Editorial

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In their pursuit of a resilient and sustainable supply–demand balance, water utilities have a range of mechanisms at their disposal with which they can influence both sides of the equation. Historically (perhaps up until the 1970s), demand side strategies had been the poor relation of supply side interventions, which delivered imposing and inspiring projects such as dams and reservoirs (substantial physical artefacts that can be ceremoniously opened and named). The operational behaviour of such investments is also amenable to detailed and often very accurate description and analysis. In contrast, demand side interventions typically involve large (sometimes very large) numbers of small scale actions, the precise impacts of which are problematic to determine. However, with environmental water resources under increasing stress and lower-quality source waters being expensive to treat to potable quality, demand side measures have flourished.

The past 10 years in particular have seen impressive growth in the range of tools and techniques used by water utilities and other agencies to encourage reductions in household water use. These strategies have also been extended to secure reductions in raw water abstraction in order to, among other things, protect critical flows in surface water bodies. Although the positive role that householders can play in water management by modifying their behaviour and consumption is rarely questioned, our understanding of the dynamics between water users' perceptions and behaviour and the low water-use technologies that deliver reduced demand is still developing. It is timely, therefore, for this journal to gather together a stable of five contributions around water demand management as perhaps a further incentive to both industry and academia to redouble their efforts in this field.

The UK has often looked to other regions and countries with relevant experiences of particular challenges as a way of seeding research and practice. In the context of water stress, there is perhaps no better archetype than Australia, where both demand management and resource enhancement via wastewater and stormwater reuse and desalination have been at the forefront of research and, latterly, practice for several decades. With a penchant for rapid but attentive technology and policy development, Australian water sector professionals provide global leadership across many aspects of water science and technology. We are therefore delighted to be able to include two contributions from Australia reporting their experiences with demand management in this themed issue.

There are few countries in the world with enough experience of water demand management to be able to offer a credible comparative overview and analysis of multiple initiatives. Neal *et*

al. provide an engaging examination of this type from an Australian perspective. They also provide a welcomingly honest appreciation of the difficulties inherent in associating demand reduction (as measured at the meter) with specific interventions. Such meta-studies are in very short supply and the insights generated through this contribution will, I am confident, be a point of reference for many years to come.

Attempts to directly influence household customer behaviour through education and information campaigns have met with highly variable success rates. Furthermore, the determinants of successful and unsuccessful initiatives have been problematic to disentangle from the morass of associated variables such as climatic conditions, pricing and underlying socioeconomic factors such as affordability. The contribution from Ampt *et al.*, which reports a sizeable and impressively managed study exploring the impact on household water consumption of a much personalised approach to behaviour change, is therefore most welcome.

Despite the wealth of seemingly ready-made experience that Australian professionals and institutions possess, adopting lessons about 'what works' requires reflection and analysis. Kayaga and Smout deliver a useful study in this context, which draws on a well-reported example of successful demand management from Zaragosa, Spain, and asks how this demand reduction programme might impact water consumption if implemented in Kampala, Uganda. Such conjectural but reflective studies are important if we are to be able to adapt the lessons from other countries.

Evidence that there remain interesting challenges to explore in the demand management field comes from Nawaz and Waya who illustrate an often overlooked area of potential water savings by analysing the volumes of water wasted as householders wait for warm water to emerge from the tap. Their study suggests that almost 10% of UK per capita demand is lost in this way; a finding that surely provides a useful challenge for technologists to develop new household water systems that can minimise these losses.

There has been much debate about the impact of greywater recycling systems on energy and carbon consumption. The scale and configuration of implemented greywater systems strongly influence these variables, and contemporary developments in the field have focused on exploring how the spatial relationship between greywater sources and end uses can be optimised. As is the case with many aspects of water reuse, the details of the scheme strongly influence the distribution of costs and benefits. Zadeh *et al.* contribute to this on-going debate by demonstrating

how innovative thinking about the configuration of sources and uses of greywater can help designers and planners achieve not only water savings but also carbon and energy reductions.

This admittedly diverse but ultimately well-balanced selection of contributions reveals the breadth of engagement with water demand management with academics, consultants and water utilities represented in the authoring teams. It also witnesses the steady improvement in our understanding of not only what works . . . but why it works.

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