TOWARDS GREEN SOIL STABILIZATION: INITIAL FINDINGS FROM THE GOAL PROJECT

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Abstract

Soil stabilization has been widely adopted when developing infrastructure on unfavorable ground conditions. In Norway, the dry deep mixing (DDM) method, which improves the properties of soft soils such as clay and peat by mixing it with dry binders including lime and cement, is frequently used. Hence, DDM is predominantly using primary raw materials, which emit substantial amounts of greenhouse gases in their production. Another limitation DDM's current practice is that adopted methods to characterize the field properties are typically destructive and lack spatial and temporal resolution. Also, latest developments in analyzing data like machine learning techniques have, so far, received scant attention in the DDM industry.

The GOAL (Green sOil stAbiLization) project is an ongoing research and development project which aims to transform DDM by exploring: i) industry by-products and biochars as alternative binders, ii) latest non-destructive sensing techniques to quantify the field properties of DDM and, iii) machine learning techniques to find new patterns in DDM data.

GOAL is a collaboration project between NGI, academic (NTNU, University of California Berkeley, UCD, Danmarks Tekniske Universitet) and industry (Keller Geoteknikk, Lindum, Bergene Holm, Celsa Armeringsstål, Norske Skog Skogn) partners, and financed by the Research Council of Norway.

This paper will focus in presenting the most recent results achieved so far in the project related to:i) the effect of industry by-products and biochars when mixed with either soft clay, quick clay, or peat on the strength and deformation properties of these soils; ii) the use of distributed fiber optics sensing and seismic measurements to document properties of stabilized soil with alternative binders; and iii) the analysis of large amounts of data through machine learning for optimized use of materials, energy, emissions and labor.