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Restoring nature in engineering structure: a modelling of Kuching bypass floodway

Darrien Yau Seng Mah

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Abstract Engineering infrastructure development usually causes disturbances to environment. Rarely, the natural processes are restored in these physical structures. This paper highlights examples of coexistence of nature and engineering structure in flood control systems in US and Kong Kong, and treats the idea on a new project, a bypass flooding system in Kuching, Malaysia by computer simulation. When the Kuching floodway idles during normal days, it is modelled as a pond to match the surrounding peat swamp. The in-channel pond requires lower flow, allowing the downstream river its natural flows. The modelling simulation shows plausible results to put back nature in man-made system to restrain saline intrusion and problem of low flushing due to flow diversion. With that, it is time to call for the society, particularly the engineering communities to adopt a more nature-sensitive approach in engineering designs.

Keywords Bypass floodway · Land drainage · Modelling · Nature · Salinity · Wetland

Background

Manmade-induced changes, for many instances, have caused environmental degradation over the human history (Myers 1988; Zimmerer 1993; Wang et al. 2001). It is typical that an engineering structure is forced to an

environmental system to meet human demand (Young 1994). In the Sarawak state of Malaysia, a bypass floodway is planned to divert floodwaters (see Fig. 1). The floodway when completed by 2015 would break the barrier of two systems that naturally distinguish in their boundaries. One comprises freshwater peat swamp and another brackish coastal mangrove wetland. Each supports ecosystem that is very different with organisms' requirement for survival.

Such man-made canal is among the many engineering projects that would affect nature on a large scale. The bypass is claimed to shorten the flood flow by 20 km to sea, prohibiting any runoff excess to enter the capital Kuching city centre. However, it also means that the channel exposes the inland nearer to sea water as a threat to interior wetland. Indication of saline intrusion is discussed in later writings. Small amount of salt water contamination is repeatedly reported to alter the balance of freshwater ecosystems (Nielsen et al. 2003; Davis et al. 2005; Winn et al. 2006).

Motivations

Kuching bypass floodway is known capable of alleviating the flooding problems in Kuching city during monsoon season (Mah et al. 2010a). Usually the North-East monsoon peaks in January and February where reports of flooding are often fall within the periods. The 2 months are comparatively a short period of time. Nevertheless, structure like Kuching bypass floodway involves a trade-off, while big portion of water is continued to be diverted for the rest of the year, less water would be released to Lower Sarawak River (Jurutera Jasa Consulting 2006). When there is insufficient head due to low flow to flush out sea water, salt water would intrude (Shannon et al. 2005), through the

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