Editorial: Addressing the human dimension in socio-technical systems

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Engineering sustainability is a big expression. It covers many issues that are reflected in the aims and scope of this journal. These aims refer to examining the 'tensions between the integration of social, economic and environmental considerations' in engineering projects and activity. The most often covered of these three topics are concerns relating to environmental sustainability. Many papers over the first seven years of the journal's life (since it was launched in 2003) have noted that less attention is given to the social aspects of sustainability.

To redress this imbalance the Editorial Panel decided to dedicate a special issue on the theme of the human dimension and invite papers to explore the wider socio-technical system within which sustainable engineering solutions must be delivered and are sometimes constrained. In particular, it was hoped to draw together a body of material which would focus on the relationship with the human communities which infrastructure systems serve. The response was tremendous with around 50 abstracts being submitted. This has resulted in an extended issue of *Engineering Sustainability* which includes nine full papers drawn from several countries and covering a range of sectors including water, transportation, urban planning and construction. Other papers on this theme will appear in future issues of the journal.

Key challenges facing infrastructure engineers today relate to dealing with increasing levels of uncertainty, not just through incomplete or missing information, but through the complex systems within which their services must operate. An important component of these systems is the human dimension in which the impact on individual lives and livelihoods of the outcomes of engineering decisions must not be overlooked. Ways of addressing human concerns in the delivery of a range of project types is therefore the focus of the papers presented here.

We hoped the call would attract papers from a range of disciplines so that as professionals we can learn how other specialists view the problem. We are delighted to be able to include contributions from political and social scientists, geographers, urban planners, industrial ecologists as well as from the liberal arts and ecology. This strongly multidisciplinary

issue strengthens our understanding and extends the advice and practical approaches we can take in ensuring people and communities are at the centre of engineering decision making.

The first paper by Alice Owen and her colleagues at the University of Leeds (Owen *et al.*, 2011) makes a strong case for understanding how people who live in a particular place respond to projects. The authors argue that factors such as cultural attachments to landscapes and place need to be considered in project design and planning. Using examples from the field of energy generation, and to a lesser extent from energy in transport use, they argue that a project that has been designed with human place-based factors in mind 'can enrich cultural heritage rather than detract from it'. In suggesting a holistic approach and a more participative design process the authors set the scene well for the papers that follow.

In the second contribution to this special issue Juan Lucena, Jen Schneider and Jon Leydens offer an historical appreciation of how engineers might make a difference to under-served communities (Lucena *et al.*, 2011). This analysis suggests that engagement between engineers and communities in the developing world has been strained by an over-readiness by engineers to specify technological solutions. The authors make a direct plea to engineers who are looking for a role in developing communities to develop a more experiential approach; an approach that recognises the multi-layered context of development problems and is founded on personal familiarity with developing community circumstances.

Next Laws and Loeber (2011) make a valuable contribution from the social science community. Writing from Amsterdam the authors use a Dutch water management case study to explore how human dimensions of sustainability can influence professional engineering practice. This requires reaching beyond the technical issues to embrace issues such as organising stakeholder involvement, managing knowledge and negotiating shared commitments on action. The authors present a practical portrait of sustainability as a process of learning through negotiation that can redefine the social and political roles that engineers and other professionals play. This fresh perspective gives real practical advice on how to resolve

conflicts and deal with the complex choices and dilemmas faced by engineers in planning and implementing sustainable projects, as well as the social and team behaviours and inter-relationships involved in doing so.

A fresh insight into the engineer–client dynamic is used by Joseph Mulligan, Anna Tompsett and Peter Guthrie to shape a very practical framework for community participation in infrastructure development projects (Mulligan *et al.*, 2011). By refusing to privilege either contribution they are able to posit a process which offers both meaningful citizen influence and well targeted technical expertise. A significant (and welcome) departure point for this contribution is its insistence on not being blinded by issues of (participation) principle but rather reflecting on the simple question of what the benefits of community participation are. This allows the authors to offer a genuinely integrative rather than a tethered model of collaborative planning.

Case study examples of successful relationships between engineers and the communities they serve are all around us but are rarely reported with a critical eye. In their paper on the considerate constructors scheme, Mike Murray, Doug Forbes and Steve Mason provide us with an outstanding illustration of what community-sensitive engineering practice can achieve (Murray *et al.*, 2011). Providing a useful perspective ‘over the perimeter hoarding’, the authors remind us just how little effective community engagement can cost, and just how valuable it can be. A discussion of the soft management skills required to deliver such benefits and reflection on the challenges faced combine to deliver a cogent case for not only the considerate constructors scheme itself but also for the advantages offered by planned, conscientious engagement.

The paper by Siddall *et al.* (2011) introduces the idea of using a series of persona types or categories (e.g. urban food grower, artist, wheelchair user, child, tourist, suburban dweller, student and expectant mother) to test how people interact within the physical infrastructure of their city, in this case Dublin. They contend that this approach provides a good tool for considering specific user needs within the built environment. Beyond this such a technique has value in considering how fit for purpose urban designs are for citizen groups who do not typically engage with the more traditional methods of stakeholder engagement. Again the theme here is ensuring that local people served by development projects and urban planning can feel engaged with a process that creates a shared sense of place.

Based on three case studies, Xingquiang Song, Karel Mulder, Björn Frostell, Wim Ravesteijn, and Ronald Wennersten (2011) address head-on the challenges of participatory decision making in China. Practice-based insights into such processes in

a Chinese context are few and far between and this paper makes a very welcome contribution. The authors report some limited initiatives in informing and consulting communities on water development projects but highlight poorly developed institutional capacity as the major hurdle to more and better public participation in China. In considering some of the more deep rooted reasons for the lack of a participatory culture in China they also make some interesting observations on the role played by Confucianism in impeding consultation and dialogue.

Providing stakeholders with the skills and tools needed to participate in the design and implementation of their own solutions is a poorly explored aspect of participatory planning. In a paper on the delivery of the London Cycle Network Plus, Deegan and Parkin (2011) report a highly relevant success story. Their direct experience working with cycling groups provides a fascinating narrative of the highs and lows of collaborative design.

Finally, Richard Newman, Richard Ashley, Susan Molyneux-Hodgson, and Adrian Cashman (2011) dig deep into the recent history of flood management strategies to highlight a shift from technocentric to governance-based approaches. Using literature and case study evidence, this erudite and closely argued contribution heralds the emergence of Learning Alliances as the dominant management response to flooding. Drawing on supporting evidence from wider geographical and problem contexts, the paper summarises both argument and knowledge to describe what is, in effect, a paradigm shift in approaches to resource management. Although there are many contributions which cover a similar territory, this contribution is to be particularly welcomed for its balanced and economical delivery.

As a collection, the papers in this special issue highlight the significant efforts that engineers are investing in working with problem owners and impacted communities. They also highlight some of the challenges that are still being faced by those pursuing a more collaborative style of practice. ‘Common understanding’, ‘communal responsibility’ and ‘just outcomes’ are all highly motivational ambitions. They are, however, merely impotent calls to arms without the vision and commitment of the type of people who have contributed to this issue.

REFERENCES

- Deegan B and Parkin J (2011) Planning cycling networks: human factors and design processes. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164**(1): 85–93, doi: 10.1680/ensu.100018.
- Laws D and Loeber A (2011) Sustainable development and professional practice. *Proceedings of the Institution of Civil*

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- Engineers, Engineering Sustainability* **164(1)**: 25–33, doi: 10.1680/ensu.2011.164.1.25.
- Lucena J, Schneider J and Leydens JA (2011) Making the human dimensions of sustainable community development visible to engineers. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 13–23, doi: 10.1680/ensu1000014.
- Mulligan J, Tompsett AL and Guthrie PM (2011) An ‘engineer–client’ framework for participation in community-scale infrastructure projects. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 35–47, doi: 10.1680/ensu.2011.164.1.35.
- Murray M, Forbes D and Mason S (2011) Considerate constructors scheme: Glenfarg water treatment works. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 49–57, doi: 10.1680/ensu.2011.164.1.49.
- Newman R, Ashley R, Molyneux-Hodgson S and Cashman A (2011) Managing water as a socio-technical system: the shift from ‘experts’ to ‘alliances’. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 95–102, doi: 10.1680/ensu.1000032.
- Owen A, Mitchell G and Clarke M (2011) Not just any old place: people, places and sustainability. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 5–11, doi: 10.1680/ensu.2011.164.1.5.
- Siddall E, Baibarac C, Byrne A *et al.* (2011) Personas as a user-centred design tool for the built environment. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 59–69, doi: 10.1680/ensu.1000015.
- Song X, Mulder K, Frostell B, Ravesteijn W and Wennersten R (2011) Transition in public participation in Chinese water management. *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* **164(1)**: 71–83, doi: 10.1680/ensu.2011.164.1.71.