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Editorial

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Editorial

Paul J. Vardanega BE, MEngSc, PhD, GMICE, MASCE, MIEAust, FHEA

Senior Lecturer in Civil Engineering, Department of Civil Engineering,
University of Bristol, Bristol, UK (Orcid:0000-0001-7177-7851)

Gaetano Elia PhD

Associate Professor in Geotechnical Engineering, DICATECh, Politecnico di
Bari, Bari, Italy (Orcid:0000-0001-7587-2004)

Kai Yao PhD

Professor in Geotechnical Engineering, School of Qilu Transportation,
Shandong University, Jinan, China (Orcid:0000-0001-8846-5184)

It is with great pleasure that we introduce the second issue of *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* for 2021, which is a themed issue entitled ‘Databases for geotechnical engineering’. The journal has recently published various papers presenting databases for use in a variety of geotechnical engineering applications (e.g., Ouyang & Mayne, 2017; Ni *et al.*, 2018; Tabatabaie Shourijeh *et al.*, 2018; Wen *et al.*, 2018; Torres-Cruz, 2019; Xu *et al.*, 2020) and therefore it was decided to compile this themed issue.

Databases are important for geotechnical engineers. Dealing with the challenge of ‘big data’ and the implications for those involved in geotechnical engineering practice and research is topical and important (e.g., see Phoon, 2019a, 2019b for discussions of ‘MUSIC’ and the ‘Six E’s’, respectively). The use of databases in geotechnical engineering has a long history. The ground is comprised of highly variable materials which require considerable testing to both characterise and quantify statistical variability. Casagrande (1947) showed the use of the soil classification chart by plotting results from a variety of soils and comparing their behaviour. The ‘A-line’ was described as ‘an important empirical boundary’ by Casagrande (1947: p.801), which is still used in soil classification today (e.g., BSI, 2018). Three papers (Barnes, 2021; Thaimo and Ekolu, 2021; Wong, 2021) in this themed issue present research related to soil classification. Another important application is to develop transformation models from large datasets (cf. Phoon and Kulhawy, 1999a, 1999b; Ching *et al.*, 2017) for prediction or estimation of soil parameters for use in geotechnical engineering. Again, for the development of transformation models, large collections of data are needed. For example, Kulhawy and Mayne (1990) present a compendium of transformation models for prediction of key parameters useful for foundation design works. Other papers have been published in this journal presenting new transformation models for prediction of effective friction angle (Ouyang and Mayne, 2017) and ultimate shaft resistance for rock socketed piles (Xu *et al.*, 2020). Torres-Cruz (2019) presented correlations linking void ratio to the slope and vertical location of the steady-state line in ‘e-log(p’) space’.

This themed issue contains nine papers (Barnes, 2021; Thaimo and Ekolu, 2021; Ahmed and Agaiby, 2021a; Ahmed and

Agaiby, 2021b; Wong, 2021; Shivaprakash and Sridharan, 2021; Lin *et al.*, 2021; Ong *et al.*, 2021; Rout and Singh, 2021) which we now outline.

The first paper by Barnes (2021) uses a database to illustrate a multi-linear approach to describe undrained strength variation in the plastic range (Figure 1). Barnes also points out the importance of the less-well-studied ‘adhesion limit’ originally proposed by Atterberg (1911a, 1911b). The second paper, by Thaimo and Ekolu (2021), presents 180 hydrometer measurements used to test the validity of the correlation proposed by Savage (2007) (which uses plasticity index and the percentage passing the 0.425mm sieve to predict the clay fraction, following the work of Skempton (1953) who defined clay activity). Thaimo and Ekolu (2021) show that the hydrometer values and those from the correlation were generally plotted within $\pm 60\%$ bounds.

In the work by Ahmed and Agaiby (2021a), spherical cavity expansion theory (Vesić, 1972) is applied to produce an expression for the rigidity index making use of the net cone tip resistance and shear wave velocity measurements in clayey deposits. The method can be used to estimate undrained shear strength. The estimated strengths of intact clays were shown to be in reasonable agreement with both field and laboratory data from various test sites. The authors show that the predictions match less favourably with the laboratory measurements in the case of fissured clays (Ahmed and Agaiby, 2021a). In the next paper, the same authors, Ahmed and Agaiby (2021b), correlate the strain parameters controlling the non-linear decay of the shear stiffness of fine-grained soils (described by various equations proposed in the literature) to the undrained rigidity index. It is suggested by the authors that this index is preferable for understanding the undisturbed compressibility of clays compared to the plasticity index. The findings of the work are supported by case study analysis (see Ahmed and Agaiby, 2021b).

Wong (2021) presents the statistical analysis and interpretation of a large database of consolidation test results for six major soil types in Hong Kong. Analysis of the large database allows for better understanding of the factors influencing the consolidation coefficients, for example test method, soil type, particle size distribution and in situ dry density. The results from Wong

Figure 1. Summary of limits and transitions with typical example (taken from Barnes, 2021)

(2021) may be useful for practitioners wishing to assign representative values of consolidation coefficients. In the next paper, Shivaprakash and Sridharan (2021) investigate the use of the reduced Proctor method as a replacement for the standard Proctor test by analysing, for 61 datasets retrieved from the literature, the correlation between the compaction characteristics obtained through the two testing procedures and the index properties of the soils.

The next two papers are related to piled foundations. Lin *et al.* (2021) conducted a series of compressive tests on ten piles to back-calculate the pile–soil interface parameters (e.g., β). The authors reported that the back-calculated β value is generally larger than the conventional design method (see Lin *et al.*, 2021). Ong *et al.* (2021) presents data from 100 instrumented test piles. The dataset contains piles installed across a range of geological formations and weathering profiles. The work aims in part to determine ultimate shaft and base resistance parameters. Ong *et al.* (2021) found that shaft resistance parameter reduces with increasing SPT N value (see Figure 2).

The final paper, by Rout and Singh (2021), presents transformation models for the prediction of compression index and hydraulic conductivity based on simple soil parameters. High correlation coefficients were observed between normalised void ratio (e/e_L) and hydraulic conductivity for the pond ash–bentonite (PAB) and sand–bentonite (SB) mixes allowing for the prediction of the logarithm of hydraulic conductivity to within around $\pm 20\%$.

We hope that all readers of *Geotechnical Engineering* will enjoy reading the papers in this themed issue. We would also like to

Figure 2. Measured shaft resistance parameters K_s plotted against SPT N (taken from Ong *et al.*, 2021)

encourage discussion articles related to any of the articles contained in this themed issue or other issues of the journal.

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