Editorial

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It is with great pleasure that I welcome you to this, the third edition of this year's *Ground Improvement* Journal. This comes at a time when we face many challenges. One we have all seen in recent months are the growing concerns about carbon emissions and their impacts on climate change, with many sectors following government leads and setting ambitious targets with drives towards a Net Zero approach. A recent 2020 report by the UN Environment Programme (UNEP), highlighted that the building and construction sectors saw their highest levels of emissions in 2019 reaching almost 10 GigaTonnes of equivalent CO₂ (UNEP, 2020). As a key part of major construction works, the ground improvement sector has an important part to play to help address this. Thus through appropriate ground improvement works, engineers can and will better utilise the ground (a key component of any construction project), helping to reduce associated carbon footprint. This will not only reduce carbon footprint but importantly help keep existing infrastructure functioning – a potential win-win situation. Add in other factors such as changing population demographics and changing patterns of infrastructure usages, it is clear that it is vital to ensure that our ground treatments are resilient to whatever the future may hold (Mitchell and Kelly, 2013). Thus as a sector it is vital to understand better how ground improvement techniques can enhance such interactions and through this help improve things across a number of key areas (Roger, 2012).

The seven papers in this issue highlight a number of the aspects associated with ground improvement approaches and hopefully these can be taken forward to meet the challenges faced with our infrastructure base. This reflects the true diversity of aspects and knowledge needed to deal with ground improvement and the ground improvement process. Papers in this edition can be grouped into two main themes. Theme one covers testing (both laboratory and field) combined with a number of assessment approaches to better understand fundamental aspects of improved ground. The second theme illustrates, through case studies, useful assessment of either techniques or methods used to assess actual improvements achieved in the field.

Under theme one, four papers demonstrate a number of these key aspects. Azneb *et al.* (2021) provides an interesting study of how different laboratory testing arrangements impact results gain on cement treated clays soils. In their study a marine clay with 10, 15 and 20% cement additive were tested using conventional triaxial compression tests and a comparison to results from plane strain tests was conducted. Whilst it is well

established that strengths determined by these laboratory method vary, their results showed how the difference compared well with those seen with over-consolidated soils. Next, Kainrath *et al.* (2021) developed a new approach to estimate cement content in grouts post treatment when used in permeation grouting in coarse grained soils. Ali *et al.* (2021) demonstrated how reduce CO₂ can be achieved by reduced cement content (using between 3% and 5% by mass) when combined with carefully controlled compaction. Whilst this approach will not be suitable to all works due to its need for high levels of construction controls, it demonstrated potential for more specialist jobs. Finally under this general theme, Hayashi *et al.* (2021) using trail embankments combined with finite element modelling, demonstrated how controlled unloading of vacuum induce preloading can significantly reduce secondary settlements of peat soils. Interestingly they observed that for over-consolidation ratio greater than 1.3 these benefits diminished exponentially.

The final three papers grouped under theme two, present interesting case-based studies and evaluations. Firstly, Chaiyaput *et al.* (2021) provided a case study from a land reclamation project in Phuket, Thailand – where sand backfill was used. This paper provides useful insights into the effectiveness of vibro-compaction in improving strength and bearing capacity of the post treated fill, and moreover reducing its liquefaction susceptibility. Next, Massarsch *et al.* (2021) using three separate sites evaluated three different deep vertical vibratory compactions methods – VibroWing, Y-Probe and Double Y-Probe methods. In addition, CPT soundings are demonstrated as a verification method of liquefaction susceptibility. Finally, Soe Moe *et al.* (2021) examined the various merits of a field measurement methods based on a land reclamation development in Singapore, where hydraulically placed sand was improved using preloading and vertical drains/deep compaction techniques. Assessment of five in situ methods were presented and, through this, provide useful insights into each of these methods. Overall, Soe Moe *et al.* (2021) found that cone pressuremeter tests provided the best overall assessment, including additional stiffness data pre- and post-treatment.

I hope that you find these papers useful, stimulating and informative, and that these papers spark debate on further developments of the role of ground improvement. On behalf of the editorial panel, may I take this opportunity to thank all our various contributors for their valuable input here. In addition, can I actively encourage our readers to discuss these papers to

help further shape our understanding and development of current and future ground improvement processes. Finally, if you have any issues or comments related to the journal more generally, the editorial panel is always pleased to receive any feedback you may wish to provide – thank you.

REFERENCES

- Ali A, Cortes DD, Weldon B, Bandini P and Lommler JC (2021) Effect of compactive effort on the performance of fine-grained soil–cement mixtures. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 167–172, <https://doi.org/10.1680/jgrim.18.00126>.
- Azneb AS, Banerjee S and Robinson RG (2021) Shear strength of cement-treated marine clay under triaxial and plane strain conditions. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 143–156, <https://doi.org/10.1680/jgrim.18.00090>.
- Chaiyaput S, Bergado DT and Kovittayanun N (2021) Vibro-compaction at a land reclamation site in Phuket, Thailand. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 185–193, <https://doi.org/10.1680/jgrim.18.00122>.
- Hayashi H, Hatakeyama O and Hashimoto H (2021) Reducing the secondary consolidation of peat ground using vacuum consolidation. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 173–184, <https://doi.org/10.1680/jgrim.19.00022>.
- Kainrath A, Adam D and Hornich W (2021) Cement-content determination for grouts and grouted soils. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 157–166, <https://doi.org/10.1680/jgrim.19.00015>.
- Massarsch KR, Wersäll C and Fellenius BH (2021) Liquefaction induced by deep vertical vibratory compaction. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 194–205, <https://doi.org/10.1680/jgrim.19.00018>.
- Mitchell JK and Kelly R (2013) Addressing some current challenges in ground improvement. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **166**(3): 127–137, <http://dx.doi.org/10.1680/grim.12.00030>.
- Rogers CDF (2012) The role of ground improvement. In *ICE Manual of Geotechnical Engineering* (Burland J, Chapman T, Skinner H and Brown M (eds)). Thomas Telford, London, UK, vol. 1, Ch. 25, pp. 271–280.
- Soe Moe KW, Bo MW, Arulrajah A, Horpibulsuk S and Hoy M (2021) Stiffness parameters from cone pressuremeter tests at Changi East, Singapore. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **174**(3): 206–218, <https://doi.org/10.1680/jgrim.19.00021>.
- UNEP (United Nations Environment Programme) (2020) *Towards a Zero-emissions, Efficient and Resilient Buildings and Construction Sector*. See https://globalabc.org/sites/default/files/inline-files/2020%20Buildings%20GS_Press%20Release%20FINAL.pdf (accessed 05/07/2021).