

## INTEGRATED URBAN DRAINAGE MANAGEMENT (INUDRAM)

**F**requent occurrences of flash flood in urban areas result in an average loss of RM 100 million a year. Department of Irrigation and Drainage Malaysia (DID) estimates that RM 10 billion is required to upgrade the conventional drainage system made up of concrete channels and channelized rivers to overcome the flash flood enigma. With the present conventional drainage system, new development means new and bigger monsoon concrete drains are required to be built at the downstream areas of the new development. Similarly the receiving river at the downstream end will need new flood mitigation project involving straightening, widening and deepening destroying the natural conditions including flora and fauna.

**T**he end product from REDAC research niche area (RNA) namely "Integrated Urban Drainage Management (INUDRAM)" will provide cost saving to the country by eliminating the need to upgrade the existing conventional drainage system by controlling the stormwater at source. INUDRAM (Figure 1) emphasizes environmentally friendly products that will create urban areas free of flash flood, water pollution, and water scarcity and remain in harmony with nature. Our river systems will also be saved from further destruction due to conventional flood mitigation projects. New industries will be created to produce the products for INUDRAM enhancing our aim of becoming a develop nation in 2020.

**R**EDAC has obtained a significant numbers of IRPA, contract research grants and specialized consultancy works amounting more than RM 10 Millions since 1997. The activities in INUDRAM include innovation of Bio-Ecological Drainage System (BIOECODS), development of a Gross Pollutant Trap (GPT) Prototype, development of a sub drainage modular component for BIOECODS, development of fluvial sediment database for river rehabilitation and conservation, and development of flood risk map for urbanized catchments. The RNA has been well supported by postgraduate research where 21 (4 PhD; 17 MSc) students have involved. 17 postgraduate students (3 PhD; 14 MSc) have graduated and 4 are still doing their research. More postgraduate students will get involved in the RNA once the MSc Mixed-Mode on Sustainable River Management is offered in 2008/2009 Academic Year. A significant numbers of peer-reviewed journal articles have been published in international journals on all activities of the RNA. More journal articles are expected to be published in the near future.



Figure 1 Issues in Integrated Urban Drainage Management (INUDRAM)

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**Prof. Dr. Nor Azazi Zakaria,**  
REDAC Director

Universiti Sains Malaysia (USM) has been chosen as one of the research universities (RU) for the period of 2007 until 2010. In line with the aspiration of the Ministry of Higher Education (MOHE), REDAC as one of the research centres in USM approved by MOHE, will be moving fast to achieve the status of one of the 20 centres of excellence recognized internationally.

Since its inception in May 2001, REDAC has been developing niche areas in River Engineering and Urban Drainage in particular Sustainable Urban Drainage System (SUDS) and Sustainable River Management (SRM). The combined research of these niche areas will be developed further as an "Integrated Urban Drainage Management or INUDRAM". Presently most of the research funding has been obtained through grants from Ministry of Science, Technology and Innovation (MOSTI), Department of Irrigation and Drainage (DID), and Municipal Councils. Efforts are being made to obtain overseas funding through contacts with prestigious research centres such as Cardiff University's Hydro-environment Research Centre and Colorado State University's Engineering Research Centre, Fort Collins.

REDAC has also received several prominent international researchers in River Engineering and Urban Drainage since its inception such as Prof. Larry A. Roesner (Colorado State University, USA), Prof. Roger A. Falconer (Cardiff University, UK), Prof. Pierre Y. Julien (Colorado State University, USA), Prof. Jörg Imberger (University of Western Australia) and Prof. Roberto Mayerle (University of Kiel, Germany). Several visits from local higher institutions have also been received continuously.

The pilot project on SUDS namely Bio-Ecological Drainage System (BIOECODS) has continuously received visitors including the one by the Minister of Natural Resources and Environment, YB Datuk Seri Azmi Khalid in October 2006. It is hopeful that many more such project can be constructed throughout the country to avoid devastating floods such as the December 2006 - January 2007 floods in Johor, Malacca and Pahang.

REDAC also has successfully organized Rivers'07 in Kuching, Sarawak from 6<sup>th</sup> June until 8<sup>th</sup> June 2007. The conference was the second in series of triennial Conference on Managing Rivers in the 21st Century. Rivers'07 was co-organized with the State Government of Sarawak through its agency Sarawak Rivers Board. 150 participants attended the conference from 20 countries.

# WELCOME TO OUR NEW STAFF

## Dr. H. Md. Azamathulla

B.Tech (Civil Engineering), 1994, SKD University  
ME (Water Resources), 1997, Devi Ahilya University, Indore  
PhD, 2005, Indian institute of Technology (IIT), Bombay



H. Md. Azmathulla, graduated in Civil Engineering from the S. K. D., University, Ananthapur in 1994 and post graduated from SGSITS, Devi Ahilya University, Indore in 1997. He completed his PhD from Indian Institute of Technology, Bombay in 2005.

From 1997 to 1998 he worked for National Water Development Agency (NWDA), specializing for river links. He joined Central Water & Power Research Station (CW & PRS) in 1998 and worked till November 2006, where he worked for various water resources projects. He was associated in hydraulic model studies for spillways and energy dissipators. Currently he is working in REDAC, University Sains Malaysia., Penang.

## Dr. Lai Sai Hin

B. Eng. (Civil Engineering), 1999, Universiti Putra Malaysia  
M.Sc. (Soil and Water Engineering), 2001, Universiti Putra Malaysia  
Ph.D (Hydraulic Engineering), 2006, Universiti Malaysia Sarawak

Lai Sai Hin was born in Kuching, Malaysia. He received his primary education at Sekolah Rendah Chung Hua Batu 10 and continued his secondary education at S.M.K. Penrissen No.1 in Kuching, the capital of Sarawak. He later continued to pursue the Bachelor of Engineering in 1995, Master of Science (Soil and Water Engineering) in 1999 at Universiti Putra Malaysia and Ph.D (Hydraulic Engineering) in December 2001 at University Malaysia Sarawak.

Since graduated, he has been with INTI College Sarawak as a Lecturer until 2006. Currently, he is a full time lecturer at River Engineering and Urban Drainage Research Centre (REDAC), Engineering Campus, Universiti Sains Malaysia, specializing in urban drainage and river management. Through the researches that have been carried out, Dr. Lai has published more than 10 articles in local and international journal and conference proceedings.



## Zorkeflee Abu Hasan

B. Sc. (Civil Engineering), 1980, University of Newcastle Upon Tyne, England  
M.Sc. (Sediment Transport and River Modeling), 1999, Universiti Sains Malaysia



Zorkeflee Abu Hasan was born on 4th June 1956 in Kg Mesjid Tanah, Melaka. His first degree in Bachelor of Science (Civil Engineering) from University of Newcastle Upon Tyne, England in 1980. Postgraduate studies at University Sains Malaysia, 1999 specializing in Sediment Transport and River Modeling. He works as an Engineer for the Department of Irrigation and Drainage from 16 September 1980 until 15 April 2007. Currently he is working as senior lecturer in River Engineering and Urban Drainage Research Centre (REDAC), University Sains Malaysia.

## Engr. Chang Chun Kiat

B.Eng. (Civil Engineering), 2002, Universiti Sains Malaysia  
M.Sc. (River and Urban Drainage Management), 2006, Universiti Sains Malaysia

Chang Chun Kiat was born in Butterworth, Penang and completed his first degree in Bachelor of Engineering with Honors (Civil Engineering) in 2002 from Universiti Sains Malaysia. He later pursued his postgraduate studies at Universiti Sains Malaysia and received his MSc degree in River and Urban Drainage Management in 2006. Chang Chun Kiat works as a Research Officer at River Engineering and Urban Drainage Research Centre (REDAC) since June 2002 and currently he is working as Science Officer. Recently, he assumed the position of the Secretary for the IAHR Student Chapter – Universiti Sains Malaysia (Session 2007/2008).



His main research interests are sediment transport, river modelling and application of Bio-Ecological Drainage System (BIOECODS). He obtained a short term grant from USM since 2006. He has also experience in research and consultancy projects such as flood mitigation and drainage improvement projects, stormwater management and drainage master plan study, river sediment data collection and analysis. He receives the 2004 Perak Foundation Excellence in Engineering Research Award for the Flood Risk Map project. Besides, Chang Chun Kiat has published articles in local and international conferences and journals.

**VISIT TO BIOECODS PROJECT:**

**A NATIONAL PILOT PROJECT ON  
SUSTAINABLE URBAN DRAINAGE SYSTEM**

**MINISTER OF NATURAL RESOURCES AND ENVIRONMENT**

12<sup>TH</sup> OCTOBER, 2006



**BRIEFING**



Datuk Seri Azmi Khalid (Second from right) was received by the USM Deputy Vice Chancellor (Research & Innovation), Dato' Prof. Muhammad Idris Saleh (Third from right), REDAC Director, Prof. Nor Azazi Zakaria (First from right) and Director General of Department of Irrigation and Drainage, Datuk Paduka Keizrul Abdullah (Fourth from right).



**SWALE OUTLET**

Datuk Seri Azmi together with Prof. Azazi and Datuk Keizrul were admiring the clear water that was flowing from the sub drain of the swale.



**RECREATIONAL POND**



**Water quality downstream  
of constructed wetland**



**Datuk Seri Azmi was impressed with the use of the dry pond or bio-retention cell as part of the BIOECODS.**

**DRY POND**

# Urban Stormwater Management Seminar Series

**Urban Storm Water Management - 5**  
**Stormwater Quality Management Seminar**

**Main Speaker**  
Prof. Larry A. Roesner  
Colorado State University USA

Organized by  
River Engineering and Urban Drainage Research Centre (REDAC)

In Association With  
Department of Irrigation and Drainage Malaysia  
PAM Associates Sdn. Bhd.

9th - 11th  
January 2007  
Geography Centre, Putrajaya

This seminar launched the last phase i.e Stormwater Quality Management of the Urban Stormwater Management Manual (MSMA), which since inception in 2001, has gained large ground in changing the way stormwater is managed in urban areas in Malaysia. In the coming years, it is expected that Stormwater Quality Management will take on increasing importance, in line with increasing efforts to clean up and rehabilitate rivers in the country. There were four speakers including the Invited Speaker, Prof. Larry A. Roesner from Colorado State University (CSU), Fort Collins, Colorado.



**PROF. LARRY ROESNER**



**DATO' IR AHMAD FUAD EMBI**



**IR. WAN MOKHTAR NAWANG**



**IR. ALIAS HASHIM**

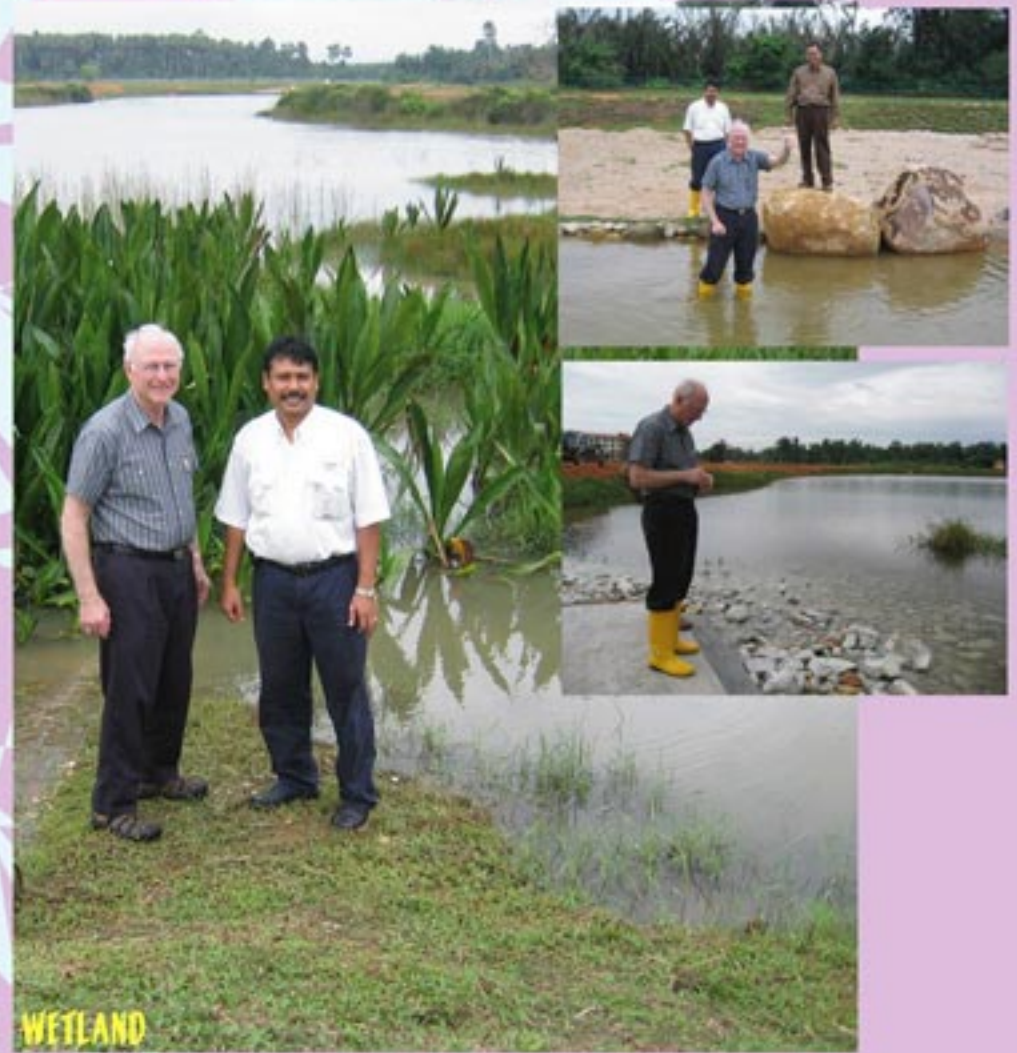
## OPENING CEREMONY



## SEMINAR PRESENTATION



**TECHNICAL VISIT TO BIOECODS PROJECT 10<sup>TH</sup> JANUARY 2007**





**2<sup>nd</sup> International Conference on Managing Rivers in the 21<sup>st</sup> Century:  
Solution Towards Sustainable River Basins  
6<sup>th</sup> - 8<sup>th</sup> June 2007  
Kuching, Sarawak, Malaysia**



Opening Ceremony



Cultural Performance



Paper Presentation

Rivers'07 was co-organized by REDAC of Universiti Sains Malaysia (USM) and the State Government of Sarawak through its agency the Sarawak River Board (SRB) in Kuching from 6th until 8th June 2007. The conference was the second of a series of triennial International Conference on Managing Rivers in the 21st Century. This series of conference is aimed to provide a major forum for researchers and engineers to present and exchange their views on the latest research issues and application methods to solve existing problems related to rivers in Malaysia and worldwide.

The three-day conference was attended by 150 participants of twenty countries including UK, Australia, Sweden, USA, Canada, Libya, Nigeria, Bangladesh, India, Iran, China and Malaysia. The official opening was made by YB Datuk Patinggi Tan Sri Dr. Alfred Jabu Anak Numpang, Deputy Chief Minister of Sarawak, representing the Right Honourable Chief Minister of Sarawak, Pehin Sri Haji Abdul Taib Mahmud on the 6th of June, 2007. The same day, four keynote speeches were delivered by established speakers namely, YB Datuk Patinggi Tan Sri Dr. Alfred Jabu Anak Numpang (Deputy Chief Minister of Sarawak, Malaysia), Datuk Paduka Ir. Hj. Keizrul Abdullah (Director-General of DID, Malaysia), Prof. Roger A. Falconer (Cardiff University, UK), and Prof. Jörg Imberger (University of Western Australia, Australia). The keynote addresses touched on river management, river restoration and developments in river modelling. Later that evening, participants were invited for a state dinner, sponsored by the Sarawak State Government. Cultural performances from the indigenous tribes of Sarawak delighted the guests, which include the Deputy Chief Minister himself. Prof. Dr. Nor Azazi Zakaria addressed his keynote speech on the final day of the event, highlighting on the importance of Sustainable Urban Drainage Systems (SUDS). The participants were then treated to a river cruise ride down the Sarawak River to the Sarawak River Barrage and back. Participants were briefed through the operation of the barrage system in mitigating flood and protecting the city against intruding tide in the half-hour stay at the barrage.



Technical Visit



Secretariat Rivers'07



Keynote Speaker





**Project Title : Study On River Sand Mining Capacity In Malaysia**

**Client : Department of Irrigation and Drainage (DID) Malaysia**

**Period : 21<sup>st</sup> September 2007 - 20<sup>th</sup> August 2008**

**Sungai Kurau**



**OBJECTIVES OF STUDY**

The study objective is to develop a sand mining planning and management tool such that Department of Irrigation and Drainage shall be able to make effective and timely decisions on sand mining applications and operations based on the following:

- To assess the current state of river morphology based on on-site data and determine the capacity of the river to act as natural conveyance to carry both water and sediment;
- To carry out hydraulic/sediment transport modeling study incorporating both the river and its capacity to sustain sediment extraction according to the sediment balance within the catchment;
- To formulate a long term solution encompassing sand mining envelope along the river stretch in terms of both river morphology and hydraulic/sediment transport modelling;

**Sungai Muda**



**Sungai Langat**

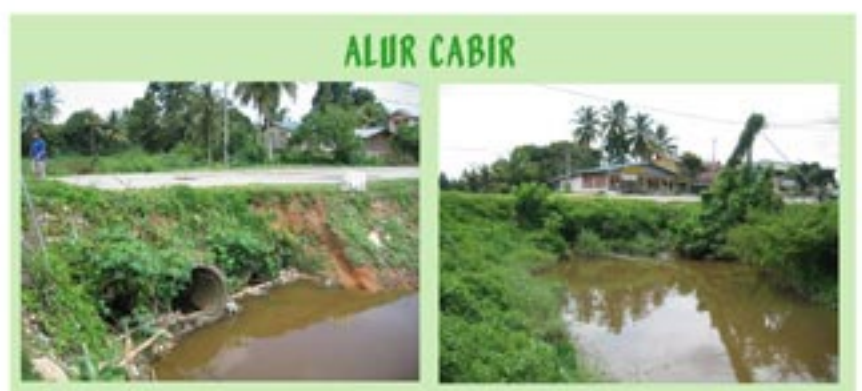
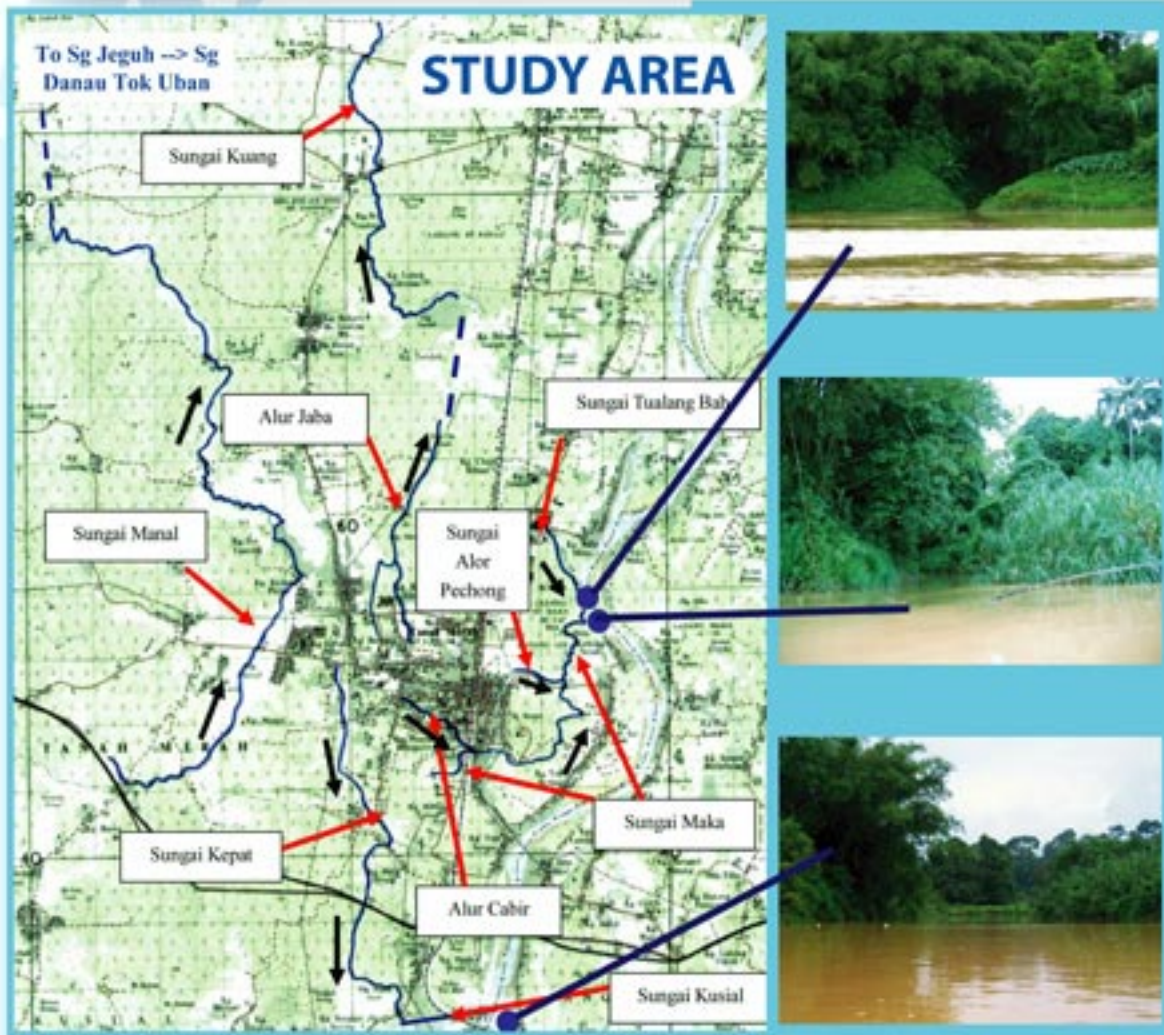




**Project Title : Stormwater Management and Drainage Masterplan Study  
for the Town of Tanah Merah, Kelantan**

**Client : Department of Irrigation and Drainage (DID) Malaysia**

**Period : 15<sup>th</sup> August 2007 - 14<sup>th</sup> August 2008**



**OBJECTIVES OF STUDY**

The primary goal of the study is to minimize the impact of urbanisation of the stormwater environment and to strike a balance between social, economic and environmental concerns to achieve sustainable development. In order to achieve this, the study shall meet the specific objectives of urban stormwater management as follow:-

- To formulate the long term solution for the flooding, drainage and storm-water management problems in the existing built-up areas in order to reduce the adverse effects of flooding on people and property and to protect the existing and proposed development by implementation of an integrated stormwater management plan by providing an appropriate level of flood protection to community expectations.
- To protect and enhance the natural water-dependent ecosystems and enhance community access to and enjoyment of water courses environments and to protect and maintain river environments to a high environmental and aesthetic quality while promoting sustainable recreational opportunities, community health, aesthetics amenity and healthy environment.



**VISIT TO BIOECODS PROJECT:**

**A NATIONAL PILOT PROJECT ON  
SUSTAINABLE URBAN DRAINAGE SYSTEM**

**UNIVERSITY BOARD OF DIRECTORS**

20<sup>th</sup> NOVEMBER, 2006



Prof. Dr. Azazi Zakaria (Second from right) with Prof. Dato' Dzulkifli Abdul Razak (First from right), Dato' Jamaludin Hasan (Fifth from right), Dato' Syed Mohamad Aidid (Sixth from right), and Dato' Dr Lim Yu Hoe (Third from right). They were given update on the operation of BIOECODS at the sites of ecological swale, wet pond, detention pond, and constructed wetland. Later, the entourage made a brief visit to the Technical Office of REDAC.



DETENTION POND



SWALE



WELCOME TO

REDAC



## THE ECONOMIC PLANNING UNIT (EPU) 07<sup>th</sup> DECEMBER, 2006

A delegation from the Economic Planning Unit (EPU) of the Prime Minister's Department made a technical visit to BIOECODS project on 7<sup>th</sup> December 2006. Impressed with the integrated measures on stormwater management utilized in the BIOECODS project, REDAC was given the task by EPU to evaluate the proposed options to rehabilitate rivers in Johore after the devastating floods in late December 2006 and January 2007.



SWALE





**WETLAND**



**DRY POND**

# Open Fishing Competition, Recreational Pond

14<sup>th</sup> July 2007



A fishing competition was held for the first time at the BIOECODS' Recreational Pond on Saturday, 14<sup>th</sup> July 2007. It was open to all staff and students of USM Engineering Campus as well as the communities in the surrounding areas of the campus. 100 participants took the challenge in getting the fishes which were released to the pond one week before the competition day. The prizes were given to the 10 winners by the USM Deputy Vice Chancellor (Student Affairs & Development), Assoc. Prof. Omar Osman and the Deputy Director of REDAC, Prof. Aminuddin Ab. Ghani.



Assoc. Prof. Omar Osman  
Deputy Vice Chancellor  
(Student Affairs & Development)



*Main Prize Winners*