

ODTÜ KIBRIS'LA BİLİM EĞLENCELİDİR.

DESIGN OPTIMISATION OF A COLLAPSING CLIFF

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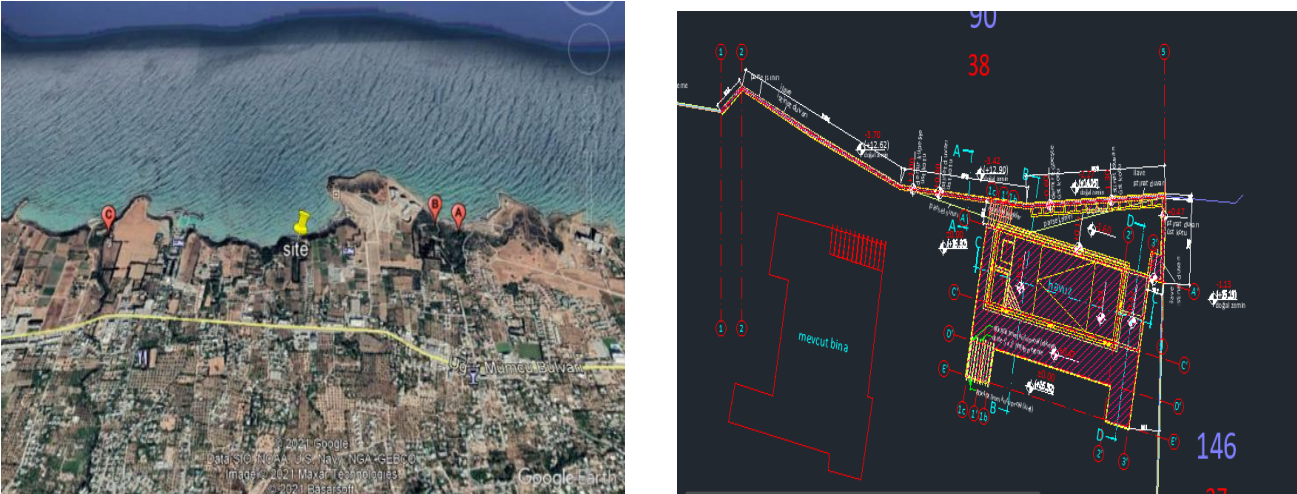
Project Description



The project concern was that a soft rock cliff located on the coast of Northern Cyprus has started to erode at an accelerated rate, leading to extensive cracking and collapse. This is due to higher rainfalls and rise of the ground water table.

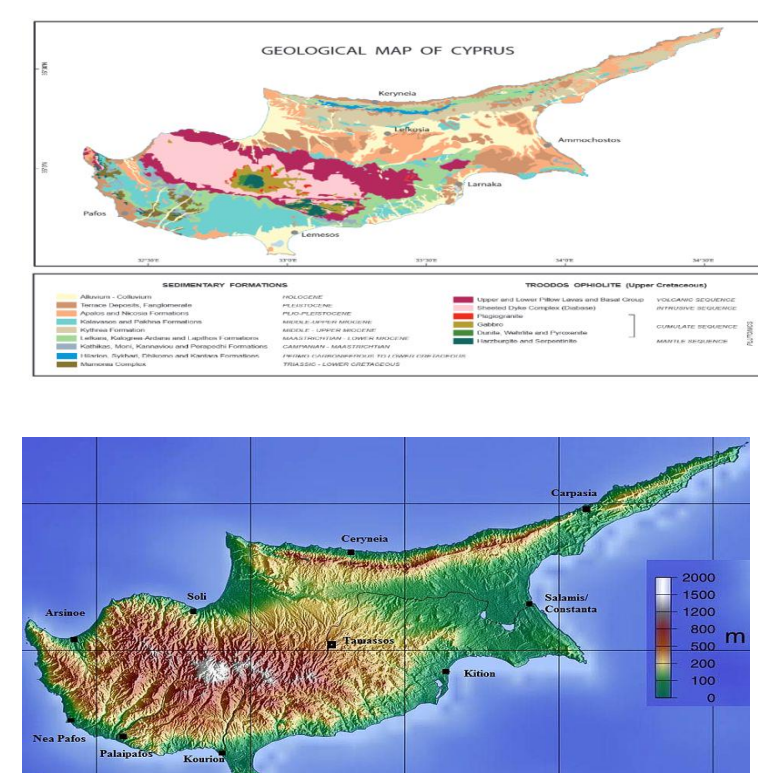
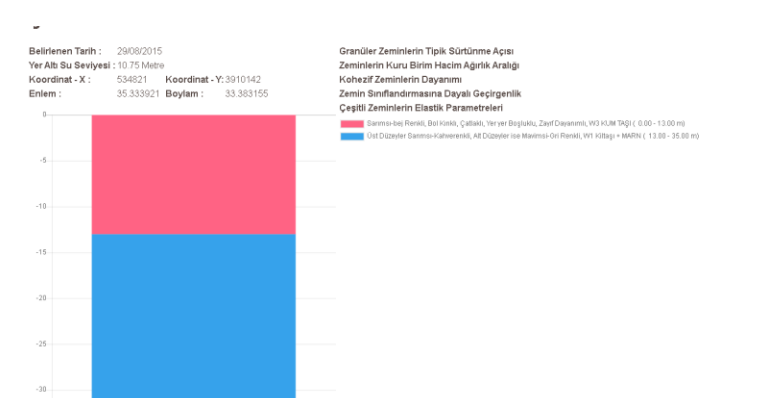
A significant amount of research was carried out to determine the availability and applicability of various design solutions. The constraints and limitations of each proposal were studied, and possible solutions were shortlisted considering cost efficiency as well as environmental impact.

Site Location



- Located on the coast in Ozankoy near the city of Girne in The Turkish Republic of Northern Cyprus.
- The site coordinates are latitude 35°20'02 N and longitude 33°22'20 E.
- The site elevation is 35 feet, and it is only 35 meters away from the sea. The width of the cliff face is 55 meters,
- Existing Structures are a two-story house building, and a swimming pool. No megastructures nearby.

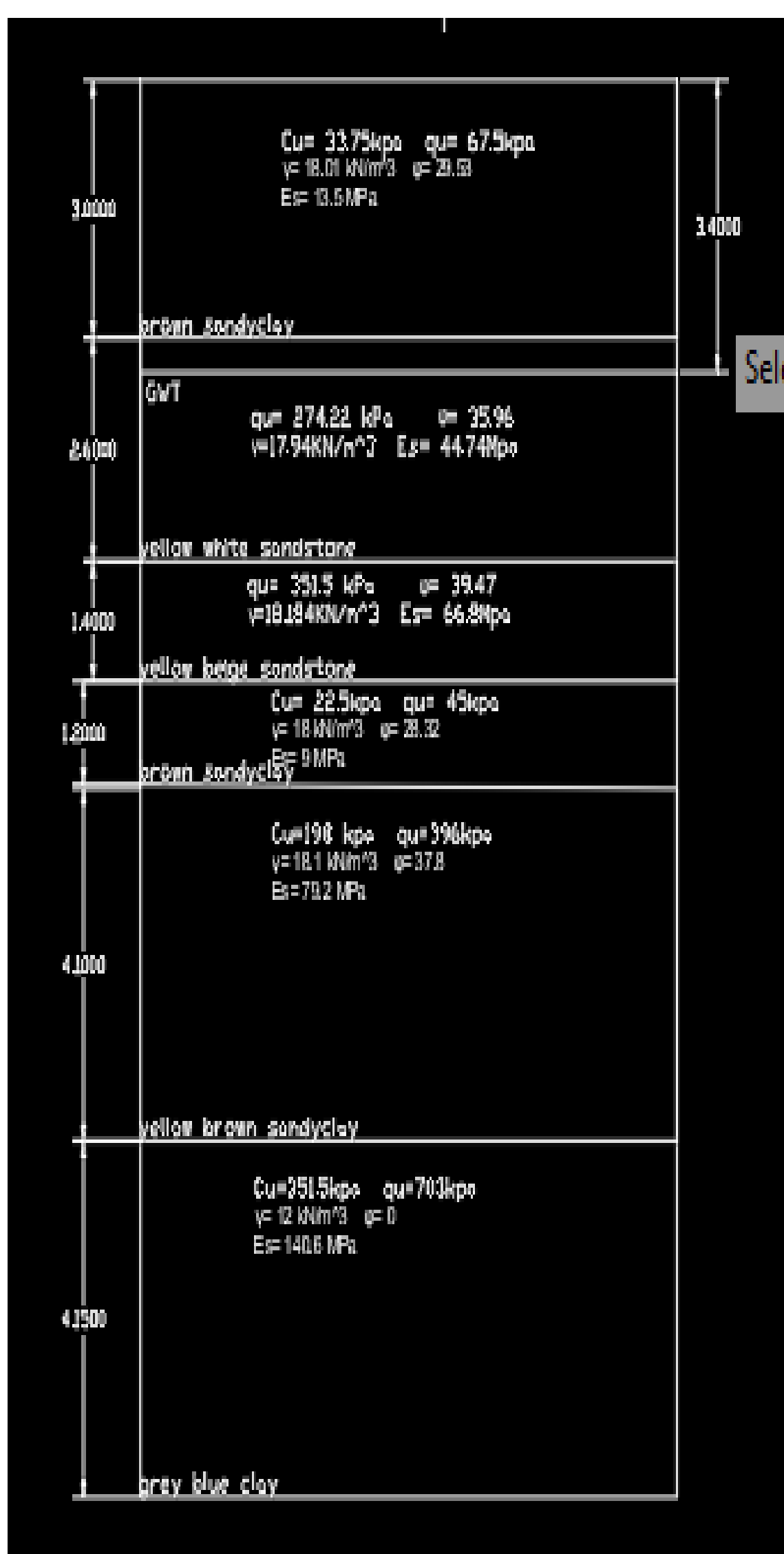
Desk Study



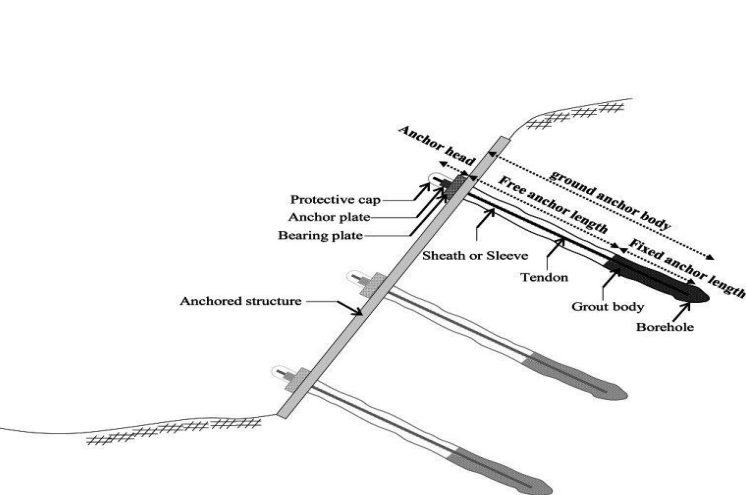
- Gathering of key information related to the site vicinity as well as establishing an idea of the soil formation
- Consisting mainly of calcarenites. Sandstone layer and Claystone with a Marlstone layer
- Kyrenia Range, Middle Miocene formation consisting mainly of Terrace deposits and Fonglomerate formations
- At the footstep of the Kyrenian Mountain Range with peaks of 800 meters.
- Ground Water table within 5-meter depth no streams or rivers nearby presence of surface vegetation.

Site Investigation & Soil profile

- Geotechnical design depends on the soil profile
- Soil profile uses soil parameters
- Soil parameters obtained from site investigation & laboratory test
- Site investigation performed, SPT
- Laboratory test performed, Atterberg limit test & undrained shear strength test

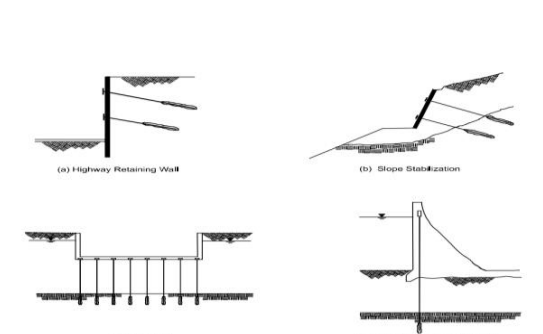


Ground Anchoring



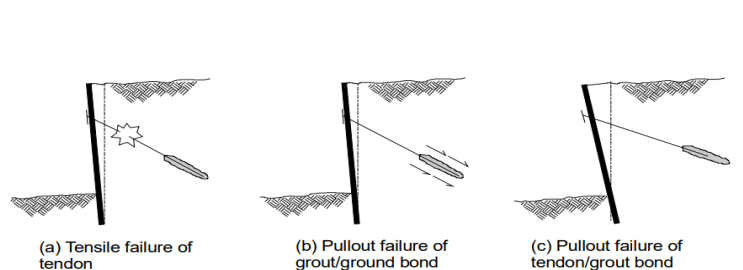
- Tensile Structural Support member
- Prestressed Steel, Strand or Rod Type
- Guides loads towards Stable Ground using Free Length & fixation by Grouting

Applications



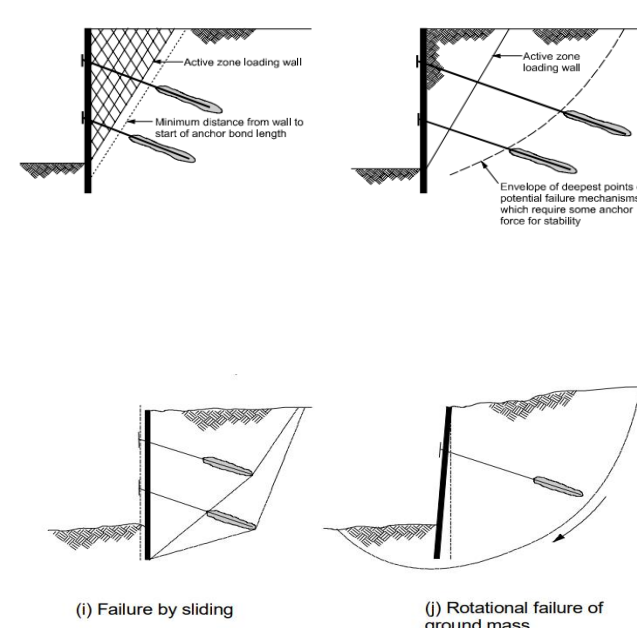
- Retainment of Highway Walls
- Tiedown of Uplift Structures
- Retainment of Walls in Deep Excavations & Slope Stabilisation

Safety Checks



- Rupture of Tendon Steel
- Pullout through Grout
- Pullout through Ground

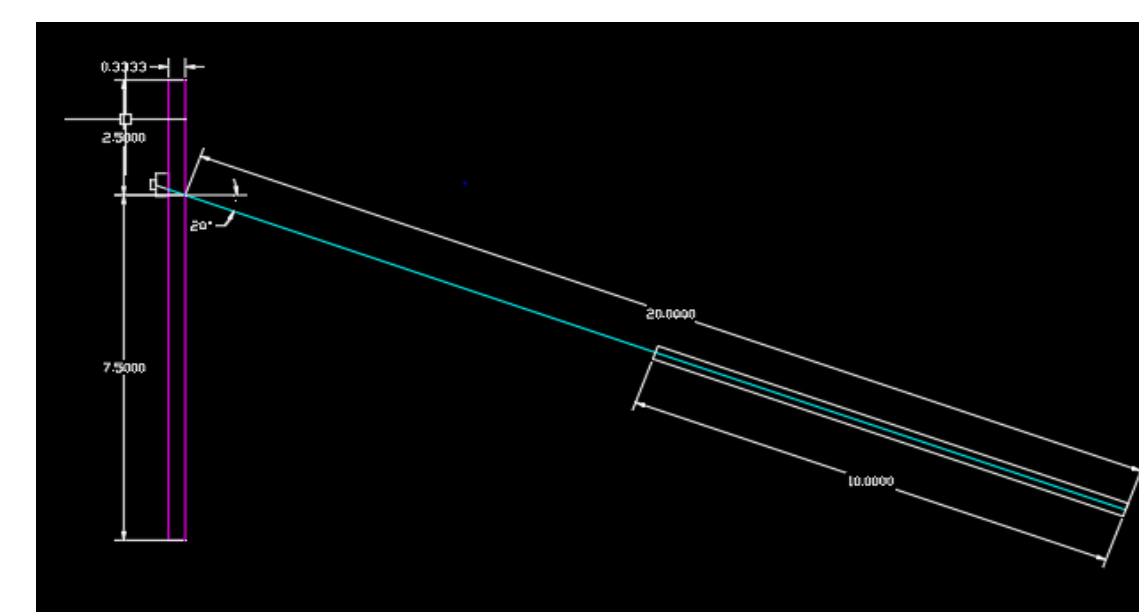
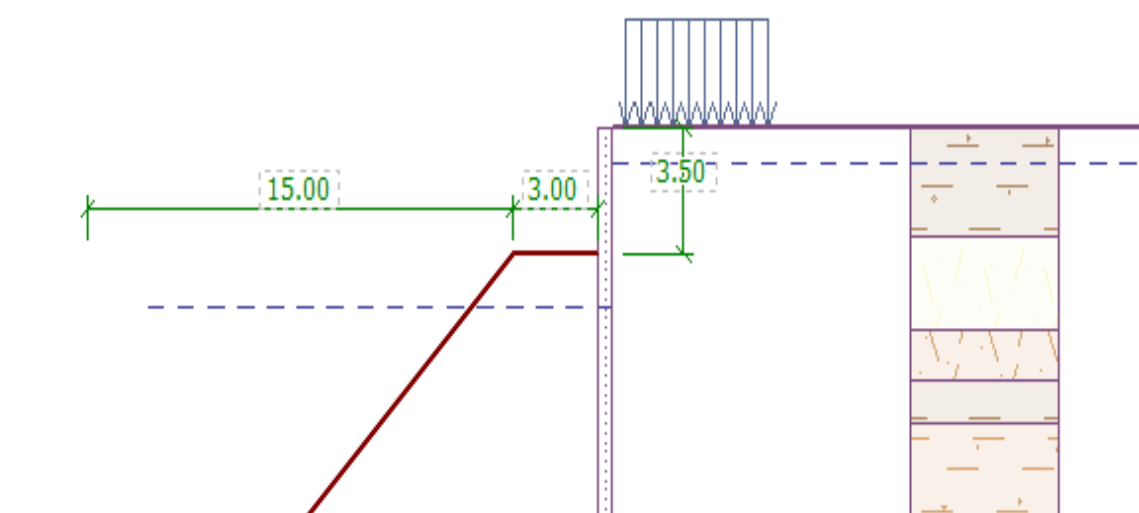
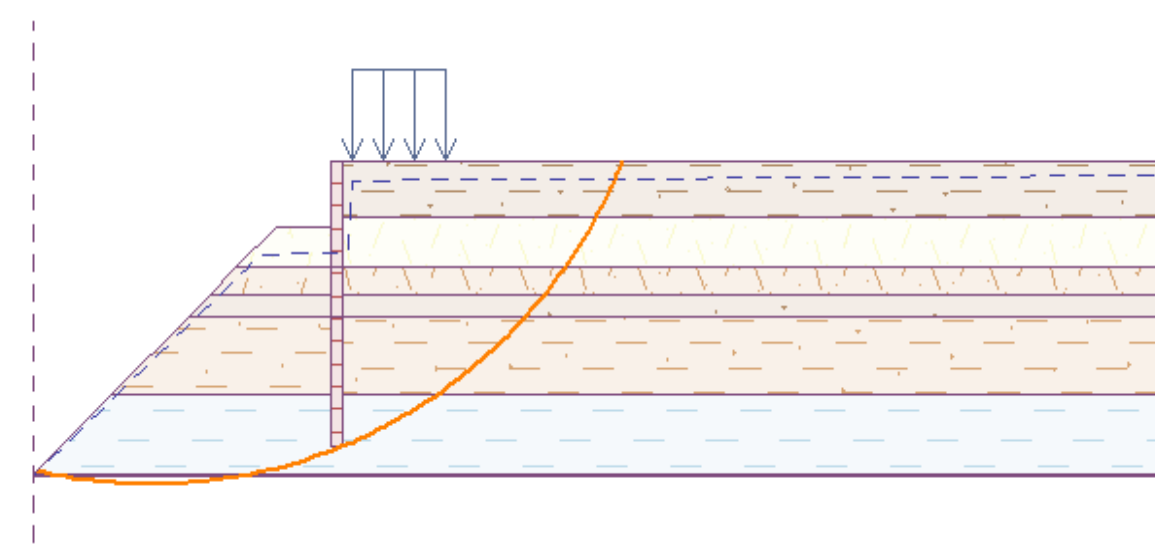
Stabilization of Slopes



- Reduced required Depth and Cross section size of wall
- High Resistance against Over turning and Active Pressures
- Prevents Mobilization of Slide by Penetrating Slip Surface

Design Solutions

- Slope stability
- Pile curtain without anchors
- Pile curtain with anchors
 - Dimensioning
 - Analysis
 - external and internal stability
 - Anchor verification



Carbon Emissions

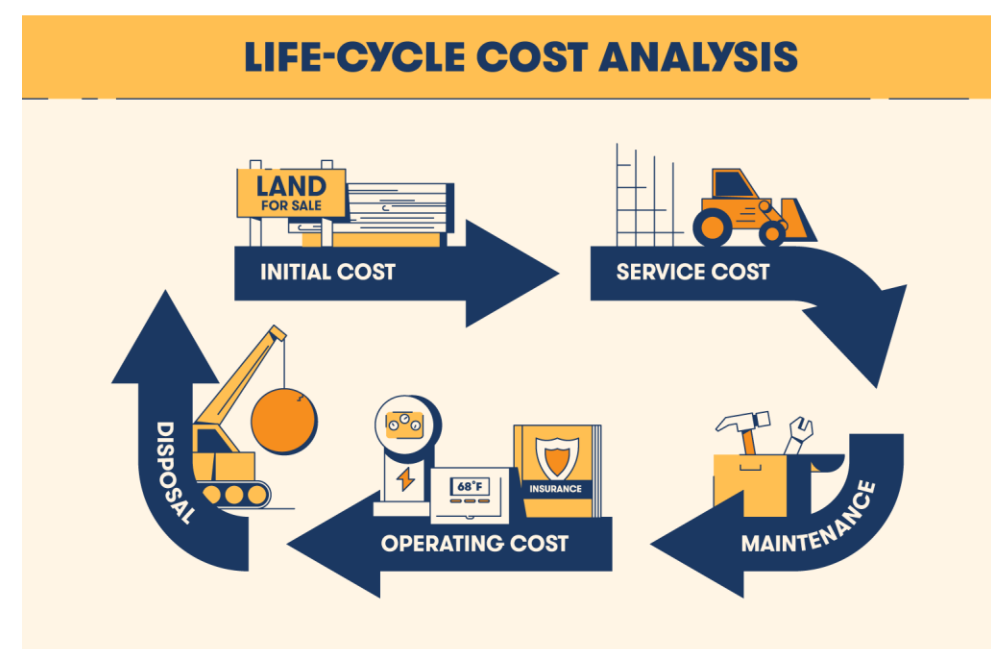
Types of Carbon in Buildings



(Carboncure, 2020)

- Total CO₂: 120558,79 kg
- Total Embodied Energy: 886200,73 MJ

Cost Calculations



(Bigrentz, 2020)

- Total Project Cost: \$82725,46