

**DEVELOPMENT OF TOTAL BED MATERIAL LOAD EQUATION FOR
HIGH GRADIENT RIVERS IN MALAYSIA**

BY:

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1. Letter of Report Submission

Our Ref : 04-01-01-SF0126

Assistant Vice Chancellor (Research)
Research Management Institute
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40450 Shah Alam

Date : 4th April 2010

**WATER RESOURCES
ENGINEERING AND
MANAGEMENT
RESEARCH CENTRE
(WAREM)
Tel: 04-5402438
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Dear Sir,

**E-Science FINAL REPORT “DEVELOPMENT OF TOTAL BED MATERIAL
LOAD EQUATION FOR HIGH GRADIENT RIVERS IN MALAYSIA”**

I refer to the matter above.

Please find enclosed herewith 2 (Two) copies of E-Science Final Report entitled
“Development Of Total Bed Material Load Equation For High Gradient Rivers
In Malaysia” for your kind perusal. The softcopy of the report attached in a CD.

Thank you.

Sincerely,



ASSOC. PROF. Dr. SHANKER KUMAR SINNKAUDAN
Head

4.

Enhanced Research Title and Objectives

Original Title as Proposed:

Development of total bed material load equation for high gradient rivers in Malaysia

Original Objectives as Proposed:

- i) To establish hydraulic and sediment database for High Gradient Rivers in Malaysia
- ii) To evaluate existing total bed material load equations (derived from high and low gradient rivers) for application in high gradient rivers in Malaysia.
- iii) To derive a new total bed material load equation based on current high gradient Malaysian rivers data.
- iv) To integrate the newly derived equation into SFlood model (public domain loose boundary model) to predict flood profiles, sediment transport pattern and reservoir sedimentation at the high gradient catchment areas

Improved/Enhanced Objectives:

- i) To establish hydraulic and sediment database for High Gradient Rivers in Malaysia – *Genuine database for 23 High Gradient rivers in Malaysia were established and verified*
- ii) To evaluate existing total bed material load equations (derived from high and low gradient rivers) for application in high gradient rivers in Malaysia- existing Total Bed material Equations are tested with the present data and the results published in refereed conferences and Journals
- iii) To derive a new total bed material load equation based on current high gradient Malaysian rivers data - The equation derived and successfully integrated in the form of Macro Predictor tool for field scale application

5. Report

5.1 Executive Summary

The phenomenon of sediment transport had been studied for the last 100 years and always given special attention by the researchers and engineers. The human activities severely affected by the sedimentation problem such as flooding, deposition, damaging the hydraulic structure and much more. Various studies had been conducted to quantify sediment transport pattern in Malaysia. However the studies which are focussed on highland rivers are still lacking. Further more, there is no specific equation to predict the total bed material load transport for highland rivers in Malaysia. Thus, the present study set as a pilot project to derive such an equation. A comprehensive field sampling and laboratory analysis were carried out to obtain the sediment database. The governing parameter that has high influence on sediment transport was selected based on literature survey and field data. These parameters were checked for its correlation with field data before developing the equation. The equation is developed by fitting the selected influential parameters into SPSS program. The Multiple Linear Regression Analyses (MLR) was employed to derive the equation. The multicollinearity effects were avoided which may reduce the efficiency of transport prediction. The performance of the existing equation was tested and validated using existing field data from rivers in Malaysia.

5.2 Introduction

The sediment transport study deals with the analysis of sediment particles and flow characteristics. The ignorance of sediment transport component during hydraulic design will bring a severe damage to the hydraulic structure and river itself. The understanding of sediment transport has led to extensive research done by past researchers. In Malaysia, the studies were conducted by Ab. Ghani (1993), Abu Hasan (1998), Yahaya (1999), Ariffin *et al.* (2001), Ibrahim (2002), Sinnakaudan (2003) and Sinnakaudan *et al.* (2006). On the other hand, a broad sediment study was also conducted abroad by White *et al.* (1975), Brownlie (1981), Yang & Molinas (1982), Shen & Hung (1983), Raphelt (1990), Nakato (1990), Karim (1998), Woo *et al.* (1993), Molinas & Wu (2001), Nagy *et al.* (2002), Wilcock & Crowe (2003), Wu *et al.* (2004) and Duan *et al.* (2006). Few studies have specifically catered to the sediment transportation in highland rivers as cited in Ashida and Michiue (1972), Smart (1984) and Mizuyama (1977). However, there is no evidence on sediment transport studies conducted specifically for highland rivers in Malaysia though a variety of sedimentation and erosion problem currently emerge in the Malaysian highlands. Many pristine highland watersheds which were developed later induced problems to the river morphology and its stability.