

Editorial

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I. FROM TECHNOLOGY ENTRAPMENT TO ADAPTABILITY

Balancing the environment, human needs and economics is always a difficult act for sustainable living. In much of Europe there are a variety of university courses that are entitled 'environmental engineering' or similar. These have emerged over the past few decades in recognition of the realisation of the importance of the environment. Although a focus on the environment has undoubtedly been important to clean up the natural environment, there have been a number of instances where there has been a failure to remember that as engineers we must first and foremost represent and look after the needs of people. The profession of 'public health engineer', which has rather fallen out of favour with the assimilation of the UK's Institution of Public Health Engineers into what is now the Chartered Institution of Water and Environmental Management (CIWEM) illustrates the trend away from 'people first' to 'environment first'. This is implicit rather than deliberate and has happened with the best intentions of all concerned. Yet the 'law of unintended consequences' applies to such developments and for example, the best intentioned innovations to recycle, reuse and directly utilise rainfall at source for water supplies can sometimes result in unfortunate outcomes. In a recent case in Deventer in the Netherlands, arrangements for on-site water reuse for a row of houses resulted in toilet-flushed waste being connected into the washing machine supplies. Good design intentions here were confounded by incompetent plumbers.

For several months this year (March to August) a significant part of Ireland has been unable to drink the supplied tap water and possibly more than 2000 people were infected¹ with a major outbreak of cryptosporidium poisoning.² The worst affected area was Galway in the west of the country. This outbreak has required the population to buy bottled water. For the majority of domestic customers there have been no water charges since 1997 and so they could not really complain about the loss of a service they were not paying for. This was not an isolated occurrence as there had been a number of cryptosporidiosis outbreaks since 2002.³ I had personal experience of the most recent as my mother-in-law had to be admitted to hospital on our way to the ferry in Dublin after a trip to Galway. She was infected by a contaminated salad.¹

Water is much undervalued in the developed world and it is true that where insufficient revenues are raised to maintain the associated infrastructure, problems eventually manifest

themselves. The Irish Government decided to abolish all charges to domestic customers in the run-up to the election in 1996.⁴ Funding the infrastructure maintenance and very significant expansion needed with the Irish economic boom since 1997 was to come from national government to the 88 local authorities who deliver the services. But little was done in preparation of infrastructure to accommodate the huge increase in housing that has occurred.³ Of the 1 million households in Ireland, some 20% are still not connected to public supplies⁵ and take their water supplies mainly from local sources which are also at risk from the source of such infections as the latest tap water outbreak has been attributed to the uncontrolled spreading of sludge to land, occurring during a very wet period.

Ironically in Northern Ireland the announcement in December 2005 by the British Government that water charges would be introduced for the first time was met by major opposition: the 'we won't pay' campaign responded to the Government's water charges announcement by stating 'Peter Hain [Secretary of State for Northern Ireland] had said those on low incomes would not face hardship from the introduction of water charges. But in reality, he is introducing a 3% cut in income for those on benefits, through water charges. This is a serious attack on the 21% of the population who depend on benefits. A 3% cut in income may not sound much to well-heeled Ministers with income in excess of £100 000 a year, but for people on benefits this will push them even deeper into poverty and hardship'.⁶

In a recent review of global needs for future infrastructure the Organisation for Economic Co-operation and Development (OECD) expressed the view that there needs to be greater use of user charges for funding infrastructure, to signal prices, reflect real costs and contribute to demand management.⁷ They also call on the involvement of a wider range of stakeholders in the process of needs assessment, prioritisation, design, planning and delivery of infrastructure. In England, Wales and Northern Ireland water services are very remote from users and Ofwat, the England and Wales economic regulator, has a mission to make these services 'invisible'. The OECD also calls for a strengthening of public capacity to inform decision making. Yet at the same time in the UK there are naïve exhortations to the public to 'save water' and become more responsible for certain aspects of personal flood risk management. While 'customers' are remote from any engagement in the processes by which these services are provided such initiatives are doomed to failure. The message here is about developing the capacity in those receiving

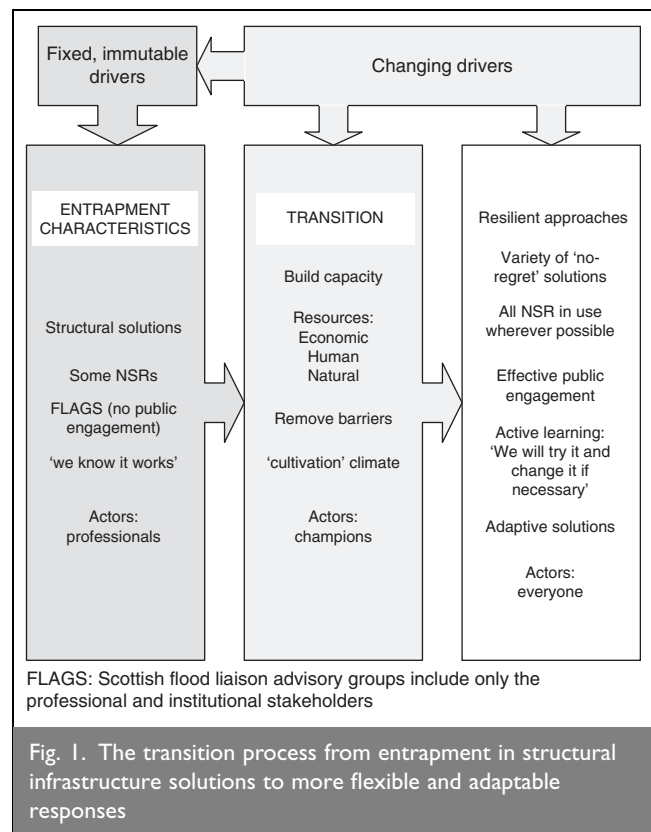
key services like water and also in those responsible for providing these services to engage effectively in the process. This engagement is about paying for the services, deciding on the best ways of delivering them and what standards are appropriate.

The paper in this issue by Pidou *et al.* about greywater recycling, while being technically illuminating, has a mountain to climb before such approaches are used to any extent in the UK. Elsewhere, such as in Australia, water stress is making all sources of water much more attractive, and local and on-site systems are extensively in use, but there are much more engaged populations in these places. If the UK Department for Communities and Local Government does manage to drive through the massive housing developments in the water-stressed south east of England, such technologies are going to be needed. But we also need to build the capacity in individuals to make the best use of them and to engage positively in their application. This includes those professionals 'entrapped' in single solutions that are tried and tested but may no longer be adaptable enough to cope with the future.⁸ Pidou *et al.* indicate that the level of contribution that the reviewed technologies make to sustainable water management will vary as a function of local context. Unfortunately information on life cycle cost and total energy requirements for greywater treatment options is sparse.

However, the power of circumstance to modify preference may mean that concerns with 'carbon footprints' might preclude the use of high-energy requirement technologies such as the MBR but, at larger scales of application and where higher variation in greywater quality is found, the energy consumption of an MBR compared with other options could be the more sustainable option nonetheless.

This latter point makes the paper by Ryu *et al.* on thermal waste treatments for sustainable energy particularly pertinent. If we are to cope with the tonne of municipal waste we all produce each year in the future, one option is to recover the embodied energy, although clearly waste minimisation would be preferable to thermal processes. The authors indicate that, as much of the waste consists of organic materials such as wood, paper and fabrics and these materials form part of a biocycle, their combustion does not contribute to the net output of carbon dioxide.

Hadjri *et al.* deal with sustainable earth housing in Zambia; particularly the need for effective engagement with all stakeholders. This is a global issue, but as I pointed out in my discussions earlier in this editorial this is also needed in developed countries. Hadjri *et al.* recommend the establishment of knowledge transfer partnerships. In studies we are carrying out in Glasgow for the Scottish Government, we have found a need to develop the capacity among all stakeholders to respond to changing flood risk by adapting a process that will entail lifelong 'active learning'⁹ and one in which all stakeholders will have to change the way in which they approach infrastructure development in the future. The transition from the current 'entrapment' approaches as evinced by the government-approved plans to build an over-sized storage tunnel to take sewage overflows into the Thames in London—simply repeating what Joseph Bazalgette did more than a century ago—to responses that are flexible and adaptable as needed to cope with the uncertainties of climate change is illustrated in Fig. 1. This is for sustainably managing flood risk and includes the use of



non-structural responses (NSR) to increasing risk. The no-regret solutions are those that may be reversed if we find that future knowledge and drivers are not what we believe them to be now. Our challenge as engineers and 'champions' is to help decision makers, our colleagues and others to move from the left to the right of this diagram.

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