

Editorial

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Although integrated water resource management (IWRM) remains the ‘gold standard’ of water resource management, it also remains an elusive achievement in practice. This issue of *Water Management* provides two interesting contributions to IWRM practice: concurrent water quality and quantity modelling within a decision support context, and the morphological prioritisation of micro-catchments to guide site selection for catchment rehabilitation interventions. The issue stays at the landscape scale with a consideration of the recurrence intervals of bankfull discharge, before moving to the more local spatial scale of scour around bridge abutments – a significant risk factor in bridge failure. The issue concludes at an experiment scale, where scale effects of velocity on incipient cavitation are presented.

Azmi and Heidarzadeh (2013) use total dissolved solids as a one-dimensional surrogate for water quality and provide a basin-scale model that enables managers and decision-makers to take concurrent account of flow and salinity changes through reservoirs and linking river sections. Combining quantitative data and qualitative scenario-building provides a flexible capacity to assess alternative development options effectively. The model can be applied at different scales and levels of basin complexity and fills an important gap in the accessibility of sophisticated modelling in the practical time-frames of decision-making. It will be interesting to follow potential interaction between a focus on a systems approach to the learning and behavioural aspects of IWRM (Du Toit *et al.*, 2011; Pollard and Du Toit, 2011) with the practical, physical systems modelling developed by Azmi and Heidarzadeh (2013).

Moving towards the practice of IWRM means taking large-scale contexts into account when making smaller-scale decisions. Raju and Nagesh Kumar (2013) present the challenge of selecting intervention sites to rehabilitate Indian landscapes toward the wise use of water for agricultural production. The authors analyse morphometric parameters using an entropy model to weight the parameters, followed by ranking and sensitivity analysis. The ungauged Kherthal catchment is placed in a regional and continental context, and the multi-criterion decision making system models criteria for micro-catchment selection in soil and water conservation programmes.

The paper by Ahilan *et al.* (2013) stays at the landscape scale, analysing data from 88 Irish locations with good hydrometric data, rating relationships and surveying bankfull levels and photographic records. Frequencies of various recurrence intervals of bankfull flow are derived (for example more than 50% if the

sites had a return period of less than 2.33 years) together with an expression for estimating bankfull discharge. These will be useful in index flood estimates, regional flood-frequency analysis and therefore in extreme event risk assessment.

Bridges are susceptible to scour (Salamatian *et al.*, 2013), and Mohammadpour *et al.* (2013) pay attention to predicting equilibrium scour around long abutments to allow for the protection of bridges during floods. The paper notes the usefulness of artificial neural networks (ANNs) in work of this sort and specifically demonstrates the application of genetic programming (GP). The authors suggest that while ANNs are accurate under conditions including varying sediment size and velocity, a GP-based formula is more useful.

Finally, at the finest scale Zhang *et al.* (2013) specifically consider scale in an exploration of incipient cavitation in high speed flows. Carrying both risks and benefits, the propensity of bubbles to form, grow and collapse in liquids (cavitation) is of interest, and the point of incipient cavitation is of particular interest in seeking to avoid cavitation damage. This experimental study varies velocity and pipe diameter and expansion rate, and provides a new formula for forecasting incipient cavitation at high velocity flow.

Scale is therefore a recurring theme that brings together an interesting and challenging set of papers in this issue.

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