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A SUSTAINABILITY-BASED APPROACH FOR GEOTECHNICAL INFRASTRUCTURE

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Abstract – Urban growth needs large cities, and the current emphasis on landscape preservation makes using underground spaces both an opportunity and a significant necessity. However, underground construction techniques significantly impact the sustainability of the built environment, including infrastructure systems and their entire supply chains. Nowadays, there is a shortage of quantitative methodologies to assess and measure the sustainability of underground building processes that effectively integrate the three pillars of sustainability (environmental, social, and economic). Thus, this study aims to solve the abovementioned issues by explaining how to incorporate sustainability goals into geotechnical projects to address measure-driven strategies and eco-design-based solutions appropriately. This study illustrates a novel methodology based on the Life Cycle Thinking approach, with a particular emphasis on geotechnical ground improvement techniques. Specifically, the suggested method incorporates the concept of the EU Taxonomy, following the EU Green Deal, with the Envision framework to guide decision-makers toward a more sustainable, resilient, and equitable infrastructure design. In addition, incorporating a cradle-to-grave Life Cycle Assessment (LCA) into the suggested methodological approach will improve the quantitative estimation of the performance of construction processes. The definition of the proposed method will provide the guidelines to systematically assess the sustainability of geotechnical infrastructures to allow further the selection of an optimal solution to reduce their impact from an environmental, social, and economic point of view.

Keywords – *Built environment; eco-design; geotechnics; LCA; sustainability; transport infrastructure*