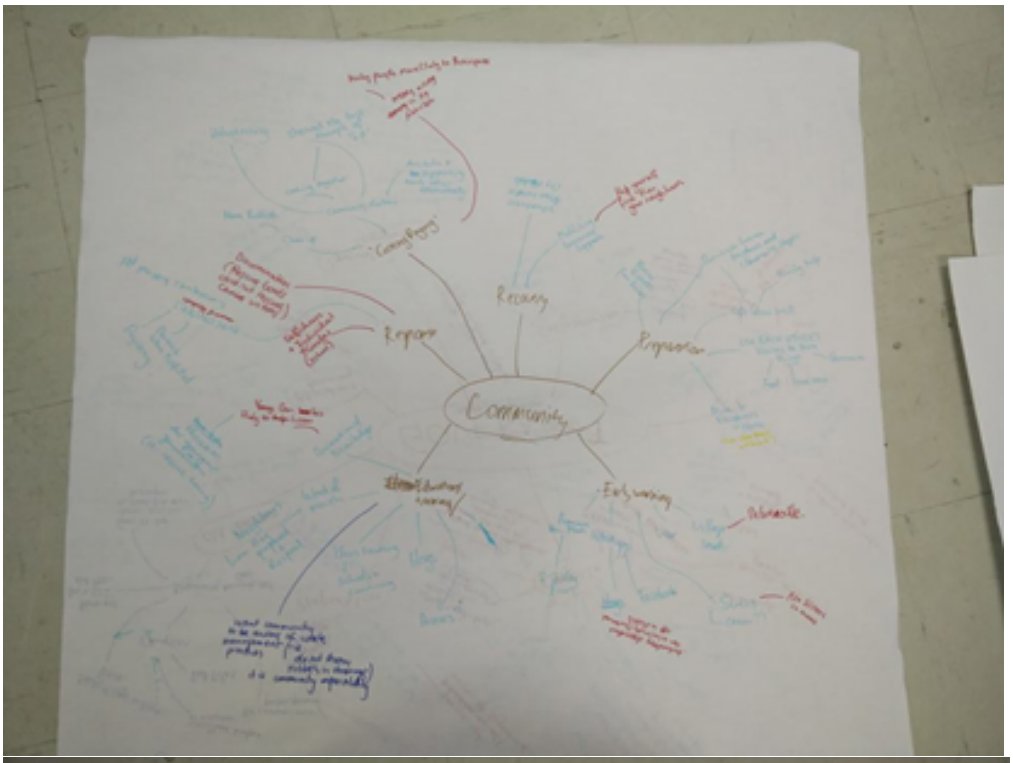
5. Has the government changed any mitigation practices since the floods?
6. Do you think the government includes the community to prepare for these events?

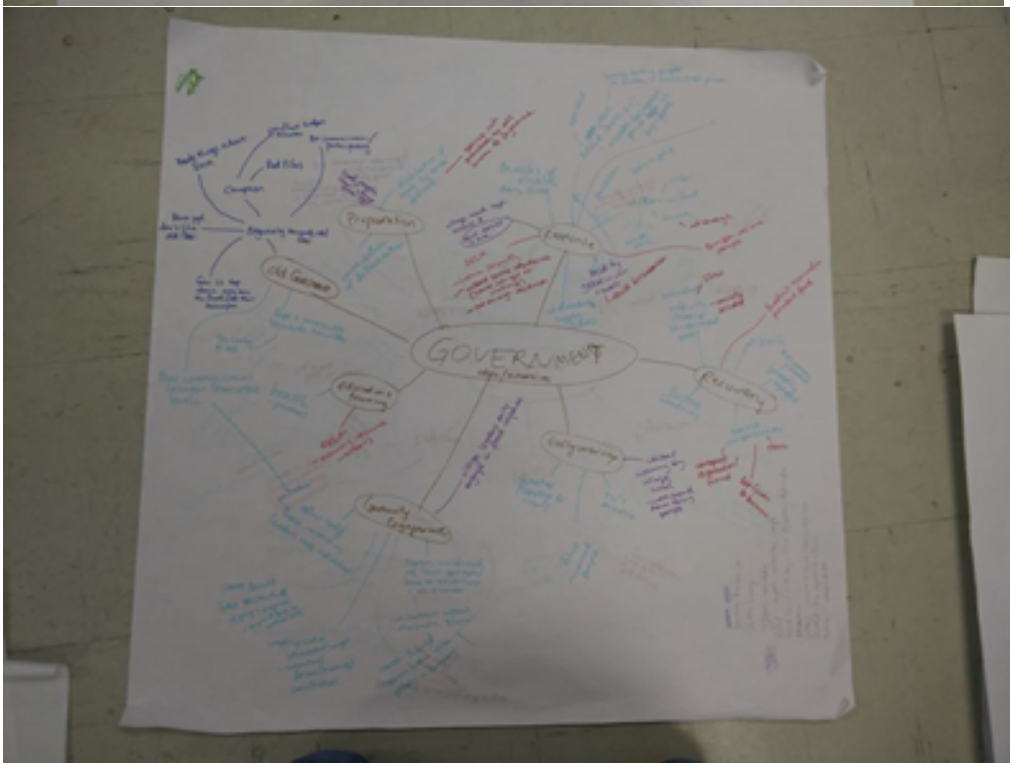
Wrapping Up

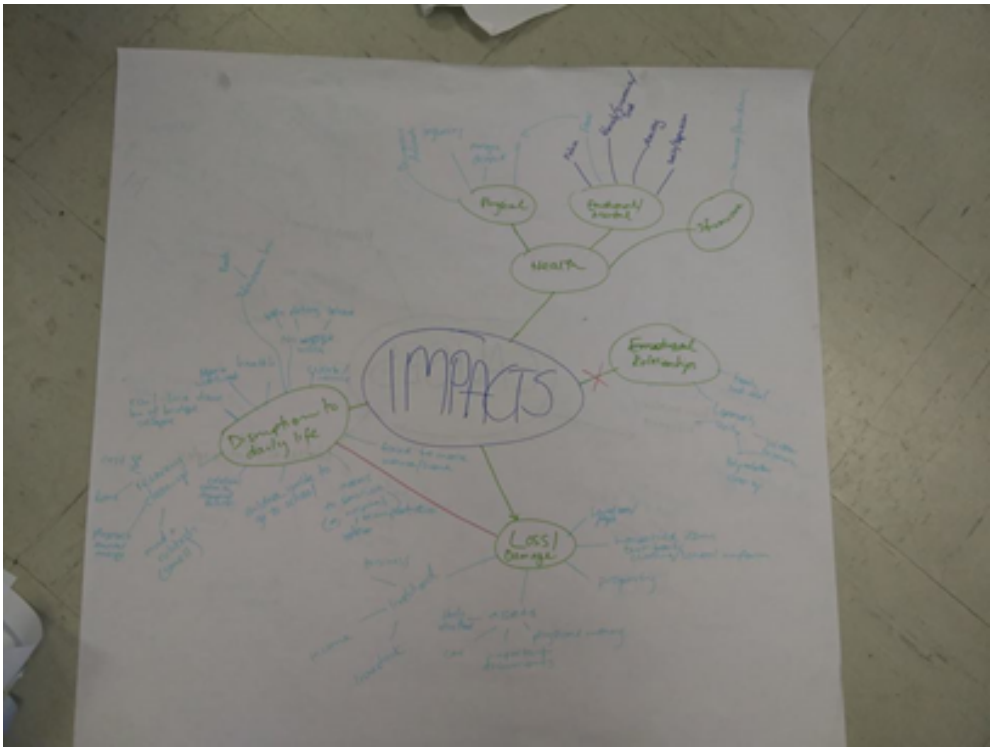
1. Is there anything we have missed that you would like to share?
2. From our conversation today, this is what we have covered ------.
3. Thank you again for your time and for being open and honest in answering our questions.

Appendix C: Observational Walks Photographs

Appendix D: Data Analysis Mindmaps






IMPACTS
Physical
Emotional/ mental
Spiritual
HEALTH
Emotional Relationships
Disruption to daily life
Loss/ Change