Editorial

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Environmental Geotechnics provides a forum for discussion on a wide range of applicative problems characterized by geo-hydro-chemico-mechanical aspects.

It has to be considered, in fact, that Science and its technical applications, namely Engineering, are the basis of the modern progress of our society. They led to the growing use of natural resources for purposes useful to the humankind but they also produced severe damages to the environment in which we live.

These negative consequences showed up since the second half of the eighteenth century, during the Industrial Revolution, but they were not fully understood for a number of decades. Perhaps even now many do not realize their devastating effects.

Some of them are studied in the four papers of this issue that aim at effectively utilizing the geotechnical principles when dealing with environmental aspects.

The engineering analysis of the presented problems are based on laboratory investigation, on field observation and monitoring as well as on conventional approaches and/or on computer-oriented procedures using constitutive models for unsaturated and compressible geomaterials.

In the first paper, Owen *et al.* (2021) introduce a topic which is relevant in several countries involved in World War II (WW2) and in more recent conflicts. It concerns, in particular, the potentially significant hazard posed by uncharted bombs in Greater London (UK). The area suffered bombing during WW2 and nowadays unexploded ordnance can be encountered during construction works in redevelopment sites.

Data collected from five sources of information show the variation in number of incidents reported recently, that is from 2004 to 2016. The authors, on the basis of a number of casualties and fatalities, conclude that the corresponding annual death rate exceeds the rate associated to accidental detonation of unexploded ordnance (UXO) at construction sites. The authors observe that nowadays the risk assessment seems based on false assumptions on the presence and number of UXOs in the London area, and conclude that a proper risk

assessment is recommended leading to the proposal of mitigation measures proportionate to the risk expected in the construction area.

The second paper (Datta *et al.*, 2021) is a contribution concerning the production of wastes, their collection and treatment. The experimental investigation carried out on municipal solid waste (MSW) specimens collected from three different sanitary landfills in the USA is summarized and, then, the numerical modelling of the observed biodegradation process is presented.

In the laboratory reconstituted MSW specimens, the leachate is collected and recirculated. Applied vertical stress and temperature are kept constant in time while the biodegradation process is taking place. The evolution in time of the volatile fatty acids concentration in the aqueous phase is monitored, together with generated biogas volume and its composition, and with height and weight changes for the waste material specimen. The lab tests were considered complete when no additional biogas generation was observed, and settlement increment was considered minimal—that is after 885, 1500 and 850 days of operation for the three specimens respectively.

The numerical modelling is based on an hydro-bio-mechanical formulation that accounts for the hydrolysis, acidogenesis and methanogenesis reactions (for further details see McDougall, 2007), for the void ratio change in the MSW matrix associated to the degradation process and, in a simplified manner, for the time dependent behavior of the waste material.

The adopted hydro-bio-mechanical approach is capable of approximating properly the experimental data of the degradation process observed during stress and temperature-controlled lab tests. Thus the experimental and numerical investigations constitute a sound preliminary step for modelling the MSW behavior in the field.

Some effects of the climate change are considered in the third and fourth paper of this issue. They concern, in particular, the evaluation of the water content and of its variation in the field in order to predict the mechanical behavior of fine grained soil mass. Both papers deal with this aspect from two different points of view, namely the water content estimated from the dielectric

constant and the climate change effects on water content of road embankments.

The third paper by Shimboe and Spagnoli (2021) is focused on the indirect determination of the in situ water content on the basis of the dielectric constant. Five methods are considered: the time domain reflectometry (TDR); the frequency domain reflectometry (FDR); the amplitude domain reflectometry (ADR); the capacitance probe (CP) and the ground penetrating radar (GPR).

After summarizing the characteristics of the methods, the parameters of the relationships between volumetric water content and dielectric constant are back calculated by the Authors on the basis of data from ADR tests performed on more than 20 different soil samples. The database is extended considering more than 250 data available in the literature, obtained using the TDR, FDR, ADR, CP and GPR techniques. The results are summarized considering the effect of soil type, dry density, clay fraction or fine content on the intercept and gradient values of the dielectric constant versus water content relationship. The information and conclusions reached in the paper seems relevant since the monitoring of the water movement into soil masses is a key factor for assessing the influence of pore water pressure in several geotechnical problems. Like, for instance, settlement evolution, ground contamination, landslide stability and road embankment collapse.

The last one of the above mentioned geotechnical problems is considered on the fourth, and final, presentation (Pk *et al.*, 2021). The contribution is focused on the effects of climate change on the stability of a typical two-dimensional (2D) design profile for highway embankments in the Southern Ontario area. The climate changes lead to variation in precipitation and infiltration/evaporation in the soil mass and consequently in the water content in the subsoil. On the basis of the climate data registered daily in the past 30 years, the authors attempt a prediction of the future climate changes, considering four different conditions in the evolution of the greenhouse gas emission for the next 90 years.

Hydrological assessments for predicting temporal/spatial distribution of pore water pressure (PWP) within the embankment were carried out using 2D transient, unsaturated seepage finite-element (FE) schemes. The assessments were carried out not only for extreme precipitation events, but also at daily resolutions. Water balance assessment was considered at the soil-atmosphere boundary to predict the net infiltration in the embankment, taking into consideration the prevailing climatic conditions and the soil moisture evolution. The unsaturated hydraulic properties were estimated with reference to an actual embankment material. The embankment stability was then verified using a conventional limit equilibrium approach, accounting for the effect of matric suction on the soil strength parameters.

The results of the investigation indicate that the PWP variations induced by climate changes can reduce the stability of embankment roads in the Southern Ontario area.

Summarizing, all the contributions suggest us to consider the effects, delayed in time, on the porous multi-phase soil deposits produced by the use of technology and resources in our current activities. The topics are open to discussion and they can be approached and discussed considering various viewpoints, from the field investigations, to be carried out in advance to and during the construction activities, to the historical review of conflict operations and to the regular collection of climate data, to the investigation methods and protocols for waste disposal, to the various risk evaluation approach, etc.

I hope the topics presented in this issue could be stimulating for your research investigation and professional activities. On behalf of the Editorial Group of *Environmental Geotechnics*, I invite you to present your point of view on the various multidisciplinary aspects characterizing the Environmental Geotechnic problems (<http://www.icevirtuallibrary.com/loi/jenge>).

In particular, my personal suggestions are as follows:

- (a) problems relevant in the Architecture, Built environment and Construction engineering area (for instance Cividini and Gioda, 2017; Cividini *et al.*, 2019) together with
- (b) recent advances in technologies, as for instance those adopted in supporting excavation boundaries, in using geothermal resources for the heating/cooling plants installed in buildings (Barla *et al.*, 2021; www.iacmag2020.org) and, of course, for the
- (c) stability analysis of earth structures like the river levees (Redaelli *et al.*, 2011) and earthquake effects on shallow excavation, supported by flexible walls, in porous saturated soils (Cividini and Gioda, 2014, 2016).

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