UNIVERSITI SAINS MALAYSIA

TECHNICAL REPORT
UNIVERSITY RESEARCH GRANT

Integrated Urban Drainage Management (INUDRAM)

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Frequent 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. The end product from this research programme namely "Integrated Urban Drainage Management (INUDRAM)" provides cost saving to the country by eliminating the need to upgrade the existing conventional drainage system by controlling the stormwater at source. The new system with environmentally friendly products (REDAC Gross Pollutant Trap and REDAC Module) will create urban areas free of flash flood and remain in harmony with nature. Besides that, our river systems will also be saved from further destruction due to conventional flood mitigation projects.

The research activities include development of a gross pollutant trap prototype (REDAC GPT), sub drainage module component (REDAC Module) for Bio-Ecological Drainage System (BIOECODS) and development of fluvial database that includes sediment transport database and flood risk maps for river rehabilitation and conservation. New industries will be created to produce the products (REDAC GPT and REDAC Module) for INUDRAM enhancing our aim of becoming a develop nation in 2020. Flood risk maps are developed for Sungai Muda based on 2003 flood modelling that will help developers and authorities in the Sungai Muda basin make decisions and take action on flood prevention measures in the future.

The investigation of the hydraulic performance and trapping efficiency of REDAC GPT was conducted in a laboratory prototype model using different flow rates and gross pollutant characteristics typical in Malaysia. Measurements of the pattern of flow and sediment deposits, velocity distribution, and amount of pollutants trapped, were conducted and analyzed. From the results, the efficiency of gross pollutant and sediment trapping efficiency is highest at the lowest water depth tested.

The hydraulic characteristics of modular channel through field study and experimental tests in a 6 m rectangular channel were also investigated. The result shows that Manning’s n

increases with increment in slope and decreases with increment in flow velocity. Field data for slope of 1:500 indicates that Manning's n of modular channel is estimated to be 0.048 for flow without backwater. Therefore, it is concluded that the average Manning's n from laboratory tests is valid for practical purposes. It is also concluded that the application of modular channel as subsurface conveyance enables flow reduction of more than 75%.

Fluvial sediment database contains sediment transport data collected from Sungai Muda. The sediment tranport data allows evaluation of the sediment transporting capacity of Sungai Muda for river conservation and rehabiltation. The analyses carried out show that Sungai Muda should not be used for sand mining purpose due to its low sediment transporting capacity. By using InfoWorks RS, based on the 2003 flood, the high potential risk areas of the Sungai Muda are identified. These flood risk maps will help developers and authorities in the Sungai Muda basin make decisions and take action on flood prevention measures in the future.