Editorial

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The climate is changing at an unstoppable rate (IPCC, 2018) and scholars have recognized the impacts of this change on water resources, energy production and its use, agriculture, coastal development and resources, ecosystems, flood control, and civil infrastructures. These impacts create significant scientific and social challenges. It is controversial whether governments should devote all climate change policies and resources towards stopping the change itself or instead develop new roadmaps to navigate these changes for adaptation. In any case, the impacts of climate change are interrelated and we've reached an era where we need to assess and treat a problem from a holistic approach — one that includes civil engineering solutions. A geotechnical and a geoenvironmental engineer holds a strategic role in this holistic approach to find sustainable solutions for public's health, natural resources, and economy.

The focus of climate change studies has been changing from only reducing the contribution of anthropogenic activities, including reducing the fossil fuel consumption and finding renewable energy solutions such as in ground source heat exchange systems (Başer *et al.*, 2016, 2018), to adaptation and mitigation strategies of climate change in North America. Research in geotechnical and geoenvironmental engineering has been steered to find solutions to detrimental impacts of extreme weather conditions as well as long-term projections of climate change.

Environmental Geotechnics has been successful not only in disseminating the information on the processes and approaches to tackle the issues to overcome the challenges of climate change but also the new techniques to help us develop adaptation strategies to a new world. Readers are advised to be aware that *Environmental Geotechnics* publishes its most recent articles Ahead of Print on its Virtual Library homepage (<https://www.icevirtuallibrary.com/toc/jenge/0/0>).

In the last decade, we've observed extreme weather events that caused droughts, floods, heat waves, cold snaps, heavy snow falls, severe winds, and intense storms causing fluctuations in subsurface hydraulic conditions. The water balance (evaporation, infiltration, etc.) of a subsurface layer depends on coupled relationships of thermal and hydraulic properties of ambient air and subsurface (Başer and McCartney, 2018; Hillel, 2003). Mine industry has been using the

water balance to calculate evaporation for dewatering purposes as an approach for stabilisation and reclamation of biproducts also known as mine tailings. The first technical paper in this issue by Simms *et al.* (2019) discusses the effects on progressive crack development on evaporation in different mine tailings including gold and oil sand tailings. They conclude that the evaporation behavior of each tailing was unique and they must be treated accordingly when assessing tailing dewatering by evaporation.

Continuous interactions between climate and earth determine the transformation, transfer, and transport processes in the subsurface. Long-term gradual changes in abiotic environmental factors alter naturally occurring soil forming processes by modifying the soil water regime, evolution of mineral composition, and the rate of organic matter formation and degradation (Istanbulluoglu and Bras, 2006). The resulting physical and chemical properties of soils play fundamental roles in hydraulic, mechanical and thermal behavior of soils. Therefore, it is crucial for geotechnical and geoenvironmental engineers to understand the mechanisms and key factors that influence these properties. The second paper of this issue by Kibria and Hossein (2019) develops relationships between electrical resistivity and physico-chemical properties of clays that are used in the construction of liner systems, to ultimately provide a tool to sustain a high construction quality of compacted clay liners in landfills. The study uses an experimental approach to identify the key parameters affecting the electrical resistivity and finds that porosity and mineralogy are the most important factors. Another work on effect of compositional properties on behaviour of clays are presented here as the third paper of this issue by Amadi and Alih (2019). This paper tackles high up-front construction costs of landfill liners by proposing an alternate composite liner material. They also remind us while laboratory experiments provide good insights and quantification of the soil properties, they must conform to the representative field conditions.

Although construction of a liner is a crucial component of a landfill design, the operational efficiency of landfills is vital for a sustainable system (Reddy, 2014; Rowe, 2015). In the fourth paper of this issue, Silva and Palmeria (2019) focus on developing a cost-effective and practical approach for geotextiles used as filters for pre-treatment of leachate from a domestic waste landfill. This is relevant for small

to medium-size landfills, particularly if associated with other low-cost treatment solutions such as wetlands. The authors apply mid-scale experiments to investigate the performance of geotextiles over granular sands and report promising results on the leachate treatment.

The organic matter in the subsurface may be originated by the disposal of bioproduct of waste water treatment. Finally, the last technical study of this issue is presented by O'Kelly (2019) in which a comprehensive review on the geotechnical properties of biosolids and sewage sludge materials, including biodegradation effects as well as techniques available to determine the specific gravity of biosolids and sewage sludge materials, are provided. The paper develops a new relationship between specific gravity and total volatile solids to provide a convenient, quicker, and reliable indirect approach to determine the specific gravity of biosolids and sewage sludge materials in practice.

The papers in this issue provide information on new techniques and contribution to the knowledge to be incorporated in a holistic approach. Readers will find more details of these studies in the full papers.

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