

**STUDY ON SEDIMENT SIZE AND DISCHARGE
AT LEBIR RIVER DUE TO 2014 FLOOD**

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RAJA IRNI FATINI BINTI RAJA IDNAN

Thesis submitted in fulfillment of the
requirements for the award of the degree of
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Faculty of Civil Engineering and Earth Resources

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JUNE 2016

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LIST OF SYMBOL

D_{50}	Particles size in m, at which 50% of the bed material by the weight is finer
u_s	Shear velocity (m/s): $u_s = \sqrt{\tau_0/\rho}$
v_{cr}	Average Flow Velocity (m/s) at incipient motion
ν	kinematic viscosity, (m^2/s)
S	energy slope, (m/m)
V	average velocity, (m/s)
G	Acceleration of gravity
S_g	Specific Gravity of Sediment
Q	Total water discharge
q_s	Sediment discharge
γ	Unit weight of water
γ_s	Unit weight of solid particles
A	Area of cross section

LIST OF ABBREVIATIONS

TSS	Total Suspended Solid
DDM	Degrees, Decimals Minutes
UMP	Universiti Malaysia Pahang

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ABSTRACT

A study on sediment was conducted at the Lebir River. Sediment is solid material that deposited in a new location by a river. It can be in many shapes and size. The deposition of sediment process was effected depends on river flow. This study was conducted to determine type and size of sediment and sediment discharge at Lebir River. There are five station of sediment sample that was taken to get that parameter. The sediment grain size was analysing through Sieve Analysis as to get type of sediment and mean grain size while the concentration of sediment will be measured through Total Suspended Solid (TSS). Most of the sample has course sand, very course sand and fine gravel type based on Udden-Wentworth scale. There are different values for TSS starting from Station 1 until Station 5 with 520mg/l, 917mg/l, 1331mg/l, 1337mg/l and 422mg/l. By using three sediment transport function which are Engulend Hansen, Yang's Stream and Colby Formula, the value of sediment discharge for each formula are quite different because the rate is related to the size of sediment. So that, Engulend Hansen Formula was preferred because meets the requirements compare to other function. The sediment discharge value by using this method starting from Station 1 until Station 5 are 0.159kg/m-s, 0.188kg/m-s, 0.087kg/m-s, 0.044kg/m-s and 0.006kg/m-s.

ABSTRAK

Satu kajian mengenai sedimen telah dijalankan di Sungai Lebir. Sedimen adalah bahan pepejal yang bergerak di lokasi yang baru dengan melalui sungai. Ia terdapat dalam pelbagai bentuk dan saiz. Pemendapan proses sedimen telah dilaksanakan bergantung kepada aliran sungai. Kajian ini dijalankan untuk menentukan jenis dan saiz sedimen dan pelepasan sedimen di Sungai Lebir. Terdapat lima stesen sampel sedimen yang diambil untuk mendapatkan parameter yang terlibat. Saiz sedimen bijirin telah dianalisis melalui Analisis Ayak untuk mendapatkan jenis sedimen dan min saiz butiran manakala kepekatan sedimen akan diukur melalui Jumlah Pepejal Terampai (TSS). Kebanyakan sampel mempunyai pasir tentu, sangat tentu pasir dan jenis batu halus berdasarkan skala Udden-Wentworth. Terdapat nilai yang berbeza untuk TSS pada setiap stesen bermula dari Stesen 1 sehingga Stesen 5 dengan 520mg/l, 917mg/l, 1331mg/l, 1337mg/l dan 422mg/l. Dengan menggunakan tiga fungsi pengangkutan sedimen iaitu Engulend Hansen, Yang Stream dan Colby formula, nilai pelepasan sedimen bagi setiap formula adalah agak berbeza kerana kadar adalah berkaitan dengan saiz sedimen. Disebabkan itu, formula Engulend Hansen telah dipilih kerana memenuhi syarat-syarat penggunaan formula berbanding dengan fungsi lain. Nilai sedimen pelepasan dengan menggunakan kaedah ini bermula dari Stesen 1 sehingga Stesen 5 adalah 0.159kg/m-s, 0.188kg/m-s, 0.087kg/m-s, 0.044kg/m-s dan 0.006kg/m-s.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Sediment is a solid material that deposited in a new location by a flow stream. The sediment normally will be carried out from their original position by water surface movement or water runoff then will be deposited in the streams, wetlands as well as lakes. The characteristics of sediments can consist of rocks and minerals as well as the remains of plants and animals that lay on the land surface. It can be differing depends on their grain size classification either can be as small as a grain of sand and silt or as large as a boulder and gravel. Sediment is one of the largest nonpoint source pollutants and it is the primary factors that contribute to the effects for weakening of water surface quality.

One of the factors that contribute to the sediment formation is the land use activities such as civil construction and maintenance, mining, agriculture, commercial and residential development as well as timber harvesting. When there are in rainy day, all of this land disturbing activities will allows weakening of soil particles causing the sediment moves from one place to another by water surface movement through the

process of erosion. Generally erosion process means the deposition and removal of rock as well as soil. In this process, the sediment will be deposited through either by water, wind as well as ice. The water surface movement then washes the sediment likes gravel, sand as well as pebbles move down from their original state which is creek deposited into the river finally to the bottom of the river or river deltas.

Sediment then will be transported along the river. Another name for sediment transport is sediment load. Sediment load can be categorized based on their grain size classification either can be suspended load, bedded as well as wash load. Suspended sediment commonly the sediment will be floating in the body of the river while bed sediment will be settled down on the bottom of a bed river. While suspended load is the amount of sediment that transport along the river to the downstream within the water column by the water flow. The size of particles for sediment that can be carried as suspended load will be depending on the flow rate. In a low water flow rate will cause a larger particles of sediment are more likely will fall through the upwards current to the bottom unless the flow rate increases then the large particles can be transport. In addition the suspended sediment will not necessary remain suspended if the flow rate slows. While for the wash load, it is a subset of the suspended load. It is the finest sediment typically it diameter less than 0.00195mm. The wash load is distinguished from suspended load because during a low water rate or there is no flow period, it will not settle to the bottom of a waterway.

Besides, bed load is the part of the sediment transport moves possible in rolls, slides as well as bounces along the bottom of a waterway. When the sediment sustains intermittent contact with the streambed, they are not truly suspended and the movement is neither uniform or continuous. Bed load will occur when there are the force of the water flow is strong enough to overcome the weight and cohesion of the sediment. While the particles are pushed along, they typically do not move as fast as the water around them as the flow rate is not great enough to fully suspend them. Bed load transport can occur during low flows for smaller particles or at high flows for larger

particles. In situations where the flow rate is strong enough some of the smaller bed load particles can be pushed up into the water column and become suspended.

1.2 PROBLEM STATEMENT

Heavy rainfall that began on the 17th of December, 2014, led to flash flooding and it is the one of the serious flood issue in recent years. Later, three days of continuous torrential rain fell from the 21st to the 23rd of December, 2014, in Gua Musang. As a result, the water levels of three major rivers, the Galas River in Dabong, the Lebir River in Tualang and the Kelantan River rose drastically.

Regarding to this issue, there are many factors that contributes to this problem. In fact, when there is rainfall, the gravity allows the surface water moves from higher to the lower ground then into the stream. As the water runoff flows, the water will pick up soil, sand as well as loose material that lay on the land surface called sediment. The sediment then will be carried out by water surface movement deposited to the river stream through the process of erosion. Thus, this would result to high amount of concentration as the eroded soil moves into the river by sediment transport.

Another name for sediment transport is sediment load. The total load in sediment transport includes all particles moving comparing depending on sediment grain size characteristics either bed load, suspended load and wash load. The transportation of the sediment load will be effected by water discharges and sediment grain size. When the greater water discharge, more sediment will be transport or otherwise. Water flow must be strong enough to suspend sediment particles on the body of the river as they transport downstream or will simply push the sediment along the bed of the waterway. The slower of water rate in streams will cause the sediment to starts settle down to the bed stream. In over period of time causing the river to overflow or flooding. Larger sediments are dropped in steep areas, but smaller sediments can still be carried.