CHALLENGES IN FLOOD DISASTERS MANAGEMENT IN MALAYSIA

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Abstract

Floods are the main disaster affecting Malaysia as the country is influenced by seasonal monsoon floods (the most serious) as well as flash floods and tidal floods. Flood disasters have brought severe impacts on the people affecting livelihoods, damaging properties and infrastructures, and killing lives. The annual flood damage is about US$274 million and lives are loss every year. The methodology involves a combination of desktop studies using secondary published government flood data, flood reports, published papers and a preliminary questionnaire survey on flood victims, and qualitative interviews with key stakeholders. Results show that flood disaster management in Malaysia has traditionally been over-focused on a top-down government-centric approach. This was workable in the past when population was sparse and the public largely made up of lowly educated citizens, and the role of NGOs and civil society limited in scope. It is time for a radical change towards a more people-friendly "horizontal" or "bottom-up" approach. People, especially disaster victims, need to be engaged and empowered to be more resilient. If not, they remain highly dependent on government aid and this is not what the Malaysian Government wants. When the public (who are the victims) are actively engaged and involved, it will enhance their ability to respond to flood or other disasters effectively and appropriately.

Introduction

Malaysia lies in a geologically stable region which is almost "Disaster-Free", with the exception of floods and human-made disasters. The country also lies in a climatologically stable region which is located too far south of the major typhoon paths, although tail-ends of tropical storms have occasionally hit it. However, Malaysia is routinely affected by floods, droughts, landslides, haze and human-made disasters (Chan, 2015). Every year, flood disasters account for a significant number of casualties, disease epidemics, property and crop damage and other intangible losses (Chan et. al., 2002). In the two decades or so, the country experienced extreme weather and climatic events, which led to severe floods in 2006, 2007, 2010, 2011 and 2014. These were largely monsoonal floods (which brought about heavy losses, including loss of life in many parts of the country exposed to monsoon winds), which occur annually and varies in terms of severity, place and time of occurrences (Sharifah Meryam Shareh Musa et al, 2015). According to Hj Keizrul Bin Abdullah (2002), the previous Director-General of the Drainage and Irrigation Department (DID) Malaysia, flood hazards and disasters have always affected Malaysia, historically and now, mostly because of its wet equatorial climate that is influenced by seasonal monsoon winds (However, in recent decades, floods have occurred with increasing frequency and severity. The December 2014 floods that devastated the east coast states of Kelantan, Terengganu and Pahang and the west coast state of Perak caused infrastructure damage estimated at MYR2.9bil (MYR is the Malaysian Currency called Ringgit. In May 2015, 1US$ approximates MYR3.59) affecting nearly 400,000 people (The Star, 21 Jan 2015). A total of 21 people lost their lives in the floods with 8 still missing (New Straits Times, 31 December 2014). To address the flood problems, the Malaysian Government has provided an initial MYR500 million for rehabilitation activities and welfare programmes for flood victims, bringing the total allocation to the National Security Council for flood management to MYR787million. Another MYR800 million had also been allotted for repairs and

reconstruction of basic infrastructure such as schools, hospitals, roads and bridges. For Budget 2015, MYR893 million would be set aside for flood mitigation projects (The Star, 21 Jan 2015).

Arguably, of all the disasters in Malaysia, floods are most frequent and bring the greatest damage annually. Hence, floods are considered the most severe disaster experienced in Malaysia. Historically, there have been big flood events in 1886, 1926, 1931, 1947, 1954, 1957, 1965, 1967, 1970/1971, 1988, 1993, 1996, 2000, 2006/2007, 2008, 2009, and 2010. Of these floods, the 1926 flood was known as "The storm forest flood" because it destroyed hundreds of square kilometres of lowland forest on the floodplains of the Kelantan and Besut rivers. Records showed that the flood was accompanied by gale force winds (Drainage and Irrigation Department, Undated). According to the DID, this flood was considered "the biggest flood in living memory" in Malaysia as it affected almost the entire length and breadth of Peninsula Malaysia, causing extensive damage. In 1996, floods brought by Tropical Storm Greg in Keningau (Sabah State), claimed 241 lives, caused more than MYR300 million damage to infrastructure and property and destroyed a few thousand houses. In 2000, floods caused by heavy rains killed 15 people in Kelantan and Terengganu, and caused more than 10,000 people to flee their homes in northern Peninsular Malaysia. The December 2006/January 2007 floods in Johor caused 18 deaths and MYR1.5 billion in damage. In 2008, floods occurred in Johor again, killing 28 people and causing damage estimated at RM65 million. In 2010, the floods affected transportation in and around Kedah and Perlis, shutting down rail, closing roads including the North-South Expressway (*The Star,* 3 November 2010) and the airport in Kedah's capital city of Alor Setar leaving helicopters as the only mode of aerial transport into Kedah and Perlis (*The Star,* 4 November 2010). Water supply in Kedah and Perlis was contaminated, forcing these two states to seek supplies from their neighbour Perak (*Bernama*, 5 November 2010). Kedah and Perlis are the "Rice Bowl" of Malaysia, and the floods destroyed an estimated 45,000 hectares of rice fields with the government pledging MYR26 million in aid to farmers in both states (*Bernama* , 6 November 2010). The floods killed four people, with more than 50,000 evacuated. In Perlis, the floods submerged over two-thirds of the state's land.

The Malaysian flood authorities should engage local communities as they have rich experience. Local leaders such as village heads can provide information and mobilise people on the ground and advise the authorities when distributing relief goods, reconstruction material, or other benefits. Some things to avoid include rushing in with reconstruction without recycling useful materials from the disaster site, bulldozing over what could be valuable building materials, and rushing in quickly to implement adhoc plans. For example, establishing new institutions in short time frames, or developing complex and inflexible project designs are not encouraged. The authorities should always use familiar disaster management plans and systems with the local officials/leaders. Another thing to avoid is to relocate people away from their jobs and social contacts. This is useless as they would eventually return. The authorities should also be sensitive as not to impose grief counseling where it is found to be inappropriate, especially in the context of multi-ethnic Malaysia with multi-cultural beliefs. The National Disaster Response Mechanism (NDRM) is largely targeted for handling monsoon flooding (Liu and Chan, 2003). Consequently, this mechanism is less than effective and should be re-modelled into something more pro-active. There is also seriously lacking in terms of stakeholders participation, although the authorities have recognised the important role of NGOs, particularly that of Malaysian Medical Relief Society (MERCY), Red Cross, Red Crescent and other NGOs. Capacity building is necessary. The disaster management mechanism should also adopt more non-structural measures, adopt state-of-the-art technology and cooperate internationally with other countries for addressing transboundary disasters. In terms of flood warning, there are many areas which can still be improved. While the total number of telemetric stations for rainfall and river flow in the country seems large enough, a closer scrutiny would expose the inadequacies of uneven distribution. Most telemetric stations are located in populated areas while the sparsely populated areas, especially highland watershed areas, do not have enough telemetric stations. The Malaysian Meteorological Department and the Drainage and Irrigation Department have also not utilised remotely sensed rainfall (radar and satellite sensed rainfall) as an input in its forecasting models (Chan, 2000).

This top-down government-centric approach is largely reactive and has been in practice since the historic 1926 flood (Winstedt, 1927). The traditional flood strategy of building structures via the structural approach to control floods is not only expensive but also not holistic/comprehensive enough

(Chan, 1995). Clearly, both approaches are not effective in addressing floods and a massive paradigm shift needs to take place to move Malaysian flood management to a more proactive and holistic approach. The objectives of this paper are to examine existing Standard Operating Procedures (SOPs) on Flood Disaster Preparedness, Flood Warning System, Flood Evacuation Plan and Institutional Arrangements for Flood Disaster Risk Management in the Malaysia with the aim of improving them towards reducing flood risks and flood impacts.

Methods

The methodology of this study is largely based on (1) Primary Data with in-depth Qualitative Interviews with Key Stakeholders, Field Observation and Documentation of SOPs on flood preparedness, warning and evacuation systems and (2) Secondary Data such as Historical Flood Data, a review of existing SOPs, government reports, NGO documents and other reports. In addition, (3) Focus Group Discussion method is also used to obtain clearer responses from flood managers and flood victims. The expected outcomes would be a better understanding of the disaster phases, before, during and after flood disasters.

Discussion

In Malaysia, the DID is the recognised flood management authority in the country. The DID, however, is a department dominated by engineers whose traditional training is to control floods. Not surprisingly, the DID's main flood mitigation policy and strategy consists largely of structural measures (for example dams and embankments to control flood flows). Despite the DID's claims in recent decades that it has taken on board non-structural measures (for example land use planning and flood forecasting and warning systems to mitigate the impact of flooding), it does not have the expertise in these areas and implementation of such measures are negligible, resulting in a lop-sided approach favouring structural measures (Chan and Parker, 1996). Hj Ahmad Hussaini (2007), the current Director-General of DID stresses that the current policy guidelines for implementing flood mitigation measures include the following: (i) Implementation of structural flood mitigation in terms of engineering and socio-economic environment; (ii) Implementation of complementary non-structural measures; (iii) Implementation of non-engineering measures where there is no engineering solution; and (iv) Continuation on strengthening flood forecasting and warning systems. All these are based on experience gained from a National Water Resources Study carried out in 1982 on structural and non-structural measures for flood mitigation and management (Japan International Cooperation Agency, 1982). In addition, the government have also conducted a number of flood mitigation projects but again these were mostly structural mitigation measures such as canalization of rivers, raising river embankments and the building of multi-purpose dams. Interestingly, Chan (2015) noted that despite their high costs compared to non-structural measures, structural measures continue to be favoured until today. Consequently, the financial allocations for such projects was increased significantly in Malaysia's every subsequent five yearly development plans. Such escalating expenditures put a heavy strain on the government and there have been suggestions to relook at the strategies via a more proactive approach in finding ways and means to address the flood disasters in a holistic manner. The current Government machinery allows the Economic Planning Unit of the Prime Minister's Department to coordinate all aspects of planning, design and implementation of water resources (including flood management) in the country.

The Malaysian Flood Disaster Relief and Preparedness Machinery (MFDRPM) was set up after the disastrous flood of 1971 when the National Disasters Management and Relief Committee (NDMRC) was formed (Hj Ahmad Hussaini, 2007). The NDMRC committee was entrusted with the responsibility for planning, coordinating and supervising relief operations during floods. Unfortunately, this was an entirely top-down approach as most of the organisations in the committee were governmental departments/agencies and social organizations that are able to provide shelter, rescue, food and medical supplies. Through the various government levels, the NDMRC, SDMRC and DDMRC committees coordinate between government departments and various voluntary organizations. In terms of early warning, the Flood Forecasting and Warning Systems have been

upgraded. By 2007, the following infrastructures for flood forecasting and warning systems have been installed: 233 telemetric rainfall stations; 190 telemetric water level stations; 256 manual stick gauges; 84 flood warning boards; 217 flood sirens; real-time flood forecasting and warning systems in nine river basins. The DID Malaysia is responsible for providing flood forecasting and warning service to the public. It has established an Internet-based National Flood Monitoring System known as Infobanjir (http://infobanjir.moa.my Accessed 8 May 2015), via which rainfall and water level data can be collected for the whole country. The government has been working closely with the Canadian government to establish the GEOREX Monsoon Flood System for the Kelantan River Basin, a flood monitoring system integrating remote sensing, hydrological model and geographical information systems (GIS). This system allows the merging of hydrological data, such as river water levels and potential flooded areas, with geographical data on demography and transportation infrastructure. Flood management activities undertaken include the following: (i) National Water Resources Study; (ii) Development of infrastructures for flood forecasting and warning systems; (iii) "Infobanjir" (National Flood Monitoring System); (iv) "Flood Watch" (a flood forecasting and warning system); and (v) Urban Stormwater Management Manual for Malaysia (MSMA) (Hj Ahmad Hussaini, 2007). All these flood management activities are basically a combination of structural methods aimed at "controlling" floods and non-structural methods aimed at reducing flood impacts. A most famous example a structural method is the Stormwater Management and Road Tunnel also known as SMART Project is developed by the Drainage and Irrigation Department to alleviate flash flood problems in the Federal capital of Kuala Lumpur (Che Moin Umar, 2007). The 9.7 kilometers and 11.83 meters' in diameter tunnel integrates both stormwater management and motorway in the same tunnel. In contrast, an example of a non-structural method is the flood forecasting and warning system (Drainage and Irrigation Department, 1988).

Results from this paper indicate that flood disaster management in Malaysia is almost entirely based on a top-down approach. At the very top is the NDMRC running a National Crisis and Disaster Management Mechanism (NCDMM). According to Chia (2004), this machinery was established with the objective of co-ordinating relief operations at the Federal, state and district levels so that assistance can be provided to flood victims in an orderly and effective manner. In the case of floods, the NCDMM would be called the National Flood Disaster Relief Machinery (NFDRM) (Figure 1). The NFDRM is basically a reactive machinery, as it reacts to major floods that have occurred. The coordination of flood relief operations is the responsibility of the National Flood Disaster Management & Relief Committee (NFDMRC), headed by the Minister of Information with its secretariat at the National Security Council (NSC). The committee is empowered, among other things, to declare any district, state or even the whole nation to be in a state of disaster so as to be eligible for getting financial assistance from the Federal Government. Members of this committee include Government departments/agencies and social organisations which provide shelter, rescue and food supplies in case of disaster. On a positive note, the FFDMRC meets at least once a year, normally before the onset of northeast monsoon. The meeting is between all organisations involved with flood disaster management on the need to get ready before the monsoon arrives (bringing with it floods). It is to ensure that its machinery will run smoothly. The entire organisational structure of the NFDRM is shown in Figure 1.

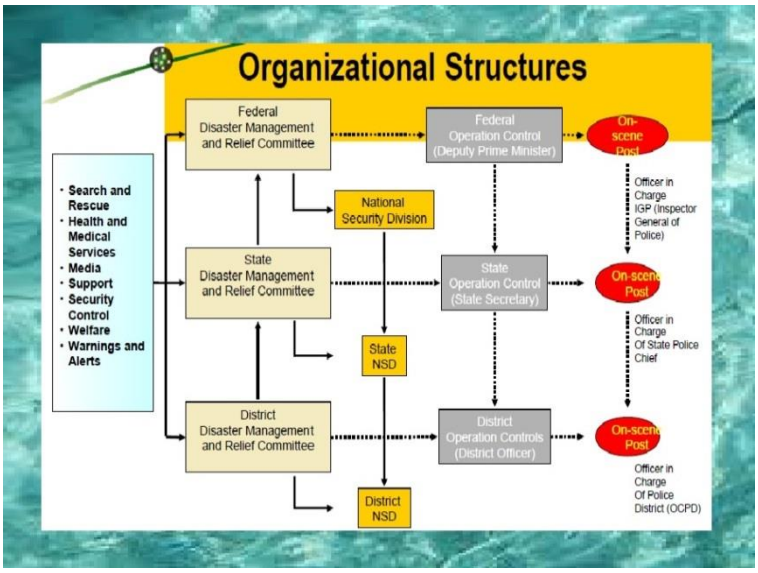

Figure 1: The Organisational Structure of the National Flood Disaster Relief Machinery (NFDRM) in Malaysia (Source: Basmullah Yusof, Undated).

It is theoretically responsible for all the operations at the national, state, district, *mukim* (sub-district) and village levels. In reality, however, it coordinates operations at the national level and overlooks operations at the state level. Much of the operations in each state are left to be run by the respective state authorities. Its main task is to ensure that assistance and aid are provided to flood victims in an orderly and effective manner from the national level downwards. As a result, its approach to disaster mitigation is largely reactive (Chan, 1995). For example, this body meets annually just before the onset of the northeast monsoon season to organise flood disaster preparedness, evacuation and rehabilitation work. It is also more of a welfare body than it is a flood management organisation. At the federal level, the National Security Council (NSC) is the secretariat for the Disaster Relief and Preparedness Committee (DRPC) which comprises members from the Ministries of Information, Finance, National Unity and Social development, Transport, the Federal Chief Secretary, the Federal Police Department and the Federal Armed Forces. The DRPC coordinates all relief operations from the Malaysian Control Centre in Kuala Lumpur. At the state level, there are 13 State Disaster Relief and Preparedness Committees (SDRPC) for Malaysia. Each state is given funds by the Federal Government every year to enable it to run its own disaster relief operations. At the district level, there are several district committees under each state, depending on the number of districts in a particular state. Each district will have its own District Disaster Relief and Preparedness Committees (DDRPC) which receives funds and directives from the SDRPC. Below the district level, there are several Mukim (County) Disaster Relief and Preparedness Committees (MDRPC), again depending on the number of mukim in each district. Each MDRPC is headed by a *Penghulu* (County Head). Finally, there are many Village Disaster Relief and Preparedness Committees (VDRPC) under each mukim. Each VDRPC is headed by a *ketua kampong* (village Head). The National Disaster Response Mechanism (NDRM) is basically a mechanism responding to disasters, as its name suggests. As such, its approach towards disaster management/reduction is largely reactive. Because Malaysia's main disaster is flooding, the NDRM is largely targeted for handling monsoon flooding. Consequently, this mechanism is less than effective and should be re-modelled into something more pro-active. There is also seriously lacking in terms of stakeholders participation, although the authorities have recognised the important role of NGOs, particularly that of MERCY, Red Cross, Red Crescent and other NGOs. This is likely due to heavy dependence of communities on government, and the reluctance of government to relinquish responsibilities to the public. Public apathy may also be a reason for low public participation in disaster management. Capacity building is necessary. These NGOs and other stakeholders should be involved right from the beginning from pre-disaster preparedness to rescue and reconstruction. NGOs would be particularly effective in creating awareness and education on disasters. The disaster management mechanism should also adopt more non-structural measures, adopt state-of-the-art technology and cooperate internationally with other countries for addressing transboundary disasters.

This paper has examined the current flood management strategies and has exposed some limitations of the Malaysian Flood Disaster Management Model. While many of these strategies have been responsible for reducing some of the impacts of flooding, they have not been entirely successful in the overall management of floods. Chan (2015) has attributed this to a largely outdated reactive approach based on evacuation, relief and rehabilitation, the low salience of floods on government agendas, the lack of interaction and cooperation amongst government agencies dealing with floods, the bureaucratic nature of government agencies, and the victims' reluctance to relocate. In fact, floodplain encroachment has even exacerbated flood hazards as more and more people are forced to occupy floodplains due to the shortage of land, high rents and rural-urban migration. Urban floodplains have also extensively developed as a result of rapid urbanisation leading to greater flood damage potentials (Chia, 2004). Flood forecasting and warning systems have also not developed as quickly as expected. Currently, two flood forecasting models have been developed and used by the Drainage and Irrigation Department Malaysia, viz. the Linear Transfer Function Model (LTFM) at Pahang River and the Tank Model at Kelantan River (Che Moin Umar, 2007). The agencies involved in flood relief have used the information to decide when they should mobilize their staffs and equipments to the areas that are potentially hit. The flood warning system consists of dissemination systems such as automatic warning siren, Short Messaging System (SMS), telephone, fax and via online website (http://infobanjir.water.gov.my Accessed 16 May 2012). The current system being used is not state-of-the-art technology as it does not have radar or satellite rainfall forecast as inputs into computer models. Rather, it uses river levels as inputs. The number of automated telemetric rain gauges and river level recorders are also short of the required number. As a result, the advantages of flood forecasting and warnings have not been optimally realised and the current system appears cumbersome and ineffective. This has led to a lack of confidence amongst floodplain users and flood victims toward flood forecasts and warnings. While every effort is made by relevant authorities to improve formal (official) FWESs, there has been little attempt to incorporate traditional (informal) FWESs into them (Chan, 2000). Traditional FWESs are an integral part of the Malaysian cultural heritage and are closely knitted into the fabric of rural societies. Due to years of responding to flood hazards, traditional FWESs are based on practical knowledge of adaptation and have served people well. As such, the authorities should incorporate them into formal FWESs in order to maximise the effectiveness of overall flood warning and evacuation response from the people.

Malaysia has passed various legislations related to flood control but there is no flood legislation directly focussing on floods. Existing legislations are also sectoral-based and outdated. While there are currently some laws governing the regulation of river use (eg. the Waters Enactment 1920, the Mining Enactment 1929, the Drainage Works Ordinance 1954, and the Land Conservation Act 1960, and others) and have some bearing on flood mitigation, they are not sufficiently clear or forceful enough as measures of flood mitigation. These laws were formulated mainly for the purpose of regulating and managing single sectoral water use. More stringent and clear-cut laws must be passed to enable the authorities to have direct control in all aspects of water use which may affect flooding. This includes laws that specify clearly water rights administration, water resource development, flood plain management and all aspects of flood mitigation. Alternatively, the existing laws should be updated with a stronger emphasis on flood mitigation.

Finally, flood hazard management in Malaysia has not kept up in the context of its rapid development. Malaysia is a newly-industrialising country in which the pace of social, economic and political change is fast, as is the pace of physical and environmental change. Other things being equal, these are the contexts in which flood hazards can be magnified and mismanaged. The contexts themselves are also changing, and changing physical systems have given rise to increased risk, exposure and vulnerability to flood hazards. Other contexts, largely structural, such as persistent poverty, low residential and occupational mobility, landlessness, and ethnic culture have also contributed to increased vulnerability to flood hazards amongst specific communities, mainly the poor. Thus, in order to better manage floods and move towards greater flood loss reduction, flood management must be given a higher salience on official agendas. In a country where poverty reduction and income equity amongst all races are targets of achievement, the reduction of flood loss appears to be an important vehicle towards achieving those targets. This is because the poor are the most vulnerable to flooding in Malaysia and any substantial increase in flood protection and flood loss reduction will reduce the income gap between the rich and the

poor. The government should also adopt a more pro-active and dynamic approach towards flood management, rather than adhere to a reactive approach.

It is found that the current flood management model lacks a multi-disciplinary approach that should include a well balanced mixture of structural and non-structural measures. In this respect, the employment of legislation to control floodplain encroachment, the development of hill land, and urbanisation is vital if Malaysia is to successfully develop at a sustainable pace and yet protect and conserve its environment, and at the same time manage flood hazards effectively. If not, flood hazards will continue to put a tremendous strain on the country's economy, exacerbate poverty and income inequity, and delay its efforts in becoming a newly industrialising country (NIC) by the year 2020 (Chan, 2011). This paper also found many constraints in post-flood disaster support systems. One is the "Politisation of Flood Disasters" whereby politicians and political parties politicise floods to their advantage. Another constraint is the "Mediasation of Flood Disasters" whereby the media becomes a potent force in either reducing the effects of a disaster or exacerbating it. It is a factor that significantly affects disaster management. So powerful is the role of the media that it can either help a nation address a disaster or make the country look bad. Yet another constraint is the role of climate change in exacerbating floods in the country. In recent years, floods have occurred in a very unpredictable manner, both temporarily as well as spatially.

Conclusion

In conclusion, Malaysia has not been effective in managing flood disasters despite its vast experience and the huge amount of expenditure spent. The country is now a rapidly developing country on the verge of becoming a newly-industrialising country. Hence, it is anticipated that future floods would be more severe given the contexts of bigger populations, more intensive agriculture and expanding industries, all of which can magnify flood effects. The contexts themselves are also changing, and changing physical systems have given rise to increased risk, exposure and vulnerability to flood hazards. Other contexts, largely structural, such as persistent poverty, low residential and occupational mobility, landlessness, and ethnic culture have also contributed to increased vulnerability to flood hazards amongst specific communities, mainly the poor. Thus, in order to better manage floods and move towards greater flood loss reduction, flood management must be given a higher salience on official agendas. In a country where poverty reduction and income equity amongst all races are targets of achievement, the reduction of flood loss appears to be an important vehicle towards achieving those targets. This is because the poor are the most vulnerable to flooding in Malaysia and any substantial increase in flood protection and flood loss reduction will reduce the income gap between the rich and the poor. A more pro-active and dynamic approach towards flood management should be adopted encompassing a multi-disciplinary approach combining structural and non-structural measures. Employment of legislation to control floodplain encroachment is vital for sustainable development and to manage flood hazards. Floods Disasters need to be reduced as they put a tremendous strain on the country's economy, exacerbate poverty and income inequity, and delay its efforts to become a developed country by the year 2020. Flood Disaster Preparedness, Flood Warning System, Flood Evacuation Plan and Flood Disaster Risk Management of Impacts in the country are all areas that need to be improved to ensure reduction of flood risks as well as reduce flood impacts. A more pro-active and holistic approach of flood management will improve awareness, preparedness and overall management thereby reducing loss of life, injury and property damage. Finally, on the part of the masses, it is anticipated that flood effects would become more severe and long lasting with longer recovery periods as the erosion of social capital becomes more and more pronounced. Aldrich (2010) has found that recovery from disasters is very much dependent on social capital, especially in post-crisis resilience. Hossain and Kuti (2010) similarly found the importance of disaster response preparedness coordination through social networks. In the case of flood disasters in Malaysia, social capital as manifested by kinships and family bonds have been found to be a strong factor in helping victims cope with and recover from flood disasters. This factor is all the more important when government aid is not forthcoming to the victims. However, out-migration from families due to the search for jobs in cities has, among other reasons, broken down the extended families. Consequently, families have lost the one thing that protects them from being totally devastated by flood disasters, i.e. the social bonding and self-reliance that has made them resilient all these years.

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