



GEOSLATE Llechi
Slate

GeoSlate: Enhanced Thermally Conductive Backfill

A sovereign, carbon-neutral
geopolymer solution for underground
HV cable infrastructure.

Presented to: GeopolymerCamp 2026

Presenter: Richard Wyn Huws (Director / Innovation Lead)

Date: 9th July 2026

Introduction

Dobré ráno

صباح الخير

Dzień dobry

おはようございます

안녕하세요

Jó reggelt

Καλημέρα

Bore da

नमस्ते

早上好

Good morning

Bonjour

Buongiorno

Buenos días

Guten Morgen

Goedemorgen

God morgen

Bom dia

Introduction

Thank you for the opportunity to present once again at this year's Geopolymer Institute Summer Camp 2026.

It is a privilege to share our latest developments with colleagues from around the world. We hope today's presentation demonstrates how far our research and application of geopolymer technology has progressed, and that some of our work may be of interest to researchers, engineers and industry across the global geopolymer community.

I would also like to express my sincere thanks to Professor Joseph Davidovits for his pioneering vision, his continued guidance and his remarkable generosity in sharing his knowledge. His work has provided the foundation upon which so many of us continue to build.

Leadership: The Capability to Execute



Technical & Innovation Core

Richard Wyn Huws
Project Director & Innovation Lead

Inventor of the slate geopolymers and driving force behind the material science. Responsible for mix formulation, structural integrity testing, and driving the technology through the ENA TS 97-1 compliance pathway.

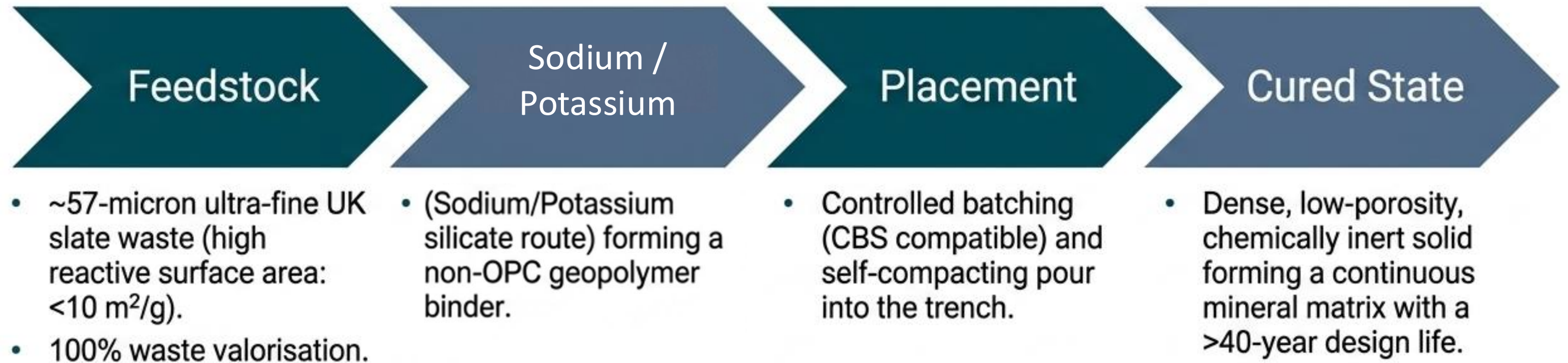


Commercial & Operational Execution

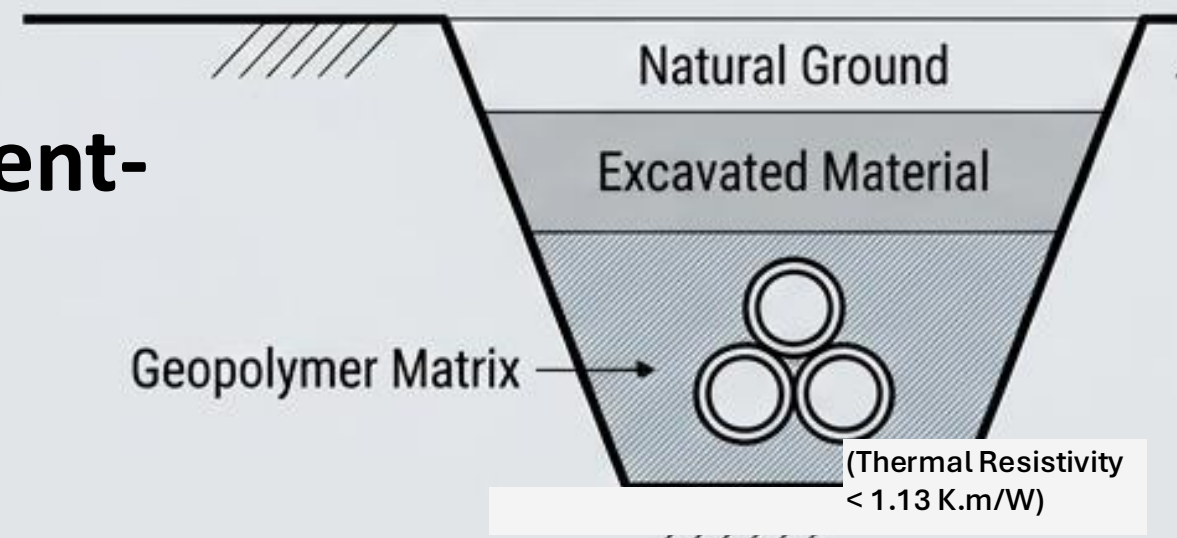
Rhodri Morgan, MBA, LLB (Hons)
Commercial Director

Anchors commercial strategy and operational delivery. Responsible for structuring enterprise supply chain partnerships, aligning stakeholder milestones, maintaining cost certainty, and managing complex trench trial logistics.

Technology Overview: A Circular, Low-Carbon Alternative



***Protected by a patent-pending application filed by GeoSlate.**



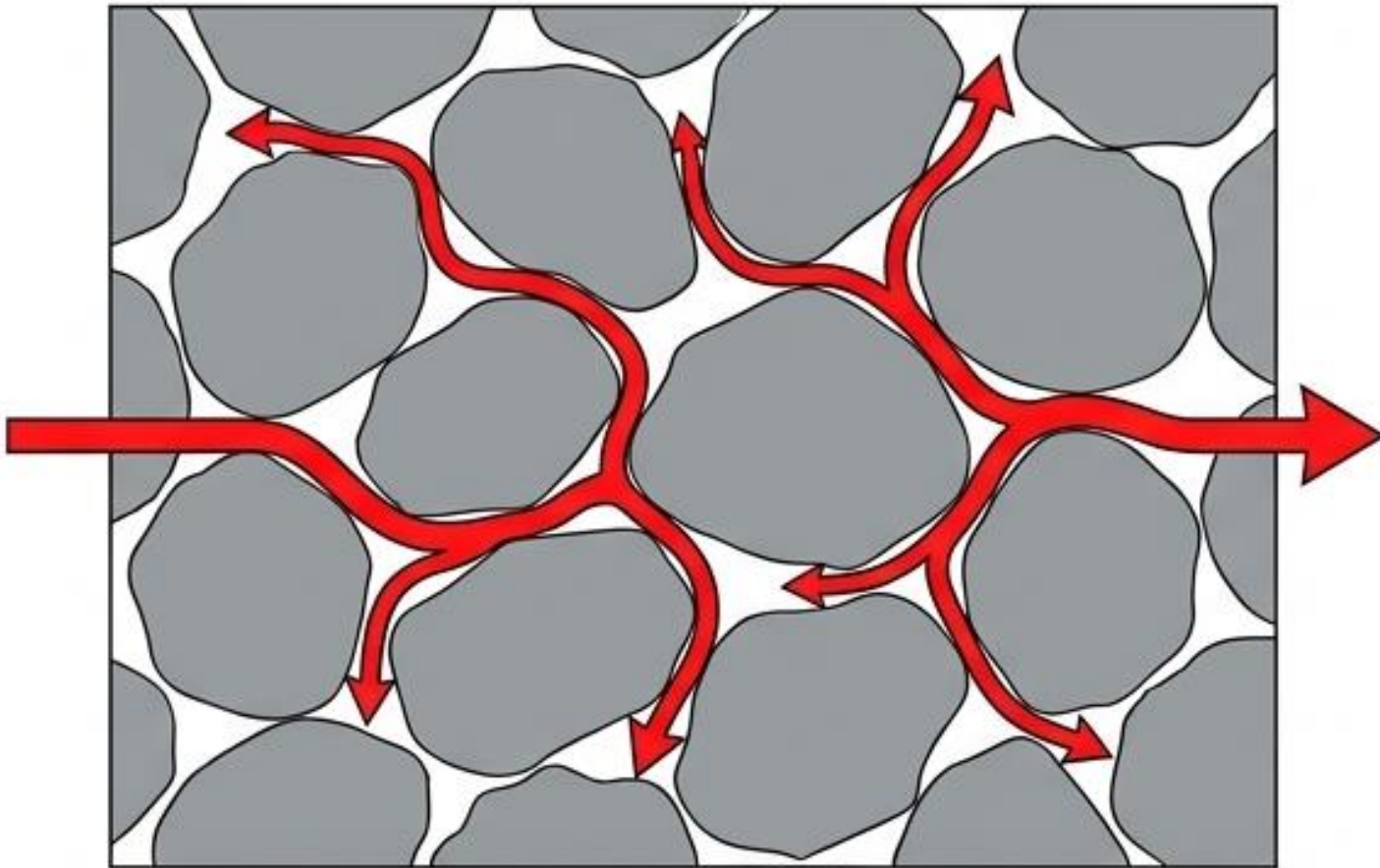
Bypassing the need for primary extraction and imported continental sands.

Performance Evidence: The Continuous Mineral Matrix

Target Dry Thermal Resistivity $<0.9 \text{ K}\cdot\text{m}/\text{W}$

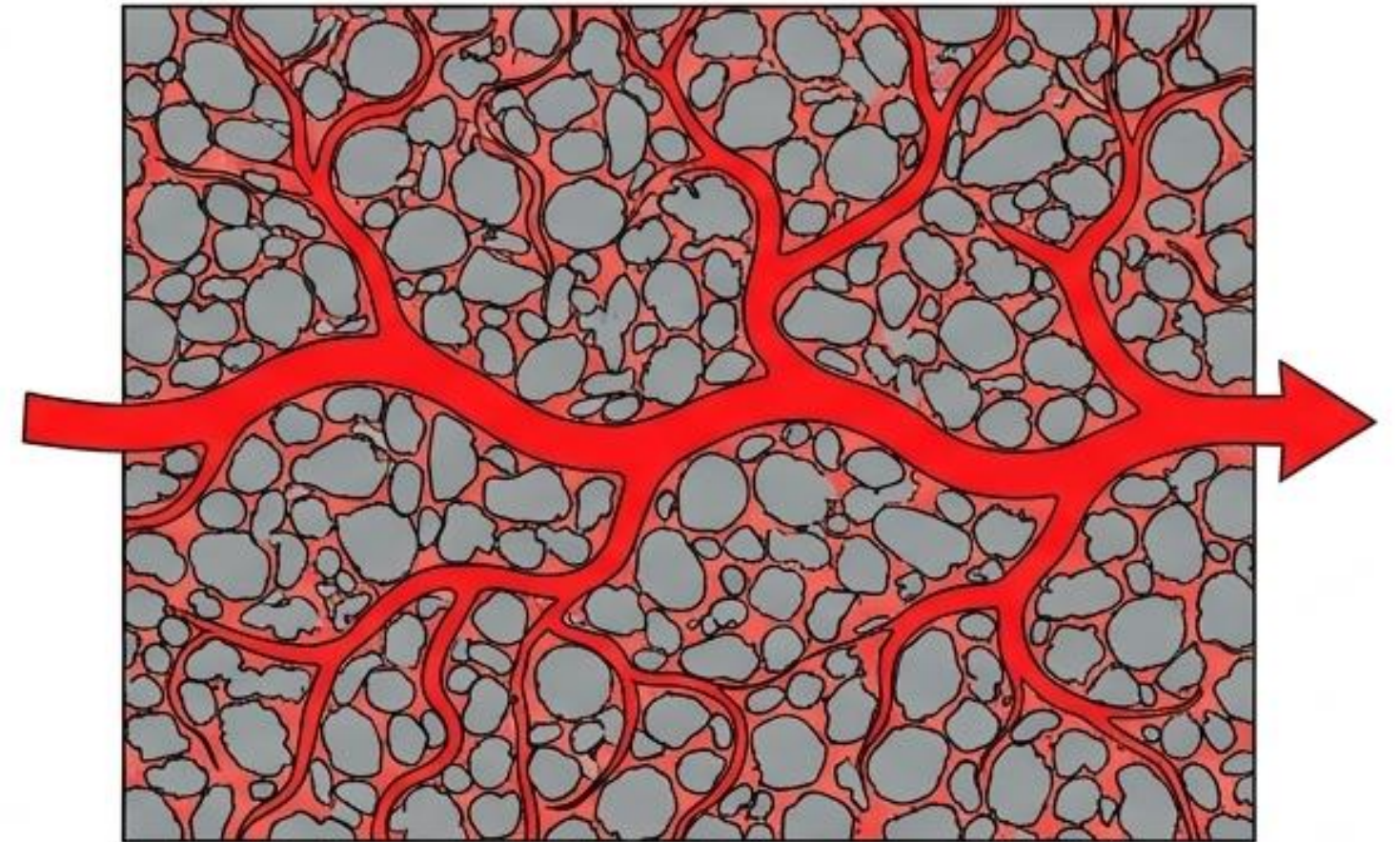
Comfortably exceeds the ENA TS 97-1 mandatory requirement ($<1.2 \text{ K}\cdot\text{m}/\text{W}$) and the OTW ideal target ($<1.0 \text{ K}\cdot\text{m}/\text{W}$).

The Old Way (Granular Sand)



Standard imported sands rely on inefficient grain-to-grain contact points, leaving microscopic air voids that create thermal contact resistance.

The GeoSlate Way (Continuous Mineral Matrix)



GeoSlate utilises ultra fine slate waste powder. This creates a continuous dielectric geopolymer that completely fills voids, eliminating thermal resistance and conducting heat continuously away from the HV cables.

Development Roadmap: Validation to Commercial Scale

Phase 1: Material Characterisation (Months 1–6)

- Particle Size Distribution (PSD), Chemical element and Mineral content analysis.
- UKAS laboratory validation of thermal resistivity.
- Leachate safety and PVC duct compatibility conformation.

Phase 2: Small-Scale Physical Trials (Months 6–12)

- Progression from bench to 3 separate 1.85 m physical trench trials.
- Validation of mix stability, flowability and CBS batching compatibility.
- Development of in-situ QA/QC density correlations.

Phase 3: National Grid Qualification (Months 12–18)

- Formal collaboration with National Grid for full-scale compliance testing.
- Preparation of ENA TS 97-1 compliance documentation.
- Co-application for NIA (Network Innovation Allowance) funding.

Phase 4: Commercial Scale-Up (Months 18–48)

- Transition from pilot to enterprise supply chain establishment.
- Rollout across regional depots networks aligned with Great Grid Partnership corridors.

EARLY TESTING OF THERMAL RESISTIVITY

- **Technical Validation (Celtest Evidence) Reports:** TR 1221161 and CTR 102729.
- **Dry Thermal Resistivity:** **1.13 K·m/W** (Meets mandatory ENA TS 97-1 requirement).
- **Thermal Conductivity:** 0.89 W/m.K.
- **Dry Density:** 2.11 Mg/m³.
- **Compressive strength:** **6.4 N/mm²** (Strength can be varied as required)

Enterprise Ecosystem: The Delivery Network



Environmental Impact: From Extraction to Valorisation

Incumbent Method (Imported Sand)

**Primary
Extraction**
(Virgin Quarrying)

**International
Marine Shipping**

**UK Road
Freight (HGV)**

**Trench
Emplacement**

**Result: Generates
massive Scope 3
emissions (est. 120–
180 kg CO₂e/m³).**

GeoSlate Method

**Legacy Waste
Tip (Zero
Extraction)**

**Local Milling &
Processing**

**Short-Haul UK
Road Freight**

**Trench
Emplacement**

**Result: Massive
Scope 3 Reduction.
(95% waste)**

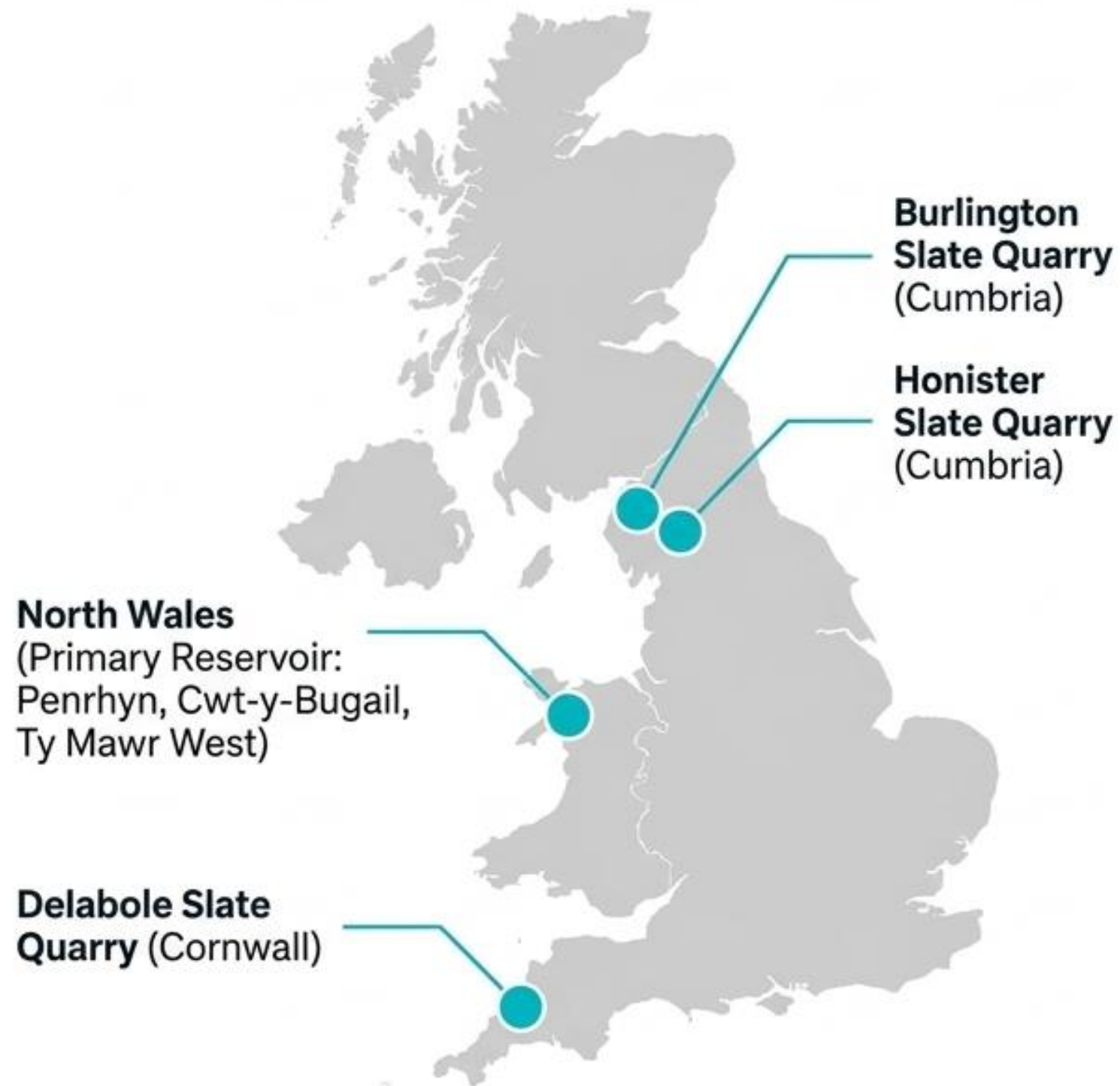
Carbon Savings

Significant reduction in embedded carbon by substituting primary aggregates with domestic waste streams and eliminating international freight.

Waste Valorisation

Repurposing 730 million tonnes of historic Landscape slate waste into critical infrastructure material.

Material Scalability: Securing a Sovereign Supply Chain



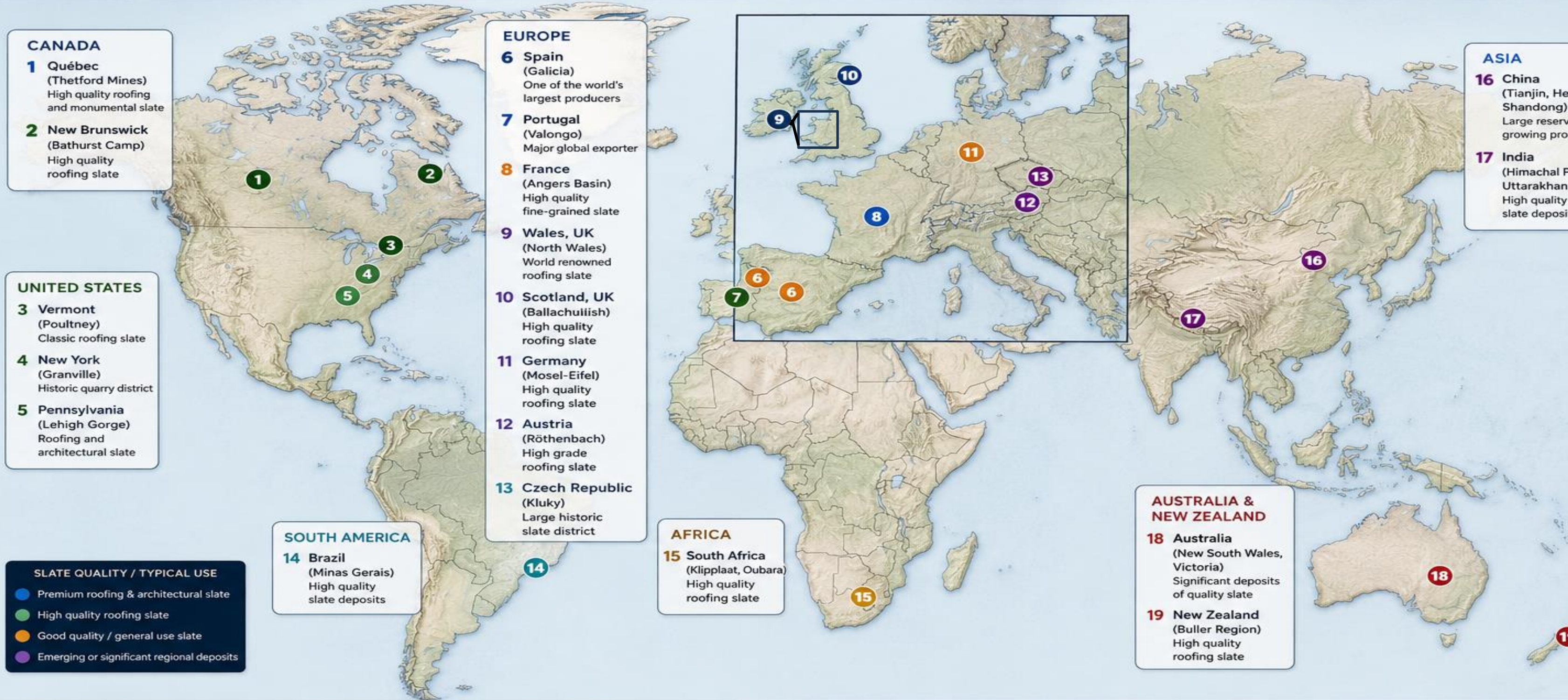
730 Million Tonnes

Historic accumulated material available across the UK, acting as an effectively infinite domestic reservoir.

Logistics Footprint: 15 + Brenntag national network locations ensuring nationwide coverage.

THE WORLD'S MOST SIGNIFICANT SLATE DEPOSITS

MAJOR OCCURRENCES OF NATURAL SLATE AROUND THE GLOBE



Slate is a fine-grained, foliated metamorphic rock valued for its durability, low water absorption and aesthetic qualities. These deposits have supplied roofing, cladding, flooring, monuments and decorative uses for centuries.

NOTES

- Locations indicate major historic or current producing regions.
- Quality and production vary by quarry.
- Many additional smaller deposits exist worldwide.

SOURCES

- British Geological Survey (BGS)
- United States Geological Survey (USGS)
- Natural Stone Institute
- Industry reports and geological surveys



What National Grid Gains

GEOSLATE: 95% waste-derived · <1.2 K.m/W · Zero electrical conductivity · Magnetically inert



Greater Cable Capacity

<1.0 K.m/W gives headroom beyond the ≤ 1.2 spec — enabling higher current ratings per cable and potentially fewer cables per route.



Zero Electrical Risk

No electrical conductivity eliminates stray current corrosion, protects cable sheath integrity and improves site safety during installation.



Magnetically Inert

No interference with cable monitoring, smart grid sensors or protection equipment as National Grid's digital infrastructure expands.



Asset Longevity

Chemically stable geopolymer matrix — no carbonation, no sulfate attack, thermally stable at continuous cable operating temperatures for decades.



Net Zero & Carbon Credits

95% waste materials drives Scope 3 reductions, PAS 2080 compliance and generates tradeable carbon credits across a national contract.



Commercial Leadership

First UK utility deploying geopolymer thermal backfill at scale — a world-first sustainability story for ESG reporting and investor narrative.

Summary & Value Proposition



Sovereign Supply Security

- Eliminates dependency on imported European sand.
- Powered by a 730-million-tonne domestic waste reservoir and an enterprise-grade partner network (Breedon, Brenntag).



Patent-Protected Innovation

- A legally protected, non-OPC geopolymer formulation.
- Ensures long-term commercial viability while providing OTW with a clear route for co-development and national scale-up.



Thermally Superior Performance

- Targeting $<0.9 \text{ K}\cdot\text{m}/\text{W}$ dry thermal resistivity.
- The continuous dielectric mineral matrix eliminates thermal contact resistance, enabling higher cable ampacity and true infrastructure longevity.

Děkuji mnohokrát

شكراً جزيلاً

Dziękuję bardzo

どうもありがとうございます

대단히 감사합니다

**Nagyon
köszönöm**

Ευχαριστώ πολύ

Diolch yn fawr

बहुत धन्यवाद

非常感谢

Merci beaucoup

Thank you very much

Grazie mille

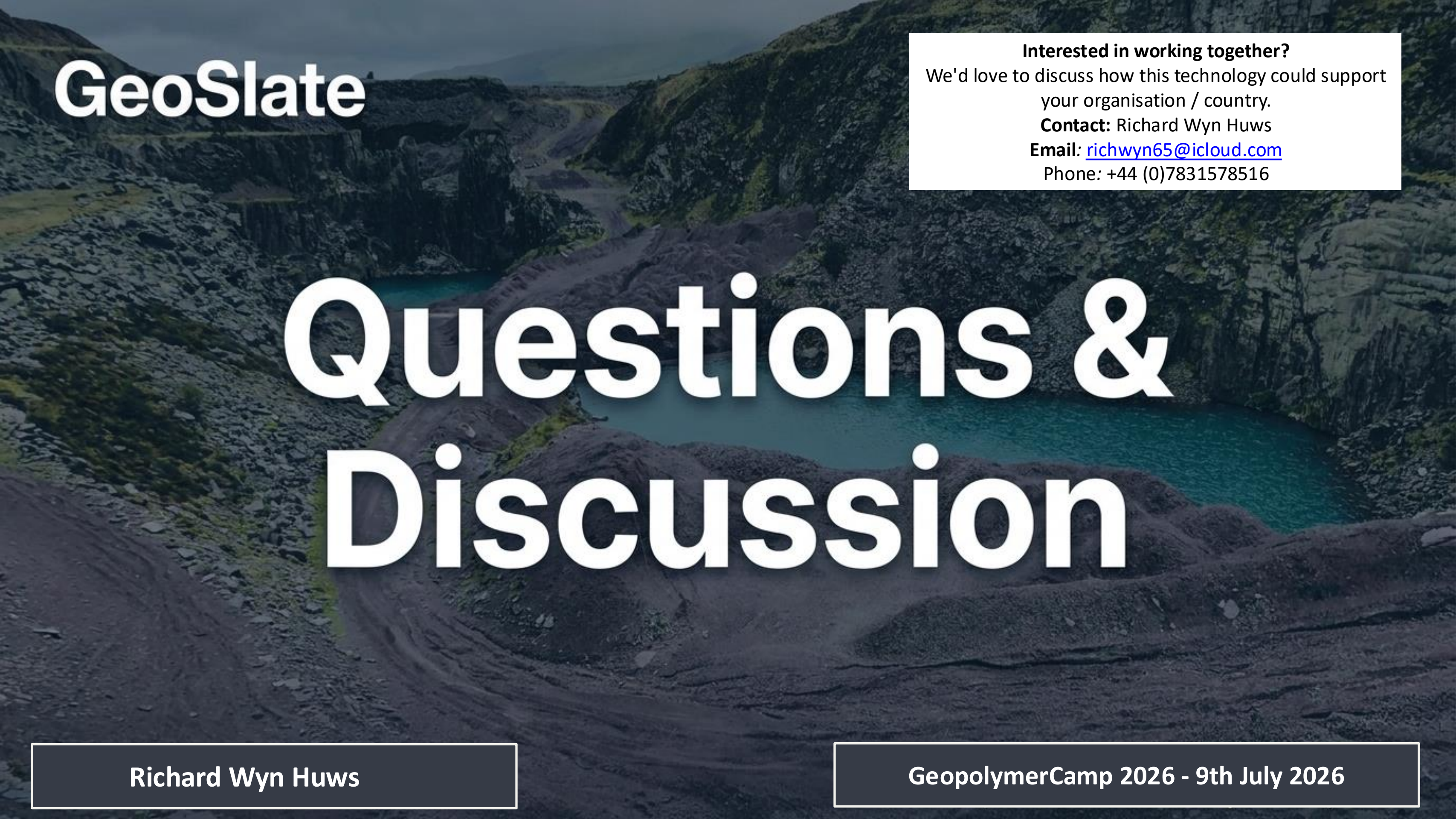
Muchas gracias

Vielen Dank

Tusen takk

**Muito obrigado /
obrigada**

Hartelijk dank



GeoSlate

Interested in working together?

We'd love to discuss how this technology could support your organisation / country.

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Questions & Discussion

Richard Wyn Huws

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