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Editorial

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Editorial

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Environmental geotechnics provides a unique blend of science and engineering in the areas of geotechnics, earth sciences, and environmental science and engineering. Its multidisciplinary framework bridges scientific understanding with technological solutions in geoenvironmental problems with the aim to protect human health and environment. The outbreak of the Covid-19 pandemic has led geo-environmental professionals to re-consider the role of the discipline on how to best meet the novel natural and anthropogenic challenges of the 21st century that have and are expected to exert global impacts. The members of the editorial board of the journal through a series of papers have addressed exactly this need, pondering the challenges posed by the pandemic, re-affirming the role of geo-environmental engineering in the protection of public health, advocating the development of sustainable solutions and practices for the protection of a fast degenerating environment, and proposing solutions forward.

In doing so, the first paper by Tang *et al.* (2021), articulated the role of environmental geotechnics to elucidate and mitigate the effects of the current pandemic through engineering works and measures aiming to contain the SARS-CoV-2 virus and safeguard public health. The article focused on the lessons learned regarding the global interaction that took place in the dissemination of knowledge, and of the massive coordination globally in actions and policy protocols, which were implemented at an unprecedented speed and extent, in order to deal with this fast-evolving global public health threat. This indeed can be considered as a first in setting up protocols and action plans for a coordinated response at the global level, which will prove indispensable in future crises. The authors articulated also the position that the Covid-19 pandemic presented not only significant challenges but also opportunities for the development of the environmental geotechnics field. The paper outlined new research directions in pathogen-soil interactions, isolation and remediation technologies for pathogen-contaminated sites, new materials for pathogen contaminated soil, recycling and safe disposal of medical waste, quantification of uncertainty in geo-environmental and epidemiological problems, emerging technologies and adaptation strategies in infrastructural projects, pandemic-induced environmental risk management, and modelling

of pathogen transport and fate in the geo-environment. Finally, emphasis was placed on the need for concentrated, coordinated, and multi-disciplinary research to provide new perspectives that will counter the multifaceted effects of Covid-19 and strategically plan for events of similar magnitude and impact in the future.

The second paper, authored by Paleologos *et al.* (2021), addressed the issue of how to safeguard our water resources and wastewater effluents from being infected and becoming transmission vehicles for the SARS-CoV-2 and other pathogenic microorganisms. Engineering has long played a critical role with major waterworks, aqueducts and clean water distribution networks, sewerage systems, and sanitary solid waste disposal in eliminating epidemics. The article alerted on potential pathways of the virus to enter water bodies, to avoid disinfection during water treatment due to poor baffling conditions, and to persist in recreational waters, if proper care is not followed. The very early research indications that SARS-CoV-2 traces could be found in the wastewater influent led to a recommendation by the authors, which is now followed in many countries, to use this as an indicator of Covid-19 exposure in a community. The article alerted on the practice of the widespread disinfection of outdoor spaces in several cities around the world, which can result into the entry of disinfectants and their by-products into storm drainage systems and their subsequent discharge into rivers and coastal waters. The problems in developing countries of low water-related disaster resilience, low household water security, and nonexistence of measures for the protection of water resources and lack of technologies for clean water and sanitation were critically assessed and recommendations for remedial measures were provided. Finally, the need was expounded to enhance our scientific knowledge in relation to the migration mechanisms of viruses in various media, as well as to the formation of trihalomethanes and other disinfectant by-products in the geoenvironment.

Landfilling of hazardous and non-hazardous wastes is of high importance to the geoenvironmental engineering profession. During the pandemic, mass burial of deceased persons became routine practice in most countries around the world. In such

circumstances, as was clearly seen recently with Covid-19 bodies found in the Ganges River, India, there is the real potential of polluting soils, and surface- and ground-water bodies. Therefore, there is a dire need to develop guidelines and policies for burial system designs and procedures during pandemics, especially for developing countries where sanitary measures may not be widely implemented. The third paper, authored by Leong *et al.* (2021), discussed this specific problem in view of the virus decomposition and its transport from human remains to the surface and subsurface environment. The authors recommended engineering burial designs and made a call for the revision of the WHO guidelines regarding the allocation of diseased bodies during pandemics.

Proper, sanitary management of municipal solid waste (MSW) is critical for protection of the environment and the public health. Research has shown that coronaviruses can remain infectious on several surfaces and in aerosols, and hence may spread through the collection, bagging, handling, transportation and final disposal of MSW, as well as during the leachate discharge in leachate ponds. To address this issue the fourth paper, authored by Vaverková *et al.* (2021), provided initially an assessment of the severe challenges placed by Covid-19 onto the whole MSW management chain, which under the pandemic contained infectious solid waste. This called for special measures for protecting MSW employees during waste collection, transportation, and disposal practices; detailed evaluation of the urban enclaves, where high numbers of infected people resided, which justified specialized MSW collection and disinfection measures, the use of thermal methods for disposal of the waste, and the cessation of recycling activities. The article identified the gaps in developing countries that lack waste-to-energy incineration facilities, or even properly engineered sanitary landfills, and in such cases called for, among others, the collaboration between municipalities that may have more advanced disposal options and others that may have substandard or inadequate facilities. It also discussed the factors that affect virus migration and activation in environmental media, the role of clay barriers, and soils, and the need for developing appropriate models of viruses' movement through different natural and engineered media. The paper concluded by providing

recommendations to the MSW industry, when operating under public health crisis conditions.

Finally, another challenge faced by the environmental geotechnics community, especially by educators in higher education institutions, is the severe disruption to traditional geotechnical and geoenvironmental teaching and learning norms during the Covid-19 pandemic. The fifth paper authored by Jiang *et al.* (2021), detailed the challenges faced by faculty members around the world in terms of lecture delivery, lab sessions, student assessments, and research activities during the pandemic, with the variations among universities and countries specifically discussed. The paper summarized the contingency measures taken by faculty members and institutions to address these challenges and discussed the lessons learned from implementing and potentially incorporating such measures in innovative, hybrid-learning environments that may combine face-to-face with distant-education. The article concludes by presenting suggestions on the development of a more resilient, engaged, interactive and technology-based teaching and learning environment when similar public health or natural crises face us in the future.

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