Editorial

D. Peach PhD, CGeol, FGS, MCIWEM

In this issue of *Water Management* a number of papers are concerned in one way or another with the solution to generic hydraulic problems or consequences of hydraulic design, in the case described here, on water quality. The importance of hydraulic precision and understanding of water flow on broader scale impacts of designs or mitigation measures is amply illustrated by Villada Arroyave and Crosato (2010). This paper provides an interesting hydraulic modelling study to assess the effectiveness of some current Dutch river management policies. The fifth paper in this issue describes a hybrid treatment technology to bring sewage effluent to a high quality (Chanan *et al.*, 2010). All of these contributions to understanding and managing fluid flow become even more important when considered in the light of climate change and the possibility of increasing frequency of extreme events. Flood control and mitigation is an ever-growing societal issue, whether considering its economic effects or the great human hardships that can follow flood devastation. This has been exemplified by the UK summer floods of 2007, as well as the recent events in the north-west of England and elsewhere in Europe and most recently in Pakistan.

The paper by Bagheri *et al.* (2010) presents an equation for the determination of the discharge coefficient for a sluice gate. This was developed using potential flow theory and then assessed against 84 laboratory experiments. Comparisons of the experimental data and the calculated coefficient values were made and proved very satisfactory. This is a neat piece of work illustrating the value of the combined theoretical and experimentalist approach.

The second paper (Vatankhah, 2010) considers the problem of choke-free flow in a trapezoidal channel. The motivation for the study arose because the author found no explicit equation for the determination of the permitted rise in bed elevation in a trapezoidal channel under choke-free conditions. The author uses a non-graphical approach and the specific energy equation is used to choose the operating ranges of upstream flow regimes. Two types of transition are dealt with, those of partial channel filling and no cross-sectional change. The procedure presented uses the fixed point method to solve the specific energy equation.

In the next paper oxygen transfer efficiency at baffled chutes is researched in an experimental study by Kaya and Emiroglu (2010). Oxygen concentration is the main indicator of water

quality in surface waters for human use and for aquatic biota, so predicting the aeration efficiency of baffled chutes is an important issue. In the study stepped, wedge, trapezoidal and T-shaped baffles are considered in relation to chute height, angle and unit discharge. The stepped baffle was found to have the highest transfer efficiency at 20° at high chute angles but T-shaped baffles were generally found to be more efficient for lower angles. The paper demonstrates that baffle blocks are very efficient at oxygen transfer because of strong turbulent mixing associated with substantial air entrainment.

The key to successful river management is the success or failure and longevity of the management interventions. The study by Villada Arroyave and Crosato (2010) of the Meers pilot project on the Common Meuse River uses a two-dimensional, depth-averaged, morphological model to investigate the impact of channel widening by floodplain excavation over a short reach. The results are very significant and show that the pilot project is likely to be effective at lowering water levels for 1–4 year return period floods for a period of 20 years but not for floods having a return period of 100 years. Floodplain vegetation was found to shorten the life of the intervention by enhancing sedimentation. This study highlights the need for morphological predictive modelling of this type, but some knowledge of the degree of uncertainty that can be placed on the model performance in this and other real cases would be important.

Water security is a growing global problem and a particularly severe problem in Australia. Therefore the paper by Chanan *et al.* (2010) highlighting water mining of sewage is timely. The paper describes the results of a first pilot test of a proprietary system in Sydney, Australia. The system is a chemically-assisted physico-biological hybrid, using chemically-assisted fin solids separation, submerged aerated biological filter, fine sand filter and ultraviolet disinfection, often combined with chlorination. The system proved in test to meet water quality requirements for use in irrigation of public open space. It seems likely that if water scarcity becomes a problem as a result of climate change these technologies will find much greater use.

In the final paper Samani and Zanganeh (2010) determine the optimal design of municipal water distribution networks using the mixed-integer real linear programming technique. Optimisation methods utilising linear programming can be used

to establish the global optimum quickly and directly. Using this method the discrete characteristics of commercially available pipe sizes, pumps and reservoir heights can be found. In the study the hydraulic and optimisation analyses are linked through an iterative procedure to obtain the optimal design. The authors' proposed model is also applied to a network studied by other researchers. When the results were compared the results for the proposed method were found to be satisfactory.

This month's papers traverse a variety of different topic areas but all provide either theoretical, experimental or modelling insights and developments that speak to the big issues of 2010 and the future decade. The struggle to adapt to predict the impacts of environmental change and adapt or mitigate its effects remains the single biggest challenge to science and engineering.

REFERENCES

- Bagheri S, Afzalimehr H and Sui J (2010) Briefing: Discharge coefficient for sluice gates. *Proceedings of the Institution of Civil Engineers, Water Management* 163(9): 435–438, doi: 10.1680/wama.900051.
- Chanan A, Saravanamuth V, Kandasamy J and Shon HK (2010) Chemical-assisted physico-biological water mining system. *Proceedings of the Institution of Civil Engineers, Water Management* 163(9): 469–474, doi: 10.1680/wama.900072.
- Kaya N and Emiroglu ME (2010) Study of oxygen transfer efficiency at baffled chutes. *Proceedings of the Institution of Civil Engineers, Water Management* 163(9): 447–456, doi: 10.1680/wama.900029.
- Samani HMT and Zanganeh A (2010) Optimisation of water networks using linear programming. *Proceedings of the Institution of Civil Engineers, Water Management* 163(9): 475–485, doi: 10.1680/wama.2010.163.9.475.
- Vatankhah AR (2010) Choke-free flow in trapezoidal channels. *Proceedings of the Institution of Civil Engineers, Water Management* 163(9): 439–445, doi: 10.1680/wama.900030.
- Villada Arroyave JA and Crosato A (2010) Effects of river floodplain lowering and vegetation cover. *Proceedings of the Institution of Civil Engineers, Water Management* 163(9): 457–467, doi: 10.1680/wama.900023.