Introduction

Paula McMahon CMgr, FCMI, CEng, FICE, FWES, FRSA
Sir Robert McAlpine, Stockton-on-Tees, UK

Welcome to this first climate-themed special issue of *Civil Engineering*. I championed this theme for the Institution of Civil Engineers' flagship journal because I believe all civil engineers need to get involved in society's drive towards achieving net zero greenhouse gas emissions. I hope this collection of wide-ranging papers will provide inspiration and insight for you to rise to the challenge of climate change.

Our lead paper by Francis (2021) sets the scene by exploring the moral duties of civil engineers to tackle the 'climate emergency'. He uses historic examples and behavioural science to reason why the profession has so far failed to act with much urgency. He goes on to suggest how the moral basis of the profession can be reframed to accelerate the necessary change.

The second paper by Cammock (2021) makes clear the links between the changing climate and infrastructure. He breaks down climate action strategies to enable civil engineers to consider the solutions more effectively. By planning for mitigation, resilience and adaptation throughout projects, he shows how the profession can deliver more impactful climate action.

Vercruysse *et al.* (2021) then consider the financial and other risks posed by the transition towards a net-zero society, which they say will be particularly acute in the infrastructure sector due to its association with greenhouse gas emissions. They use the controversial expansion of London's Heathrow airport as a case study to show that civil engineers need to acquire a broader range of skills to play a major role in mitigating transition risks.

The fourth paper by Muller (2021) says there are many sustainability lessons civil engineers can learn from the successes and failures of over 5000 years of human intervention on the Nile in Africa. From these various attempts to manage and exploit one of the world's greatest water resources, the profession can better understand how to implement sustainable and politically acceptable solutions in the face of a changing climate.

Increasing the resilience of the UK's low-lying eastern coastline to flooding is the subject of the next three papers. The Boston flood barrier in Lincolnshire demonstrates how civil engineering projects can not only improve climate resilience but also enable wider societal benefits. Pollard *et al.* (2021) measured the project's outcomes against the United Nations sustainable development goals, providing a framework for others to follow.

Rouse *et al.* (2021) then describe the annual beach nourishment of the Lincolnshire coast, which is the UK's largest and longest-running coastal protection scheme, while Clipsham *et al.* (2021) report on an alternative sandscaping scheme in Norfolk, which – according to its digital twin – should provide 15 years of coastal protection without intervention. Both papers demonstrate that by working with nature, civil engineers can successfully deliver climate adaptation projects with minimal carbon dioxide emissions.

The final paper by Clarke (2021) highlights the benefits of increasing the lifespan of infrastructure through maintenance and rehabilitation schemes. He says that all civil engineers can use asset management as a sustainable solution to reduce whole-life emissions.

I hope this issue highlights how vital civil engineers are to the climate change challenge. Each of you can make your own work more sustainable by understanding and measuring its impact on our climate and society. Civil engineering can form part of the solution and every civil engineer can make a difference. Let us all work towards creating an industry that truly serves society, both now and in the future.

References

- Cammock R (2021) Opportunities for a civil engineering climate action strategy. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 10–15, <https://doi.org/10.1680/jcien.20.00043>.
- Clarke R (2021) Asset stewardship: delivering sustainable sewer rehabilitation across Ireland. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 57–64, <https://doi.org/10.1680/jcien.20.00047>.
- Clipsham V, Flikweert J J, Goodliffe E *et al.* (2021) Bacton to Walcott sandscaping, UK: a softer approach to coastal management. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 49–56, <https://doi.org/10.1680/jcien.20.00064>.
- Francis N (2021) Civil engineers' role in saving the world: updating the moral basis of the profession. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 3–9, <https://doi.org/10.1680/jcien.20.00037>.
- Muller M (2021) Learning from the River Nile about engineering sustainable futures. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 24–31, <https://doi.org/10.1680/jcien.20.00042>.
- Pollard K, Thompson G, Robinson A *et al.* (2021) Boston tidal barrier, UK: adapting to climate change and delivering social outcomes. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 32–40, <https://doi.org/10.1680/jcien.20.00069>.
- Rouse A, Campbell D, Scott A *et al.* (2021) Rising to climate challenges and opportunities in managing Lincolnshire's coastline, UK. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 41–48, <https://doi.org/10.1680/jcien.20.00073>.
- Vercruysse J, Yates K and Stronati D (2021) Managing climate change transition risks: another potential role for civil engineers. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **174**(5): 16–23, <https://doi.org/10.1680/jcien.20.00045>.

CALL FOR PAPERS: Civil Engineering relies entirely on material contributed by civil engineers and related professionals. Illustrated articles of 600 words and papers of 2000 to 3500 words are welcome on any relevant civil engineering topic that meets the journal's aims of providing a source of reference material, promoting best practice and broadening civil engineers' knowledge. Please contact the editor for further information.