



Critical
Minerals
Challenge
Centre



University
of Exeter



UK Research
and Innovation

Research to Accelerate Critical Minerals and Sustainable Development in SW England

Professor Frances Wall OBE

Camborne School of Mines, University of Exeter
f.wall@exeter.ac.uk



19 May 2026: Swedish Mining Research and Innovation Days

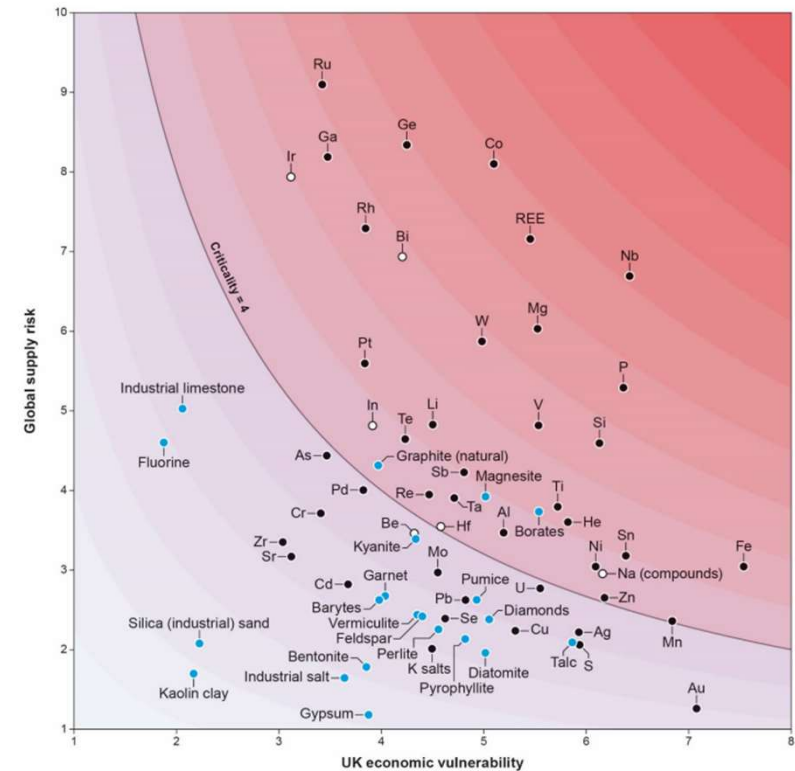
Critical Minerals – the Risk



EU 2023, a fifth list of 34 CRMs

Bauxite	Coking Coal	Lithium	Phosphorus
Antimony	Feldspar	Light rare earth elements	Scandium
Arsenic	Fluorspar	Magnesium	Silicon metal
Baryte	Gallium	Manganese	Strontium
Beryllium	Germanium	Natural Graphite	Tantalum
Bismuth	Hafnium	Niobium	Titanium metal
Boron/Borate	Helium	Platinum group metals	Tungsten
Cobalt	Heavy rare earth elements	Phosphate Rock	Vanadium
		Copper	Nickel

UK 2024, 34 CRMs

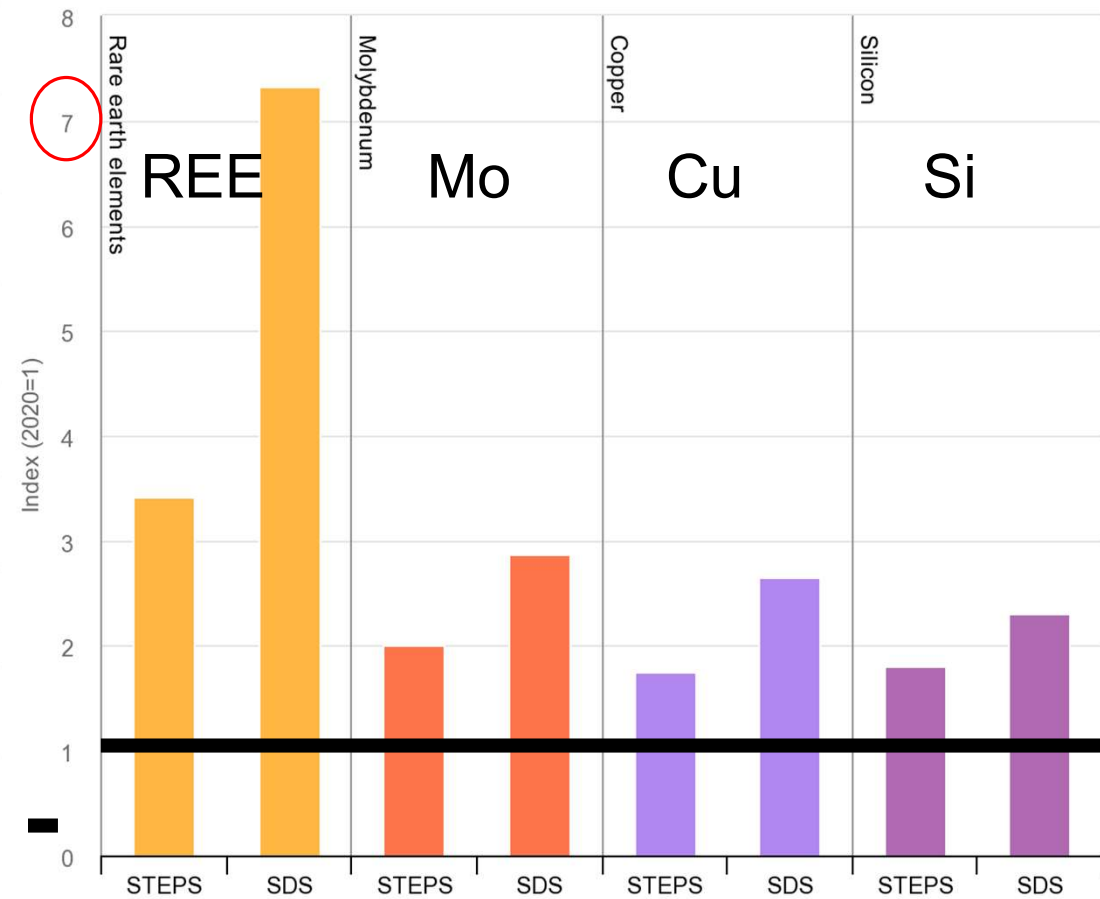
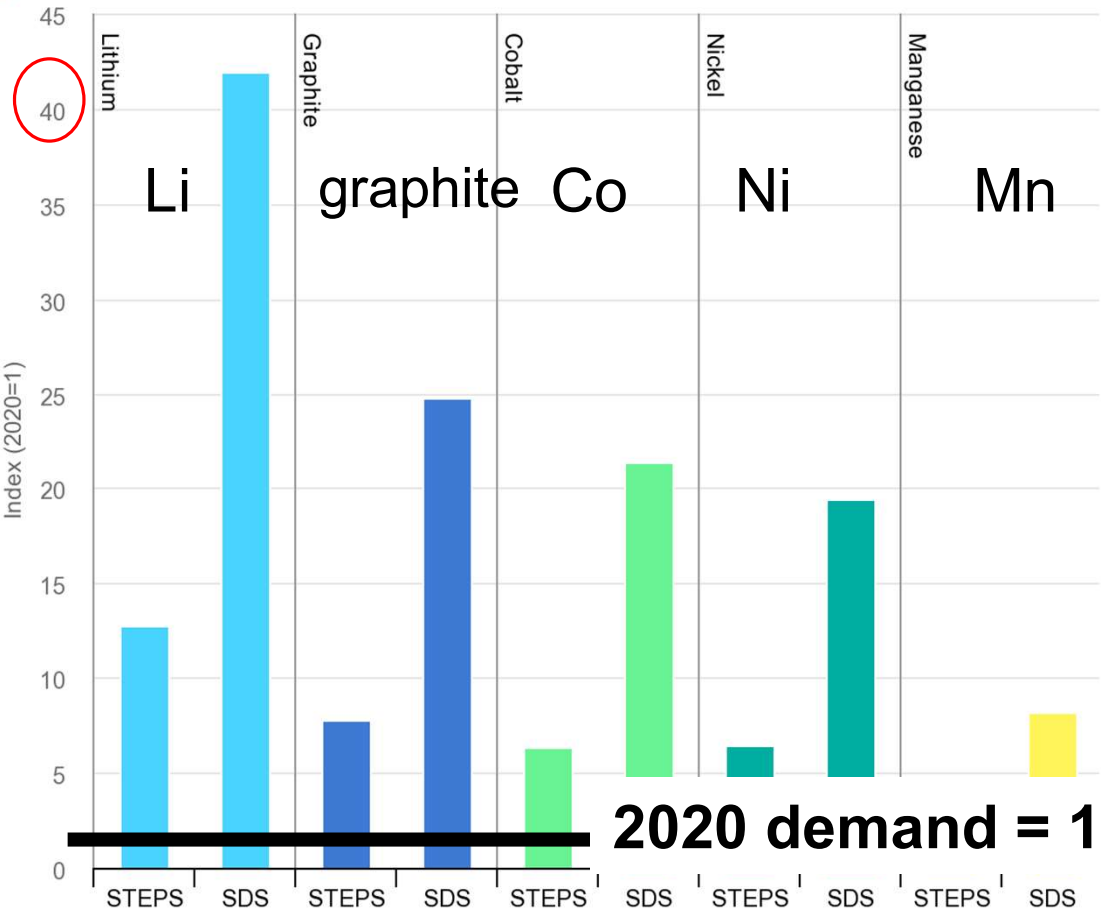


<https://www.ukcmic.org/downloads/reports/uk-cmic-2024-criticality-assessment.pdf>

Critical Minerals – the opportunity



All models predict rapid increases in metals demand. This example: two scenarios from the International Energy Agency change from 2020 to 2040





Critical
Minerals
Challenge
Centre



University
of Exeter



UK Research
and Innovation

What do people really want from
production of critical minerals?



Critical
Minerals
Challenge
Centre



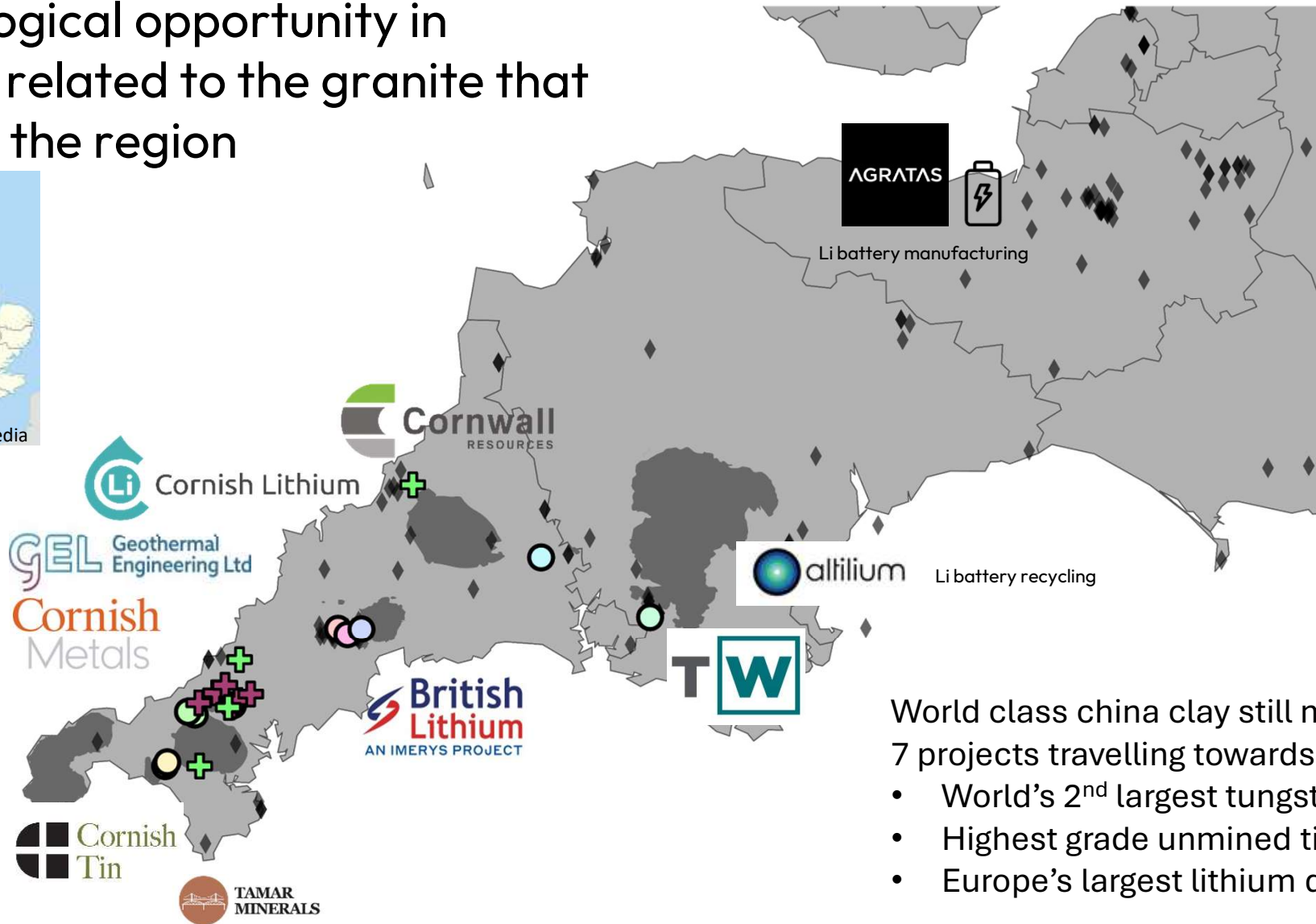
University
of Exeter



UK Research
and Innovation

Resource riches or Resource Curse?

The geological opportunity in SW UK is related to the granite that underlies the region



- World class china clay still mined
7 projects travelling towards production:-
- World's 2nd largest tungsten reserve
 - Highest grade unmined tin
 - Europe's largest lithium deposit

Cornwall



Photo F Wall



Photo F Wall

Cornish Metals reopening South Crofty mine

Critical Minerals Accelerating
the Green Economy Centre



2,896kt (indicated)	1.50% Sn	43.6kt Sn
2,626kt (inferred)	1.42% Sn	374kt Sn

<https://cornishmetals.com/project/uk/south-crofty-tin-project/>

Hemerdon W-Sn Mine, Devon

TUNGSTEN **WEST**



Photo R Shail



Photo F Wall



Photo F Wall

UK was 4th largest global tungsten producer 2018. New company Tungsten West producing small amounts now and ramping back up to full production

Total Ore Reserve comprising 70.7Mt at 0.15% WO_3 (wolframite) and 0.03% Sn (cassiterite) <https://www.tungstenwest.com/>

Lithium-bearing micas are separated from feldspar, quartz and other micas in the granite and then further processed/refined to lithium carbonate or lithium hydroxide



University of Exeter



Photo F Wall



Photo F Wall



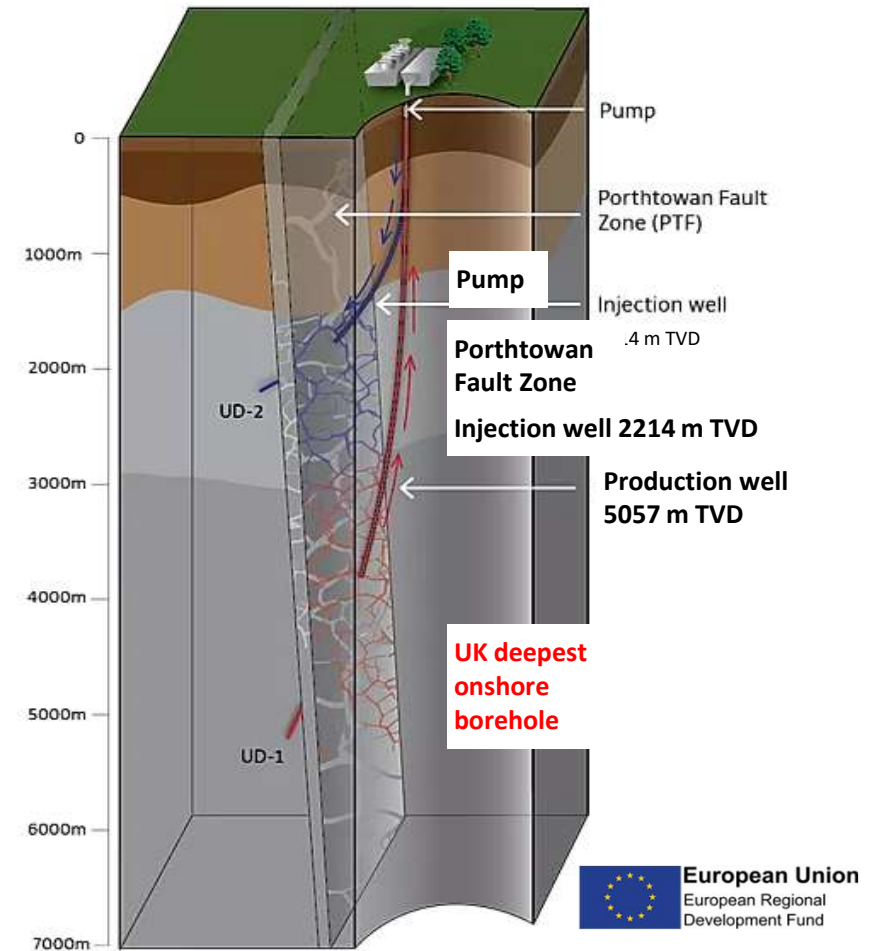
Photo F Wall

Photos F Wall at Imerys British Lithium, March, 2025

Polyolithionite – siderophyllite (zinnwaldite, lepidolite group)

Deep geothermal

SW England is most prospective area in UK – major projects involving 4-5 km deep boreholes that extract heat – and lithium – from granite.



Images from Eden Project and GEL

Legacy Mine Waste – In a UNESCO Mining Landscape World Heritage Site in Cornwall and West Devon



Photo F Wall

Critical Minerals Challenge Centre team & partners ready for transdisciplinary research – all research co-created and co-lead by industry partners with the academics

Critical Minerals Accelerating the Green Economy Centre

TWP1

Analytical & geo-metallurgy protocols
Industry lead: Petrolab

TWP2

Value from Mine Waste
Industry lead: Cornwall Resources

TWP3

Exploration and Extraction Technologies
Industry lead: Geolorn

TWP4

Smaller projects with cluster, workshops, building new projects

15 academics



2.5 management

commercialisation, policy, comms., coordination



Innovation fellows all in different disciplines for transdisciplinary team



Researcher co-lead

AI/Software



Regional Government



National Government

31 partners



Companies



NGOs

<https://criticalmineralschallengecentre.co.uk/>

Centre team and partners ready for transdisciplinary research - six post-doctoral innovation fellows in different disciplines

Critical Minerals Accelerating
the Green Economy Centre



<https://criticalmineralschallengecentre.co.uk/>

United Nations Resource Management System (UNRMS)

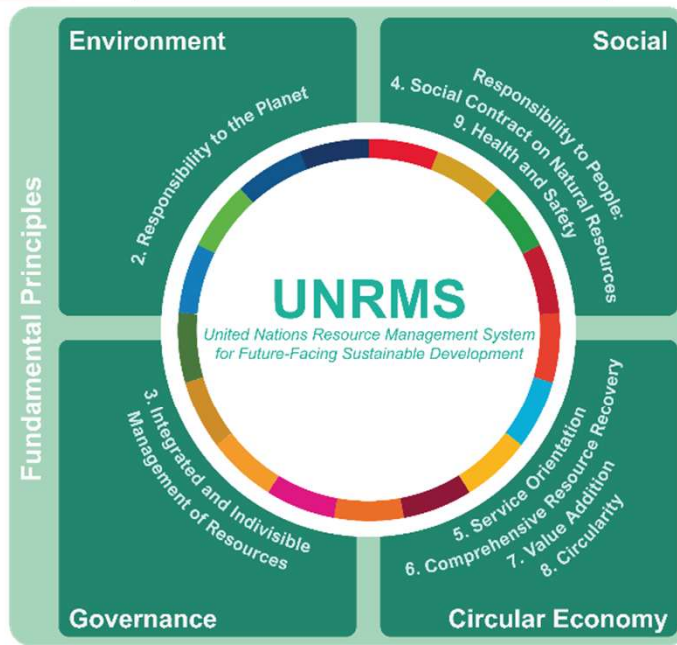
12 Principles (and 54 underlying requirements)

1. What is UNRMS?
<https://youtu.be/4BryhgEwDa8>
2. Introduction to the Cornwall case study using UNRMS:
<https://youtu.be/IR6SvZdNFs0>

Marquis et al, 2024, Optimizing Resource Management for Critical Raw Materials: A Case Study of the Application of the United Nations Resource Management System with Cornwall Regional Government, United Kingdom, UNECE
<https://unece.org/sed/documents/2024/04/working-documents/optimizing-resource-management-critical-raw-materials-case>

Priority Determination

1. State Rights & Responsibilities in the Management of Resources



12. Competency & Capability

11. Transparency

Collaboration

10. Innovation

Facilitating Principles

UNRMS adapted for Cornwall Case Study

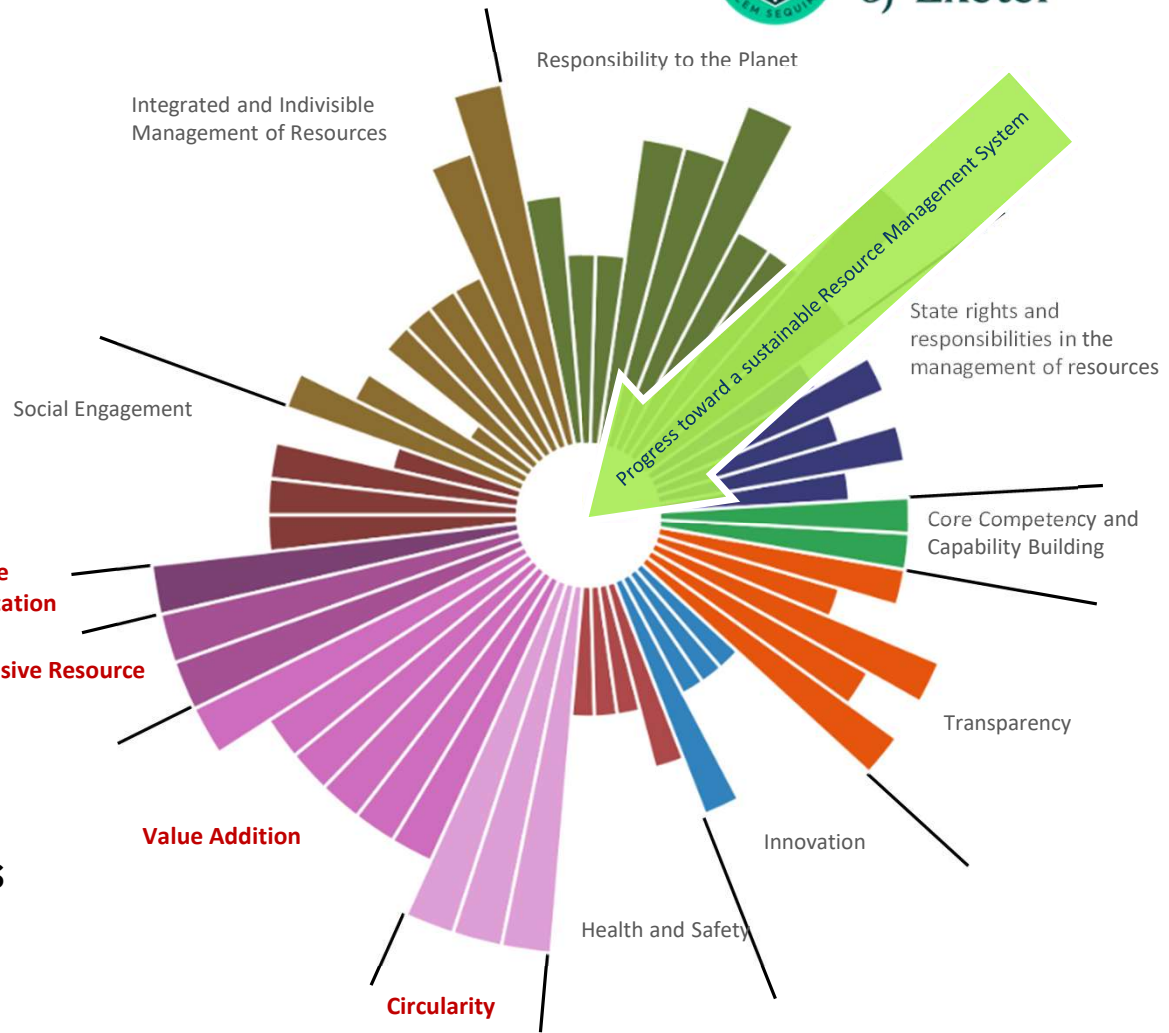


UNRMS results for Cornwall – things to do



Table 3
Preliminary mapping of U.K. Cornwall Critical Raw Materials regulatory, governance, and industry ecosystem to UNRMS principles and requirements

Principle	Requirement	Rating
State rights and responsibilities in the management of resources	(01) National policy and strategy: To support the implementation of sustainable resource management aligned to the 2030 Agenda for Sustainable Development.	Green
	(02) Compliance with legislation: Establish regulatory bodies which are responsible for sustainable resource management.	Green
	(03) Coordination: Coordinate with different authorities responsible for regulating sustainable resource management.	Green
	(04) Provision of technical services: Provide technical services needed for sustainable resource management.	Green
Responsibility to the planet	(05) Addressing environmental degradation and management in mineral extraction.	Green
	(06) Long term sustainability analysis concerning plant development.	Green
	(07) Strategic environmental assessment: A Strategic Environmental Assessment (SEA) is a systematic process for evaluating the environmental implications of proposed policy, plans, programmes and projects, such as looking at cumulative effects and appropriately addressing them at the earliest stage of decision-making strategic economic and social considerations.	Green
	(08) Climate change-related activities: All activities align to Nationally Determined Contributions (NDCs), involve and engage citizens, and climate change policies.	Green
	(09) Resource and energy use efficiency: Actions to reduce resource and energy inputs used to produce resources.	Green
	(10) Greenhouse Gas (GHG) intensity indicator: expressed in CO ₂ eq/Mt.	Green
	(11) Water use and management: Ensure water resources are protected and related to the environment and managed according to country legislation.	Green
	(12) Land use and management: Actions to restore or optimally manage the land (soil).	Green
	(13) Management of air emissions and pollutants in an appropriate manner.	Green
	(14) Biodiversity conservation and enhancement activities: All activities in the area to conserve and enhance biodiversity.	Green
Integrated management of resources	(15) Information platform/data transparency, availability: Availability of accurate and complete information on the area and project promptly to help in decision making.	Green
	(16) Estimation of resources and managing the degree of confidence in the estimated quantities according to UNFC.	Green
	(17) Opportunity and risk management: identification, evaluation, and prioritization of opportunities and risks, followed by coordinated and commercial application of resources to enhance, monitor, and control the probability or impact of uncertain events, including resource-based activities, and to maximize the realization of opportunities.	Green
	(18) Productivity: Ensuring required resources to enhance production efficiency. Efforts to improve productivity are typically an integral part of a production process, i.e., output per unit of input, typically over a specified period.	Green
	(19) Preventing Child Financial Flows, Base Emission and Profit Shifting (BEPS): Digital capital flight: However, the BEPS topic also includes international tax systems relating to gas, and subsidies between countries' tax systems affect all countries. Developing countries' higher income tax systems become less attractive to them from BEPS implementation.	Green
	(20) Sustainable investment framework: A set of standards for a company's operations that socially conscious investors use to screen potential investments.	Green
	(21) Annual and semi-annual reporting (ASMR): If ASMR is present in the area, it should be integrated with the development programme.	Green
	(22) Environmental and social risk management: Availability of accurate and complete information on the area and project promptly to help in decision making.	Green
	(23) Environmental and social risk management: identification, evaluation, and prioritization of opportunities and risks, followed by coordinated and commercial application of resources to enhance, monitor, and control the probability or impact of uncertain events, including resource-based activities, and to maximize the realization of opportunities.	Green
	(24) Productivity: Ensuring required resources to enhance production efficiency. Efforts to improve productivity are typically an integral part of a production process, i.e., output per unit of input, typically over a specified period.	Green



Eva Marquis' target diagram – better is closer to the centre of the target, larger means more to do

Geometallurgy of Li in granite



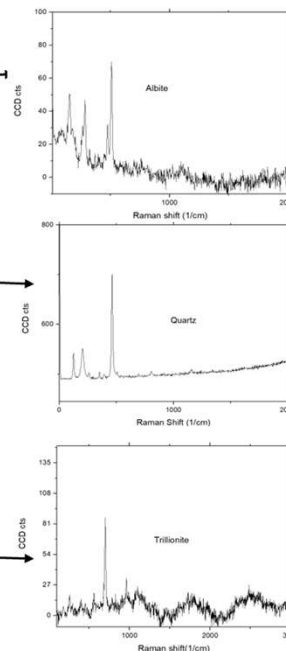
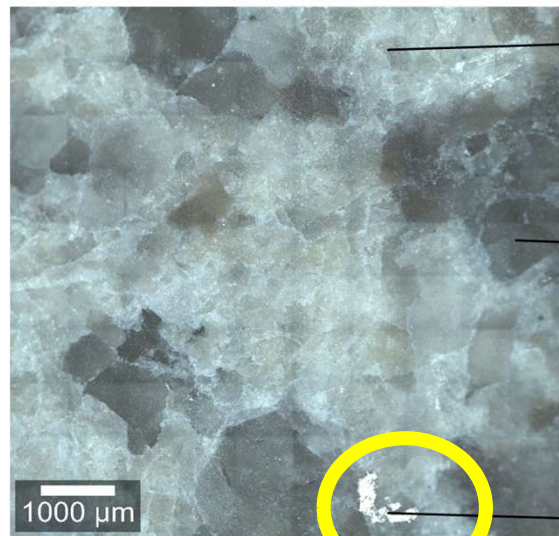
New protocols for characterisation and selection of mineral processing routes

Lower projects risks

Optimise separation efficiency

Encourage nature positive solutions

Accelerate financing



Raman, with spectra of three minerals quartz, albite and lithium mica (trillionite)



Critical Minerals Challenge Centre (Dr Lebogang Babedi) is using Raman and Hyperspectral imaging to study and identify Li-bearing micas for geometallurgy studies with industry partners, lead industry partner is Petrolab

<https://criticalmineralschallengecentre.co.uk/>

Value from Mine Waste

- Biodiversity net gain strategies including monitoring biodiversity rather than habitat
- eDNA sampling by Dave Hudson (ecology) with Eva Marquis (geology)
- Regulatory workshop – demonstrated the ‘vintage waste’ has many heritage and also biodiversity protections. More modern tailings have more potential
- UK Government interest and support
- Industry partners



photo Eva Marquis



<https://criticalmineralschallengecentre.co.uk/>

Social Sciences



3 Strands



Christie Van Tinteren

1. Future of Work

- Drawing on good labour practices in the SW, to ensure prosperity for all –

2. Meeting Skills Needs

- Developing and Social and community innovations to ensure a local talent pipeline. 'Getting in and Getting on'

3. Philanthropy and Social Infrastructure

- Looking at past Cornish industrial revolutions, to consider what we can learn from their legacy of social infrastructure.
- Cornwall Council (local government), Cornwall Community Fund (NGO), SW Trades Union Council and the local industry partners

D.I.G Club Kernow
DISCOVER INDUSTRIAL GEOLOGY

Learn about mining in Cornwall. Discover the opportunities the industry offers. Join us for mine visits, practical events, talks, and networking.

POWER FROM THE UNDERGROUND	MORE INFO
 Introduction to Geothermal from GEL. Group Activities Social lunch	29.11.2025 Location: Clay Tarmac, St Dennis Time: 10:00 - 1:00
 The role of Geothermal in Cornwall's Operations Activities and talk Social lunch	17.01.2026 Location: Estin Project Time: 10:00 - 1:00

ALL COMPLETELY FREE

www.criticalmineralschallengecentre.co.uk



photo Christie Van Tinteren

<https://criticalmineralschallengecentre.co.uk/>

Sustainable Finance



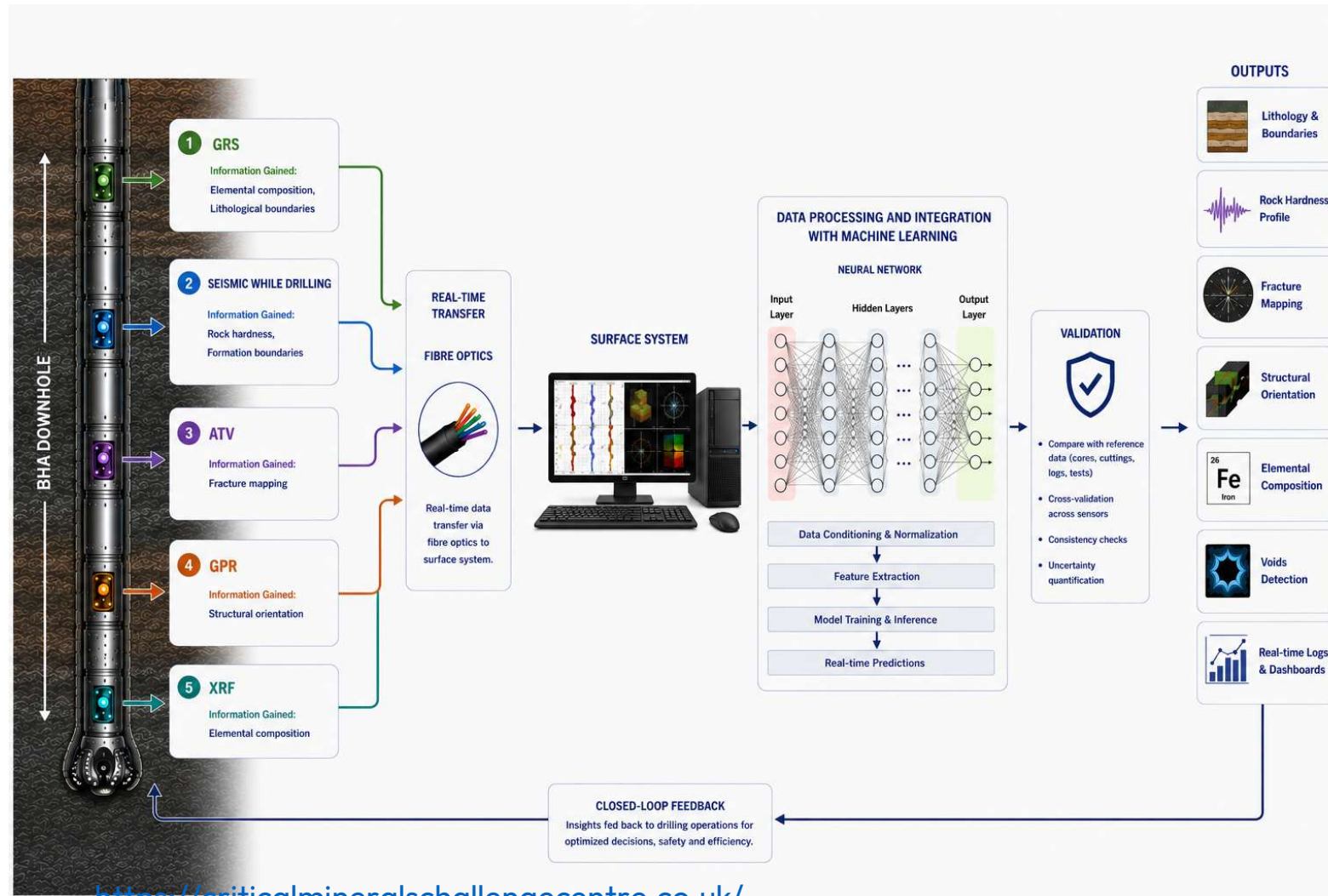
- Joint Business School and Camborne School of Mines study by Chenyan Lyu
- Conducting semi-structured research interviews with project leaders & investors
 - What are the gaps in funding?
 - Role of ESG?
 - How to speed up investment and project development?

<https://criticalmineralschallengecentre.co.uk/>

Extraction Technologies



Modelling future mining techniques, starting with a review of downhole sensors by Lesego Senjoba with Matt Eyre, Rich Crane, Matt Tonkins and industry partners, led by Geolorn



<https://criticalmineralschallengecentre.co.uk/>

Whole Systems approaches to materials stewardship including the Urban Mine

Critical Minerals Accelerating
the Green Economy Centre

World class REE deposits in the UK?
None – but we can take geological
views of resources available for recycling
We are doing this building on an LCA
approach to household inventory of elements:

Based on household figures from Hu, X and Yan, X (2023) Estimation of critical metal consumption in household electrical and electronic equipment in the UK, 2011–2020, Resources, Conservation and Recycling, 97, 107084, doi.org/10.1016/j.resconrec.2023.107084



<https://criticalmineralschallengecentre.co.uk/>

What Success looks like



Positive profile of projects attracts new green sector investment



New UK products worldwide e.g. ecology services

Critical Minerals Accelerating the Green Economy Centre



Well on the way to 3000 good, new jobs



Strong Contribution to UK Industry strategic advantage



Photo: Cornish Metals



**Critical
Minerals
Challenge
Centre**



Critical
Minerals
Challenge
Centre



University
of Exeter



UK Research
and Innovation

Thank you!

Frances Wall - f.wall@exeter.ac.uk

<https://criticalmineralschallengecentre.co.uk/> - policy papers, MOOC, research

<https://cmeh.co.uk> - critical minerals equipment hub for commercial minerals processing and analysis

This work was supported by UK Research and Innovation (UKRI) Building a Green Future strategic theme, Grant 5052188.