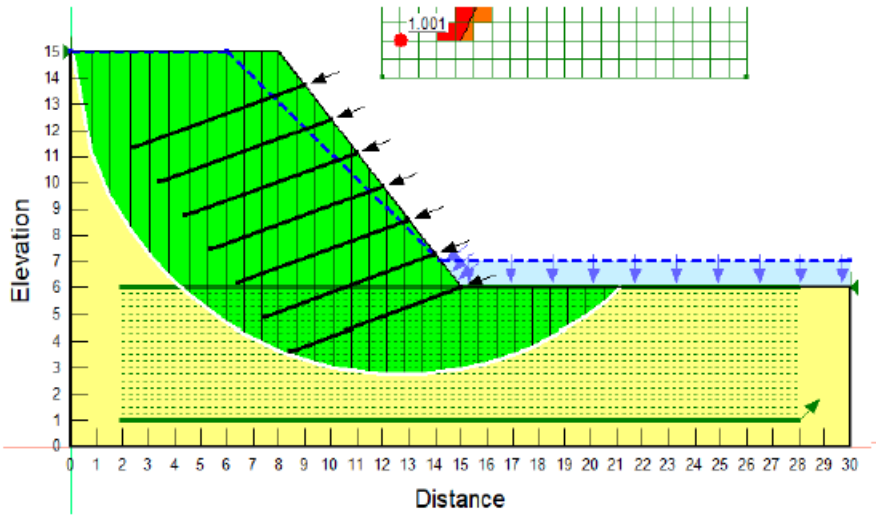
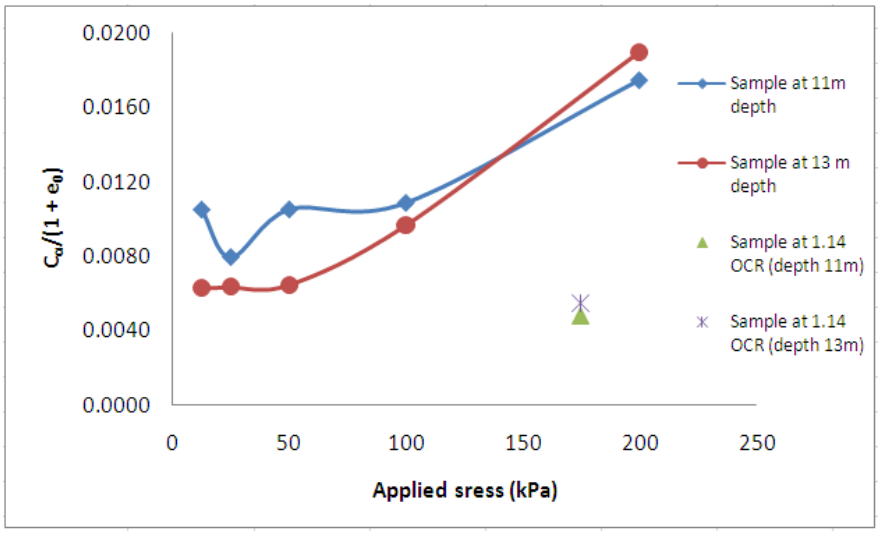
Soil mechanics and foundation engineering

Key Researcher (s): Prof. Saman Thilakasiri, Eng. Sanathanan Velauthapillai



Screenshot of the Limit Equilibrium (LE) analysis model

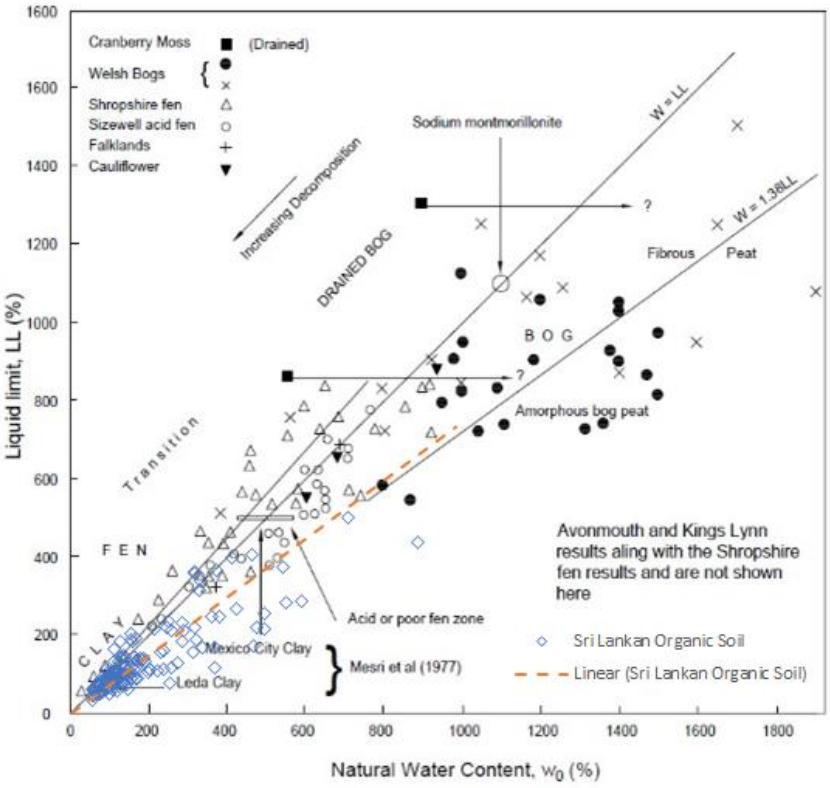
- Monsoon climatic conditions promotes the natural disasters such as landslides or slope failures in wet zones of Sri Lanka every year. Many districts in the wet zones are categorized under landslide-prone districts due to frequent natural disasters took place in the past. The challenge is to safeguard these slopes whilst maintaining the natural beauty of terrains by exploring environmentally friendly and economical solutions. The very common natural fibrous material is the bamboo as reinforcing element. Limit Equilibrium (LE) analysis is performed to explore the possibility of using bamboo as reinforcing element. In spite of arguments regarding limitations of bamboo applications such as nail length, diameter, durability etc., they can be still considered for improving the stability of slopes.
- Organic soils show primary consolidation and long-term secondary consolidation properties, and the secondary consolidation coefficient depends on the. The long-term behavior of the Sri Lankan peaty soils were investigated by recovering undisturbed samples of organic clays from Colombo Kandy Expressway project in SLIIT geotechnical laboratory



Variation of the secondary consolidation coefficient with the stress level

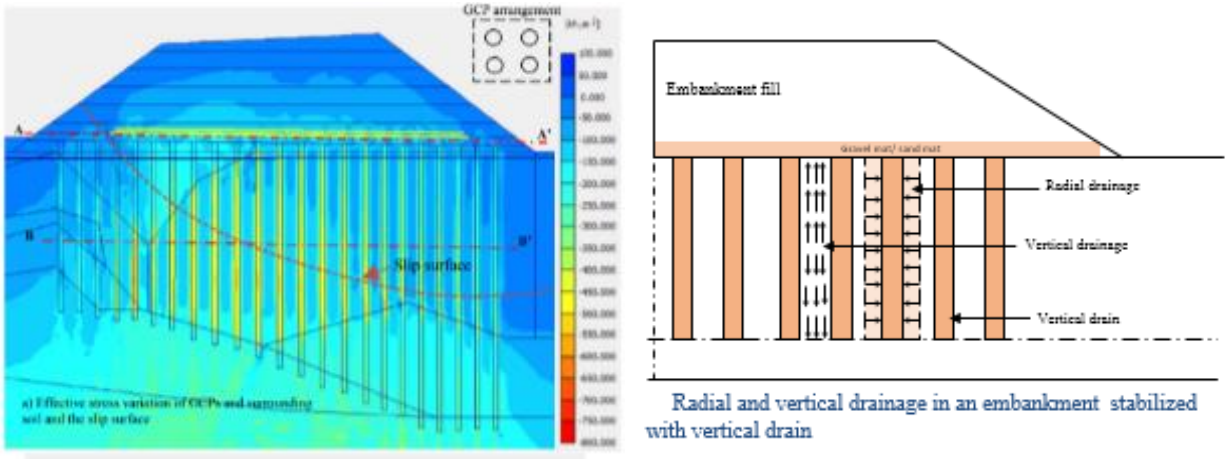
Recovering of the undisturbed samples from the CKE project and Investigation of the long-term behavior of Sri Lankan peaty soils in SLIIT geotechnical laboratory

- Engineering properties of soft grounds should be determined to ensure the constructability and long-term performance of the proposed structures. These properties can be determined by using empirical correlations which is cost-effective and convenient than extracting undisturbed samples. Sri Lankan organic soils shows soil properties and compressibility characteristics in a range between highly organic soil and mineral soils. It is important to derive new correlations between properties of Sri Lankan organic soils as most relationships found in the literature for organic soils with high organic content cannot be applied for these soil deposits.

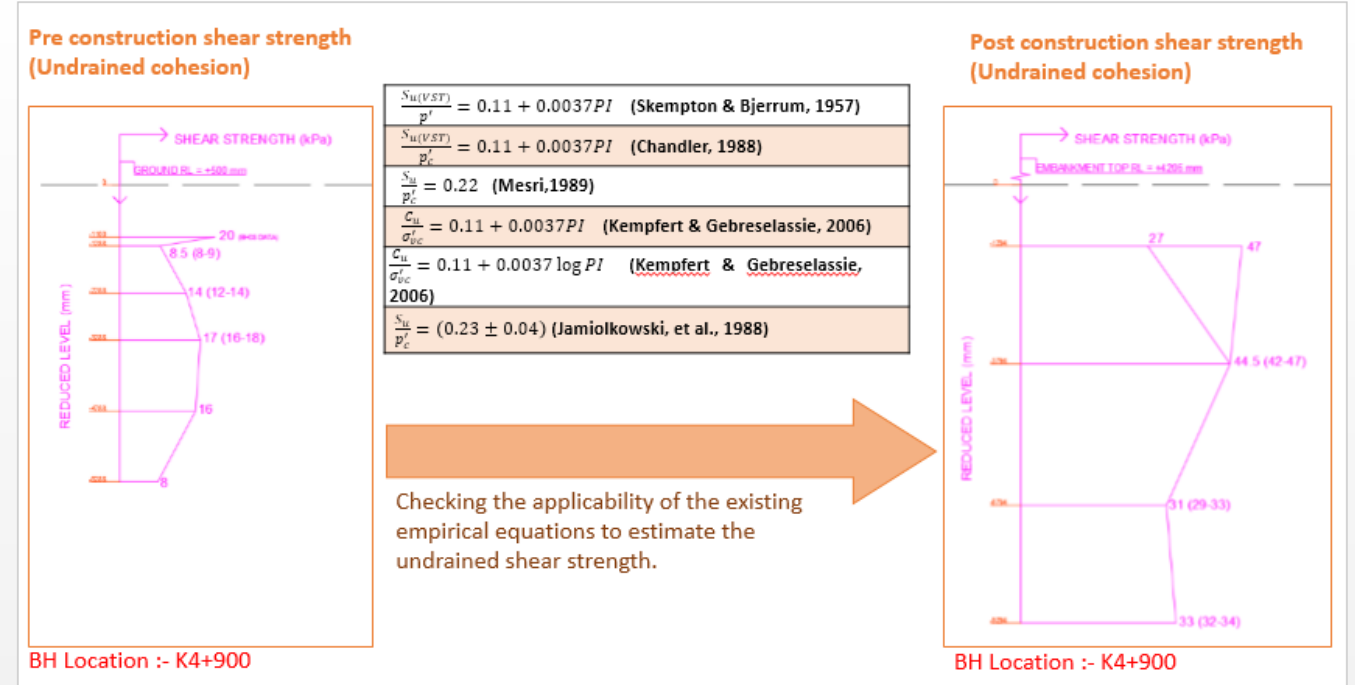


Empirical correlation of NMC and the LL of Sri Lanka peaty soils and comparison of the same with the other correlations in the literature

- Preloading, sand compaction piles (SCP), gravel compaction piles (GCP), Pre-fabricated vertical drains (PVD) are some of the methods used to improve soft organic soils. The numerical simulation of improvement of peaty soils by forming sand columns were conducted by considering Ramp F of the Outer Circular Highway (OCH) project. The following figure shows the numerical simulation results and the model used for modelling.

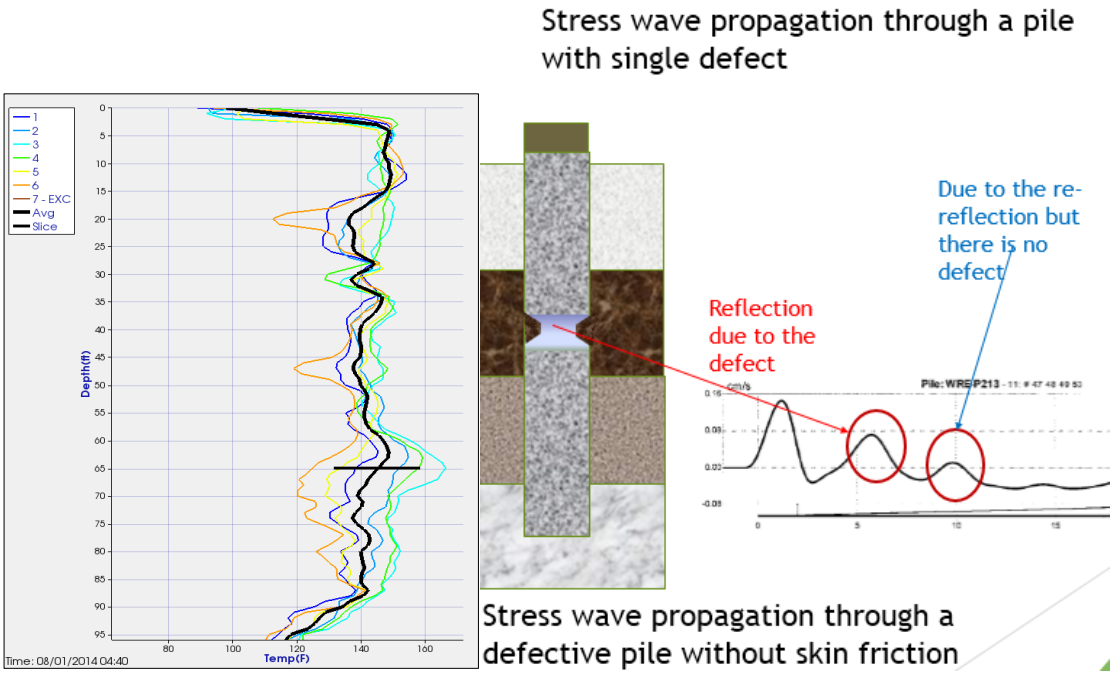


Numerical simulation of the behavior of sand column



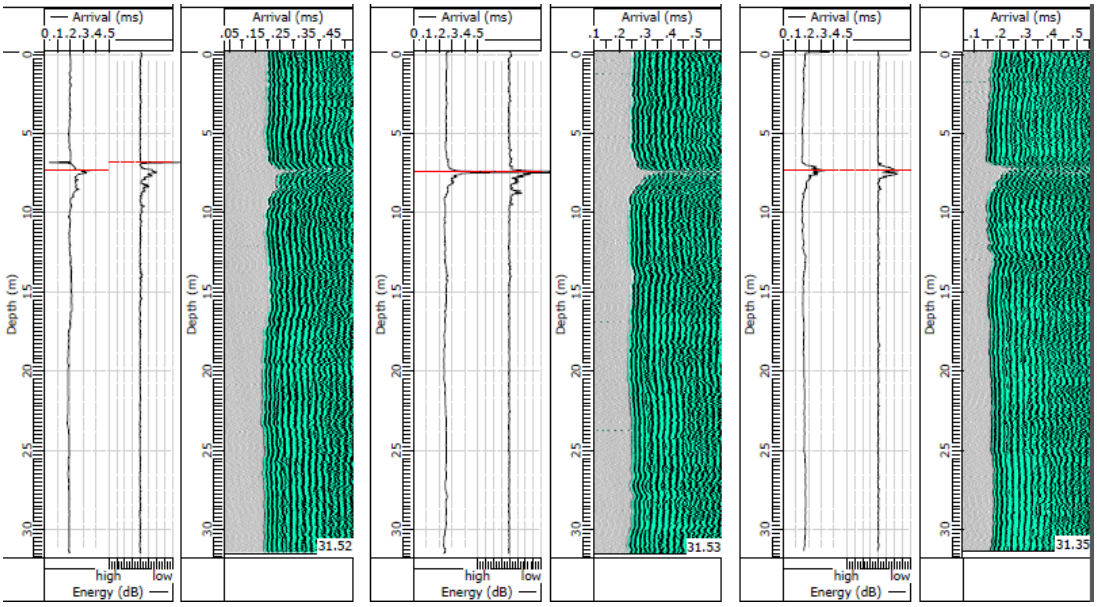
Improvement of the organic soil layer due to preloading due to preloading and the established correlations used to predict the behavior

- The quality controlling of the constructed piles are carried out using small strain Integrity testing (PIT), Cross hole sonic logging test (CSL), Thermal Integrity Profiling (TIP), High strain dynamic load testing (PDA), Maintained Load testing (MLT), Instrumented Maintained Load testing (IMLT) etc. Different methods of integrity testing of piles are investigated. Using the load testing methods, the prediction of ski friction and end bearing for the rock condition in Sri Lanka is investigated.

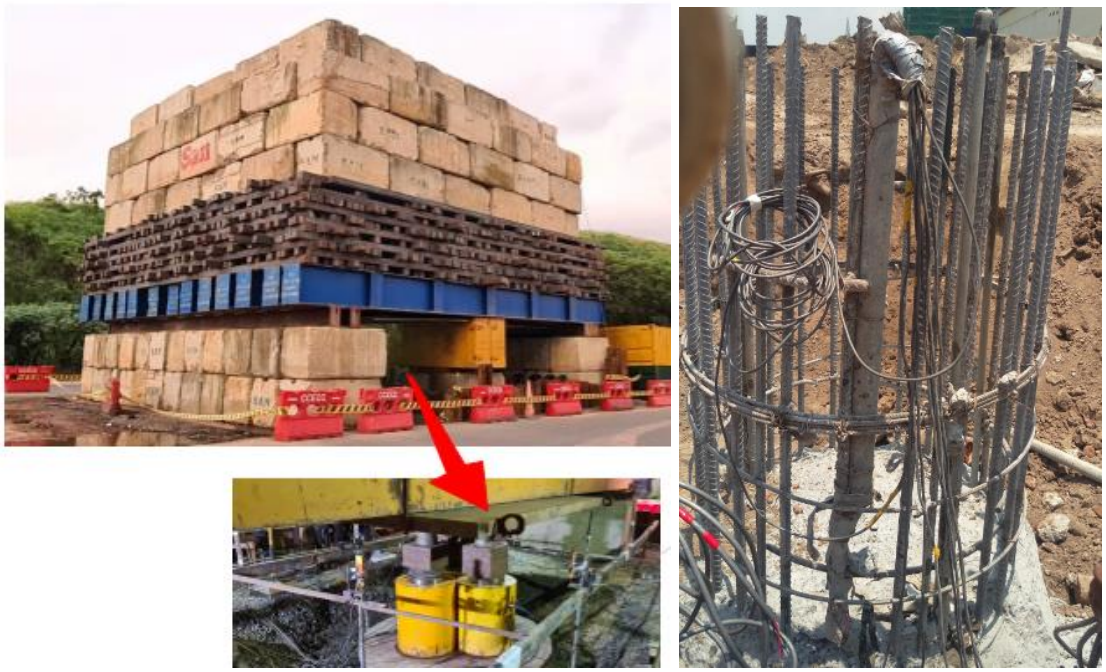


TIP profiles and the PIT record showing the defect

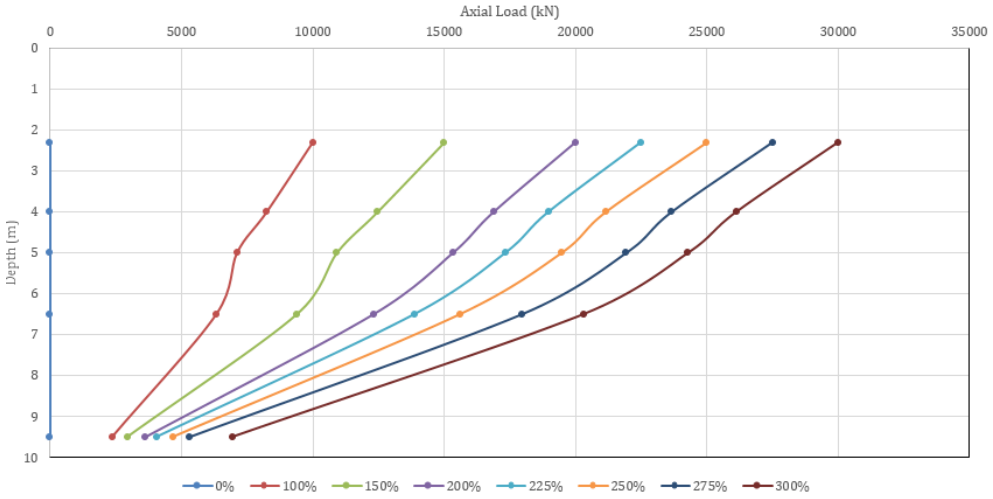
Carrying out the PIT using transient dynamic response method using an instrumented hammer



Waterfall diagram from CSL



Instrumented Pile Load test (IMLT)



One of the results of the IMLT