JJ Mac Ltd

GROUND STABILISATION CARBON SAVINGS

Ground stabilisation techniques can significantly reduce carbon emissions in construction projects by

1. **Minimising the need for imported materials**
2. **Reducing vehicle movements**
3. **Utilising waste products**

These methods involve stabilising in-situ soils with cementitious binders.

How ground stabilisation reduces carbon emissions:

- **Reduced Material Transport:**

By stabilising existing soil in place, projects can minimise the need to import materials like aggregates or concrete, reducing the associated carbon footprint from transportation.

- **Reduced Material Consumption:**

Techniques like using geogrids allow for thinner aggregate layers, decreasing the overall volume of materials required.

- **Lower Carbon Cement Alternatives:**

GGBS, a byproduct of steel production, acts as a cement replacement in concrete and soil stabilisation, leading to lower embodied carbon in construction projects.

Some ground stabilisation methods utilise geopolymer or other cementitious binders that incorporate waste materials, significantly reducing the carbon intensity compared to traditional cement.

- **Waste Material Utilisation:**

Stabilising soils with waste products like GGBS (Ground Granulated Blast Furnace Slag) reduces landfill waste and lowers the demand for virgin materials.

- **Efficient Construction:**

Stabilised ground allows for more efficient construction processes, reducing time on site and the associated carbon emissions from machinery and vehicles.

- **Potential for Carbon Sequestration:**

Some ground stabilisation methods, particularly those involving organic matter or biochar, can enhance soil's capacity to sequester carbon, further contributing to carbon reduction.

Examples of carbon-saving ground stabilisation techniques:

- **Lime/Cement Stabilisation:**

Using lime or cement to stabilise cohesive soils, potentially combined with GGBS, can improve soil strength and reduce swelling and compression.

- **In-situ Stabilisation:**

Using a single-pass application of cementitious binders to stabilise soils on site can significantly reduce vehicle movements and material transport.

Ground stabilisation using GGBS (Ground Granulated Blast Furnace Slag) can significantly reduce carbon emissions compared to traditional methods. GGBS, a byproduct of steel production, acts as a cement replacement in concrete and soil stabilisation, leading to lower embodied carbon in construction projects.

GGBS and Carbon Savings:

- **Cement Replacement:**

GGBS can replace a significant portion of cement in concrete mixes, reducing the amount of cement required and the associated carbon emissions.

- **Reduced Embodied Carbon:**

Replacing one tonne of traditional cement with GGBS can reduce embodied carbon by approximately 780kg, according to Heidelberg Materials UK.

- **Sustainable Construction:**

Using GGBS promotes more sustainable construction practices by minimising reliance on traditional cement production, which is a major source of CO2 emissions.

- **Durable Concrete:**

GGBS not only reduces carbon footprint but also enhances the durability and strength of concrete, leading to longer-lasting structures.

Ground Stabilisation with GGBS:

- **Soil Improvement:**

GGBS can be used as a binder in soil stabilisation, improving soil properties like strength, bearing capacity, and volume stability.

- **Reduced Excavation:**

By stabilising weak ground with GGBS, it may be possible to reduce the amount of excavation and replacement with new materials, further minimising carbon emissions.

- **Waste Reduction:**

GGBS is a byproduct of steel manufacturing, so using it in ground stabilisation helps to divert waste from landfills and repurpose it for construction purposes.

Considerations:

- **Supply Chain:**

The availability of GGBS is dependent on the steel industry, so it's important to consider the supply chain and potential limitations.

- **Specific Project Requirements:**

The suitability of GGBS for ground stabilisation depends on the specific soil conditions and project requirements.

- **Carbon Footprint Calculation:**

When assessing carbon savings, it's important to consider the entire life cycle of the materials, including production, transportation, and end-of-life scenarios.

By utilising GGBS in ground stabilisation, construction projects can achieve significant carbon savings and contribute to more sustainable development.

Table 5. Embodied emissions of Stabilisers.

Material	Emissions (kg CO_2/kg)
Hydrated Lime	0.74
Portland Cement	0.83
Ground granulated blast furnace slag	0.07