Editorial

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Given the opportunity for casual discussion among geotechnical practitioners and academicians, perhaps at a monthly professional society meeting, I would find an opportunity to ask, ‘Can you tell me something about the sustainability aspects of your part of the geotechnical design project?’ A common response would be, ‘Hmmm...’, while the head is in a slow, side-to-side negative shaking motion. ‘Nothing on my project has anything to do with sustainability.’ My reply might be, ‘Really? Are you able to balance cut- and fill-volumes for your road alignment?’ The typical response would be, ‘Of course cut- and fill-volumes are balanced. That’s just good engineering.’

Readers of *Engineering Sustainability* are likely to find this example to be sophomoric because we know that opportunities for engineering sustainability are everywhere and make themselves available every day. Improved awareness among geotechnical engineers of touchpoints in the triple bottom line of economic, environmental and equitable sustainability in simple, low-budget projects without the fanfare of a state-of-the-art wastewater treatment facility or a formal environmental process will do a lot for advancing engineering sustainability. Sustainable options can be mundane, as well as magnificent. Sustainable solutions that were dismissed as nothing but ‘good engineering’ slowed down the progression of some geotechnical engineers into a modern era of ‘better engineering’. What we call ‘sustainable engineering’ today is more than just good engineering, but it is less than what good engineering will become in future decades.

Sustainability is recognised as a balanced approach which maintains harmony among the three ‘E’s – environment, economy and equity – so that the quality of life of current and future generations is not compromised. Resilience, on the other hand, is the ability to withstand and recover from disruptions, particularly sudden shocks. Sustainability can be implemented effectively at the component, building and community levels. Resilience, however, needs to be implemented at the community level. After all, a high-rise building that survives a major earthquake and remains functionally operational would have to be vacated if the toilets cannot be used because the sanitary sewer system is inoperable. These two concepts are related because resilient systems support sustainable communities by

remaining functional or having redundancy. This is particularly important for geotechnical engineering because facilities and geo-structures like tunnels, dams and retaining structures that may not be able to return to functionality after disruptions, such as earthquakes or bomb blasts, would not support sustainable communities even if they were constructed with a balance among the three ‘E’s.

This is the first of two issues in a themed collection of papers in *Engineering Sustainability* on the topic of sustainability and resilience in geotechnical engineering. This issue of *Engineering Sustainability* comprises four papers; the next issue will comprise five more papers on the theme. Each of these papers was published ‘ahead of print’ on the Virtual Library homepage of *Engineering Sustainability*, thereby allowing quicker access to fresh content.

The first paper in the February 2018 issue of *Engineering Sustainability* addresses resilience and sustainability in the management of landslides using Wollongong and Hong Kong as examples (Flentje and Chowdhury, 2018). Site-specific and regional landslide hazard and risk methods are identified and discussed. Risk is the product of hazard and consequences. Slope hazards are indexed to recognised landslide deposits and features (i.e., landslide inventory) and slopes considered to be susceptible to landslide processes. A modern observational approach to landslide hazard management includes monitoring stations for rainfall, groundwater levels and slope deformation. The monitoring results inform decision-making about slow-moving landslides and provide the basis for updating previous hazard assessments.

The second paper focuses on slope stabilisation in terms of sustainability and resilience (Das *et al.*, 2018). Opportunities for sustainability in a project decrease as the project progresses from planning to construction and commissioning. The geotechnical aspects are considered in the early planning and sustainable geotechnical alternatives need to be identified early. Resilience is measured by four ‘R’s – robustness, redundancy, resourcefulness and rapidity. The stabilisation alternatives evaluated by Das *et al.* (2018) include lime, fibres and compost; the evaluation relates to effectiveness in inhibiting surficial slope failures and metrics for resource consumption, environmental impact, socio-economic impact, sustainability index,

factor of safety and reliability index, and, ultimately, resilience index and cumulative sustainability and resilience index.

The third paper uses a scenario slope condition on Saint Lucia to evaluate the details of what goes into stability analyses for slope design (Shepherd *et al.*, 2018). This paper recognises that geotechnical design codes account for possible worst-case conditions and require minimum factors of safety, which might make code-compliant designs too expensive to be implemented in many parts of the world. This study presents a method for maximising stability information from limited data, disaggregating the effects of design-parameter combinations and safety-factor thresholds, and identifying dominant geotechnical and landslide-triggering factors to provide a transparent basis for sustainable slope-management decisions. Application of geotechnical recommendations that address relevant conditions in a slope, yet fall short of code requirements, could be beneficial to impoverished communities if they could be accepted by regulatory and financing agencies.

The final paper in the February 2018 issue of *Engineering Sustainability* describes an innovative approach to stabilising coastal slopes in Scotland (Mickovski and Thomson, 2018) that has a conclusion reminiscent to the third paper (Shepherd *et al.*, 2018). This research showed that community awareness of risks, potential solutions and mechanisms of funding is critical in the initial stages of a community project. An engaged community is motivated to find innovative solutions based on an understanding of the risks and willingness to accept change once the risk

ownership is clear. Additionally, communities that recognise the value and need for intervention to ensure the long-term resilience of a slope to climate change can be empowered to contribute to the case for securing public funds or seeking expertise to maximise limited resources.

The papers in this issue of *Engineering Sustainability* describe 'good engineering', while demonstrating that geotechnical engineers contribute to sustainability and community resilience. Read on, and hopefully you will be motivated to comment on some aspect of at least one of these interesting papers.

REFERENCES

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