

Editorial

Michael C. R. Davies

School of Engineering and Informatics, University of Sussex, Brighton, UK; Department of Engineering, School of Science and Technology, University of London, London, UK; Department of Civil Engineering, University of Western Ontario, London, Canada (Orcid:0000-0002-0036-8708) (corresponding author: michael.davies@sussex.ac.uk)

Isaac L. Howard

Rula School of Civil and Environmental Engineering, Mississippi State University, Starkville, Mississippi, USA (Orcid:0000-0003-4642-7723) (corresponding author: ilhoward@cee.msstate.edu)

This issue of *Ground Improvement* presents five papers covering a range of ground-improvement technologies. Three of these contributions focus on the use of recycled materials in geotechnical engineering and have been selected by the Guest Editors to form a special section entitled *Applications of recycled aggregates in ground improvement and infrastructure*.

In recent years, the international uptake of recycled aggregates in construction has increased markedly, driven by the need to adopt more sustainable practices, reduce reliance on primary aggregates, and lower both carbon dioxide emissions and construction costs. Recycled aggregates are commonly sourced from demolition and construction waste, and – where materials like recycled waste glass are used – from post-consumer products such as bottles. In the present day, recycled aggregates are featured in a wide range of ground engineering applications, from temporary works platforms and flexible pavements to sustainable alternatives to natural aggregates in stone columns. Responsible implementation of recycled materials into ground-improvement practices is of meaningful value to the geotechnical engineering profession and to society as a whole.

The three papers in this special section report studies that not only investigate the engineering performance of recycled aggregates but also aim to provide design-relevant recommendations to support their wider adoption into practice.

The first of these papers, by Divall *et al.* (2026), reports full-scale direct shear testing of a recycled aggregate using a newly developed Giant Shear Box at City St George's, University of London, enabling reliable measurement of shear strength parameters for materials with particle sizes up to 125 mm that cannot be tested in a standard apparatus. Nineteen large-scale tests were performed on three recycled aggregate types sourced from working platforms, each differing markedly in grading, constituent proportions, and durability. The results show that friction angle varies significantly with aggregate composition and particle size distribution, demonstrating that recycled aggregates cannot be treated as a uniform material class and that design parameters must reflect actual site-specific properties. By providing representative shear strength data for full-scale recycled aggregate, the study supports safer and more economical temporary works design and

contributes to carbon-reduction goals through improved confidence in the use of recycled materials.

The second paper in the special section, by Zulfiqar *et al.* (2026), evaluates the long-term performance of recycled aggregate base (RAB) materials in flexible pavements by comparing predictions from conventional linear elastic analysis (LEA) with those from a non-linear finite element framework, using both laboratory resilient modulus data and field-derived falling weight deflectometer (FWD) moduli. Three pavement test sections were built with RAB materials, and a fourth with a limestone base, and assessed for fatigue cracking and rutting over a 20-year design life. The study shows that recycled concrete aggregates exhibit higher stiffness and improved structural performance when compared to virgin limestone, with FWD data consistently indicating stiffer in situ behaviour than laboratory resilient modulus tests. LEA produced more conservative distress predictions, whereas non-linear analysis captured stress-dependent behaviour and yielded lower predicted cracking and rutting. Overall, the findings highlight the structural advantages of recycled concrete aggregate materials and demonstrate the importance of incorporating non-linearity and field-calibrated parameters when predicting pavement performance for sustainable aggregate bases.

In the final paper of the recycled aggregates special section, Premathilaka and Liyanapathirana (2026) present an experimental evaluation of a new geopolymer-bound recycled waste glass (RWG) composite developed as a sustainable alternative to stone or cement-mixed columns for ground improvement. The study investigates both durability under prolonged water immersion and geotechnical performance under drained triaxial loading. Unconfined compressive strength tests revealed an initial 33% strength reduction within the first 24 h of immersion, attributed to dissolution of highly soluble crystalline phases, after which strength stabilised at approximately 9 MPa. Consolidated drained triaxial tests demonstrated high stiffness, with a secant modulus of 980 MPa after immersion, and a stress–strain response characterised by pronounced post-peak softening followed by a distinct ultimate strength state, similar to cement-mixed soils but with higher strength and stiffness. The findings confirm that both peak and ultimate strength parameters are essential for evaluating this novel RWG–geopolymer composite, highlighting its potential

as a durable, high-performance, and environmentally responsible ground-improvement material.

Complementing the final paper in the special section, Meftahi *et al.* (2026) present an integrated experimental and numerical investigation into the stabilisation of collapsible silty sand using 20 wt.% colloidal nanosilica (CNS) permeation grouting. The study demonstrates substantial improvements in soil behaviour under monotonic and cyclic loading. Laboratory tests showed that CNS treatment markedly increased shear strength, stiffness, and brittleness, reduced volumetric contraction and excess pore water pressure, and prevented liquefaction even after 300 cycles, in contrast to untreated soil, which liquefied within the first few cycles. The authors also extended a bonded soil elastoplastic constitutive framework to capture the enhanced mechanical response of CNS-treated specimens, achieving good agreement with experimental results while noting minor discrepancies in pore pressure and volume change trends due to factors such as incomplete saturation and CNS gel compressibility. Overall, the work provides clear evidence of the effectiveness of colloidal nanosilica grouting for improving collapsible soils and offers a validated modelling approach for predicting their behaviour across a range of loading conditions.

Turning from ground improvement using additives, the final paper in this issue presents a study on deep soil reinforcement. In their paper, Raj *et al.* (2026) report large-scale field load tests evaluating the performance of stone columns installed in soils with exceptionally high organic content ($\approx 40\%$), addressing a gap in understanding their suitability for such challenging ground conditions. Stone columns of 900 mm diameter were tested at spacings of 1.6–2.2 m across sites where organic layer thickness ranged from 1.5 to 8.5 m, with performance assessed through load–displacement behaviour and bearing capacity improvement. The results show that when the ratio of organic layer thickness to column diameter exceeded 4.45, excessive settlement occurred and stone columns were ineffective, whereas for t/d ratios below

2.22, settlements stabilised within acceptable limits, demonstrating successful performance. Complementary standard penetration test data and hydrotest observations from large petroleum storage tanks further validated these findings. The study provides clear field-scale evidence of the limitations and viable application ranges for stone columns in organic soils, offering practical guidance for design.

The Guest Editors would like to thank the authors, reviewers, editorial panel members, and Emerald Publishing staff who have contributed to this issue of *Ground Improvement*. We also wish to thank the editorial panel for agreeing to invite papers addressing applications of recycled aggregates in ground improvement and infrastructure. We hope that these papers, together with the other contributions in this issue, will prove to be thought-provoking and informative for academic researchers and ground engineering professionals alike.

REFERENCES

- Divall S, Davies MCR, Stallebrass SE, Mahony J and Quintavalle S (2026) Direct shear box tests on full scale recycled aggregate used in temporary works. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **179**(4): 249–261, [10.1680/jgrim.25.00068](https://doi.org/10.1680/jgrim.25.00068).
- Meftahi M, Lu Y, Naeini SA and Schneider-Muntau B (2026) Experimental and numerical study of collapsible soils treated by colloidal nanosilica. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **179**(4): 290–308, [10.1680/jgrim.25.00065](https://doi.org/10.1680/jgrim.25.00065).
- Premathilaka KKW and Liyanapathirana S (2026) Geotechnical properties and durability of geopolymer-bound recycled waste glass. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **179**(4): 277–289, [10.1680/jgrim.25.01011](https://doi.org/10.1680/jgrim.25.01011).
- Raj S, Manna B and Tiwari G (2026) Performance of stone columns in organic soil: insights from large-scale field load tests. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **179**(4): 309–323, [10.1680/jgrim.25.00060](https://doi.org/10.1680/jgrim.25.00060).
- Zulfiqar Q, Haider SW, Cetin B, Coban HS and Abdollahi SF (2026) Performance of recycled aggregate base using linear and non-linear prediction models. *Proceedings of the Institution of Civil Engineers – Ground Improvement* **179**(4): 262–276, [10.1680/jgrim.25.00093](https://doi.org/10.1680/jgrim.25.00093).