Editorial

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In the UK we seem plagued by water management issues: two of the driest winters on record and the threat of a super-drought, followed by one of the wettest summers on record and yet more serious flooding. Hosepipe bans were introduced only to be rapidly lifted. Fresh food prices are spiralling. Fortunately, as I write this in the pause between the Olympic and Paralympic summer, there has been no significant weather-related disruption. But, I wonder, how much longer can we go on keeping our fingers crossed or hoping for a return to the sorts of summers and winters we fondly remember from our childhood? Of course this is a selfish and somewhat romantic perspective I suspect, but one not unique to either myself, my countrymen, or for that matter billions of fellow humans right across the globe. It is therefore a privilege to work in such a diverse, multidisciplinary and globally connected field as water and to have a level of insight and understanding to some of the cutting-edge science and engineering involved in trying to tackle these problems. This issue of *Water Management* illustrates this diversity and global dimension perfectly and I am therefore delighted to be able to introduce it to you.

The first paper (Pezzaniti *et al.*, 2012) is an Australian case study of an urban stormwater detention basin. Given its historic reliance on the River Murray it is perhaps not surprising that South Australia leads the way in terms of integrated approaches to water management. This paper presents a methodology and findings of the hydrological and water quality performance of an established full-scale highway drainage system. The study was based on six carefully selected storm events in which a number of inflow and outflow parameters were monitored. The results show there was significant water loss, mainly attributed to exfiltration. Although significant load reductions (notably for heavy metals) were observed, and hence improvements to water quality, the mean effluent concentrations exceeded some of the local environmental trigger values for releases into freshwater bodies.

The next two papers are concerned with the increasingly important issue of bed scouring and in particular, the implications for the design of bridge piers. Accurate simulations and modelling approaches are required to balance economic considerations in construction and maintenance with the obvious health and safety implications in failure.

The first paper (Borghei *et al.*, 2012) is an Iranian experimental study of scour depth evolution under steady and unsteady flow conditions. It is based on two cylindrical pier diameters with a relatively uniform and non-cohesive sediment bed in a clear water flume flow. A large number of experiments are performed with

the steady state flow tests being used to validate methodology against a previous study. For unsteady flow conditions a matrix of hydrograph types and shapes is used to simulate spate conditions. These results show that both gradual, sudden and repeating increases in flow to peak hydrograph have little effect on scour depth over the same base time, with example empirical equations derived for some specific sets of conditions.

While empirically derived models have advantages in terms of simplicity, data availability and hence practitioner utility, the second paper (Khan *et al.*, 2012) describes the novel application of an artificial intelligence (AI) modelling tool for predicting pier scour. Such AI tools are incredibly data hungry and the Pakistan and Malaysia-based investigators have taken a large data set and applied it to a selection of traditional regression-based models, AI-based artificial neural network (ANN) models and gene expression programming (GEP) models to both train and validate to elucidate relative performance. The results of the study show that, whilst GEP performance is slightly better than ANN, both AI techniques are superior to the more traditional approaches. In the study GEP is preferred over ANN due to the relative simplicity of the resulting equation and this perhaps offers a more favourable route through into practice.

River sediment flow and water yields present unique hydraulic challenges in cold regions of the world where flow is often bounded by a layer of ice. Application of Manning's coefficient to cross-sectional slices is therefore problematic based on both accessibility for visualisation and obtaining field measurements, and the differing physical properties of the bed and underside of the ice sheet. In this fourth paper Li (2012) utilises a large dataset based on 13 seasonally frozen Canadian rivers to examine four different methods of calculating a composite Manning's number. The pros and cons of the different methods are described, which produce remarkably consistent results from different data parameters. The findings present an expected range of composite Manning's values based on the individual characteristics of the rivers, but also significant spatial (cross channel) and temporal distributions, which have obvious implications for sedimentation and yield.

The final paper in this issue is a collaborative Chinese and American study by Liu *et al.* (2012) and describes a mathematical solution to the age-old engineering problem of calculating a conjugate depth for rapid energy dissipating hydraulic jumps in open trapezoidal channels. Such design features are typically used to protect downstream hydraulic structures in artificially modified

or engineered water bodies. Mathematical treatment is in common usage in rectangular channels, and time-consuming trial-and-error and less accurate methods are available for other shapes, including circular and trapezoidal cross-sections. The iterative approach here is based on formulae derived from the 1D momentum equation supported by estimation formulae to provide meaningful initial values and facilitate solution convergence. The accuracy and speed of the method is compared with previously reported experimental data with an excellent match.

I hope you will agree that these papers represent the diversity and international importance of water engineering and that you will enjoy reading them as much as I have. As ever the editorial team are pleased to receive feedback on this issue or any previous issues or comments related to water management generally.

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