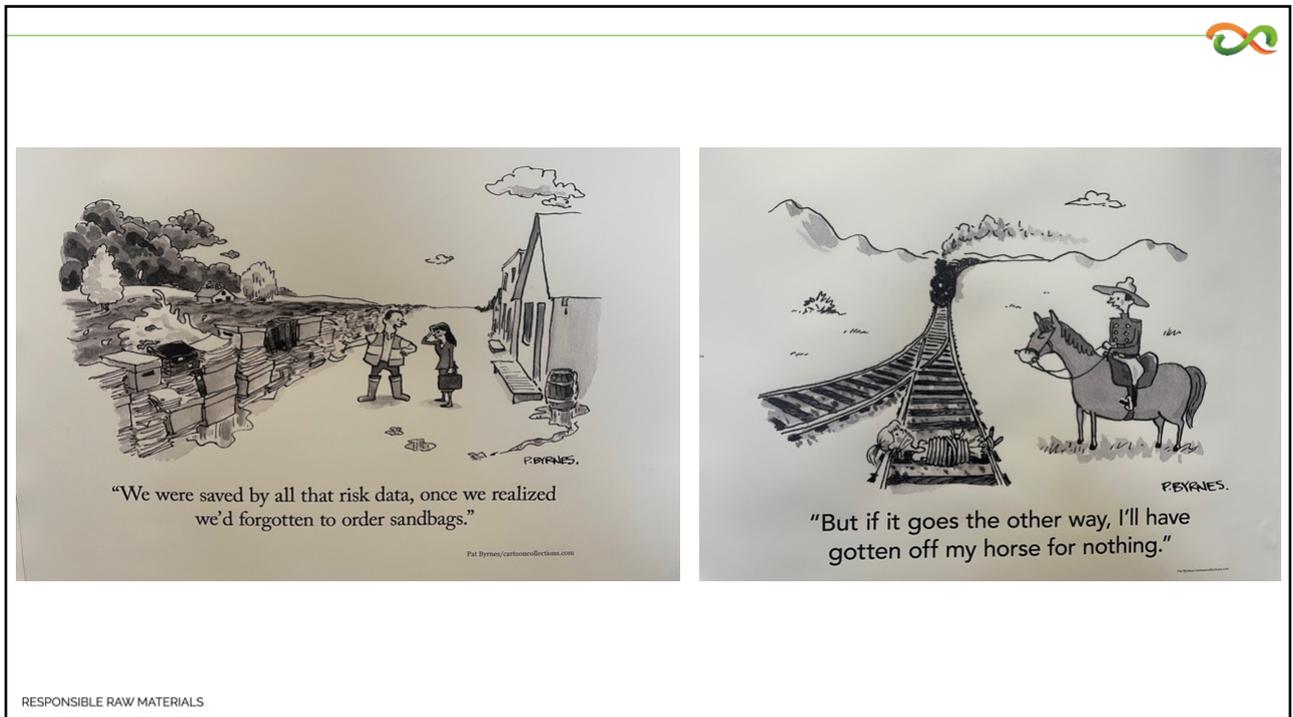




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2

**COP26 discussions / agreements:**

- 1.5 degree max increase (above pre-industrial levels) is still the aim
- Dramatic shift to renewable forms of power provision and energy storage.
- Significant reduction in use of coal
- End to deforestation (and boost to carbon sequestration)
- “Greenification” of finance
- Pledges of trillions of dollars including “loss and damages”
- “Just” transition




RESPONSIBLE RAW MATERIALS

3

**COP26 discussions / agreements:**

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Geoscience vital to find, mine, process and trade the materials needed for this infrastructure

“old” coal mines still have lots of uses and therefore value – we need to make use of the “post-closure”.

Carbon sequestration reliant on geoscience.

Geoscientists vital to advise and monitor success of where the money is being spent

Geoscientists vital to understanding where loss and damages have occurred.

Transition of skills between sectors with new competencies being developed = many rely on geoscience

RESPONSIBLE RAW MATERIALS

4

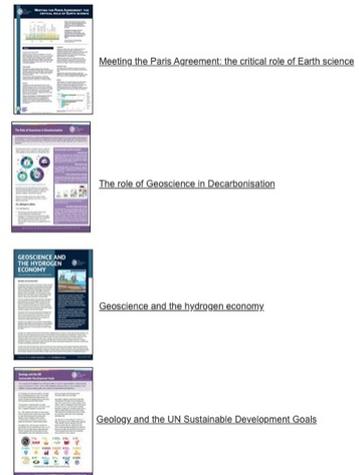


Some links:

Geological Society – Road to COP26:  
<https://www.geolsoc.org.uk/COP26>

Geoscience for the future blog:  
<https://geoscienceforthefuture.com/geoscience-reflections-from-cop26/>

Detail – ESG and mineral resource and reserves:  
<https://www.responsible-raw-materials.com/post/fammp-training-course>



RESPONSIBLE RAW MATERIALS

5



**COP26 discussions / agreements:**

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**What is missing.....?**

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6



**COP26 discussions / agreements:**

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Geoscience vital to find, mine, process and trade the materials needed for this infrastructure

**What is missing.....?**

**Opportunity: The UK still holds the pen on COP (until COP27...)**

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7



**What is the opportunity? – a reminder...**

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8

**Safe and efficient transportation Electric vehicle**

**The materials we desire are also changing**

**Li** Lithium  
**Co** Cobalt  
Lithium, aluminium and cobalt rich metal-oxide batteries emit no tailpipe pollutants when running, making a significant reduction in local air pollution.

**Al** Aluminium  
**Mg** Magnesium  
A 10% reduction in the weight of a car can result in a 6%–8% fuel economy improvement. Replacing cast iron and traditional steel components with lightweight materials such as magnesium or aluminium alloys can reduce the weight of a vehicle's chassis by up to 50%.

**Fe** **Mn** **Mo** **V**  
Steel (an alloy of iron and carbon) – strengthened using small additions of manganese, molybdenum and vanadium provides a strong yet lightweight frame for cars. There is increasing competition between steels and aluminium to provide the greatest efficiency.

**Cu** Copper  
The average car contains at least 15kg of copper. It's an essential component in the functioning of the motor, wiring, radiator, connectors, brakes and bearings.

**Dy** Dysprosium  
**Nd** Neodymium  
Electric cars are three to four times more efficient than combustion engines. Rare-earth metals are used in the motors and generators of many electric cars.

ICMM  
International Council on Mining & Metals

9

## Some stats....

### Leading scientists set out resource challenge of meeting net zero emissions in the UK by 2050

First published 5 June 2019

[f](#) [t](#) [e](#)

A letter authored by Natural History Museum Head of Earth Sciences Prof Richard Herrington and fellow expert members of SoS MinEralS (an interdisciplinary programme of NERC-EPSC-Newton-FAPESP funded research) has today been delivered to the Committee on Climate Change

The letter explains that to meet UK electric car targets for 2050 we would need to produce just under two times the current total annual world cobalt production, nearly the entire world production of neodymium, three quarters the world's lithium production and 12% of one year's total annual production of mined copper.

A 20% increase in UK-generated electricity would be required to charge the current 252.5 billion miles to be driven by UK cars.

Last month, the Committee on Climate Change published a report 'Net Zero: The UK's Contribution to Stopping Global Warming' which concluded that '*net zero is necessary, feasible and cost effective.*' As a major scientific research institution and authority on the natural world, the Natural History Museum supports the pressing need for a major

<https://www.nhm.ac.uk/press-office/press-releases/leading-scientists-set-out-resource-challenge-of-meeting-net-zero.html>

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10



## For example: Electric vehicles in the UK

### Demand:

UK government has pledged (in legislation) to honour the proposals that all new cars should be battery electric by 2035 and the UK private car fleet will be all battery electric by 2050. This sets a major resource supply challenge for the UK, as a group pointed out in a [letter](#) to the CoCC in May.

An electric car weighs twice as much as a conventional car, requiring more energy to propel it. This is owing to over twice as much metal being used compared to a conventional car, including 3 to 4x as much copper ([Copper Development Association](#)), and even more nickel, graphite, cobalt, and lithium.

### Supply gap:

Prof Richard Herrington, Natural History Museum, + other UK scientists calculated that as a result, the UK fleet requires:

- 207,900 tonnes of new cobalt,
- 264,600 tonnes of lithium carbonate (LCE),
- 7,200 tonnes of Nd-Dy and
- 2,362,500 tonnes of copper.

This is equivalent to the UK needing the following to meet its own targets JUST for electric vehicles:

- twice the annual global production of cobalt,
- the entire global production of neodymium,
- three quarters of the world's lithium and
- half the world's copper supply.

Scaling this to the world's car fleet, this means increasing current world REE production by 70%, doubling copper production, and increasing cobalt production by three and a half times through until 2050 to satisfy these demands.

<https://www.nhm.ac.uk/press-office/press-releases/leading-scientists-set-out-resource-challenge-of-meeting-net-zero.html>

<https://www.copper.org/environment/sustainable-energy/electric-vehicles/>

11



## For example: Carbon footprint for the production of the metals in the UK electric vehicle fleet (not powering the vehicles)

### Demand:

zero

### Supply gap:

Energy cost of metal production:

- Estimated to be 7000 - 8000 kWh for every tonne of Cobalt produced
- Estimated to be 9000 kWh/t for Copper
- Rare Earth Elements at least 3350 Kwh/t

= for the 31.4 million cars in the UK, this requires 22.5 TWh of power to produce the new metals for the UK electric vehicle fleet.

*(This is the equivalent to 6% of the UK's current annual electrical usage, however remember that most of this energy will be used in countries other than the UK, however would be included in the carbon footprint)*

<https://www.nhm.ac.uk/press-office/press-releases/leading-scientists-set-out-resource-challenge-of-meeting-net-zero.html>

12

## For example: Carbon footprint for the charging of the UK electric vehicle fleet



**Demand:** zero

### Supply gap:

Assuming no improvement in efficiency (which is a worst case scenario)

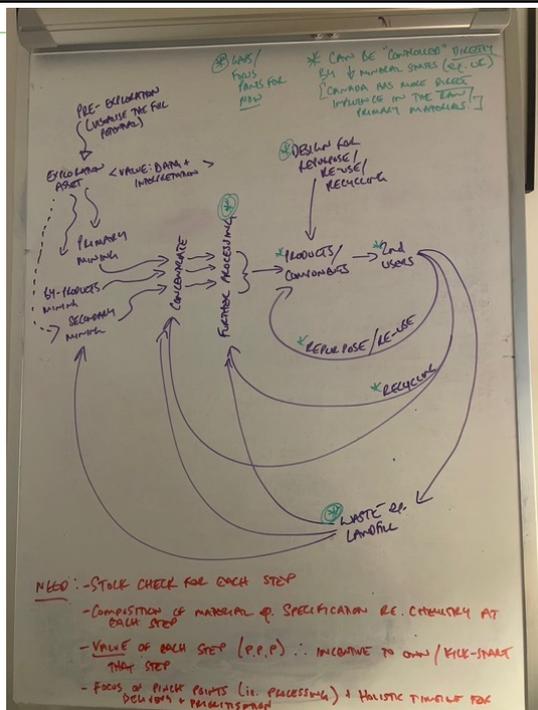
- The 31.5 million cars will drive 252.5 billion miles.
- The electric vehicles are double the weight of a fuel-powered car and so required more energy to move.
- This will need at least 63 TWh of power
- Total electricity generated in the UK in 2019 was 323.7 TWh
- Therefore, by adding in the requirement for the charging of electric vehicles, we need to increase the UK total power requirements by 20%.
- Which requires more e.g. wind turbines etc... which in turn require more minerals and metals...

<https://www.nhm.ac.uk/press-office/press-releases/leading-scientists-set-out-resource-challenge-of-meeting-net-zero.html>

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/877047/Press\\_Note\\_March\\_2020.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/877047/Press_Note_March_2020.pdf)

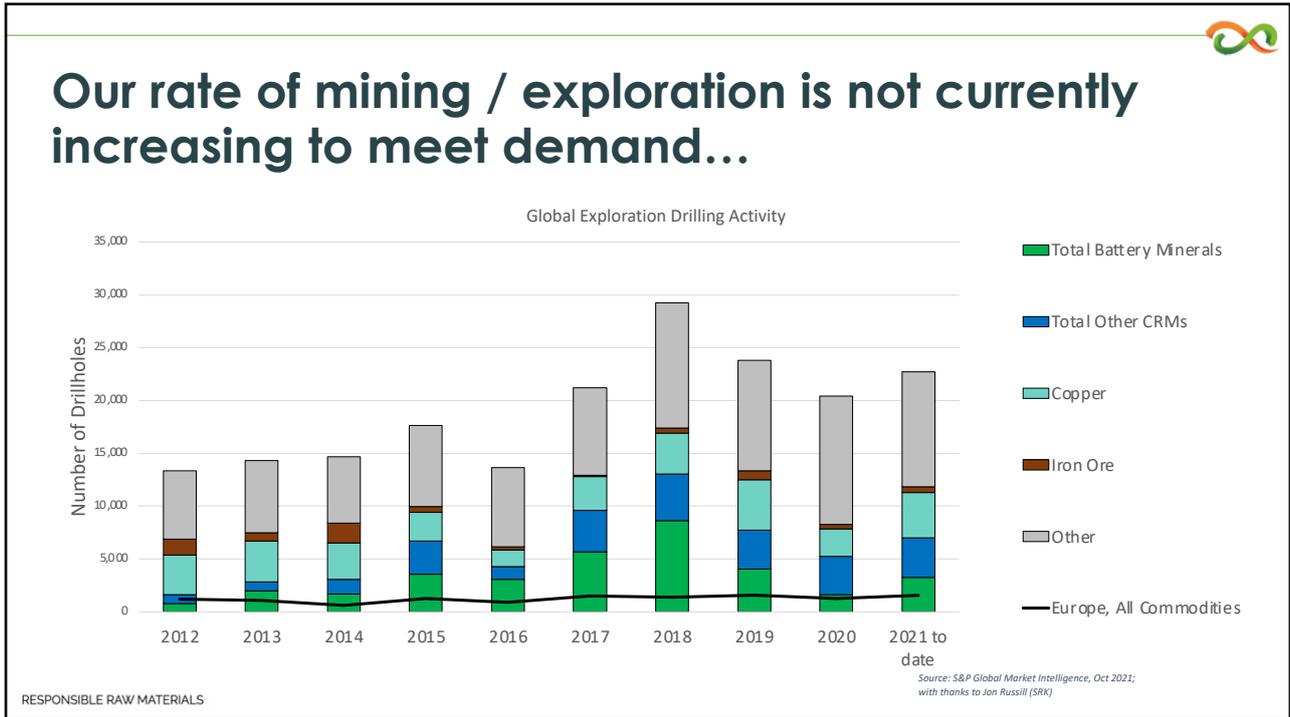
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## The circular economy helps.... But will take years to develop to meaningful volumes

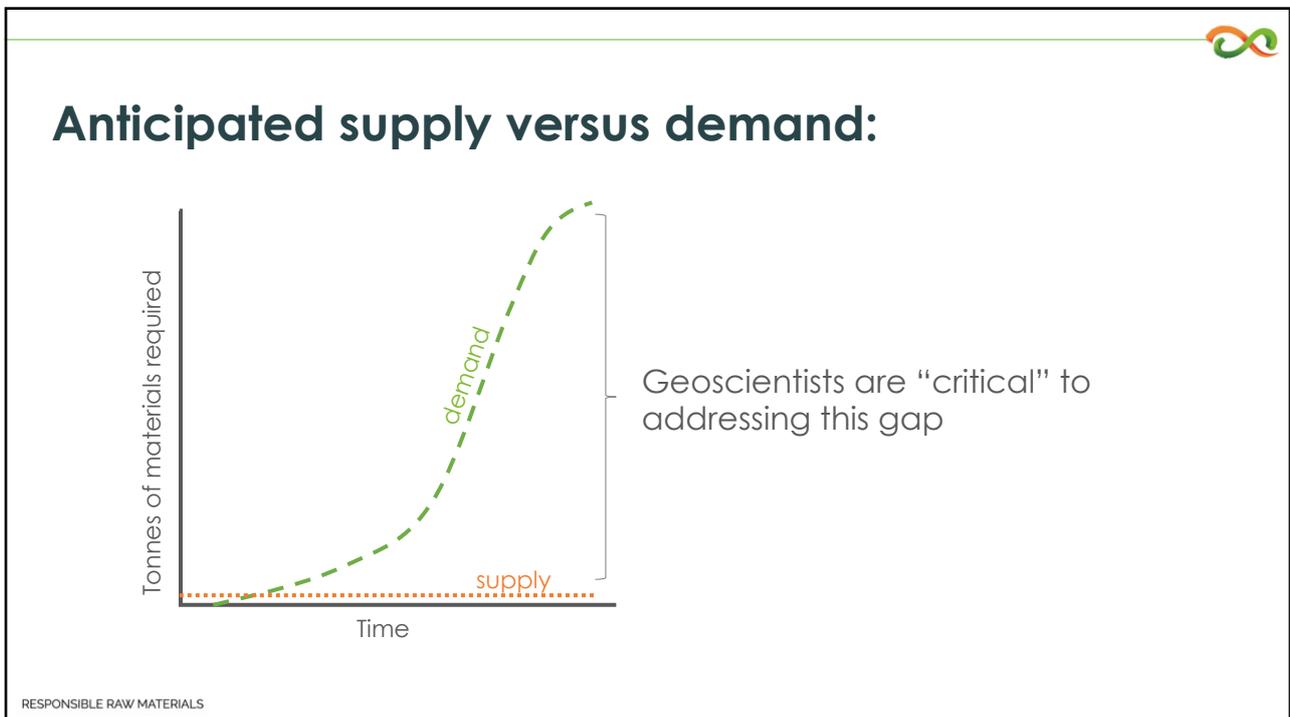


Scribbles from bi-lateral event looking for UK's / Canada's "gap in the market" for raw materials using the circular economy

14



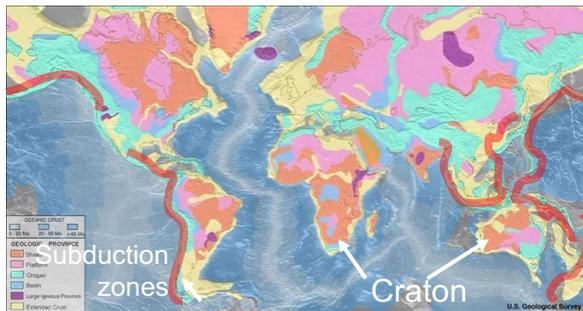
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16



**It gets better.... Many of the materials come from more developing countries.**



We just need to make sure we extract, process and trade materials responsibly.

RESPONSIBLE RAW MATERIALS

17



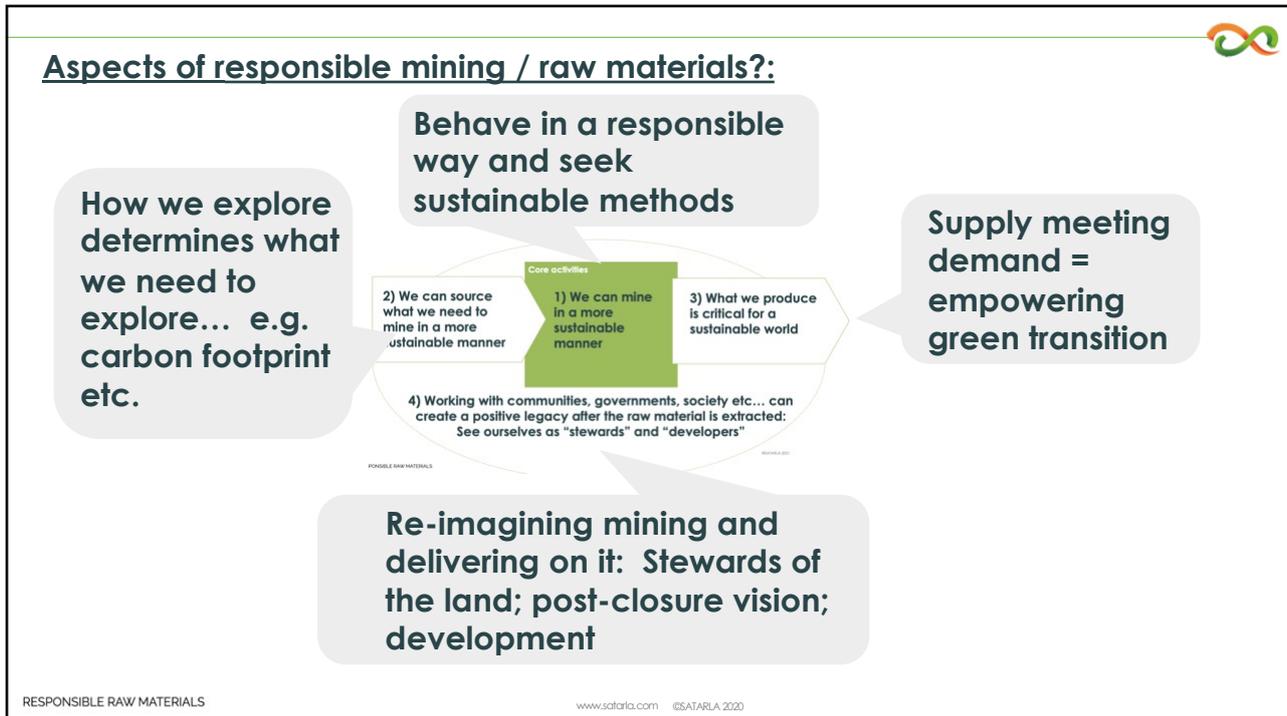
**Aspects of responsible mining / raw materials:**



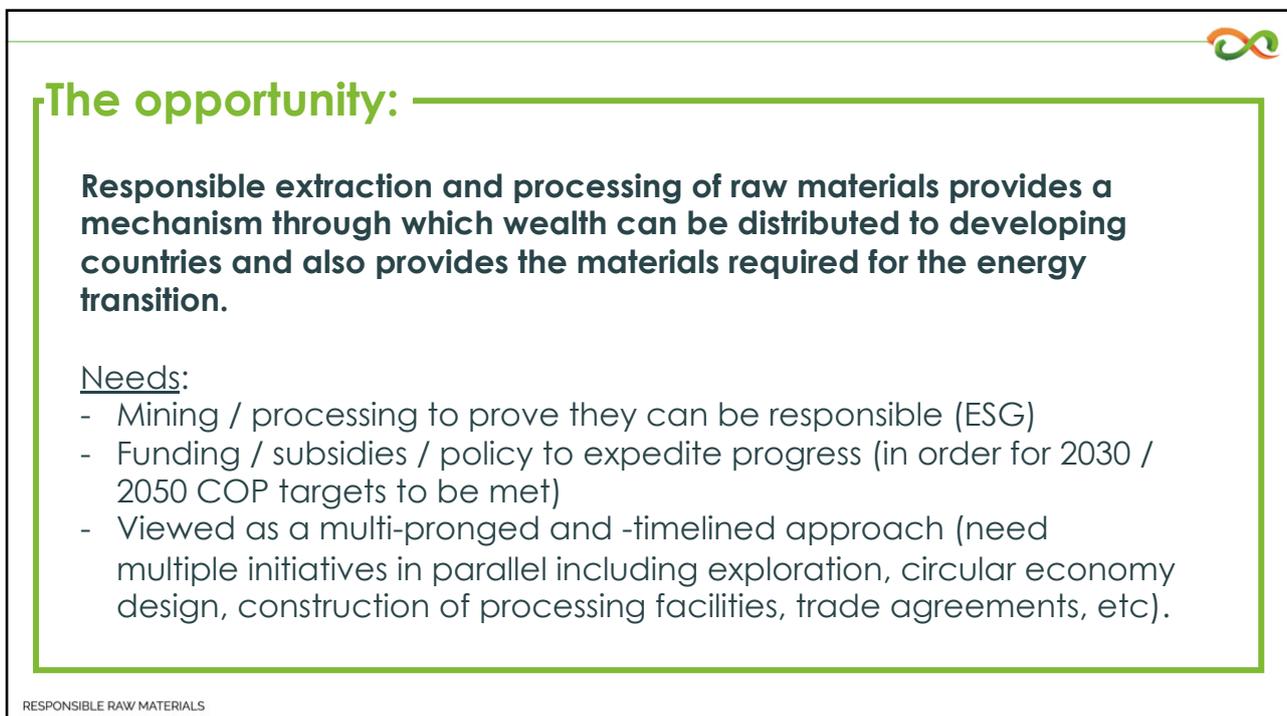
RESPONSIBLE RAW MATERIALS

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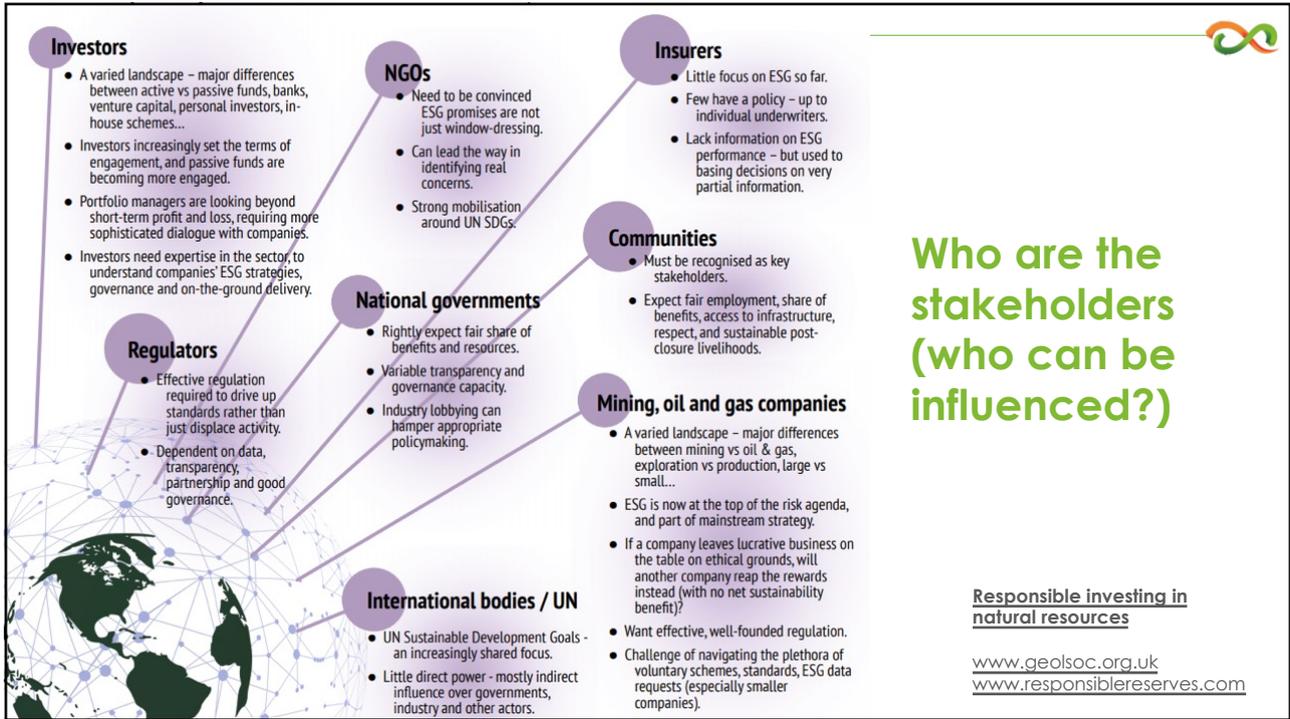
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19



20



## Who are the stakeholders (who can be influenced?)

Responsible investing in natural resources

[www.geosoc.org.uk](http://www.geosoc.org.uk)  
[www.responsibleinvesting.com](http://www.responsibleinvesting.com)

## What have we been doing?

(and what is beginning to work?)

Working with **government** to encourage them to understand the “opportunity” posed by the raw materials sector... especially in post-brexite Britain.

- Papers that have ended up on Boris Johnson's desk. (<https://www.satarla.com/post/esg-paper-launch>)
- Run free training courses for civil servants and MPs on what mining is and ESG in mining
- Helped to facilitate meetings / workshops / roundtables with other nations on raw materials e.g. Canada, Australia = tripartite work on raw materials.
- Expert committee on raw materials established in November = advise UK government on mining.

**Message:**  
 Where can **[the UK]** be world-leading?

RESPONSIBLE RAW MATERIALS

**INTRODUCTION TO MINING – MP Researchers**  
 CRITICAL MINERALS ASSOCIATION TRAINING COURSE

This specialised 4 module course has been developed for MPs and will be delivered by a qualified experienced trainer. The training will be delivered in 2 x 2 hour sessions.

**ESG IN MINING – 4 MODULES**

- WHAT IS ESG IN MINING?**
  - What is ESG / Sustainability?
  - What is mining?
  - Why is mining required to deliver a sustainable planet?
  - What is meant by responsible mining?
  - What are the challenges and opportunities for responsible mining?
- ESG ACROSS THE MINING VALUE CHAIN**
  - Frameworks, principles and guidelines relevant to mining.
  - What are the good ESG practices that the sector has implemented and what are the challenges?
  - What does the "Net Zero" target mean for the mining sector?
  - The role of the circular economy.
  - Importance of ESG issues and the role of the mining sector.
  - How does ESG impact on mining companies and society?
- THE PERSPECTIVES AND ROLES OF STAKEHOLDERS**
  - Risks, responsibilities and incentives in mining.
  - Role of the mining sector in the UK.
  - Role of the mining sector in the UK.
  - Role of the mining sector in the UK.
- TOOLS AND TECHNIQUES**
  - Why, how and when to monitor ESG.
  - Tools and techniques for monitoring ESG.
  - Reporting and communicating on ESG.
  - ESG data requests (especially smaller companies).

**WHAT AND WHY MINING**

- What is included in mining?
- What is not included in mining?
- The UK's investment strategy (current and future potential).

**MINING VALUE CHAIN**

Steps to be explored in the course:

- Exploration
- Processing
- Shipping and sale
- Manufacture
- The circular economy

**MINING COMMODITIES**

- For various commodities, we will explore:
- Where is the commodity located on earth?
- How is it mined?
- How is it processed?
- Are there any other uses?

**ROLE OF GOVT IN RESPONSIBLE MINING**

- Government's role in responsible mining.
- The direct role of government in mining.
- The indirect role of government in mining.
- The role of government in mining.



# What have we been doing?

(and what is beginning to work?)

Working with **finance** regulatory requirements such as the Taskforce for Climate-Related Financial Disclosure and mining companies to show where they need to change their strategy

**Message:**  
*Make sure the raw materials sectors are in the mix = can be funded.*

**AND**

*Make sure raw materials companies understand what they need to be doing.*



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23



# What have we been doing?

(and what is beginning to work?)

Working with **mining companies** to ensure they understand what ESG actually means for them – both the opportunities and threats (and strategic as well as nitty-gritty)

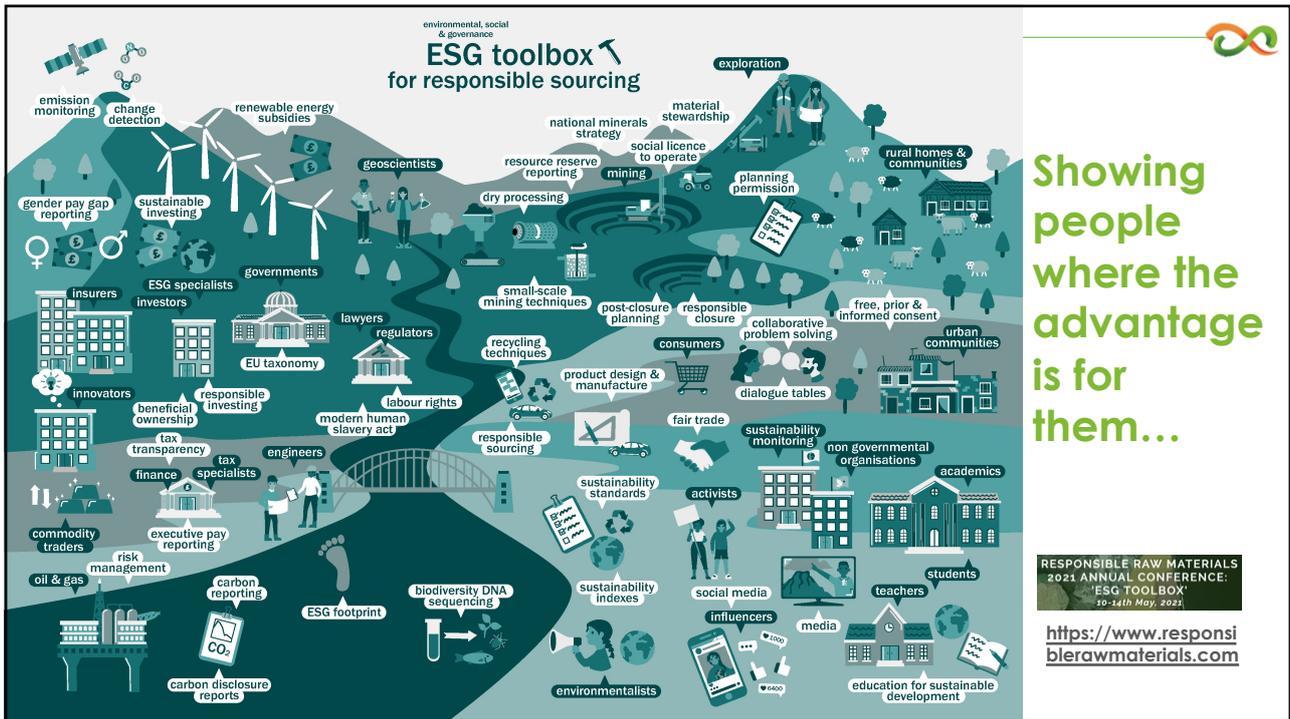
- Updates to mineral resource & reserve reporting codes (e.g. PERC). <https://www.responsibleawmaterials.com/r-round-tables>
- Translation of endless ESG / sustainability standards and guidelines so that they are manageable for the smallest company. <https://diabee.com/esg>
- Awareness through dialogue tables, roundtables, conferences. <https://www.responsibleawmaterials.com/>

**Message:**  
*ESG is core to mining and provides massive opportunity (as well as if you don't do it, you can't be funded...).*



RESPONSIBLE RAW MATERIALS

24



Showing people where the advantage is for them...

### COP26 discussions / agreements:

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- "Just" transition

### Back to COP...

- The UK government is beginning to understand the opportunity. "A fire has been lit".
- As a geoscientific community, we can use this. We need to quickly articulate clear actions with their benefits. Change will happen.

RESPONSIBLE RAW MATERIALS



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