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Editorial

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Editorial: Shallow geothermal energy for buildings and infrastructure

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In 2015 *Environmental Geotechnics* produced a highly successful themed issue on Energy Geostructures (Barla and Di Donna, 2016). The success of the previous edition highlighted the interest of worldwide researchers in the field of energy geostructures and produced a fertile environment for a new edition. This was also enhanced by the activities of the COST (Cooperation of Science and Technology) Action TU1405 (European Network for Shallow Geothermal Energy Applications in Buildings and Infrastructures). Between 2015 and 2019, the action linked a network of researchers and professional engineers and triggered collaborative research in this area. With this new themed issue, the journal presents a further contribution to the global exchange of knowledge and practise with respect to energy geostructures.

In recent years, the growing need for renewable energy sources has led to the increased interest in shallow geothermal applications for the heating and/or cooling of buildings. The integration of heat exchangers in the elements of the structure that interface with the ground, such as foundations, tunnels, and diaphragm walls, is particularly attractive, due to the inherent cost savings involved in combining a required structural component with the harvesting of geothermal energy. Thermoactive geostructures present the additional benefit of relying on localised resources (the ground) and, therefore, do not need additional infrastructural investments. By providing an alternative to fossil fuels and reducing peak demand from the grid, they also provide an attractive tool towards energy independence and distributed generation with no adverse impact on the environment. However, the widespread application of this sustainable technology is currently still hindered by the large disparity in development and uneven regulatory frameworks worldwide. The Guest Editors believe that sharing up-to-date and reliable information from leading researchers and practitioners in this field can bring increased confidence and visibility to these applications. Having this in mind, this special issue collects state-of-the-art knowledge on the topic.

To start with, the paper by Habert *et al.* (2020) describes the benchmarking exercise that was performed by a number of research groups to analyse the geotechnical behaviour of a thermoactive pile. Following papers focus on energy piles and energy walls (Angelotti and Sterpi, 2020; Delerablee *et al.*, 2020; Nguyen *et al.*, 2020), describing long term assessment of the performance of energy geostructures. Ninikas *et al.* (2020) provides a contribution on water source heat pump systems, installed and operated at a Glasgow Subway station in the UK, showing alternative usage

of existing sources of underground heat. Subway tunnels could also be fruitfully used to exploit heat under a urban environment. This is shown by Baralis *et al.* (2020), who provide an interesting study related to the thermal activation of energy tunnels in the city of Warsaw (Poland). The usage of the subsurface as an energy source opens the issue of potential thermal interactions between installations. This is a topic of growing importance, and is addressed both by Focaccia *et al.* (2020), who shows how heat transfer by buildings to the ground should be considered when designing both traditional vertical ground heat exchangers and energy geostructures in urban areas, and by Barla *et al.* (2020), who present a city-scale analysis of subsoil thermal conditions due to geothermal exploitation with reference to the central district of the metropolitan area of Turin (Italy).

The Guest Editors hope that readers will appreciate the variety of topics addressed here and that they may find inspiration for additional studies and or real implementation of energy geostructures. Guest Editors are also willing to acknowledge the support of authors, reviewers and the Editor-in-Chief, without which the issue could not come to fruition.

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