



Rivers'04

1st International Conference On Managing Rivers in The 21st Century : Issues and Challenges



Malaysia has pursued river enhancement policy in line with the recent launching of the Urban Storm Water Management Manual for Malaysia (MSMA). With this national interest at its heart, The National Organizing Committee is honored to invite all interested researchers and engineers from national and international level to present and exchange their views at Rivers'04. For presentation purpose, papers will be organized under the following themes:

River Hydraulics & Hydrology	River Management
Erosion and Sediment Transport Floodplain Hydraulics River Regime and Morphology River Bank Erosion and Stabilization Wetlands and Water Quality Treatment	Sustainable Urban Drainage System Integrated River Basin Management Watershed Land Use Planning and Management Flood Risk Mitigation / Flood Management and Control Rural and Urban Catchments Hydrology Urban Streams Restoration and Conservation Maintenance Strategies for River System
River Modeling	Case Study
Modeling Approaches and Applications Identifying Model Parameter GIS / MIS Application	

There will be approximately 80 papers from authors from over 15 countries to be presented in the conference in addition to the four Keynotes Address. There are five technical sessions conducted in three parallel sessions. Full details of the paper accepted for the conference are available in the conference website : <http://www1.eng.usm.my/redac/html/conference/rivers2004/default.html>

The conference will be held at the Mutiara Beach Resort, Feringhi Beach, Penang from 21st until 23rd September 2004. Engineers, Researchers, Administrators, NGO's and Publics concerned with the conservation of our river system worldwide are encouraged to attend Rivers'04.



By Associate Prof Dr Nor Azazi Zakaria, REDAC Director

Foreword

Our Bio-Ecological Drainage System (BIOECODS) project under the contract research grant amounting RM 2.9 million from the Department of Irrigation and Drainage (DID) will be completed in June 2004. It has been a five-year effort starting with a presentation at the World Water Day Seminar in March 1999 at the Historical City of Malacca and numerous presentations to DID and Vice Chancellor of Universiti Sains Malaysia (USM) before the project was finally approved with the Memorandum of Understanding (MoU) signing ceremony at USM on 1st October 1999. A Special Technical Session on BIOECODS will be organized at the 6th International Conference on Hydroscience and Engineering (ICHE), Brisbane, Australia from 29th May to 3rd June 2004. An article on BIOECODS has also been published in the International Journal River Basin Management (JRBM). A special book collection consisting of 18 selected papers covering all aspects of BIOECODS including concept, design, construction, and data analysis will be launched during Rivers'04 – International Conference on Managing Rivers in The 21st Century: Issues and Challenges from 21st to 23rd September 2004 at the Mutiara Beach Resort, Teluk Bahang, Penang.

BIOECODS continues to receive visitors from government agencies and research institution including researchers from overseas. A 10-year data collection programme (2003 to 2012) covering quantity and quality aspects of BIOECODS has also started in June 2003 with the involvement of undergraduate Final Year Projects and postgraduate research students.

Our research on Sediment Transport in Rivers continue to augur well with the completion of another DID's contract research grant namely the River Sediment Data Collection and Analysis Study. A total of 346 sediment transport data was collected during the study covering several rivers in Kulim River catchment, Kinta River Catchment, Klang River Catchment and Langat River Catchment. Five postgraduate research students (2 PhD, 3 MSc) were involved in the study and successfully completed their studies. A guideline was produced on the river sediment data collection and analysis that will help the engineers to appreciate better the dynamic interaction between the flowing water and the sediment bed.

In this issue of REDAC Bulletin, two postgraduate research synopses on BIOECODS and River Sediment Transport are also included. All researchers, engineers and planners are invited to share their experience to achieve sustainable river management in Rivers'04. The registration form for Rivers'04 is included at the back page of this Bulletin for interested participants. It is expected that 200 paper presenters and participants will attend Rivers'04.

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Director,

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USM Engineering Campus, Seri Ampangan

14300 Nibong Tebal, Pulau Pinang, Malaysia

Tel: 604 - 594 1035 Fax: 604 - 594 1036

e-mail : redac01@eng.usm.my

website : <http://www1.eng.usm.my/redac>

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- Name** : **Anita Ainan (MSc Candidate)**
Engineer, Department of Irrigation and Drainage, Malaysia
- Project Title** : **An Evaluation of Bio - Ecological Drainage System (BIOECODS) As An Application of Urban Storm Water Management Manual**
- Supervisors** : **1. Assoc. Prof. Dr. Aminuddin Ab. Ghani**
2. Assoc. Prof. Dr. Nor Azazi Zakaria
- Present Status** : **Completed (September 2003)**

INTRODUCTION

The rapid urbanization and industrialization in major Malaysian river basins involve a large portions of agricultural and ex-mining land are being converted for urban use. As a result of the extensive development, river basins are being subjected to over-bank floods, flash floods due to clogged drainage systems and river environment degradation. This has prompted the authority to adopt a new concept in the planning and management of urban storm water runoff. The new concept is to broaden the storm water management to minimize the impact of urban storm water to the environment. This new concept applies the concept of control at source method. BIOECODS is a drainage system that exhibits the concept of control at source. The system component is designed to incorporate the concept of infiltration engineering, storage at source and flow retardation. The system component of BIOECODS includes swale for floodwater conveyance, dry pond for on-site detention to manage storm water at source and ecological pond system. The urban management model XP-SWMM used to evaluate the performance of BIOECODS. Storm Water Management Model (SWMM) is capable of simulating of all aspects of urban hydrologic processes with emphasis on quantity and quality of surface runoff, its transport was the drainage network, the storage and treatment applied to it and impact to the receiving water.

STUDY SITE

The site is the Engineering Campus, (Figure 1) Universiti Sains Malaysia (USM) enclosed in an area of 320 acres in Seberang Perai Selatan, located 1.5 km northeast of Parit Buntar Town, 2.0 km south east of Nibong Tebal and 1.5 km northwest of Bandar Baru Town. The main river in the area is the Kerian River that drains into the Strait of Malacca.

BIOECODS MODELLING

The link-node model of XP-SWMM is used to represent and simulate the hydraulics of BIOECODS. A link represents a hydraulic element of flow in the system where the model offers different type of conduits for simulation. A node represents the junction of hydraulic element (links) and can be assigned with a particular contribution area (watershed) associated with the drainage system. The storm water runoff hydrograph generated from sub-area enters the drainage system through the node. The node can also represent a storage device such as pond or lake, or a point junction to represent a point change in channel or conduit geometry or a boundary condition in the model. The BIOECODS modeling simulation is implemented with BIOECODS catchment divided into three sub-catchments i.e Engineering School sub-catchment, Hostel sub-catchment and Ecological Pond sub-catchment. The main component of BIOECODS is ecological swale (Figure 2), dry pond, wet pond, detention pond and wetland.



Figure 1 Study Area: USM Engineering Campus

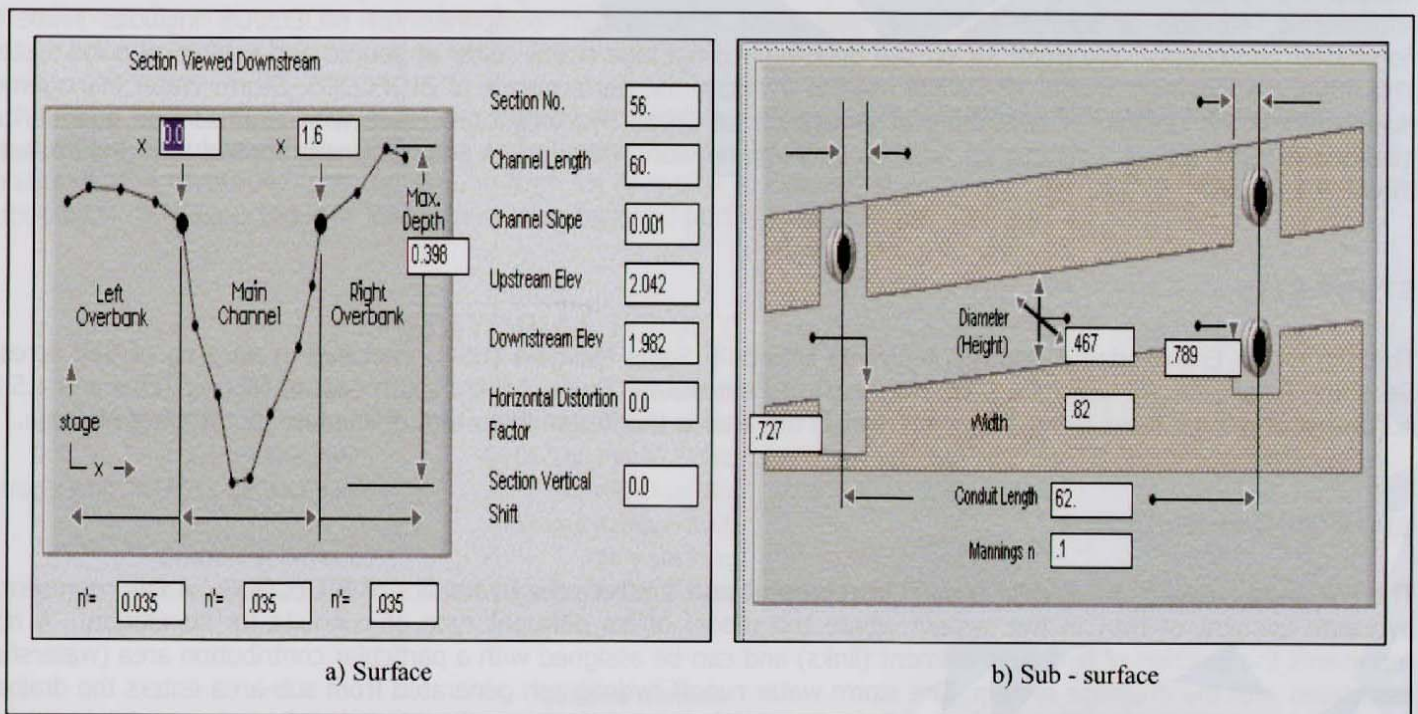


Figure 2 Representation of Ecological Swale in XP - SWMM

SIMULATION RESULT

The simulation and calibration of SWMM is based on the flow measurements obtained at the downstream of Engineering School sub-catchment. Site 3 Left (Figure 3) refers to a flow from the left hand side of the sub-catchment and Site 3 Right (Figure 3) refers to the flow from the right hand side sub-catchment. The simulation and calibration is limited to the surface swale. Figure 4 to Figure 6 show the simulation results for different rainfall events. Table 4 and Table 5 show the results of simulated and observed data and the relative error. The relative error for observation and simulation data for both volume and peak flow range between 1.3 % and 30 %.

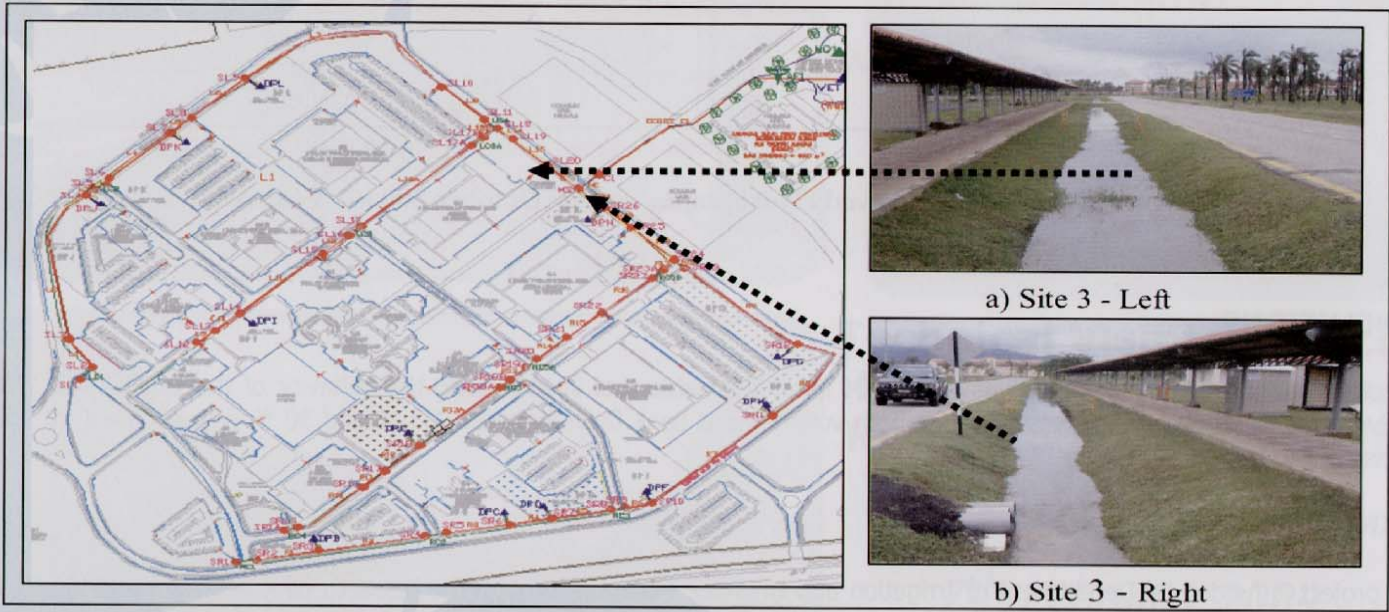


Figure 3 Location of Velocity Area Module For Flow Measurement

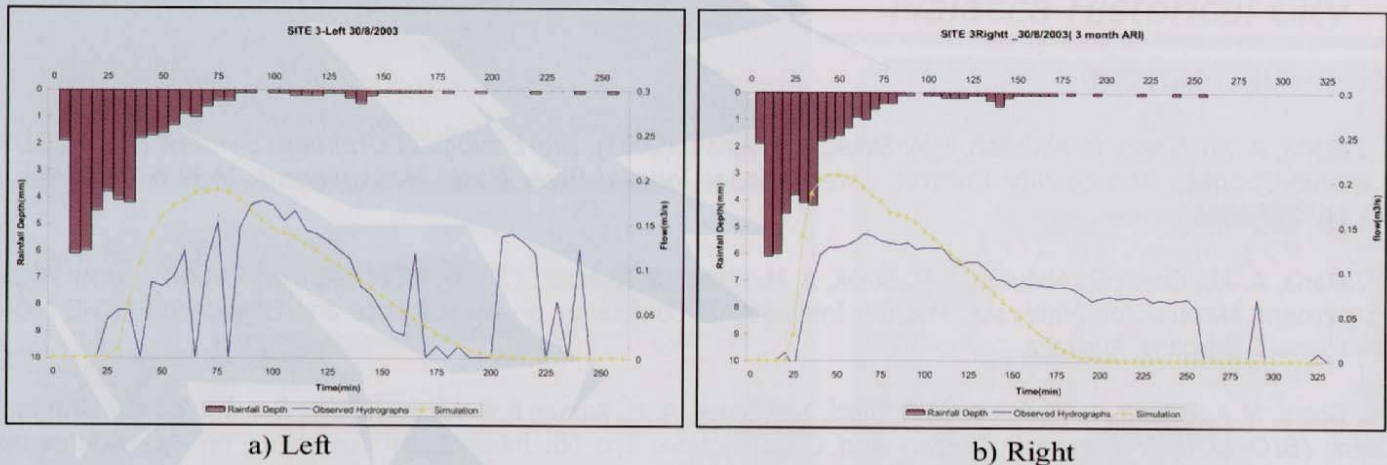


Figure 4 Simulated and Observed Hydrograph on 30th August 2003(3 month ARI)

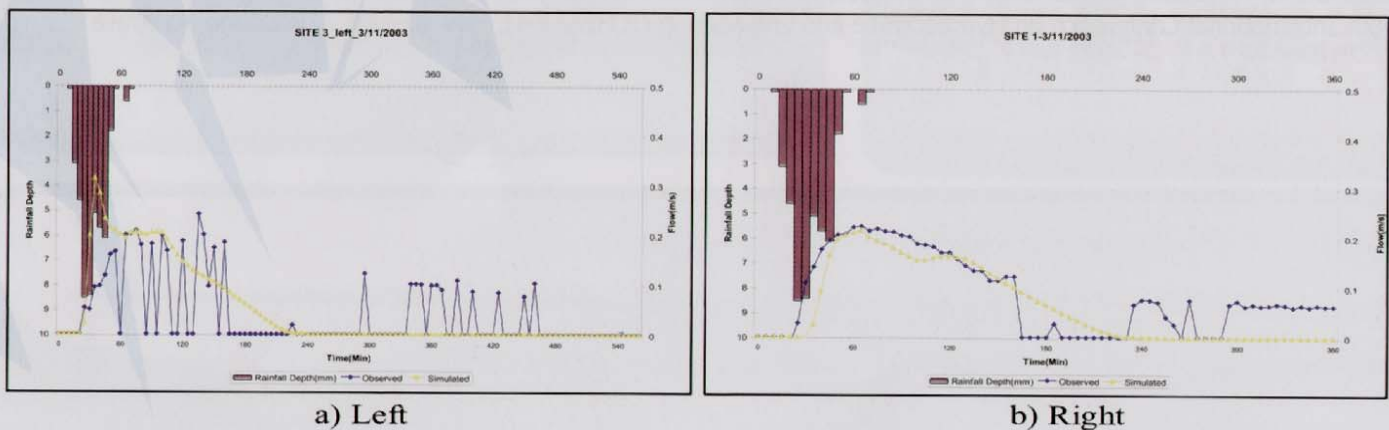


Figure 5 Simulated and Observed Hydrographs on 3rd November 2003 (1 year ARI)

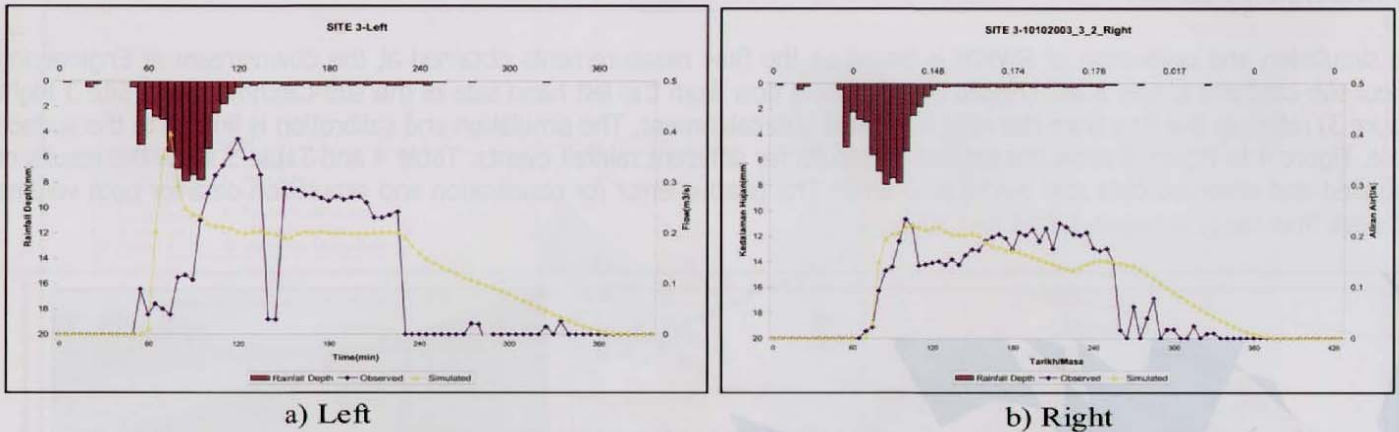


Figure 6 Simulated and Observed Hydrographs on 10th October 2003(2 Year ARI)

CONCLUSIONS

The urban management model such as XP-SWMM is an invaluable tool in simulating the behavior of the BIOECODS. The relative error for observed and simulated for both volumes and peak flows between 1.3 % and 30 % was obtained for the assessment of the BIOECODS.

ACKNOWLEDGEMENTS

This project is funded by Department of Irrigation and Drainage Malaysia through the research contract grant and also full support given by the Vice Chancellor of University Science Malaysia in approving the construction of BIOECODS at the new USM Engineering Campus.

RECENT PUBLICATIONS

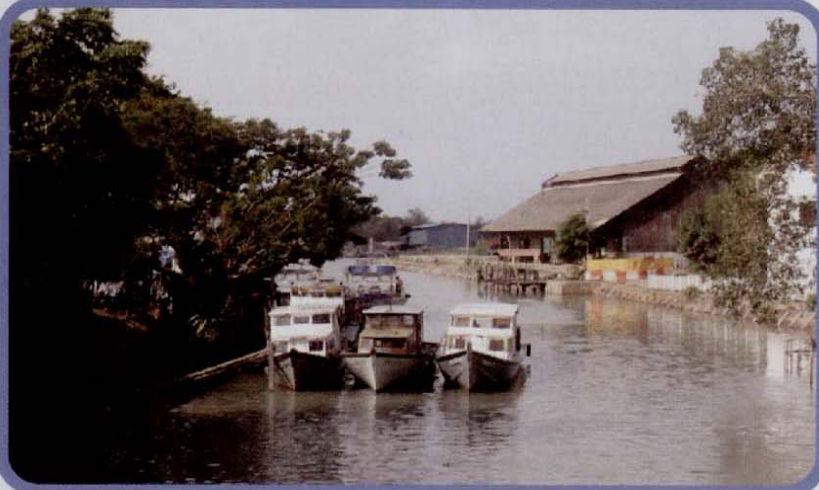
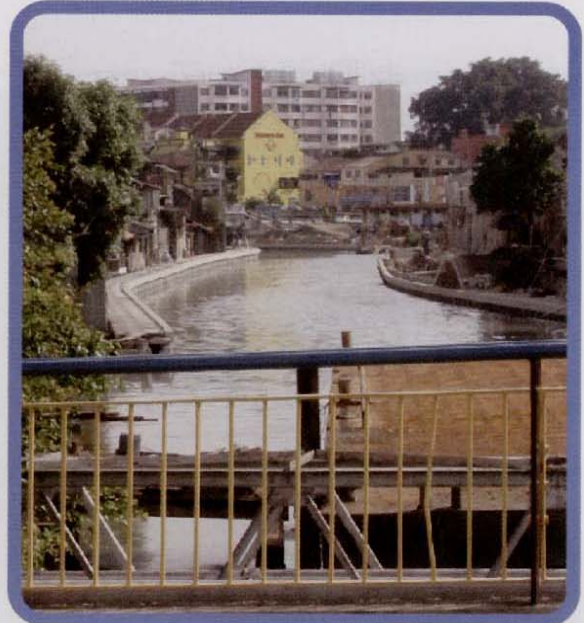
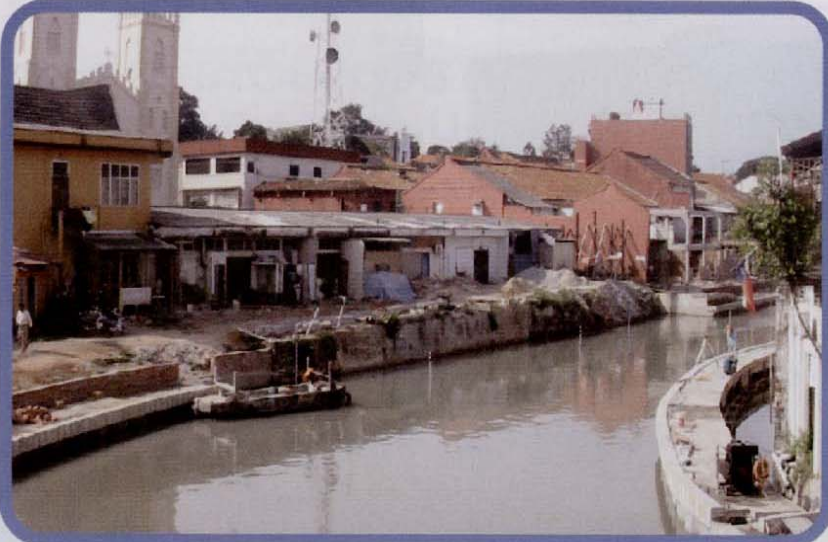
N.A. Zakaria, A. Ab. Ghani, R. Abdullah, L.M. Sidek, & A. Ainan. (2003). *Bio-Ecological Drainage System (BIOECODS) For Water Quantity And Quality Control, International Journal River Basin Management, IAHR & INBO, Vol. 1, No. 3, pp. 237-251.*

N.A. Zakaria, A. Ab. Ghani, R. Abdullah, L.M. Sidek, A. H. Kassim & A. Ainan. (2004). *MSMA-A New Urban Storm Water Management Manual for Malaysia, The 6th International Conference on Hydroscience and Engineering (ICHE-2004), May 30-June 3, Brisbane, Australia*

A. Ab. Ghani, N. A. Zakaria, R. Abdullah, M.F. Yusof, L.M. Sidek, A. H. Kassim & A. Ainan. (2004). *Bio-Ecological Drainage System (BIOECODS): Concept, Design and Construction. The 6th International Conference on Hydroscience and Engineering (ICHE-2004), May 30-June 3, Brisbane, Australia*

R. Abdullah, N. A. Zakaria, A. Ab. Ghani, L.M. Sidek, A. Ainan & L.P. Wong. (2004). *BIOECODS Modelling Using SWMM. The 6th International Conference on Hydroscience and Engineering (ICHE-2004), May 30-June 3, Brisbane, Australia*

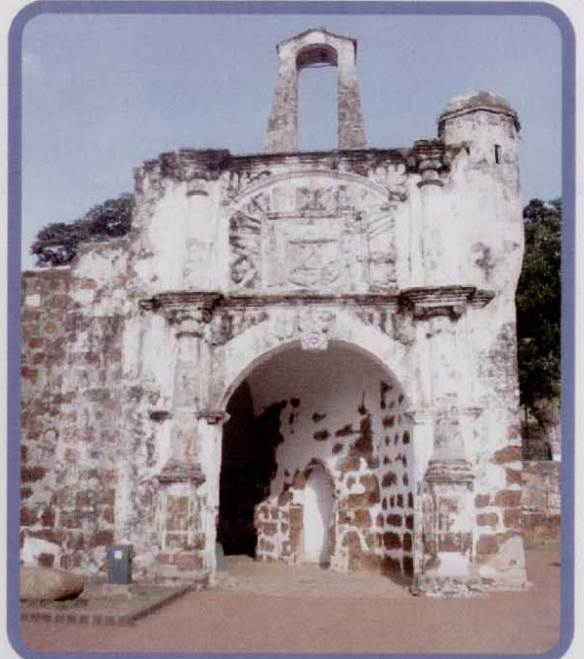
Activities



Technical Visit to Malacca River Rehabilitation and River Front Development Project

7th February 2004

Malacca Historical City





Technical Visit to BIOECODS Project: Federal Implementation Project Unit

23rd August 2003

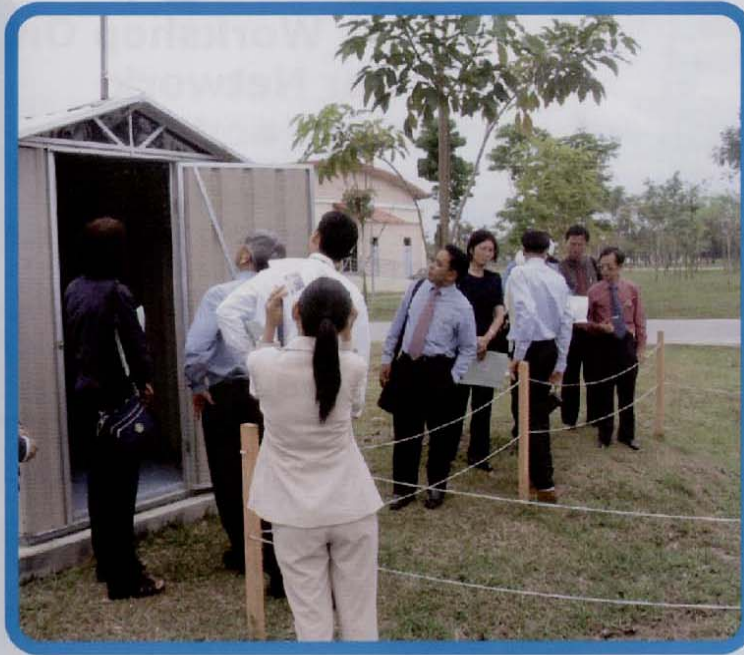
Department of Irrigation and Drainage,
Malaysia, Kota Bharu, Kelantan



Activities

Visit to BIOECODS Project : Prince of Songkla University, Thailand

17th March 2004





1st Asian Junior Scientists Workshop On Sewer Network Processes and Urban Drainage

7th - 10th February 2004

Malacca





Name : Junaidah Binti Ariffin (PhD Candidate)

Project Title : Development of Sediment Transport Models for Rivers in Malaysia Using Regression Analysis and Artificial Neural Network

Supervisors : 1. Assoc. Prof. Dr. Aminuddin Ab. Ghani
2. Assoc. Prof. Dr. Nor Azazi Zakaria
3. Assoc. Prof. Ahmad Syukri Yahya

Present Status : Completed (March 2004)

INTRODUCTION

The problem of determining sediment discharge has been the subject of interest to river engineers and numerical modelers for decades. The prediction of sediment discharge using the existing equations does not usually give favorable solutions. In view of the above, this research was carried out to develop a sediment transport model for rivers in Malaysia. The results of the analysis yields the following equation.

$$C_V = 1.156 \times 10^{-5} \left(\frac{R}{d_{50}} \right)^{0.716} \left(\frac{U^*}{W_s} \right)^{-0.975} \left(\frac{U^*}{V} \right)^{0.507} \left(\frac{V^2}{gy} \right)^{0.524} \quad (1)$$

The equation 1 gave the best prediction for Malaysian rivers under the flow range between 0.74 m³/s - 87.79 m³/s and sediment size ranging from 0.37 mm to 4.0 mm. The prediction accuracy is 83.33% on data from present study and 53% on data by Ibrahim (2002) and DID (2003).

HYDRAULICS CHARACTERISTICS

A total of 92 data from Sungai Lui, 50 data from Sungai Semenyih and 23 data was extracted from Sungai Langat between 6th Nov 2000 and 17th May 2002. Width of the rivers observed during the study period were between 13.5 m and 30 m with flow depths ranging from 0.228 m to 3.226 m. Discharge observed during the period of study was between 0.737 m³/s and 87.792 m³/s. Typical river cross-sections at Kg. Lui Station along Sungai Lui are shown in Figure 1. Figure 2 shows the locations of the gauging and sampling points at the four stations.

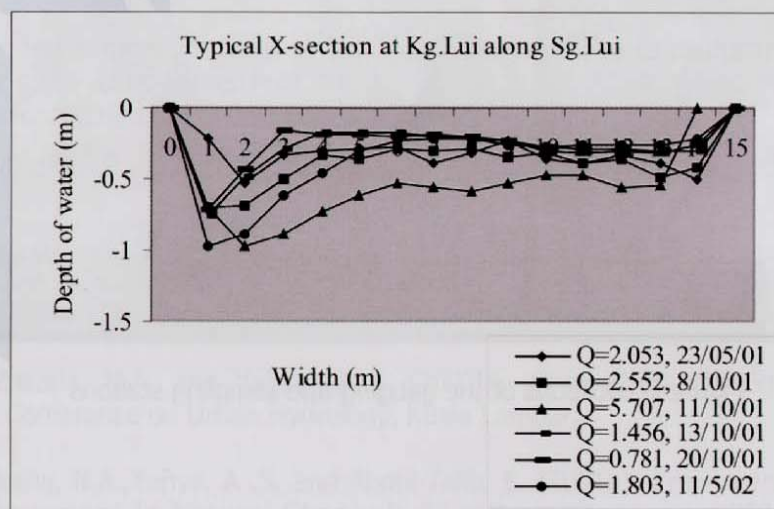


Figure 1 Typical cross-sections at Kg. Lui Station along Sungai Lui

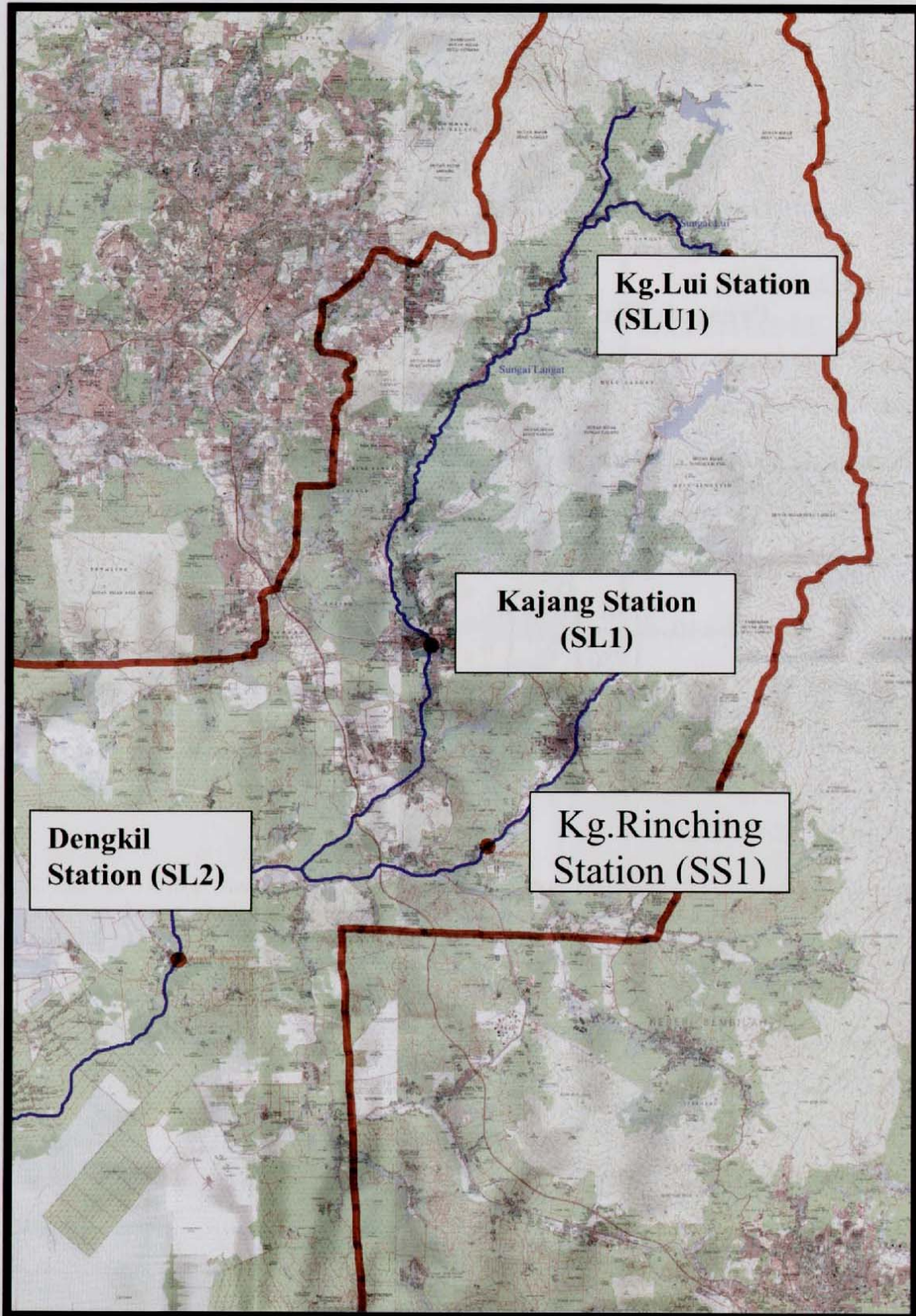


Figure 2 Locations of the gauging and sampling stations

The model was developed using multiple linear regression analysis from data extracted from three rivers shown above. Data by Ibrahim (2002) and DID (2003) were used to validate the model. The significance of the model can be quantified by the p-value that satisfies $p < 0.025$. This signifies that the independent variables are important predictors.

RATING CURVE FOR MALAYSIAN RIVERS

Using Equation 1, a rating curve has been derived for Malaysian rivers and is illustrated in Figure 3. The rating curve established can be used as a basis for the design of stable alluvial channel.

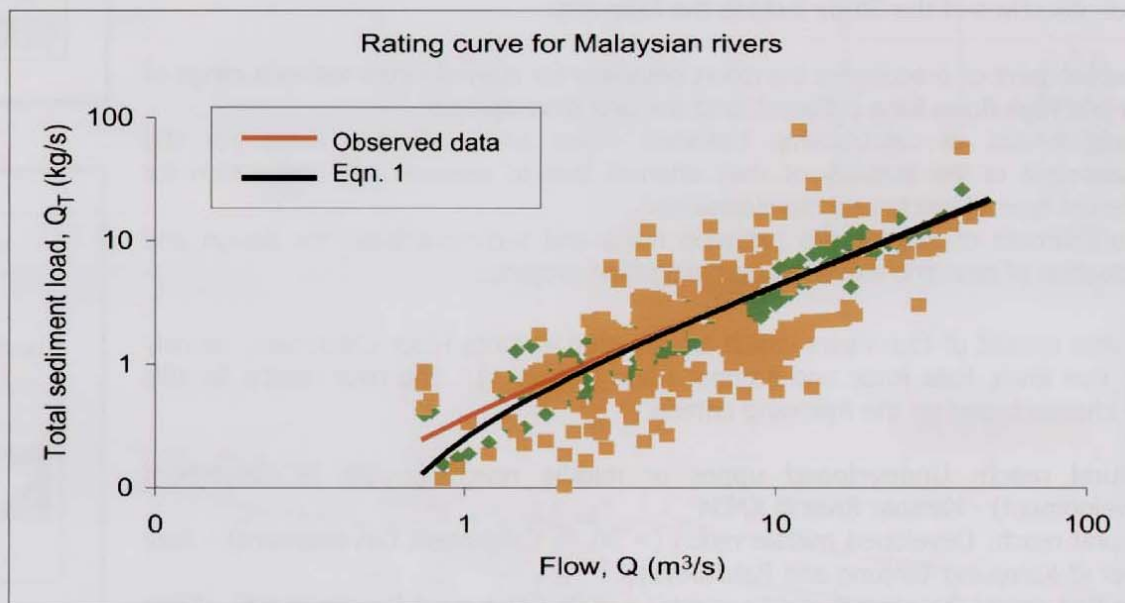


Figure 3 Sediment rating curves using Equation 1

CONCLUSION

The outcome of the research indicates that the proposed model predicts sediment transport effectively for Malaysian rivers under the specified flow range and sediment characteristics. With the derived model a rating curve for Malaysian rivers has been established that serves as a basis for the design of stable alluvial channels.

ACKNOWLEDGEMENT

The author wishes to express her sincere gratitude to Bureau of Research and Consultancy UiTM for the funding of grants and dedications to her supervisors Assoc. Prof. Dr. Aminuddin Abdul Ghani, Assoc. Prof. Dr. Nor Azazi Zakaria and Assoc. Prof. Shukri Yahya for the successful completion of her research.

PUBLICATIONS

Ariffin, J., Abd.-Ghani, A., Zakaria, N.A. and Yahya, A S. (2002a). *Error Introduced In Measurements Of Bed Load Transport*. 13th IAHR-APD Congress, Advances in Hydraulics and Water Engineering, Singapore

Ariffin, J., Abd.-Ghani, A., Zakaria, N.A. and Yahya, A S. (2002b). *Evaluation Of Equations On Total Bed Material Load*. International Conference on Urban Hydrology, Kuala Lumpur.

Ariffin, J., Abd.-Ghani, A., Zakaria, N.A., Yahya, A .S. and Abdul-Talib, S. (2001a). *Transverse Velocity Distribution In Relation To Bed Load Movement In Natural Channels*. River Basin Management 2001, Cardiff, Wales.

Project Title : **River Sediment Data Collection and Analysis Study**
Funder : Department of Irrigation and Drainage (DID) Malaysia
Duration : September 2000 - October 2003

The final report for the study consists of three Volumes and a guideline as follows:

- Volume I : Main Report (ISBN : 983-3067-00-X)
- Volume II : Sediment Transport Equation Assessment (ISBN : 983-3067-01-8)
- Volume III : Sediment Size Distribution Curve (ISBN : 983-3067-02-6)
- Guideline : River Sediment Data Collection and Analysis (ISBN : 983-3067-03-4)

The principal objectives of the Study include the following:

- (a) Establishment of a sediment transport database for alluvial rivers within a range of low and high flows for a different land use and development.
- (b) Establishment of relationship between flows and sediment loads for the assessment of the stability of river channel due to erosion and deposition for different type of catchment developments
- (c) Establishment of relationship between flows and sediment loads for design and evaluation of new and existing flood mitigation projects.

The Study sites consist of four rivers which are situated at Kinta River Catchment, namely Kinta River, Pari River, Raia River and Kampar River (Figure 1). The river reaches for this Study were chosen based on the following criteria :

- (i) Natural reach: Undeveloped upper or middle reach (< 30 % Catchment Development) - Kampar River@ KM34
- (ii) Natural reach: Developed middle reach (> 30 % Catchment Development) - Raia River @ Kampung Tanjung and Batu Gajah
- (iii) Modified reach: Developed middle reach (> 30% Catchment Development) - Kinta River@ Ipoh, Pari River @ Buntong and Manjoi

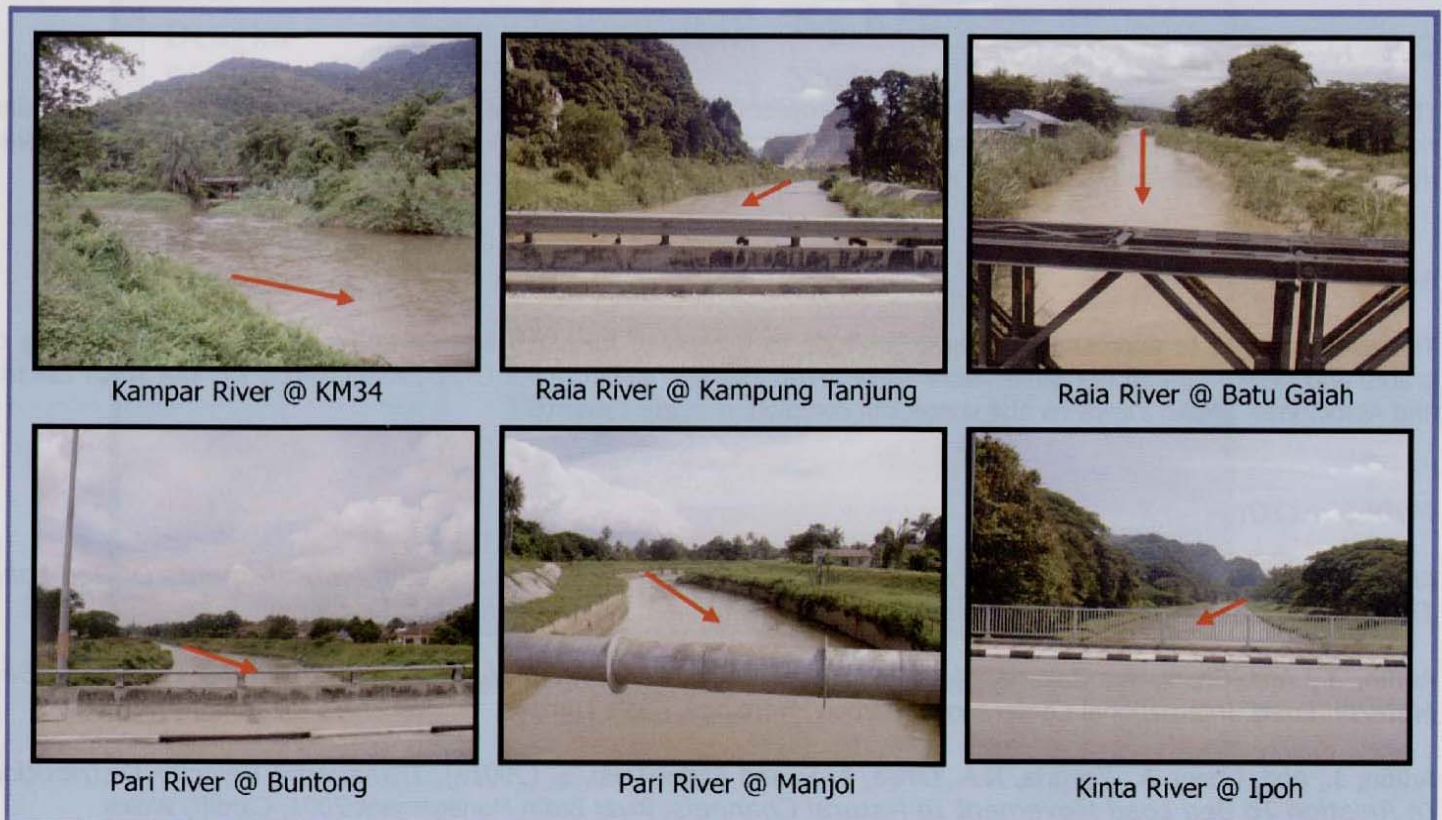


Figure 1 : River Reaches for Kinta River Catchment

Data collections including suspended load, bed load, bed material and flow discharge have been carried out during the study (Ibrahim 2002, Darus 2002, Abdul Ghaffar 2003, Sinnakaudan 2003). A total of 122 set of data have been obtained for the period from September 2000 until October 2002. The analysis also includes Yahaya (1999) and Ariffin (2002) study for Kerayong River, Kulim River and Langat River catchment (224 sets of data). Table 1 shows the summary of the sediment transport assessment for the 122 and 346 sets of data. Figure 2 shows that the relationship between transport and flow parameters of the total 346 data.

Table 1 : Sediment Transport Assessment

Equation	Discrepancy Ratio (0.5 - 2.0)			
	Present Study		All Data	
	No. of data	Percentage	No. of data	Percentage
Einstein	0	0	0	0
Einstein-Brown	0	0	1	0.29
Meyer-Peter-Muller	0	0	2	0.58
Shields	0	0	2	0.58
Yang	22	18.03	82	23.70
Engelund & Hansen	30	24.59	76	21.97
Ackers & White	7	5.74	44	12.72
Graf	10	8.20	46	13.41
Total	122	100	346	100

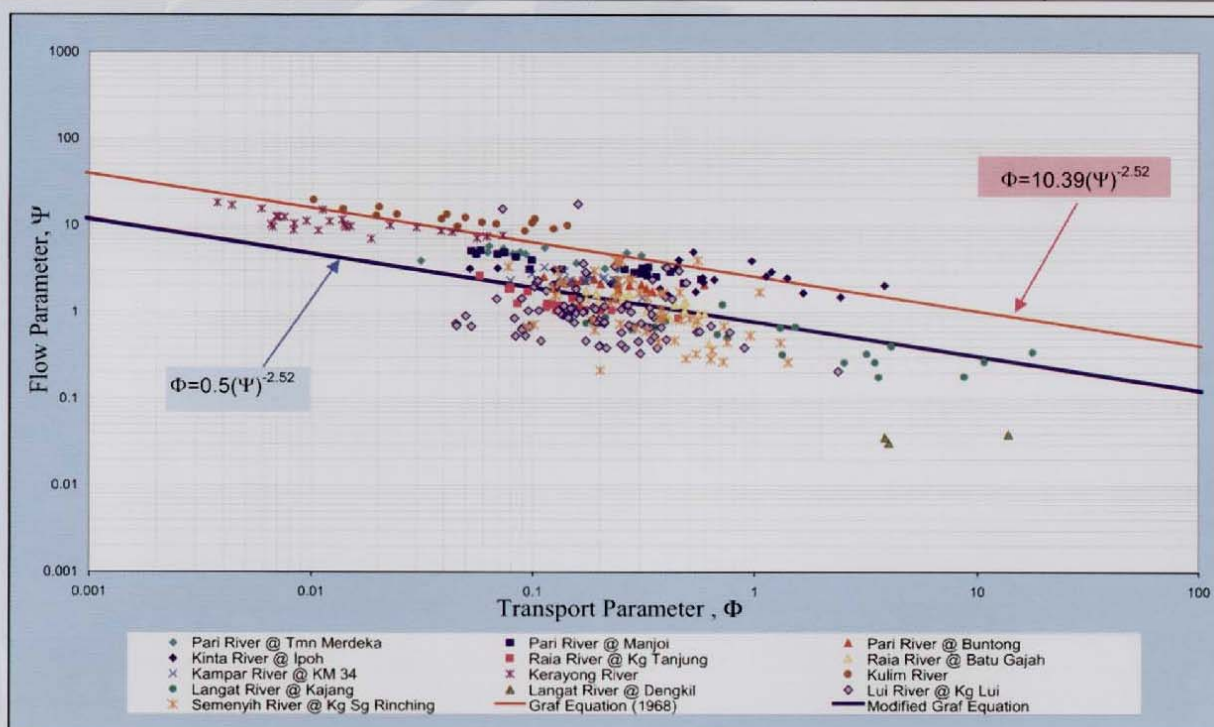


Figure 2 : Relationship between Transport Parameter (Φ) and Flow Parameter (Ψ)

Postgraduate Researches that involve in the study are as follows:

Ariffin, J. (2004). *Development of Sediment Transport Models for Rivers in Malaysia Using Regression Analysis and Artificial Neural Network*, PhD. Thesis, Penang : Universiti Sains Malaysia.

Sinnakaudan, S. (2003). *Sediment Transport Modeling and Flood Risk Mapping in Geographic Information System (GIS)*. PhD. Thesis, Penang : Universiti Sains Malaysia.

Abdul Ghaffar, A. B. (2003). *Factors Affecting Values of Manning's Flow Resistance Coefficient*. MSc. Thesis, Penang : Universiti Sains Malaysia.

Darus, A. (2002). *Conservation and Restoration of Urban Rivers: Case Studies of Raia River and Pari River*. MSc. Thesis, Penang : Universiti Sains Malaysia.

Ibrahim, N.A. (2002). *Evaluation and Development of Sediment Transport Equations for Kinta River Basins, Kulim River and Kerayong River*. MSc. Tesis, Penang : Universiti Sains Malaysia.



1st International Conference on Managing Rivers In The 21st Century : Issues & Challenges 21st – 23rd September 2004 * Penang, MALAYSIA

Conference Registration Form

(Deadline for submission: 1st September 2004)

(Conference Registration Code : _____)

Surname Name/Family Name (Prof / Dr / Mr. / Mrs. / Ms)			
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Country / State		Postal Code	
Telephone No.		Fax No.	
Email			

Conference Fee			
Category	Rate		Please Tick
	Local	International	
Participant	RM 1330	USD 350	
Presenter	RM 750	USD 300	
*Student	RM 400	USD 250	
Total Amount Payable			

* For students, a copy of your student identification card is required upon registration.

Dietary Requirement Non - vegetarian Vegetarian Halal
 Others, please specify _____

Mode of Payment:

Cheque / Bank Draft Number		Bank / Branch	
L.O. Number		Agency	

* Only cheques / bank draft drawn from a Malaysia bank is acceptable

* Please make cheque / bank draft payable to: "BENDAHARI USM ". Kindly indicate your name, contact numbers and your conference registration code at the back of your cheque

Cancellation Policy:

* Cancellation must be made in writing or fax to the secretariat

- Before 1st July 2004, 50% refund

- After 1st July, No refund

* All refunds, if any, will be mailed after the conference

Please send the completed form and required payment to:

Secretariat, **Rivers'04**

River Engineering and Urban Drainage Research Centre (REDAC)

Engineering Campus, Universiti Sains Malaysia, Seri Ampangan, 14300 Nibong Tebal, Penang, MALAYSIA

Tel : +604-5941035 Fax : +604-5941036 E-mail : rivers04@eng.usm.my / redac@eng.usm.my

<http://www1.eng.usm.my/redac/html/conference/Rivers2004/default.html>