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# PAHANG FLOOD DISASTER : THE POTENTIAL FLOOD DRIVERS

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**ABSTRACT**

The northeast monsoon which occurs from November to March carries heavy rainfall which always result in flood especially to the east coast of Peninsular Malaysia. Pahang was one of the state that severely affected by this flood. Although the heavy rain is the main driver of the flood but human being cannot ignore the other flood drivers especially the river and its nearby environment circumstance which regard the flood event. The objective of this study was to determine the other flood drivers especially the river and its nearby environment circumstance which regard the flood event. The methodologies used in this study involved data collection through literature reviews and flood reports from Drainage and Irrigation Department (DID) and districts and interview to gather more information and verify the issues and other related drivers. The possible drivers of flooding in Pahang that occurred are as follows : 1) High rain intensity (>60 mm/hour, 200 – 450 mm/day) at the upstream that increases the quantity of water in the river and causes it to overflow 2) Water from area that has no drainage connection with the river (lowland, recessed and swamp area) was also flowing out and contributed to the flood 3) The size of the irrigation system is insufficient to bear the water flow rate and the tributary network is unable to withstand the large runoff 4) Increased reclaim of wetland area for development that causes irrigation system to be narrowed and obstructed for the water to flowing in to the tributaries 5) Prevalent forest clearing and logging activity increased the water non-absorbent area 6) Ground cutting for development purpose decreased the rain water absorption into the ground and increased surface water runoff, thus causes the watershed area decrease in its ability to hold water 7) Shallow estuary caused by high sedimentation from various activities leads to slow water conduction flowing from flood area to the sea 8) Most residential area are located at lowland and flood plain region coupled with bad irrigation system especially in big residential area, thus increased the flood risk. Each possible driver of flooding in Pahang that occurred in 2014 has to be discussed further in term of the responsible stakeholders who should involve in the management and maintenance. The heavy rainfall from northeast monsoon which was the main flood driver cannot be avoided but some flood drivers especially the river and its nearby environment that may contribute to higher magnitude of flood can be fixed and controlled by human

## INTRODUCTION

Malaysia had a hot, wet humid equatorial climate regime and the most obvious attribute is its heavy year-round rainfall ranging from 1, 500 mm to more than 3, 500 mm annually ( Dale, 1974). Peninsular Malaysia is located within an area which receives the seasonal monsoon winds especially the east coast states of Johor, Pahang, Terengganu and Kelantan which occur from November to March (Cheang, 1987 ; Chan 1989). During the monsoon season, the rainfall collected can be reached out to 610 mm in a day (Malaysian National Committee, 1976). This Northeast monsoon wind which comes from the Asian interior bring heavy rain to the East Coast as they are moisture-laden after crossing the South China Sea and the Gulf of Siam and often result in flood to the east coast states (Chan, 1995).

Pahang as one of the state located within the East Coast of Peninsular Malaysia, experienced this seasonal flood almost every year but the flood magnitude is different for each year. The flood in 1971 was one of the worst flood (with recorded information) experienced by the east coast states and Pahang was severely affected by it with great economic losses and death toll of 24 (Chia, 2004). In 2014, the East Coast re-experienced big flood after about 43 years since the 1971 flood. In Pahang, all districts were swept by the flood resulted in almost 68, 000 flood victims had to move out from their houses and about RM 73, 000, 000.00 losses suffered by DID in form of river structure damages. The flood occurred from 22/12/2014 to 15/01/2014 in Rompin, Pekan, Kuantan, Maran, Temerloh, Bera, Jerantut, Raub and Lipis, 05-06/11/2014 and 27/11/2014 in Cameron Highland as well as 26/10/2014, 05/1/2014, 02/12/2014 and 11/01/2015 in Bentong district (DID, 2014).

Although the heavy rainfall brought by the Northeast monsoon wind is the main reason of the flood, but human being cannot ignore the other potential or possible flood factors and drivers that contribute to higher flood magnitude. The objective of this study was to determine the other flood drivers besides heavy rainfall especially the river and its nearby environment circumstance which regard the flood event.

## METHOD

### Study Area

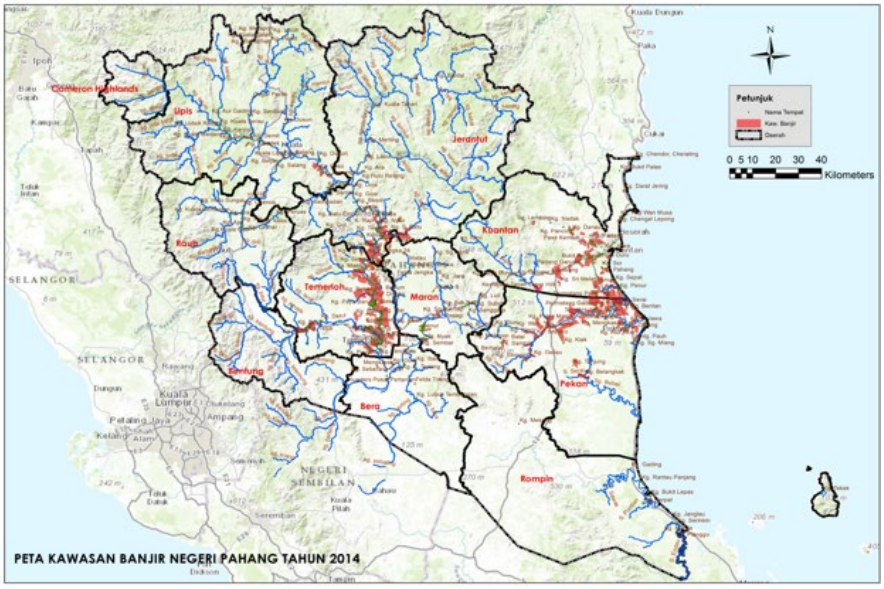
The state of Pahang can be divided into five major river systems, namely, Pahang, Kuantan, Bebar, Rompin and Endau River. All the five major river systems flow in an easternly direction and ultimately discharge into the South China Sea (Kajian Sumber Air Negara, 2000). Although the flood drivers discussed in this paper covered the whole Pahang state but focus will be given to the Pahang River Basin as it is the largest basin and covers 75% of the state.

The Pahang River Basin is located in the Peninsular Malaysia between latitude 2° 48’45” - 3° 40’ 24”N and longitude 101° 16’ 31” - 103° 29’ 34”E with total area of 27, 000 km2 and 440 km length. It is a confluence of the Jelai River and Tembeling River from the upstream which join together at Kuala Tembeling that situated about 304 km from the river mouth at the east coast of Pahang state (Muhammad, 2007). Jelai River is one of the two main tributaries which drain from the eastern slope of Banjaran and Titiwangsa Mountain, the foot of Central Mountain Range. The Central Mountain Range is the largest mountain in the Peninsular Malaysia and separates the Peninsular into an eastern and western part. Tembeling River originates from the Besar Mountain Range in the Northeast of the basin. For the purpose of fixing its length, however, the Tembeling and Pahang are considered as one river (Takeuchi,et al 2007). Other main tributaries of the River Pahang are Semantan, Teriang, Bera, Lepar, Gelugor, and Chini (Ashenafi, 2010). Flood of 2014 in Pahang involved all districts (Figure 1) whereby Temerloh and Pekan were two districts being affected the most.

### Methodology

The methodology used in this study involved data collection through literature reviews from previous studies by researchers around the world and flood reports from Drainage and Irrigation Department (DID) of previous years and reports of Pahang districts offices. Interviews with community and stakeholders were also being carried out to gather more information and verify the issues and other related drivers.

Figure 1. Map of flooded area in Pahang of 2014




Sources : DID, 2015

**RESULT**

The potential drivers of flooding in Pahang that occurred in 2014 are as follows :

| | |
|---|---|
| 1. | High intensity of rain (>60 mm/hour, 200 – 450 mm/day) at the upstream that increases the quantity of water in the river and causes it to overflow. |
| 2. | Water from area that has no drainage connection with the river (lowland, recessed and swamp area) was also flowing out and contributed to the flood. |
| 3. | The size of the irrigation system is insufficient to bear the water flow rate and the tributary network is unable to withstand the large runoff. |
| 4. | Increased reclaim of wetland area for development that causes irrigation system to be narrowed and obstructed for the water to flow in to the tributaries. |
| 5. | Prevalent forest clearing and logging activity increased the water non-absorbent area. |
| 6. | Ground cutting for development purpose decreased the rain water absorption into the ground and increased surface water runoff, thus causes the watershed area decrease in its ability to hold water. |
| 7. | Shallow estuary caused by high sedimentation from various activities leads to slow water conduction flowing from flood area to the sea. |
| 8. | Most residential area are located at lowland and flood plain region coupled with bad irrigation system especially in big residential area. This increased the number of flood victims. |
| 9. | High tidal level |

C local authority need to generate a new resettlement area at higher region to reduce the number of flood victims and reduce the flood risk. Fifthly, the developer need to ensure the possible flood level is taken into consideration when setting up the floor finish level in any future project. Lastly, to carry out the works in flood mitigation plan (Rancangan Tebatan Banjir) which includes bunding of rivers, flood wall and storage ponds of flood attenuation. Department of Irrigation and Drainage of Temerloh district suggested that the deepening and digging area of Pahang River should starting from Lipis to Jerantut to Temerloh (Figure 2). The digging or deepening process should not disrupt the river banks and the mean depth is between 2.0 m to 3.0 m (Figure 3). Flood report from Pekan district suggested that the land clearing area for agriculture should be limited and reduced since Pahang experienced wide land clearing for agriculture especially oil palm plantation.

Both flood mitigation measures, structural and non-structural measures should be planned and carried out. Non-structural measures aim is reducing the flood magnitude through the management of catchment conditions as well as reducing the flood damage. Integrated River Basin Management (IRBM) is one of the non-structural measures which can be used in Pahang. IRBM is understood to mean co-ordinated planning, development, management and use of land, water and related natural resources within hydrologic boundaries (Nigel 2004). In IRBM concept, the whole river basin is planned in an integrated manner and all factors are taken into consideration when a certain development plan is proposed. Factors like zoning for river corridors, riparian areas, natural flood plains, conservation of wetlands, storage ponds, etc. will be taken into consideration when preparing flood management plans (Chia 2004). In IRBM, both government and non-government organizations including public people should play their role in order to preserve the river basin since it is affected by the activities done by human.

Figure 2. Proposed dredged area for Pahang River Basin

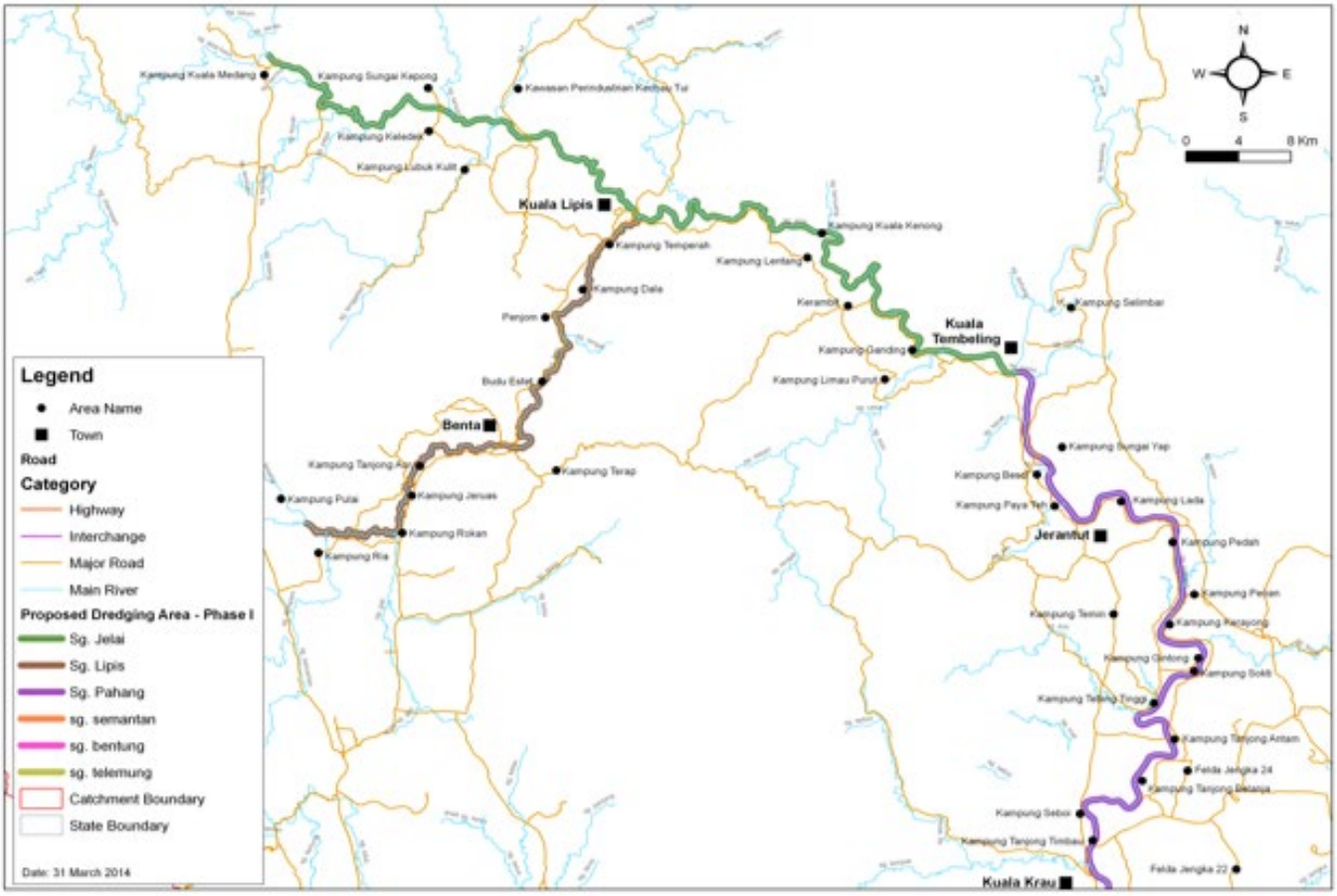
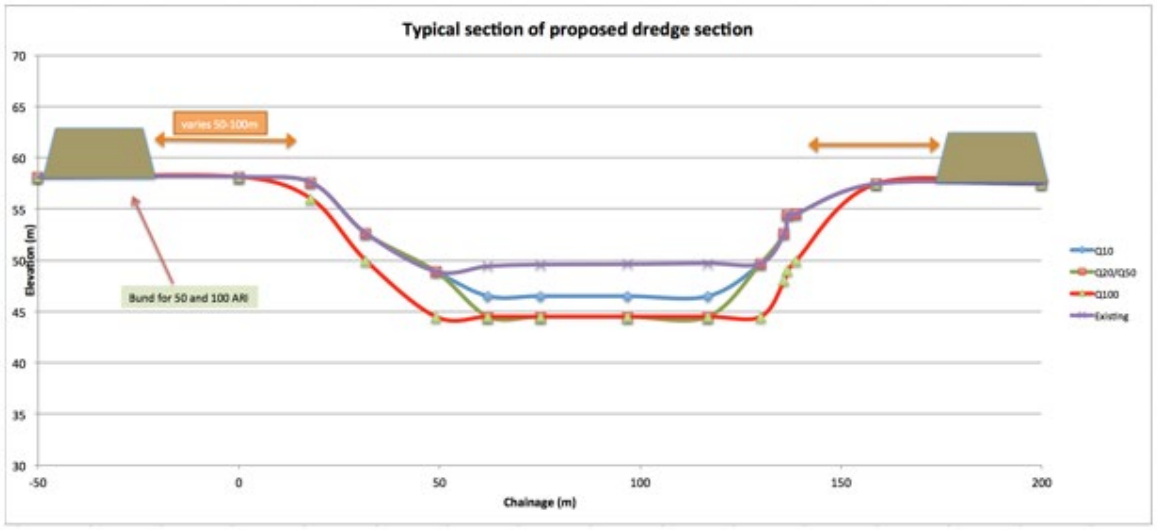



Figure 3. Typical section for various protection level for proposed river digging process

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