VIEWPOINT

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The Rockwood Lithium Mine, Silver Peak, Nevada. Colin Reeves questions whether we fully grasp the step-change in extraction volumes required to achieve the green revolution

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COLUMN

Balancing our resource needs

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There can be no net zero without mining more – and faster. Colin Reeves asks, "Where is the next generation of informed Earth scientists in this debate?"

While 'stopping oil now' may be unrealistic, phasing out the consumption of fossil fuels over the next few decades is an immense challenge for humankind that more and more countries and people are signing up to. I am not convinced that Earth science professionals, let alone the public at large, realise the step-change in the rate of extraction and consumption of minerals and elements that is implicit in this strategy.

The new role of niche minerals and elements such as lithium may be obvious, but wholesale electrification of the world is impossible without vastly increased supplies of copper for transmission lines, not to mention the burgeoning demand for steel, cement, fertiliser and sand etc. that comes with increasing personal wealth and sophistication of lifestyles everywhere. Think better homes, schools, hospitals, infrastructure, and human nutrition and their inevitable raw materials input (Conway, 2024).

Much of the world has, as yet, little to recycle.

Prime mover

Many years spent working in Africa, Canada and Australia caused me to realise that the role of 'prime mover' in geoscience is typically played by the mineral exploration and exploitation industry. Mining, in short. Are the students of today – and their mentors – aware of this real-life challenge and career opportunity? Declining student enrolment suggests otherwise.

'At what cost to the environment?' is, of course, the next question. Fairly or unfairly, mining has long been charged with degrading the environment. While there are examples of wanton destruction in pursuit of profit, there are increasing examples of better practice and remediation in the industry. It is often forgotten that the same charges may be made justifiably against the development of agriculture worldwide. Humankind benefits from both activities.

The commercial mining sector itself appears equivocal about facing the necessary challenge (*The Economist*, March 2025). Adverse government policies, nimbyism and environmental restrictions only discourage the large upfront investments that will clearly be necessary to produce the resource streams net zero will require ten to twenty years hence. Without intervention, future raw materials will be sourced primarily from poorly governed countries with lax environmental laws. And exploration will be pursued there by the least-scrupulous companies and organisations. Some environmental cost is inevitable if we are to move forward but we should strive to minimise it globally.

Responsible debate

What is missing – and should emerge – is a responsible and intelligent debate over the balance between resource needs and environmental costs at global scale. Turning our backs on the role of Earth science in this debate is not part of a logical approach. It would be most unfortunate if the well-intentioned environmental considerations of today became an obstacle to longer-term sustainability.

COLIN REEVES
Professor in Exploration Geophysics (retired and based in The Netherlands)

FURTHER READING

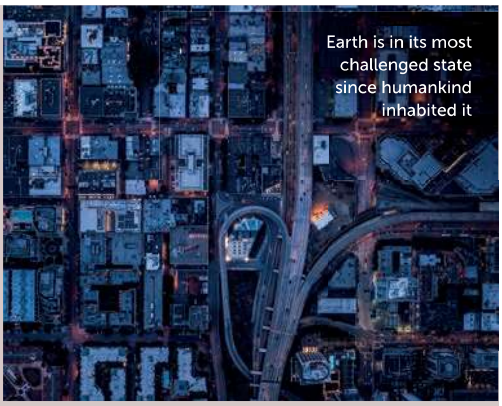
A full list of further reading is available at geoscientist.online.

- Conway, E. (2024) Material world. Ebury Publishing, 512 pp.
- The Economist. (2025) Should BHP, Rio Tinto and Vale learn from Chinese rivals? 22 March; economist.com

COLUMN

Breaking down silos

John Ludden argues for the power of collaboration in a connected world



Earth is in its most challenged state since humankind inhabited it

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We are at a critical time geopolitically and it is appropriate, given the current state of the planet, to ask the question, 'what Earth do we want to live on?'. Is it one where economic growth is continually threatening key tipping points? Or is it one where the systems that govern the planet and its people allow for a more holistic view of life on Earth?

Geoscience – the basic science of how the dynamic Earth has evolved and will evolve in the future – is critical for addressing these questions. Geoscientists are essential for ensuring the healthy functioning of Earth and contributing to the safety of our planet. But we cannot do it alone – collaboration is key.

We live on a dynamic system of plates. In general, we understand their workings, but we struggle to predict hazards and the risks to people and infrastructure. Better monitoring systems, satellite technology and the use of artificial intelligence on multi-sourced databases are essential.

Geoscientists can help protect and ensure clean, adequate water supplies, especially in challenging areas such as Africa where much of the water is underground. Likewise for soils and ecosystems that need to be nurtured and are located in the critical zone where lithosphere meets hydrosphere and atmosphere.

As we adapt to a warmer and more urban world, and transition to low-carbon societies, runaway economic growth and resource development must be curbed and become sustainable. Geoscience is essential for managing the subsurface that will be used in the energy transition in areas such as geothermal energy, carbon capture, energy storage, resource extraction, and waste management.

To achieve this requires geoscientists to move away from our silos and engage not only with other geoscientists, but with engineers and socio-economists who will help us deliver solutions to the crises facing our planet. Opening new frontiers – for example, in planetary and lunar exploration, deep-sea mineral resources, and geoengineering to address climate change – requires oversight and best practice in the geosciences, as well as open exchange between geoscientists, policy makers and the public on difficult questions.

Our geoscientific advice will be required in a regime of tougher environmental regulation and greater public scrutiny, set against a backdrop of global digital communications and social media that can make environmental services harder to manage due to disinformation and extreme positions from both exploiters and activists.

As geologists we must embrace the term Anthropocene – one of the few geological concepts (aside from Jurassic) that the public can easily engage with. The term acknowledges that human impacts on the planet are measurable and long-lasting and go beyond the realms of traditional geology and stratigraphy – it is the geology of humanity.

Earth is in its most challenged state since humankind inhabited it. It is incumbent on us to work with others and look toward the provision of geological-based solutions to save the planet we know and love.

JOHN LUDDEN
Outgoing President of the International Union of Geological Sciences (IUGS), now retired and a consulting geoscientist living in France

(This discourse was delivered by John Ludden at the 38th International Geological Congress in Busan in August 2024 at the end of John's mandate as President of the IUGS.)