



## **An Adaptation of Kota Bharu Community towards Monsoon Flood** **Ang Kean Hua**

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### **Abstract**

*This study deals with how the community of Kota Bharu adapts to monsoon floods that strike in the Monsoon season. Malaysia is a developing country, but the flooding problem still cannot be prevented even with the application of science and technology. Monsoon flooding is a natural disaster. Therefore, this disaster is difficult to avoid using a variety of methods. So, the only way to react to a flood disaster is through understanding adaptation methods towards flooding. This research study is uses the quantitative methods, which is through a questionnaire study. A total of 400 respondents from the Kota Bharu community were willing to spend their time and managed to give the information by answering the questionnaire provided. The study area was set to involve the people living along and near the river in the district of Kota Bharu, Kelantan. The results indicated that continuous rains from upstream will provide big impact to the downstream. This happens when water flows from high to low areas, plus a large amount of water from elsewhere, such that the river cannot cope with the excessive water and overflows. These conditions cause monsoon floods to occur. So, the people of Kota Bharu have a variety of methods such as paying attention to the rain and flood warning system, preparing food before the food sources are cut off, keeping important items in a safe place, and using boats as a primary form of transport.*

**Key Word:** *Monsoon flood, adaptation, continuous rain, excessive water.*

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**Introduction:** Malaysia is a rapidly developing country, soon achieving developed country status on par with other countries. The government has many plans for developing the country through a variety of projects. However, the development of the country has still not been able to prevent disasters like the monsoon floods experienced by people living in the east coast states, especially Kelantan and Terengganu (Suhaila *et al*, 2010). Monsoon floods are a natural disaster that occur as a result of the passage of the earth about its axis, which produce different winds (known as the Northeast Monsoon Winds) that contains a lot of water vapor moving from a high pressure areas to low pressures areas (Juneng *et al*, 2007).

Generally, the floods happen seasonally, especially during the monsoon season that occurred from November until March. Floods may occur due to certain factors, such as non-stop rain (Shaluf & Ahmadun, 2006). Rainwater moving over the earth's surface is known as surface water, which will flow from a higher to lower point (Flynn, 2011) (Poff *et al*, 1997). The surface water will flow into the river at the higher area and the water will start to move until it reached the flat land or at lower area. A large amount of water that flowing into the river can cause the size of the river to be unable to cope with large quantities of water and spill out of the river (Vivoni *et al*, 2006). This may

result in the disaster known as monsoon floods. This situation has created a problem for the people living on the east coast and is also a major issue and obstacle to the development of the country.

Per common knowledge, a flood is a natural disaster that occurs in the human environment. Natural floods can be attributed to river flooding, flooding estuaries, coastal flooding, muddy floods, and other effects. In Malaysia, most floods are caused by river flooding. Such floods can be divided into two types, fast and slow type (Billa *et al*, 2004). The floods considered slow or taking a longer time are caused by heavy rain or snowmelt continuously produce surface runoff which is very high and exceeds the capacity of a river channel. Among the factors that cause heavier rains are monsoons, hurricanes, and precipitation that affects the density of snow (Chan, 1995). Flooding that occurs quickly or takes a shorter time is due to low surface area and water retention resulting in flash floods. Among the factors that promote the occurrence of flash floods are convective precipitation (intense storms) or sudden release of water associated with dams (Chan, 1995). So, the natural flooding that occurs on the east coast is river flooding closely related to the monsoon floods.

Monsoon flooding that occurs as a result of air pressure differences exists in different areas. In November until March, sunlight falls on the Southern Hemisphere and creates an area of low pressure in Australia, while in the Northern Hemisphere forms a high area in Central Asia (Braesicke *et al*, 2012). Due to radiation and convection, cooling air creates a layer of very cold air which is stable near Siberia and in the North China block movement in the Southwest by the Tibetan Plateau. This increases strength “Baroklinik zone” between the cold continental air mass and warm air mass into the Tropical South (Braesicke *et al*, 2012) (Samah *et al*, 2010). Thus, a gap in the middle latitudes of the increase “anticyclogenesis” near Central China and “cyclogenesis” occurs near the East China Sea (Samah *et al*, 2010). The bonding surface pressure gradient across the waters of the East China causes cold surges towards the South China Sea. Cool outdoor act with gap Equator (near-equatorial trough) to generate additional turbulence and associated with a period of heavy rainfall in peninsular Malaysia and its surroundings (Samah *et al*, 2010). This situation has resulted in flooding due to heavy rains brought by the northeast monsoon winds. Heavy rainfall in some states such as Kelantan, Terengganu, and Pahang cause them to be more prone to flooding. However, the people in the flood plain can still adapt each time the floods hit. Therefore, a study of the monsoon floods conducted to understand how community residents of east coast, especially Kota Bharu, can adapt to natural floods when they occur.

### **Methodology:**

**Survey Methodology:** The method used to conduct this research study was a quantitative method, which involves the questionnaire or “survey method”. In producing questionnaires, the formation of questions is designed and used in the type of “close-ended approach” or approach a closed type questions. Closed-type questions ask questions to respondents without those respondents expressing an opinion, because the question posed is directly and they only have to mark the answer provided in the questionnaire. The questionnaire can be divided into two main parts.

The first part is related to the social and demographic background of the respondents, where the information to be obtained includes gender, age, duration of stay, level of education, and occupation (table 1). The second part is related to respondent’s perceptions of the monsoon floods. Ratings for the second part will be involve with in the expression of agree and disagree, which can be divided into 5 scale (1-strongly agree, 2-agree, 3-neutral, 4-disagree, 5-strongly disagree).

**Sampling Method:** The sampling is based on a stratified systematic sampling method. The sample size of 400 was obtained for the 400 houses that would provide information by filling out the

questionnaire provided (Krejcie & Morgan, 1970). Most of the questionnaires were distributed to the community of Kota Bharu to the people living near the river which have experience before, during and after of monsoon floods which sweep through (figure 1).



Figure 1 show that there are majority of the Kota Bharu community stays near to river.  
Photo taken on 10 February 2014

**Result and Discussion:** The results obtained through the questionnaire were input into the computer software known as Statistical Package for Social Science or SPSS. A total of 400 questionnaires were analyzed to produce new information. In this analysis, the research study will involve the correlation method in between two fixed variables. This two fix variables will be correlate with other variables to see either that there was a significant correlation in the alpha ( $\alpha$ ) = 0.05. The two fixed variables mentioned above are precautions when raining continuously at upstream, and precautions when raining continuously at downstream (table 2).

Table 1 show the first part of analysis in the social and demographic background of respondents. Gender of respondents was 188 for men and 212 for women. Meanwhile, age of respondents was the highest at 156 peoples for those between the ages 25 to 35, and the lowest was 8 peoples under the age of 17. Next, the most respondents in duration for living in the area was 168 peoples between 1 to 10 years, and the lowest was 32 peoples with more than 30 years. Educational status of the respondents showed that the majority had SPM, with a total at 136 people, and minorities were the standard 6 and higher education degrees, which amounted to 60 peoples. The last analysis for the social and demographic background is the type of job, where the highest rating was 148 respondents that were jobless, and the lowest rating was 52 respondents working in the government sector.

**Table 1: Social and demographic profile of respondents.**

<b>Category</b>	<b>Frequency</b>
<b>Gender</b>	
(1) Male	188
(2) Female	212
<b>Age</b>	
(1) < 17	8
(2) 18-24	112
(3) 25-35	156
(4) 36-45	92
(5) > 46	32
<b>Duration of Stay (Years)</b>	
(1) 1-10	168
(2) 11-20	92
(3) 21-30	108
(4) > 30	32
<b>Education Level</b>	
(1) Standard 6	60
(2) PMR	64
(3) SPM	136
(4) STPM/GCE	80
(5) University	60
<b>Occupation</b>	
(1) Jobless	148
(2) Self-Employed	116
(3) Government	52
(4) Private	84

According to the analysis of the social and demographic background of respondents, the main reason for male respondents being 24 fewer than the female respondents is because the majority of women are not working and are fully housewives, while men will go out for work during office hours. This reason can be proved that majority respondents are in jobless status, with 148 people for this type of job category. This situation also shows that the standard of education is not prioritized, especially among women, because most of them are full housewives. This also leads to the occurrence factor of 'illiterate' because the standards of education are no longer paramount; this can be proved by only 60 respondents who had education up to university level, and only 80 respondents who had education up to GCE or STPM. Education is very important because without knowledge, people will not learn from the experience of floods, and also will not know that the flood will bring advantages and disadvantages to their own lives. With knowledge, society will be capable of changing flood disadvantages into advantages for daily life during the floods season.

In addition, the duration for habitation time in terms of years for each respondent is important because the longer the time for the community of Kota Bharu living near the river, the more experience they will be able to adapt with the monsoon flood disaster. For example, flooding occurs which will lead to the destruction of property, but most of the citizens consider that the monsoon floods can give a joyful condition, leading to water playing and bringing a few food sources like

fish. This situation shows that there is a social life changing in accordance to the current situation. Finally, the age of the respondents is also very important, as young people between the ages of 25 to 35 were the most numerous at 156 people. So, this can prove that many people of Kota Bharu still able to adapt to the monsoon floods in the monsoon season and do not feel this to be a burden in their lives.

The second part of the analysis in this study will display the information about the respondent’s perception of adaptation to the monsoon flood. This study show how the community of Kota Bharu will react when raining is continuous at the upstream or downstream areas, and this will provide very important information to the researcher to see which areas will be of more concern to them. Referring to the analysis in table 2, two variables used are fixed in comparison, which is ‘precaution when raining continuously at upstream’ and ‘precaution when raining continuously at downstream’.

**Table 2: Correlation analysis**

Category	Frequency				
	Variable 1	Variable 2	Variable 3	Variable 4	Variable 5
Precaution when raining continuously upstream.	r = 0.359 p = 0.000 (p < 0.05) N = 400	r = 0.231 p = 0.021 (p < 0.05) N = 400	r = 0.259 p = 0.009 (p < 0.05) N = 400	r = 0.273 p = 0.005 (p < 0.05) N = 400	r = 0.273 p = 0.005 (p < 0.05) N = 400
Precaution when raining continuously downstream.	p = 0.078 (p > 0.05) N = 400	r = 0.663 p = 0.067 (p > 0.05) N = 400	r = 0.302 p = 0.063 (p > 0.05) N = 400	r = 0.452 p = 0.073 (p > 0.05) N = 400	r = 0.289 p = 0.006 (p < 0.05) N = 400

\*r means Pearson Correlation; p means Significant for 2-tailed; N means total respondents.

\*Variable 1 = Forecasting and warning of heavy rain and flooding become guiding to the public on precautionary measures.

Variable 2 = Food sources cut off.

Variable 3 = Rice and food preparation required.

Variable 4 = Important items place at higher area.

Variable 5 = Boat use as main transport.

‘Precaution when raining continuously at upstream’ and ‘forecasting and warning of heavy rain and flooding become guiding to the public on precautionary measures’ show that both variables have a strong significant relationship at  $\alpha = 0.05$  with p value of 0.000, which has a weak positive relationship in correlation of 0.359. Next, ‘precaution when raining continuously at upstream’ and ‘food sources cut off’ indicates that both variables have a strong significant relationship at  $\alpha = 0.05$  with a p value of 0.021, which has a weak positive relationship with correlation of 0.231. The third variables were the ‘precaution when raining continuously at upstream’ and ‘rice and food preparation required’ with a strong significant relationship at  $\alpha = 0.05$  with p value is 0.009, with a weak positive relationship in correlation of 0.259. ‘Precaution when raining continuously at upstream’ and ‘important items place at higher area’ has a strong significant relationship at  $\alpha = 0.05$  with p value is 0.005, with a weak positive relationship and a correlation of 0.273. Last but not least, ‘precaution when raining continuously at upstream’ and ‘boat use as main transport’ shows the two variables have a strong significant relationship at  $\alpha = 0.05$  with p value is 0.005, which has a weak positive relationship correlation of 0.273.

Variable for 'precaution when raining continuously at upstream' show a significant relationship with the five other variables. This indicates that the community of Kota Bharu is concerned if heavy rain occurs in the upper reaches during the monsoon season. If there are any warnings about potential of heavy rains hit the state of Kelantan, the Kota Bharu community will be prepare to place their important items at a higher area or safer place from the flood disaster. In addition, the community of Kota Bharu will also make preparation in terms of food source like buying some rice and preparing some canned food like sardines to face the monsoon flood. This is because when a flood hits Kota Bharu, most retailers of fish, vegetable retailers, or retailers who sell wet goods, are unable to open the shop due to the difficulty in obtaining transportation and raw resources. So, practically the food sources may be cut off for a period of time until the flood recedes (probably about one or two months). For Kota Bharu community living near the river, most of them will prepare a boat to serve as major transportation when the flood hits the state (figure 2). The main reason for this is because when the flood arrives, there will definitely be no ground transportation that can move freely, other than water transportation such as boat.



Figure 2 show that Kota Bharu community prepares boats when monsoon flood hit the state. These become the main transport when monsoon floods arriving.

Photo taken on 10 February 2014

However, the situation is quite different for the other variables, namely 'precaution when raining continuously at downstream'. According to table 2, the variable of 'precaution when raining continuously at downstream' and 'forecasting and warning of heavy rain and flooding become guiding to the public on precautionary measures' have no significant relationship at  $\alpha = 0.05$  with p value more than  $\alpha$ , which is 0.078 at correlation of 0.556. Next, 'precaution when raining continuously at downstream' and 'food sources cut off' also showed no significant relationship between the two variables at  $\alpha = 0.05$  with p value exceeding  $\alpha$ , which is 0.067 at correlation of 0.663. The third variable would be between 'precaution when raining at downstream' and 'rice and food preparation required' also showing that the two variables have no significant relationship at  $\alpha =$

0.05 with p value more than  $\alpha$ , which is 0.063 at correlation of 0.302. This situation is similar for the 'precaution when raining at downstream' and 'important items place at higher area' is having no significant relationship at  $\alpha = 0.05$  with p value exceeding  $\alpha$ , which is 0.073 at correlation of 0.452. However, 'boat use as main transport' and 'precaution when raining at downstream' indicates that both variables have a strong significant relationship at  $\alpha = 0.05$  with p value is 0.006, with a weak positive relationship in correlation of 0.280.

Among the main reason that can cause 'precaution when raining at downstream' have no significant with other variables because the community of Kota Bharu is believe that the amount of rain that fell at downstream will not affect their daily activities. In the opinion if the people who live near the river, when it rained continuously and rainfall in a large number, this condition will not cause water to accumulate in the river for a longer time, to increase rapidly in the river due to the heavy raining. This is because downstream, the water flow in the river will directly flow to the mouth of the river and into the sea. Therefore, the people do not have to worry about important items to place at higher or safer place and compulsory to make any preparation in food supply like rice or in canned food like sardine. Moreover, the residents will not need to worry that the food source would be cut off due to heavy rain downstream due to catastrophic monsoon floods. However, there is the one thing of concern for the community of Kota Bharu, in that living near the river area causes higher percentages of minor monsoon floods due to the low flat land. So, they need to make preparations by having a boat, so that when a minor flood or short term flood occurs, they can still enjoy free movement by having a water transport, with no need to be too dependent on land transport, which stops for a period of time.

**Conclusion:** This research study shows how the community of Kota Bharu can adapt to the monsoon floods when they hit. Experience over the years has led to maturity of habits for the Kota Bharu community to face this monsoon flood. A major factor contributing to the monsoon flood disaster is significant and continuous rainfall. Rain water will typically be absorbed into the ground. But if the quantity of the water is too much, then the water cannot be absorbed into the ground and runs off into streams as surface runoff. So, the amount of water flowing into the river from different directions will cause the amount of water to increase rapidly, and this will encourage a monsoon flood disaster to occur.

If flooding occurs at the upstream and together with continuous rainfall, the Kota Bharu community living in the downstream areas still have time to prepare for the coming of monsoon flood. However, the floods that strikes upstream in the upper area will not take a longer time because the upper area is at a highland. Therefore, the highland area will produce a higher gradient. So, the water in the river will move down the slope at a relatively high velocity until it reaches the same gradient as the sea level, which is downstream. When the water arrives downstream, it will definitely accumulate in the area for a longer time. This situation will lead to water in large quantity in the river, and the water will flow out from the river and cause flooding to occur.

Although the monsoon floods arrive every year, but this situation will not bring sadness and frustrating to the community of Kota Bharu among those who live with the flood. In their opinion, the flooding is no longer a major burden and problem that will affect their lives; the flooding is instead thought to bring a great boon to people living near the river (figure 3). For example, when the floods hit this may lead to fishing activity, and when the floods recede, the land around the house will be fertile, encouraging small-scale cultivation to occur. Thus, this study indicates that Kota Bharu can adapt to the flood disaster in the east coast state of Kelantan.





Figure 3 shows that Kota Bharu community carries out small-scale cultivation due to the land is infertile after monsoon flood. Photo taken on 10 February 2014

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