



## STAKEHOLDERS' RESPONSE AND PERSPECTIVES ON FLOOD DISASTER OF PAHANG RIVER BASIN

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### ABSTRACT

The Pahang river basin is the largest river basin in the Pahang State, with total catchment area covering 29300km<sup>2</sup>. Floods of Pahang river basin have become an annual natural disaster event where all the stakeholders have their own responsibility and parts to take care of it. This study has focused on stakeholders' response and perspectives to verify the issues on flood disaster of Pahang river basin. The methodology used in this study is the stakeholders' consultation workshop. This workshop was conducted by involving the stakeholders' representatives from various agencies. The result from this workshop has revealed the response and perspectives based on the important parts of each stakeholder to face the flood event that occurred in Pahang river basin. Besides, the issues aroused from this workshop have shown the stakeholders' response and their perspectives on how to reduce the impacts on flood disaster of Pahang river basin. According to the workshop, there are two factors contribute to flood event which are the heavy rainfall and the arising of water level. The causes of these two factors are the reason that we need to involve all aspects in order to reduce the impact of flood disaster. The aspects are to identify the frequent problems to arise during flood event, to improvise the operating systems such as flood forecasting systems, telemetric systems and hydrology system, the plans of each stakeholder on how to cooperate and reduce the impact as one team, to provide the proper flood maps at the study level and to review and verify what are the communities' complaints and perspectives as they also one of the victims. This study had discussed the proposed actions need to be taken according to the stakeholders' response and perspectives. The overflow of river water had caused by the low absorption of rainfall from forest which due to deforestation and loggings. The high water level also caused by the high sedimentations which contributed by these activities. The law enforcement with more stringent need to be done on these matters. Besides, the operating systems need to be improvised and added as these approaches can help in reducing the impact of flood events. The flood maps should be provided at study level to identify and produce a valuable case study. Stakeholders' consultations and involvement are the keys to improvise the weakness on how to cope with the floods event from the early stage. The proposal and implementations of the development should be done by involving the stakeholders' response and perspectives in any disaster.

### INTRODUCTION

The state of Pahang is the largest State located centrally in the eastern region of Peninsular Malaysia. The Sg. Pahang, Sg. Rompin, and Sg. Kuantan are the three principal rivers in the State. The Pahang river basin is the largest river basin in the Pahang State, with total catchment area covering 29300km<sup>2</sup>. The length of the river is estimated to be 440 km and it is a confluence of the Sg. Jelai and Sg. Tembeling from the upstream which join together at Kuala Tembeling, about 304 km from the river mouth at the east coast of Pahang state (Muhammad 2007). River Jelai is one of the two main tributaries which drain from the eastern slope of Mountains Banjaran and Titiwangsa, the foot of Central mountain range. The Central Mountain range is the largest mountain in the Malaysia Peninsula and separates the Peninsula into an eastern and western.

Sg. Tembeling originates from the Besar Mountain Range in the Northeast of the basin. Other main tributaries of the River Pahang are Semantan, Teriang, Bera, Lepar, Gelugor, and Chini. There are two main natural reservoir sites in the basin which are Lake Chini and Lake Bera. Lake Chini is surrounded by variously vegetated low hills and undulating lands which constitute the water-shed of the lake and drains north easterly into Sg. Pahang via the Sg. Chini (Muhammad, et al., 1998). Lake Bera is located at the southwest in the basin and is the larger of the two lakes via area. It is shallow and seasonal flowing into the River Pahang via River Bera. This lake plays an important role in flood control, water flow regulation and also provides natural resources for local community. Hence, it is protected under the international RAMSAR Convention, which was declared in November 1994 (Takeuchi, et al 2007). However, the lake is under threat of drying up in the near future as the water source disappears due to increasing conversion of natural forests to palm oil plantations, excessive siltation, and soil erosion caused by uncontrolled logging activities in the area (Takeuchi, et al 2007).

Pahang experienced an equatorial climate with distinct wet and dry seasons, characterized mainly by the northeast monsoon which occur between

November to January bringing heavy rainfall and floods to the region and have the average humidity of about 86%. The monsoons are characterized by the seasonality, geographical preference and strength. This season is the result of heating patterns by sun and distribution between land and ocean (John 1987). Pahang is rich in water resources and receive high total rainfall during northeast monsoon period with almost 40 percent of total rainfall annually (JMM 2010). The peak flow increased rapidly in the Pahang river basin because of natural land has been converted to be concrete surface and this phenomenon increases in the surface runoff (Muhammad 2007). Floods of Pahang river basin became the annual natural disaster event where all the stakeholders have their own responsibilities to take care of. With the growing awareness and concern over environmental issues, it is imperative that water resources development must be undertaken in an environmentally sustainable manner.

### 3.0 OBJECTIVES

This study has focused on stakeholders' response and perspectives to verify the issues on flood disaster of Pahang river basin. Besides, the objective of this study also to gather information and identify the source of floods, issues, causes, impacts and related factors for pre and post flood events from the stakeholders.

### 4.0 METHODOLOGY

The study area involved three main districts which are Jerantut, Temerloh and Pekan as shown in Figure 4.1. A stakeholder consultation workshop was conducted at Hotel Darul Makmur, Jerantut, Pahang. This workshop had invited the stakeholders from Land and District Office (PDT), Department of Irrigation and rainage (DID), Town and Country Planning Department (JPBD) and headmen from the three districts. A representative from DID Temerloh District was the main speaker for this workshop.

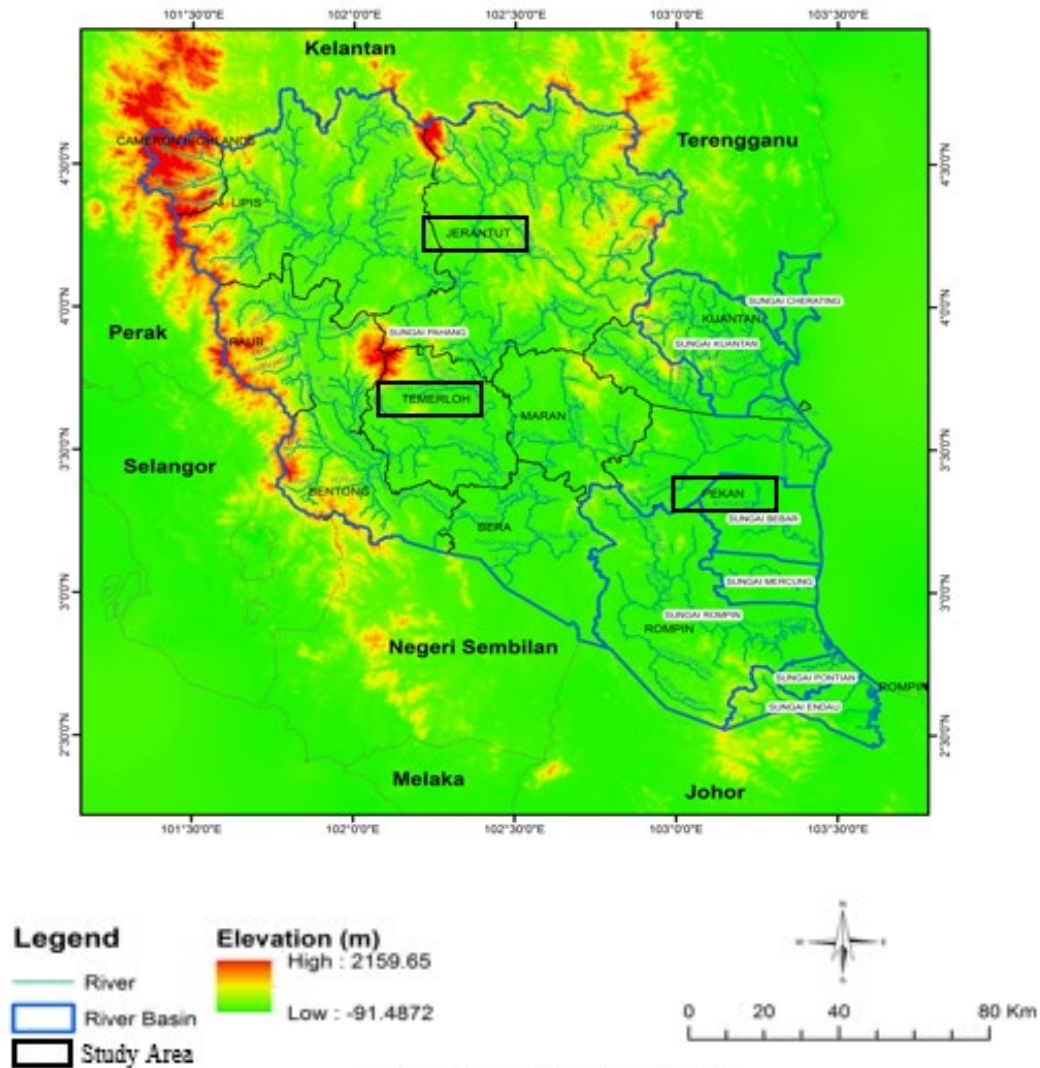


Figure 4.1. Study area: Pahang River Basin

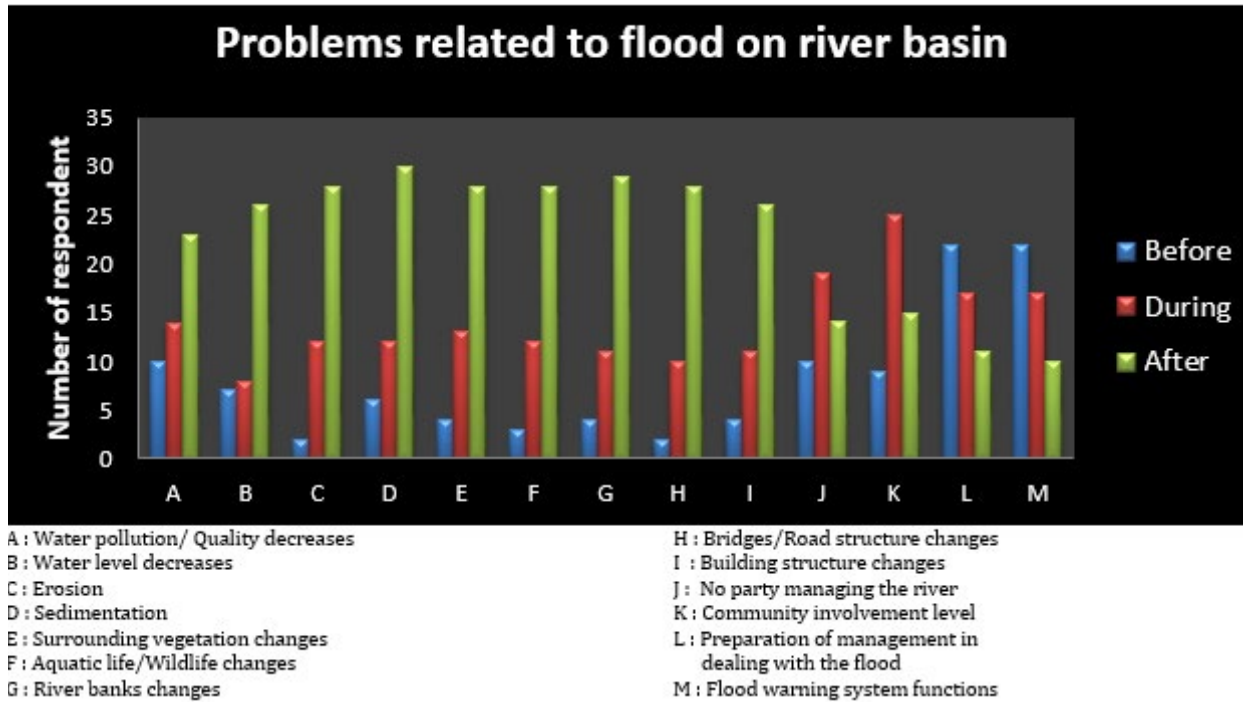
The result of this workshop has revealed the response and perspectives based on the important parts of each stakeholder to face the flood event that occurred in Pahang river basin. Besides, the issues raised from the flood event have been discussed. According to the stakeholders, the main sources of flood event are extreme and heavy rainfall triggered by the northeast monsoon and resulted to higher river flow started from the water discharged at the upstream and flows into Pahang river basin. This situation finally contributed to serious flood events at Pahang River Basin (DID 2005 & DID 2009).

However, not only the natural climatic condition like heavy rainfall had caused the flood event in year 2014 much worse than previous years. The worse impacts also caused by the human activities in the form of exploitation of natural resources and developments are always the external factors which affect and increase the river dynamic process. These changes may continue to river degradation (Jackson et al., 1995). The river would involve in the process of evolution due to its dynamic system (Camporeale et al., 2007; Robert, 2003). This is due to river water overflow from low absorption of rainfall from forest which caused by developments, deforestation, loggings and contributes in high sedimentation. The law enforcement with more stringent need to be done to avoid the worst flood event in the future

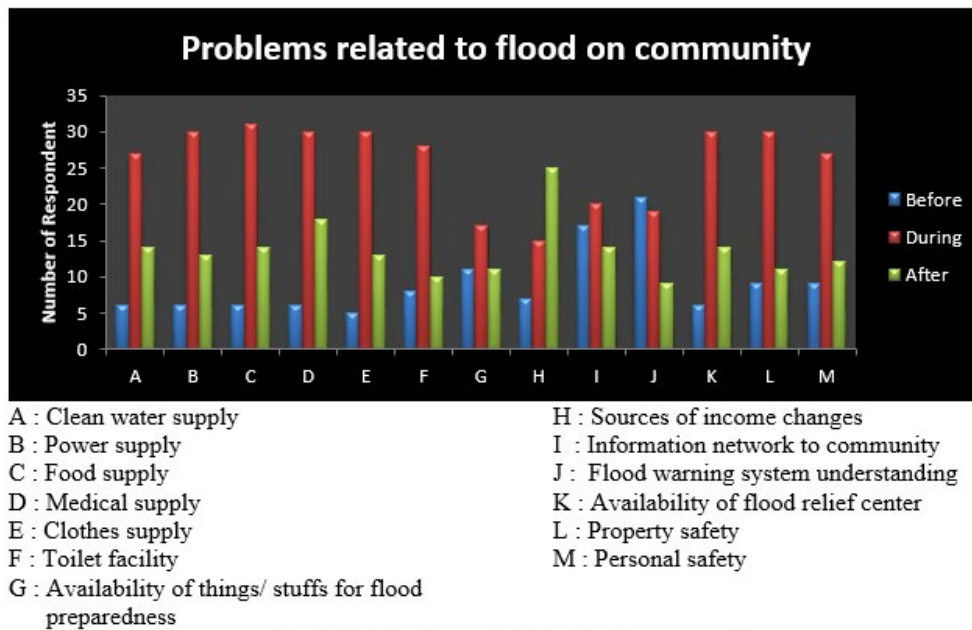
Other issues have been discussed in the workshop included the operating systems to function well before, during and after the flood event, the integrated river basin management among agencies, provide the proper flood maps at the study level and review the communities' complaints and hopes to avoid the worse flood impact. The Graphs 5.1 to 5.4 have shown the results of the questionnaires distributed during stakeholders' consultation workshop. The management and operating systems are involving the telemetry system, hydrological system and forecasting

system. The problems related to operating system are such the telemetry stations couldn't function well due to unstable water level reading. This situation also caused by no power supply and communication fail was not functioning. The stakeholders also suggested and planned to improve the damaged hydrology system. Most of the gauge and rainfall stations were flooded and caused damages to the system. Rivers and tributaries were not cleaned and organized properly. This matter was contributing to blockage of the flow of water. The main issues raised in the workshop and stakeholders complaints and hopes were summarized in Figure 5.1 and 5.2 respectively.

This workshop also was conducted to introduce the Integrated River Basin Management (IRBM) to reduce the impact without overlapping power and jurisdiction. In order to raise awareness and the involvement of all stakeholders in Pahang River Basin, the stakeholders consultation workshop is the approach method should be discussed in reducing the impact of flood events. Integrated River Basin Management (IRBM) is the concept to gain awareness from each stakeholder and to be alert their own roles in protecting the Pahang River Basin. The list of stakeholders and their roles are shown in Table 5.3.



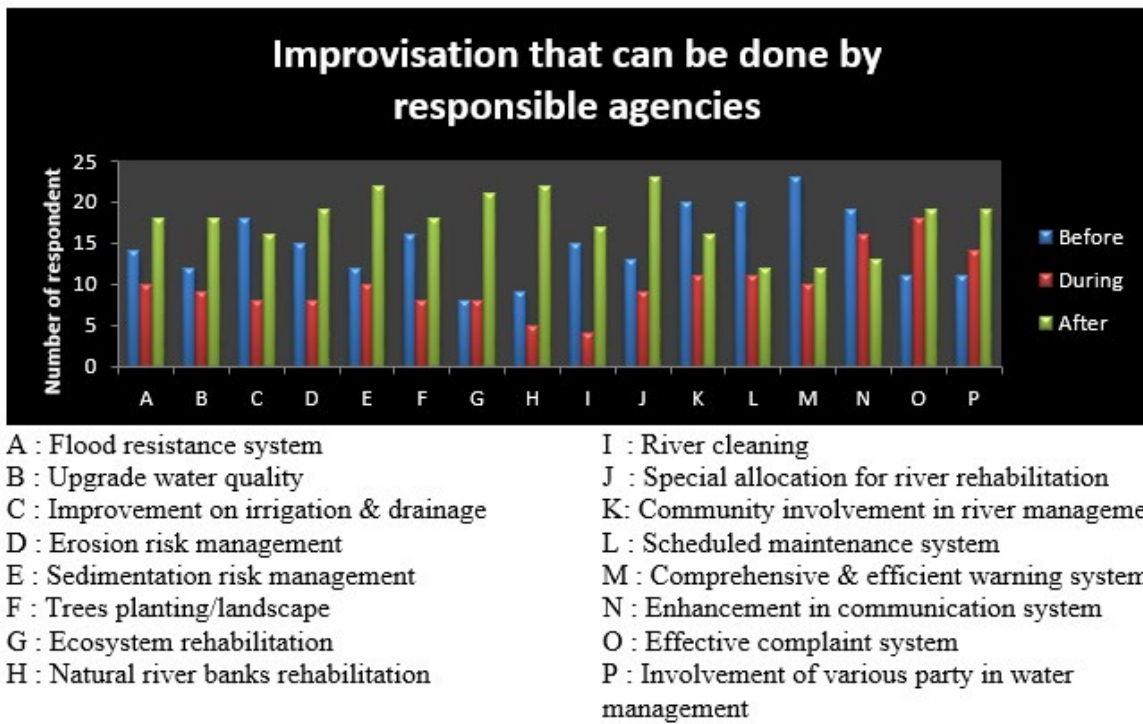
Graoh 5.1. Problems related to flood on river basin



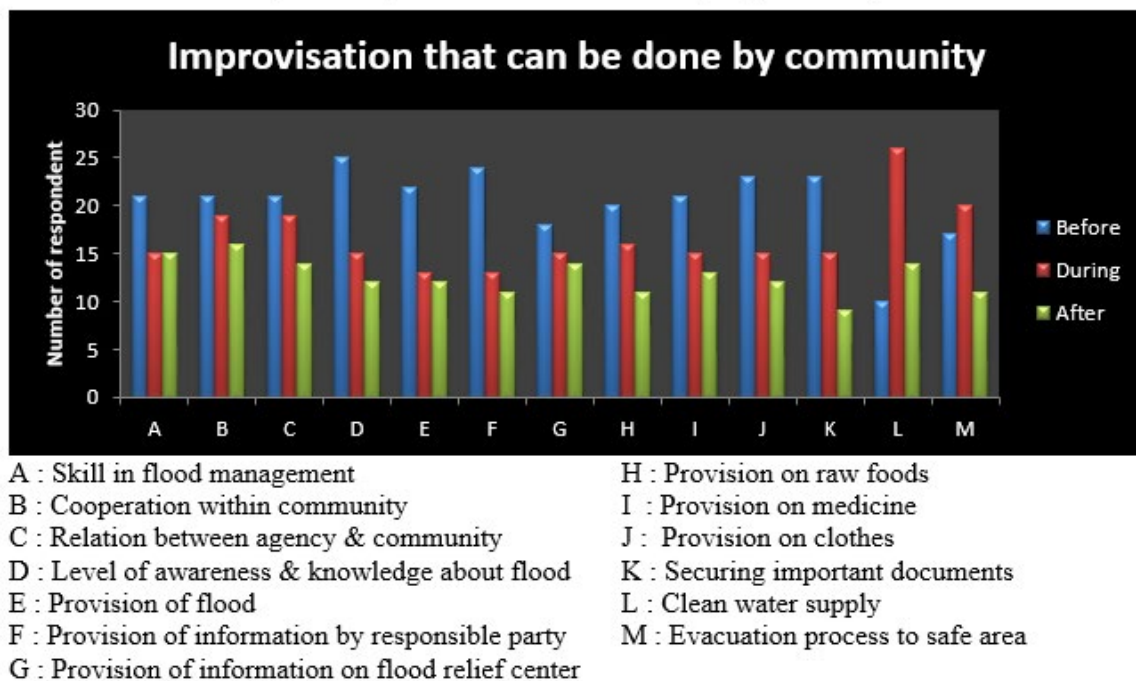
Graph 5.2. Problems related to flood on community

**Figure 5** Location on the stereonet of wedge weight,  $W$ ; the normal  $N_i$ ,  $NA$  and  $NB$  and angle to the normal,  $\beta_i$  ( $\delta_i$ ),  $\delta A$  and  $\delta B$  (Kliche, 1999).

The resisting force on plane A and B according to Mohr-Coulomb criterion



Graph 5.3. Improvisation that can be done by responsible agencies



Graph 5.4. Improvisation that can be done by community

Table 5.1. Flood related main issues.

ISSUES	FACTOR	PROPOSED ACTION
Development on swamp areas	High human growth population	Avoid development in the 'hold-water' area in the future
Heavy rainfall at upstream of Pahang river	Heavy rainfall caused by monsoon season	Build dam or structure that can help the river to hold the water
Operating system problem	Low maintenance	Increase maintenance
Blockage in the river	Heavy rainfall carry the trees into the river due to loss forest area to absorb the heavy rain	Law enforcement on the responsible party who did the logging
Lack of clean water resources	Non-functioning pump system caused by clogged sediments	Improvise the pump system
Lack of allocation	High-cost maintenance	Increase the allocation for flood mitigation

STAKEHOLDERS	COMPLAINTS	HOPES
Government/ management agency	<ul style="list-style-type: none"> <li>Lack of allocation</li> <li>No site visit from responsible person</li> </ul>	<ul style="list-style-type: none"> <li>Supply more boat</li> <li>Provide more allocation</li> <li>More site visit from responsible person</li> </ul>
Private agency/donator	<ul style="list-style-type: none"> <li>Lack of food supply</li> <li>Lack of cooperation</li> <li>Lack of awareness event</li> </ul>	<ul style="list-style-type: none"> <li>Continue and increases in supplying the needs</li> <li>Deal more with management</li> </ul>
Non-Government Organization (NGO)	<ul style="list-style-type: none"> <li>Lack of cooperation</li> <li>Lack of involvement after flood</li> </ul>	<ul style="list-style-type: none"> <li>Increases in supplying the needs</li> <li>Give more cooperation</li> </ul>
Researcher/University	<ul style="list-style-type: none"> <li>Research done was not comprehensive</li> </ul>	<ul style="list-style-type: none"> <li>Give more input</li> <li>Give more concern</li> </ul>
Local Authority (PBT)	<ul style="list-style-type: none"> <li>No maintenance on involved area</li> <li>No discussion with community</li> <li>Not enough evacuation equipment eg : boat</li> </ul>	<ul style="list-style-type: none"> <li>Do proper maintenance</li> <li>Do discussion with community &amp; responsible agency</li> <li>Provide more boat</li> <li>Give more allocation</li> </ul>
Land & District Office (PDT)	<ul style="list-style-type: none"> <li>Lack in flood management</li> <li>Not enough allocation for flood relief</li> </ul>	<ul style="list-style-type: none"> <li>Give more allocation</li> <li>Improve &amp; enhance the flood management</li> </ul>
Community	<ul style="list-style-type: none"> <li>Lack of cooperation</li> </ul>	<ul style="list-style-type: none"> <li>Be more alert &amp; give good</li> </ul>

Table 5.3. The agencies and their roles

Agencies	Roles
Government	<ul style="list-style-type: none"> <li>• Source of provision</li> <li>• Main coordinator and project Advisor</li> <li>• Ensuring that regulations and laws enforced by the Departments</li> <li>• Appointment of Consultant</li> <li>• Pelan activities and implementation of public awareness programs</li> <li>• Communication and encourage public involvement</li> <li>• Appoint companies to carry out conservation and develop projects of basin in phases</li> </ul>
Department of Town and Country Planning	<ul style="list-style-type: none"> <li>• Land use study coordinator and Sg. Pahang basin inventory</li> <li>• Advisor to local authorities on town and country planning and development of Sg. Pahang basin</li> <li>• Provide potential and the proposed development of Sg. Pahang</li> <li>• Coordinate the activities and programs related to Sg. Pahang</li> <li>• Provide GIS land use data base of Sg. Pahang</li> <li>• Provide Rancangan Kawasan Khas of Sg. Pahang and guideline development nearby the river</li> </ul>
Department of Irrigation and Drainage	<ul style="list-style-type: none"> <li>• Conduct a comprehensive flood mitigation program</li> <li>• Determine the buffer zone of the river</li> <li>• Provide the database associated with the river (tidal, depth of the water current, width of the buffer zone etc.)</li> <li>• Coordinate and maintain the logboom and ban line</li> <li>• Assisting the state authorities and local government to deter appropriate development activities around the river</li> <li>• Improving the dissemination of information through media</li> </ul>
Department of Environment	<ul style="list-style-type: none"> <li>• Conduct enforcement by the Environmental Quality act 1974</li> <li>• Ensuring environmental conservation for people's welfare</li> <li>• Monitor and identify the causes of pollution</li> <li>• Prepare and monitor the water quality index at sampling stations</li> <li>• Conduct awareness campaign for community</li> </ul>
Local Authority	<ul style="list-style-type: none"> <li>• Monitor and enforce compliance for development along riverbank</li> <li>• Monitor illegal dumpster</li> <li>• IWK clean and transport the sewage from septic tanks periodically</li> <li>• Ensure the development at the river frontage</li> <li>• Maintain and ensure cleanliness around the riverbanks</li> <li>• Regular garbage collection</li> <li>• Controlling application and the proposed development along the river</li> <li>• Give license to manufacture along the river</li> <li>• Establish mangrove trees planting program</li> <li>• The involvement of integration program between members of councils</li> </ul>

<b>Office of Land and Minerals</b>	<ul style="list-style-type: none"> <li>• Verify the status of the land</li> <li>• Coordinating the application on land from all the Land Offices</li> <li>• Registration of land title</li> <li>• Enforcement on land development and dredging</li> <li>• Advisor of State Government on land management</li> <li>• Help define the boundaries of land lots</li> </ul>
<b>Department of Forestry</b>	<ul style="list-style-type: none"> <li>• Ensuring mangrove forest is preserved</li> <li>• Monitor unauthorized intrusion</li> </ul>
<b>State Education Department, District</b>	<ul style="list-style-type: none"> <li>• Conduct a program to raise awareness in school</li> <li>• Assist in river conservation through R&amp;D involving school students</li> <li>• Educate the community on the importance of preserving the river</li> </ul>
<b>Public Community</b>	<ul style="list-style-type: none"> <li>• Participate in conservation programs held by organizers</li> <li>• Maintain and keep the river clean</li> <li>• Establish a 'gotong-royong' program</li> </ul>
<b>Non-Government Organizations</b>	<ul style="list-style-type: none"> <li>• Conduct awareness programs with community</li> <li>• Educate the community on the importance of preserving the river</li> </ul>
<b>Manufacturer/Entrepreneur</b>	<ul style="list-style-type: none"> <li>• Ensuring the waste is dumped systematically not being channel into the river</li> <li>• Maintain the irrigation and drainage to prevent clogging</li> </ul>

## CONCLUSIONS

Although the rainfall is the main natural factor that given impact to the changes of Pahang River, but anthropogenic factor always considered as the cruel factor that causes and worsen the whole natural scenario into more complicated way (Pan Ia Lun 2011). The high rainfall intensity cannot be controlled but other possible flood factors which contribute to higher magnitude of flood can be controlled especially development in sensitive area. All agencies should give high cooperation in playing their roles in order to preserve and maintain the river while considering all factors involved. The stakeholders' response and perspectives are the keys to improve the weakness to face the flood of Pahang River Basin. IRBM is a concept of a management field which comprise all factors with considering the environmental resources, socio-economic and the institutional frameworks. Thus the Pahang River Basin can be well preserved

## 7.0 ACKNOWLEDGEMENT

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