

FLOODS IN MALAYSIA

Historical Reviews, Causes, Effects and Mitigations Approach

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Abstract: Flood is the most devastating natural disaster experienced in Malaysia is flood. Throughout Malaysia, including Sabah and Sarawak, there is total of 189 river basins (89 of the river basins are in peninsula Malaysia, 78 in Sabah and 22 in Sarawak), with the main channels flowing directly to the South China Sea and 85 of them are prone to become recurrent flooding. The estimated area vulnerable to flood disaster is approximately 29,800 km² or 9% of the total Malaysia area, and is affecting almost 4.82 million people which is around 22% of the total population of the country. This study is aimed at finding the causes, effects and mitigation of floods. A comparative study was carried out to determine the people perception on floods. It is clear that, most of the people believe that, improper drainage condition is the main cause of floods. About 33% of the population agrees that, water damage to building is the main effect of flooding and other part suggested that evacuating people from flood prone to safe zones is the best way of reducing flood victims. It is finally agrees that, government and local community should take necessary measures to ensure proper drainage is build and clear during rainfall season. It is suggested that people should avoid developing new buildings on a water ways to reduce frequent occurrence of flooding, or people and government most ensure that, flood prone areas are not occupy with buildings.

Keywords: Malaysia, flood, disaster, vulnerable area, river basin, and rainfall season.

I. INTRODUCTION

A flood can be defined as any high water flow that dominates the natural or artificial banks in any part of the river system. Therefore, when a river bank is overtopped, the water extends over the flood plain and generally becomes hazard to the society (Ching et al., 2013).

When floods occurred, it has terrible impacts on people as it disrupts their day to day activities and the impacts can last for a week in the coming years, climate change is likely to make the situation even more challenging (NFRA, 2011). Flooding is a natural event, and no matter how hard a government or society tried to minimize or to stop it completely (FRMP 2012).

The most devastating natural disaster experienced in Malaysia is flood. Throughout Malaysia, including Sabah and Sarawak, there is total of 189 river basins with the main channels flowing directly to the south china sea and 85 of them are prone to recurrent flooding (89 of the river basins are in Peninsula Malaysia, 78 in Sabah and 22 in Sarawak). The estimated area vulnerable to flood disaster is approximately 29,800 km² or 9% of the total Malaysia area, and is affecting almost 4.82 million people which is around 22% of the total population of the country (DID, 2009).

Floods in Malaysia have been classified in two categories by the Malaysian Drainage and Irrigation Department, i.e. flash flood and monsoon floods (DID, 2000a). Based on the hydrological perspectives, the clear difference between these two disasters is the period taken by the river flow to recede to the normal level. Flash floods take only some hours to return to the normal water level, while monsoon flood can last for a month (Noorazuan, 2006).

Figure 1 below shows the rainfall pattern in Malaysia and how is it influenced by the two monsoons: the South west and north east Monsoons. The location of Malaysia itself consists of West Malaysia (Peninsula Malaysia) and East Malaysia (Sabah and Sarawak) and they are divided by the South China Sea (Toriman et al., 2013).

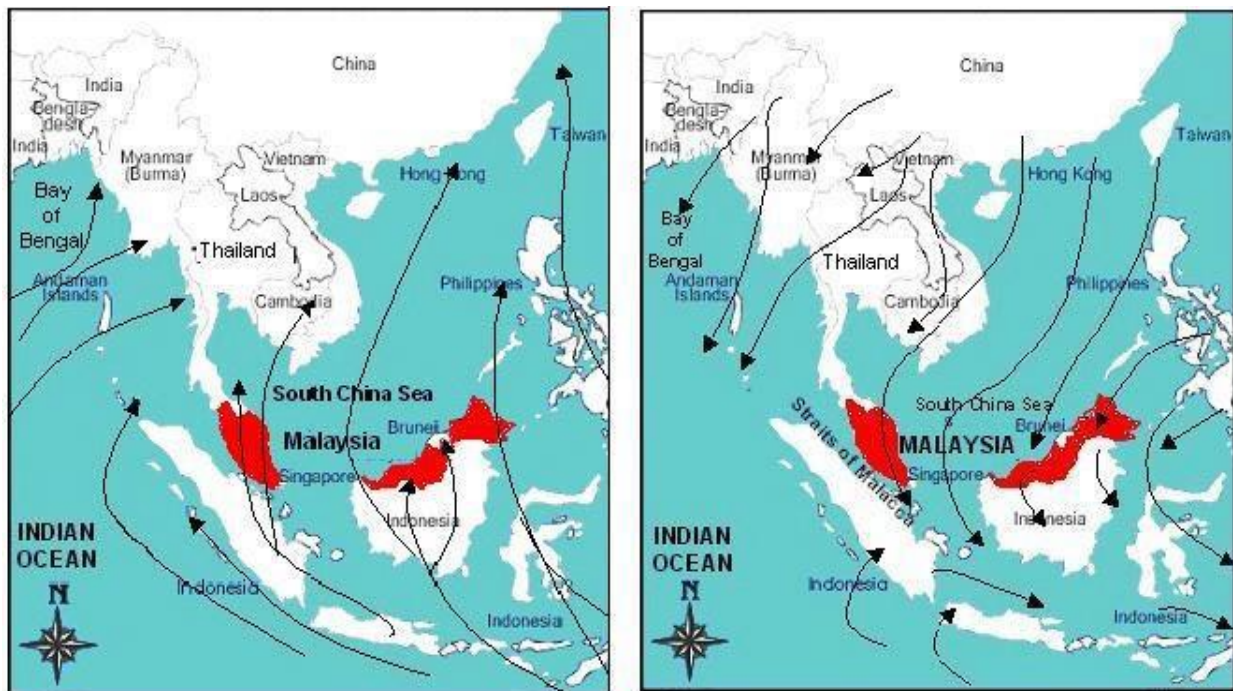


Figure1. Southwest and Northeast monsoons

Local weather changes are among the natural cause that triggered flash flood; while non-natural causes such as inefficient urban drainage system and increase of the number of building in the urban areas, and it is the causes of most of the flash floods event in the Klang Valley Peninsular (DID 2000a).

According to Chan, (1996), due to an increase in impervious surfaces such as roads, buildings and parking spaces, the risk and exposure of urban dwellers to floods has recently increased. It has been observed that, the economic repercussions of floods are more severely felt by the low-income dwellers especially in the flood-plain area (Chan, 2000). With their minimal level of income, what they can do is only small effort to mitigate the impact of floods (Sulong et al., 2012). Malaysia has experienced series of floods since 1920s and one of the severest is the December 2006 and January 2007 floods, the rescue and recovery departments has learn a lot of experiences as a results of these floods (Barton, 1994, Drabek, 1995, Ewen et al., 2007 and Tompkins et al., 2008).

II. MATERIALS AND METHODS

Description of the Study Area

Malaysia is located in the South East Asia, it lies between the latitude 2° N and 7° N of the equator and longitude 99.5° E and 120° E. it also covers an area of approximately $329,750 \text{ km}^2$, comprise of Peninsula Malaysia (i.e. West Malaysia) and the states of Sabah and Sarawak (East Malaysia) which is located along the northwest coast of Borneo Island. A large open water of about 531.1 square kilometers of the South China Sea separated the Peninsula Malaysia and the states of Sabah and Sarawak. Similarly, Peninsular Malaysia is also separated from Sumatra and Indonesia by the narrow straits of Malacca and from Singapore by Straits of Tebrau (Ching et al., 2013). Malaysia generally is enclosed by over 4800 km of coastlines, and the weather along these coastlines is influenced by convective rain and the rainfall distribution is greatly influenced by topography and the monsoon winds (Ching et al., 2013).

Figure 2, below shows the location of the study area, the location of Peninsula, the Borneo Island and how the Peninsula is also separated Sabah and Sarawak and surrounded by South China Sea by the Straits of Malacca and that of Tebrau (Google.com).



Figure 2. Map showing the study area.

Review of Flood History in Some Areas in Malaysia

Terengganu receive heavy rainfall during the North east monsoon that occurs between October and March and leads to severe floods almost every year at all over the state. Terengganu is located at the east coast of Peninsular Malaysia that has never missed a flooding event especially during the months of November and December during the north east monsoon period. The floods that occur at Dungun area of Terengganu state was due to the combination of physical factors such as elevation and also its close proximity to the sea apart from heavy rainfall received during the monsoon period. Hence, a flood that affects the Terengganu area and other location along the eastern coast is termed as a coastal flooding (Muhd Barzani et al., 2007).

Historically, Muar River Basin has experienced frequent flooding over the years, there had been series of heavy rainfall events that had resulted in flooding within the Muar River Basin catchments. The recorded floods are shown from December 1926 to January 1927, February to April 1967, November 1967 to January 1968, December 1970 to January 1971 and November 1979 respectively. From 1980 to 2010, a total of 29 flood events have been recorded (Ching et al., 2013).

Another enormous flood in the Malaysian flood disaster history, striking in four states in the Peninsular Malaysia like: Melaka, Johor, Pahang and Negeri Sembilan. The flood incident started when the Northeast monsoon brought a heavy rain through series of continues storms, causing destructive flood in Kota Tinggi, Johor (MNRE 2007a). The flood strike as a result of two waves, the December 2006 which last for 13 days from 19 – 31 December, and January 2007 lasted for 7 days from 12 – 17 January. The series of floods were unusual as the 2006 average rainfall return period was 50 years while the 2007 had more than 100 years of return period (Shafie 2007, BadrulHisham et al., 2010). The flood was destructive with the highest water level recorded reached 2.75m, is the highest level ever recorded since 1950 and it resulted in more than 100,000 people to be evacuated and the death of 18 people recorded (MNRE 2007a). Table 1, below shows the flood history in Malaysia, including the lost and the fatality rate.

Table1. Floods history in Malaysia

Date/Year	Incidence	Property, Material, Crop or other losses USD	Number of Deaths	Source (Chan, 2012)
1926	Flood known as "The storm forest flood"	Thousands of hectares of forests destroyed	NA	
December 1996	Floods brought by Tropical Storm Greg in Keningau (Sabah State)	300 million	241	
2000	Floods caused by heavy rains in Kelantan and Terengganu	Millions	15	

December 2004	Asian Tsunami	Millions	68
December 2006 & January 2007	Floods in Johor State	489 million	18
2008	Floods in Johor State	21.19 Million	28
2010	Floods in Kedah and Perlis	8.48 Million (Aid alone)	4
2011 & 2012	La Nina in 2011 and 2012 (which brought floods)	NA	NA

III. RESULTS AND DISCUSSION

After an in-depth review of the previous finding by many researchers on floods, the causes, attributes, effects and action taken to prevent or reduce the impacts, we come out with discussion as follows:

Causes of Floods

A research carried out by Kong et al., (2010), on urban flooding figure 3 shows that, 28% of people believe that flood is due to improper drainage system, 20% think the cause is pollution, 18% says is the management of urbanization and 16% said environment factor and 11% believe weather is the causative agent while 7% choose dam break (Kong et al., 2010).

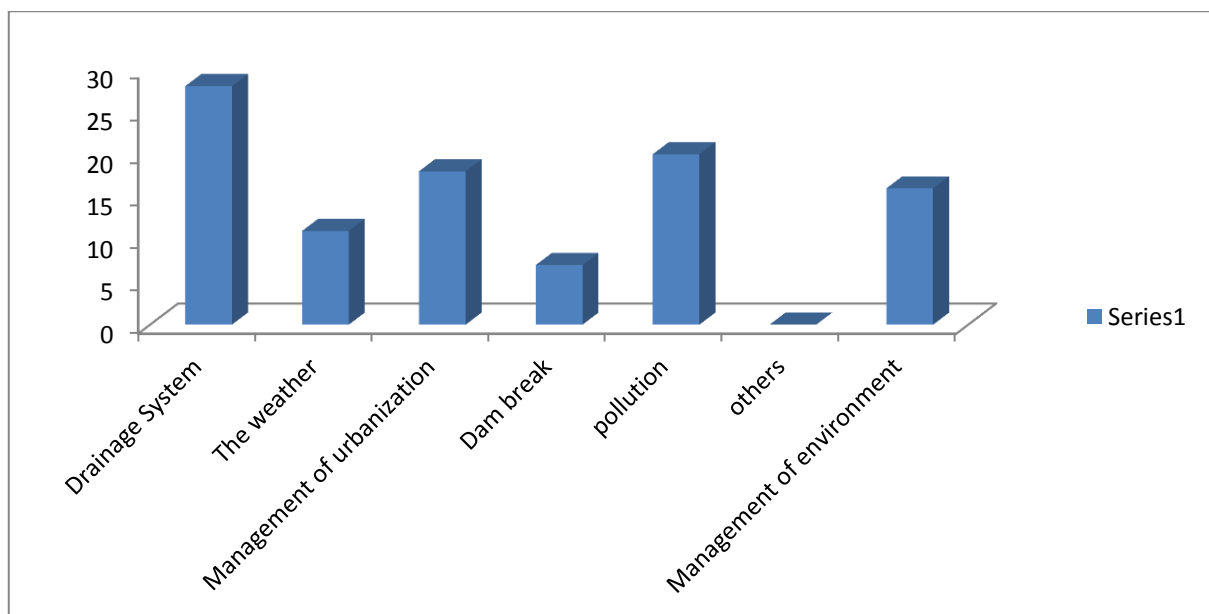


Figure 3. Six Causes of flooding

This result was validated by the research carried out by Thorndahl et al., (2008). According to the study, flooding occurs as a result of improper drainage system and they also state seven causes of urban flooding in which three of them are related to drainage system (Thorndahl et al., 2008). Similarly, urban flooding due to dam breaking has been stated in a research carried out by Gallegos et al., (2009). Another statement by Oguntala et al., (1982) also validates the research of Kong et al., (2010) on the improper management of environment is one of the causes of flooding (Akin et al., 1982).

Therefore, this shows that, factors like improper drainage system, dam breaking and improper management of environment are main causes of flooding with the support of almost 60%.

Effects of Flooding

A study by Vinet (2008) stated that, as the effects of flooding include damage to home, shops and industries. He point out that, flood victims have problem with the cost of repair and some small shops do not reopen after the disaster.

The above research was recently validated by Kong et al., (2010), where they ascertain that, more than 33% of people during their research agree that, water damage to house, structures and appliances are some of the effects of flooding.

Also loss of income due to closing of business is another effect of flooding. About 25% of people agree with this effect, and 17% believe that transport disruption is another effect of flooding (Kong et al., 2010). Figure 4 below shows the results of their research.

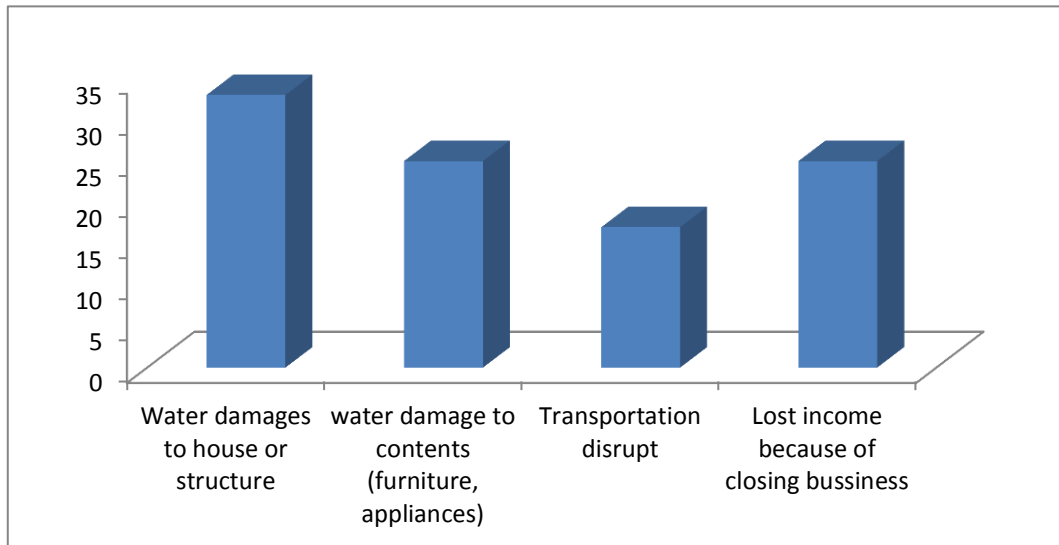


Figure 4. Four Effects of flooding

IV. FLOOD MITIGATION

One of the solutions to flooding is to relocate people from flooded area and move them to more designed areas that are on elevation area. Another way to reduce flood is to control the hazards with structural measures (Texier, 2008).

Similarly, research by Kong et al., (2010), yield almost similar result where they suggest that to reduce the effect of flooding is to move people to higher elevation as shown in figure 5 below. They added that, 44% of people with the suggestion of removing people to a higher elevation. Another suggestion is to use modified structures that can reduce frequency of flooding, and more than 34% of their interviewers support this method. About 17% believes that, to reduce flood people must participate in any type of emergencies of flood fighting, and 5% agree that none of this measures can reduce flood since it is natural disaster (Kong et al., 2010).

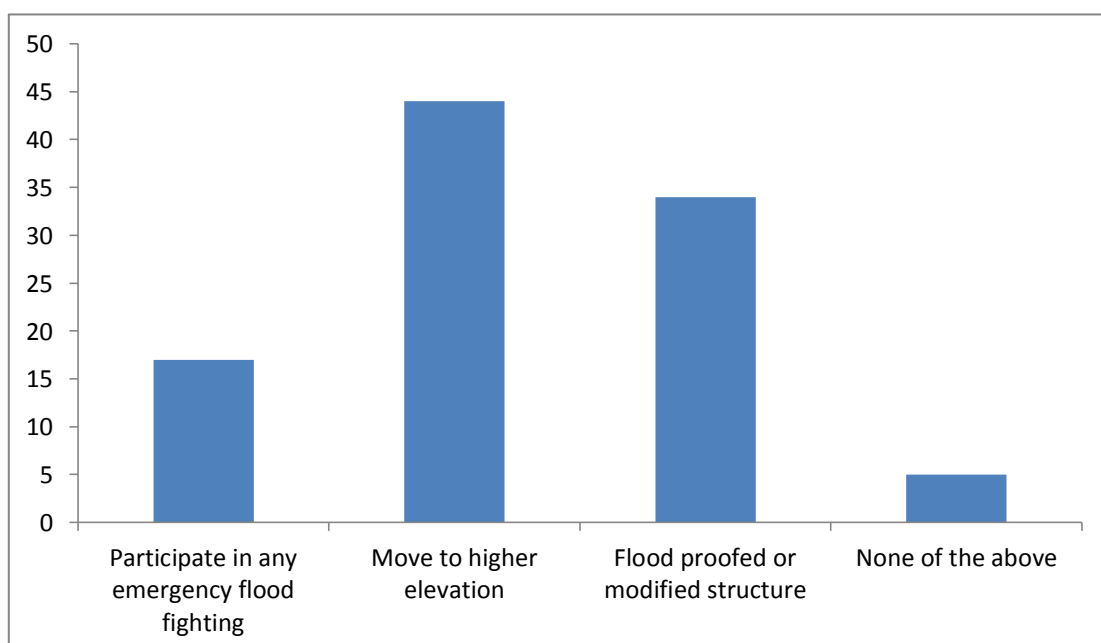


Figure 5. Five suggestion of Flood Mitigation

V. DISCUSSION

Based on the research available, it shows that there are at least 4 effects of flooding which include water damage to houses, disruption of transportation, reduction of income and damage of furniture and other appliances. But, most of the population strongly believes that, water damage to houses is the main effects of flooding. Therefore, it is suggested that, houses, shops and industries should be properly build so that to avoid building on the floodplain and on the flood prone zones.

From the finding of the flood histories, it is clear that, there are many cause of flooding which include drainage system, weather, urbanization, environmental factor, dam break and others. But from the previous research, most of people believe that, improper drainage system is the main cause of flooding. Hence, the drainage system should be properly managed and designed in such a way that it can accommodate the waste water flow and in case there is dam break or the bank of the river is full due to persistent rainfall the drainage system can easily and conveniently drain the water.

For mitigations, there are many suggestions on the ways to reduce flood, many people think removing people from the flood prone zones to a place with high elevation is the best way of mitigation. Therefore, the best mitigation is to stay away from low elevation areas and engage in emergency awareness.

VI. CONCLUSION

The research was conducted in order to review the past work on flood causes, effects and mitigations approach so as to keep people around the river area up to date on how to tackle and control floods and also how to reduce the impact and if possible to avoid damages. The findings of this study shows that, large percentage of people believes improper drainage system is the main cause of flood and also some part agree that the main effects of flood is the damage to houses and appliances, lastly some stated that the main way to avoid flood damages is to evacuate people from the flood prone zones. Finally the main aim was achieve and the author hope that, this work will help people and government in designing appropriate flood control measures

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