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Editorial: River modelling and flood mitigation; Malaysian perspectives

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Malaysia is fortunate in that historically it has not experienced natural disasters in the form of earthquakes, volcanoes, and typhoons. The most common natural disaster frequently encountered in Malaysia is flooding. Two major types of floods occur in Malaysia, including monsoon floods and flash floods. The Department of Irrigation and Drainage in Malaysia has estimated that about 29 000 sq. km, or 9%, of the total land area and more than 4·82 million people (i.e. 22% of the population) are affected by flooding annually. The damage caused by flooding is estimated to be about RM915 million (£160 million).

While monsoon floods are governed by heavy and long durations of rainfall, more localized flooding, which occurs especially in newly developed town areas, has been reported more frequently in recent years. In October 2003 major flooding affected a large area in the northwestern part of the Peninsular, including the states of Kedah, Penang and Northern Perak. The December 2007 floods, on the other hand, occurred in the state of Pahang, after more than 30 years since the last similar floods of 1971. Flash floods have occurred more frequently in the country since the 1980s, with these types of floods often having a drastic impact on parts of the country.

Two common approaches adopted in reducing the impact of flood problems have been increasingly adopted in Malaysia and these include structural and non structural measures. Structural measures include such measures as river widening, deepening and straightening, with the aim being to reduce the magnitude of the flood, but at the same time this approach often transfers the flooding problem further downstream. For non structural measures, tools such as computer models can be used to quantify the effects of human interference to the river system. Such tools are already available widely used in many countries worldwide, but the application of sophisticated models is still relatively new in Malaysia. One reason for this limited use of such models in Malaysia is that the tools often do not properly model the more extreme flood events, where the river flows are often supercritical. In Malaysia it is regarded as increasingly important to carry out a thorough analysis of flood events with the help of available river models to understand the flood behaviour before any structural measures are undertaken. Therefore, before any amendments are implemented within a catchment and the flood plain, river engineers must evaluate the potential extent and impact of flood events and advise the implementing agencies as to what steps need to be undertaken to provide further preventative measures to avoid the anticipated flood problems that might occur.

This special issue of the *Journal* contains four technical papers that were presented at the Second International Conference on Managing Rivers in the 21st Century or *Rivers '07*, held in Kuching, Sarawak, Malaysia, June 2007. The selected papers address the pressing issues of flooding and related water quality problems in Malaysia and the use of available numerical river modelling software tools to mitigate for the effects of flooding. The first paper by Teo *et al.*[1] describes the significant effect of mangrove trees on the hydrodynamic processes of tsunami waves. An existing two-dimensional depth-integrated numerical model was refined to simulate these tsunami currents in a real estuary, namely the Merbok Estuary, Kedah, Malaysia. Simulations have been undertaken for the swamp area and main river, with the effects of mangrove trees being compared against conditions without trees, with the main aim being to study the effects of mangrove trees on the hydrodynamic processes during tsunamis. Comparisons of velocity profiles and water elevations for both cases have been undertaken. These results show that mangroves trees help in reducing the effects of a tsunami in the main river and swamp areas.

The second and third papers describe the use of commercial software tools to mitigate against flooding in urban areas. Lim and Cheok[2] applied a 2D hydraulic model, namely MIKE Flood, to study the Damansara River catchment. The results of the simulations show that the model is capable of providing crucial information with regard to the direction and rate of flood propagation, the flood inundation extent, as well as flood depths and flood durations for the study areas. Leow *et al.*[3] showcase how urban river modeling, using the InfoWorks Collection System (CS), applied to the Berop River, Perak (Malaysia), can assist stormwater system design. The calibrated model uses historical flood event data, with the developed model being used for to establish the impact of various design storms, possible scenarios for mitigation and planning for existing and future land use changes.

Lastly, Said *et al.*[4] explored the use of a water quality simulation model via InfoWorks River Simulation (RS) for the

Maong River, which flows through Kuching City, Sarawak. The focus of this paper is on predicting the dissolved oxygen (DO) parameters in the river basin. The model adopted a hydrodynamic and transport flow simulation tool to capture the advection and diffusion processes for different flow conditions. From the results, it is clear that the model generally predicted and identified the main impacts of flooding on the river water quality.

A general paper by Mantz and Benn[5] finishes off the first issue of the year followed by a book review of *Future flooding and coastal erosion risks*.

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