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STUDY ON BED LOAD PATTERN AT LEBIR RIVER AFTER 2014 FLOOD

NUR INSYIRAH IZZATI BINTI OMAR

Report submitted in partial fulfilment of the
requirements for the award of the degree of B.Eng
(Hons.) of Civil Engineering

Faculty of Civil Engineering and Earth Resources
UNIVERSITI MALAYSIA PAHANG

JUNE 2016

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LIST OF SYMBOLS

Q	Flow Rate of Water $(^{m^3}/_{s})$
A	Area (m^2)
V	Velocity (m/s)
mm	Millimetre
km	Kilometre
m	Meter (m)
g	Gravitational Force $(^{m}/_{s^2})$
n_s	Manning Coefficient
τ_C	Critical Shear Stress
τ_0	Actual Shear Stress
D_s	Mean Diameter (mm)
v	viscosity $(^{m^2}/_{s})$
γ	Specific Weight $(^{N}/_{m^3})$
S	Slope
Gs	Bed Load Discharge (lb/sec-ft)
d	Depth of River
B	Width of River

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ABSTRACT

The purpose of this research was to identify the size and types of sediment at Lebir River after 2014 flood, to analyse the bed load discharge of Lebir River using selected method and to identify the sediment pattern/bed load pattern due to sedimentation process. The study conducted at 5 stations at Lebir River. The rainfall precipitation in December 2014 showed that the maximum rainfall event will cause the high amount of rainfall precipitation and will increase the production of bed load transport. Therefore, the surface erosion also gives contribution to the increase of sediment transport and had become the one of main problem at Lebir River after flood in December 2014. The bed load pattern at each point were identified through the sedimentation process. The bed load pattern gave the variation of sediment transport modes at Lebir River. The bed load discharge were evaluated using three different formulas which were Meyer Peter and Muller, Schoklitsch and Duboys equation. From the analysis of the results of each of the formula, Meyer Peter and Muller can be used to predict bed load transport for Lebir River.

ABSTRAK

Tujuan kajian ini adalah untuk mengenal pasti saiz dan jenis mendapan di Sungai selepas banjir pada tahun 2014 untuk menganalisis pelepasan beban dasar di Sungai Lebir dengan menggunakan kaedah yang tertentu dan untuk mengenal pasti corak corak mendapan / beban dasar yang disebabkan oleh proses pemendapan.Kajian dijalankan di 5 stesen di Sungai Lebir. Taburan hujan pada bulan Disember 2014 menunjukkan bahawa peristiwa hujan maksimum akan menyebabkan jumlah hujan yang tinggi dan akan meningkatkan pengeluaran pengangkutan beban dasar. Oleh itu, hakisan permukaan juga memberikan sumbangan kepada peningkatan pengangkutan mendapan dan telah menjadi salah satu daripada masalah utama di Sungai Lebir selepas banjir pada Disember 2014. Corak beban dasar pada setiap titik telah dikenal pasti melalui proses pemendapan. Corak beban dasar memberi perubahan mod pengangkutan mendapan di Sungai Lebir. Beban dasar telah dinilai menggunakan tiga formula yang berbeza yang iaitu Meyer Peter dan Muller, Schoklitsch dan Duboys. Daripada analisis keputusan setiap formula, Meyer Peter dan Muller boleh digunakan untuk meramalkan pengangkutan beban dasar untuk Sungai Lebir.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Sediment is natural earth material which consists of soil particles that are ranging in sizes from the smallest which are mud and sand to the larger sizes which include the gravels, cobbles and boulders. Sediment can move and deposited in a new location. Sediment can move from one place to another through the process of erosion. Erosion is the process of removal and transportation of rock or soil.

Sediment can be transported by a flow of water. Sediment transport can be in the form of bed-load and suspended load, which are depending on the size of the bed material particles and the flow conditions. Some factor which influence the sediment transport are flow conditions, sediment size and sediment density. Usually, the greater the flow of water, the more sediment will be transported while the movement of sediment will control the size and shape of bed forms.

The sediment load is varies from river to river. The velocity of the water is important in determining the way of how sediment is being transported. Bed-load transport depends on the flow characteristics and sediment properties, such as shear stress, surface roughness, and

particle size, density, and shape. Bed-load transport is the main connection between river hydraulics and river form and has a significant effect on restoring the channel geometry.

1.1 BACKGROUND OF STUDY

Lebir River is located in Kelantan, Malaysia. The river is located at the latitude and longitude coordinates of 5.516667 and 102.2. Lebir River is the main river that joins Sungai Galas to form Sungai Kelantan at Kuala Krai. Records from the Kelantan Department of Irrigation and Drainage (JPS) indicated heavy rainfall in Ulu Kelantan from Dec 16 to 24, 2014 and the amount of rain recorded within the period at the Gunung Gagau Station was almost half of the state's annual rainfall (Hoong, 2007).

Human interference is one of the effects of sediment transport process that gives impacts on sediment load and bed load pattern. Vegetation removal from agricultural, logging activities, are the factor that will increase erosion and sediment loads of rivers. Erosion will cause the bed load to increase at the river. Therefore, the depth of river will decrease. When the depth of the river decreases, the volume of the flow rate remain same, and it will cause the flood.

1.2 PROBLEM STATEMENT

Each year, usually flood is often to occur in Kelantan. In year 2014, it can be considered as one of the worst flood and Lebir River is one of the most affected areas in Kelantan by flood. Erosion of sediment is one of main cause that begins the process of sediment transport which also can cause bed load in river to increase. Once a particle has been eroded, water becomes the “principal vehicle for transport of the eroded material,” (Linsley al., 1975). Through this study, bed load pattern through the sedimentation process at Lebir River can be determined.

1.3 OBJECTIVES

The objectives of this research are:

- To identify the size and types of sediment at Lebir River
- To analyse the bed discharge of Lebir River using selected method
- To identify the sediment pattern/bed load pattern due to sedimentation process

1.4 SCOPE OF STUDY

The study will focus at 5 Points at Lebir River. The methods for bed load equation that will be used are Meyer-Peter and Muller, Schoklitsch, Duboys, Einstein. The methods will be selected based on their suitability for the river.

1.5 SIGNIFICANCE OF STUDY

This study can give data of bed load that can be used for future research at Lebir River. The bed load pattern will be identified at Lebir River. It is crucial to know the pattern of sediment erosion and deposition so that it can become reference for upcoming study about the Lebir River.