Future-Proofing the Supply of Critical Minerals for Net-Zero Emissions

Summary report, January 2022

Overview

The 26th United Nations Climate Change Conference (COP26) in Glasgow, Scotland, in November 2021 delivered national emissions reduction pledges and commitments to reach net-zero by about mid-century. As the building blocks of renewable energy and electric vehicles, critical minerals, such as lithium, cobalt, and copper are vital for delivering a transition to net-zero emissions and safeguarding future economic resilience.

Demand for these materials will grow fast as governments and businesses take action to meet the goals of the Glasgow Climate Pact under the Paris Agreement. The World Bank estimates that three billion tonnes of metals and minerals are needed to decarbonise the global energy system by 2050. According to the Organisation for Economic Co-operation and Development (OECD), the world's demand for raw materials is expected to double by 2060[1].

Following COP26, the Permanent Mission of the United Kingdom (UK) of Great Britain and Northern Ireland to the United Nations and other international organisations in Geneva, together with the United Nations Economic Commission for Europe (UNECE), hosted a high-level briefing and discussion on 23 November 2021 on how to secure a resilient, sustainable and ethical supply of critical minerals for the transition to a net-zero economy. The event, *Future-proofing Supply of Critical Minerals for Net-Zero: Cross-sectoral Perspectives,* was joined by about 300 registrants from the public and private sectors.

Speakers presented and discussed how minerals can be mined, processed, distributed, tracked, re-used, and recycled effectively to increase supply sustainably and move towards a circular economy. The following is a summary of the discussions.

Taking COP26 Forward

Speakers outlined the importance of critical mineral supply to delivering on the Paris Agreement and Glasgow Climate Pact. Following COP26, over 90 per cent of the world economy is now covered by commitments to reaching net-zero emissions by 2050[2]. Scaling clean technologies to meet those commitments will require vast mineral inputs.

---

[1] OECD (2019), *Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences*, OECD Publishing, Paris, https://doi.org/10.1787/9789264307452-en.

[2] UNFCCC (2021), *World Leaders Kick Start Accelerated Climate Action at COP26,* Press Release, https://unfccc.int/news/world-leaders-kick-start-accelerated-climate-action-at-cop26

The importance of critical minerals lies in the anticipated rapid and long-term growth of sectors involving advanced technology and manufacturing processes. These sectors include electric vehicles, renewable energy technology such as offshore wind, robotic technologies using motors and sensors, and optical fibres for communications. The projected number of electric vehicles is expected to grow to 31 percent of the global light-duty vehicle fleet, reaching nearly 675 million on the road[3].

As the U.K. Prime Minister's Envoy for Economic Resilience and Chair of the G7 Panel on Economic Resilience, Lord Mark Sedwill, noted during the session, “critical minerals, semiconductors, and data are the oil, steel, and electricity of the 21st century”.

Speakers identified the following key areas for focus in accelerating the sustainable, resilient, and ethical supply of critical minerals:

(a) The need for strong Environmental, Social, and Governance (ESG) standards in production, to ensure economic benefits are shared and to minimise environmental impact.
(b) The importance of transparency and traceability along the value chain.
(c) The need to accelerate the transition towards a circular economy and make greater use of secondary resources.
(d) The need to leverage the full potential of trade policy in supporting this effort.
(e) The importance of stringent climate and sustainable development policies and legal frameworks for sending clear signals to suppliers.

Responsible and Sustainable Production

Growing demand for manufacturing materials like lithium and cobalt is shifting resource competition and investment to the Global South. These minerals are not only a prerequisite for accelerating a green transition, but if responsibly extracted and produced, can be powerful sources of social and economic development in source countries. This depends on the use of strong ESG standards[4].

Yet many of the world’s technology-critical mineral and metal reserves are in countries with weaker ESG standards and high carbon emissions. The International Institute for Sustainable Development (IISD) mapped production against indicators of conflict and vulnerability to identify potential new hotspots of fragility in green energy supply chains. Their 2018 report called for embedding greenhouse gas emissions accounting into supply chain evaluations from production. It asked that other considerations be taken into account, including local pollution and water use, ensuring worker safety and human rights, and avoiding conflict financing.

---

[3] EIA (2021), *EIA projects global conventional vehicle fleet will peak in 2038,* Today in Energy, https://www.eia.gov/todayinenergy/detail.php?id=50096

[4] The International Council of Mining & Metals (ICMM) has found that mining-dependent countries have managed to develop faster than countries that are not endowed with these metals and minerals. Within mining-dependent countries, those with “sound governance” across the public and private sector have outperformed countries where the levels of governance are less strong. These measurements are based on a range of sustainable development indicators: ICMM (2018), *Social Progress in Mining-Dependent Countries: Analysis through the lens of the SDGs*, http://www.icmm.com/en-gb/research/social-performance/social-progress-1-2018

Tools to promote responsible sourcing include:

- The International Council of Mining & Metals (ICMM) 10 mining principles provide a framework for companies and governments to minimize harm and maximize benefit in minerals production.
- The OECD Due Diligence Guidance on responsible use of minerals, which supports companies to respect human rights and avoid contributing to conflict through their mineral purchasing decisions and practices.
- More stringent requirements and standards are being instituted, such as the London Metal Exchange (LME) requiring third-party audits of supply chain due diligence.

Transparency and traceability tools

Key to promoting investment in ethical and environmentally friendly sources of critical minerals are predictability and transparency. Resources must be classified and managed in ways that integrate risk factors, including production concentration, social and environmental issues, and supply chain geopolitical risks. The UNECE's United Nations Framework Classification for Resources (UNFC), provides a tool for such holistic analysis, classifying and reporting natural resources in alignment with the 2030 Agenda. In addition, the United Nations Resource Management System (UNRMS), under development, will provide a set of standards for integrated management of natural resources from an economic and environmental standpoint.

The British Geological Survey has applied UNFC to mineral resources in the UK. The framework is used to calculate resource estimates, determine uncertainty, and make international comparisons. In so doing, issues were identified, including data quality, mineral data availability, and resolution of the data to undertake the analysis. More reliable estimates of critical mineral resources require consistent reporting of data on the by-product nature of many minerals.

Having resources in the ground is not enough. Some of the rocks containing the materials require harsh and complicated downstream metallurgical processes to refine and make it usable for various clean energy uses. UNFC is the only available international system that considers the whole mineral value chain and makes the correct assessments based on the environmental-social-economics and technological maturity of the metallurgical processes. Such assessments need to include proper environmental management and safety precautions, which may be required if hazardous chemicals are used in the process steps.

Traceability systems provide a means to track materials along supply chains, including ensuring adherence to ESG standards. Digital tools such as distributed ledger technologies are increasingly being employed to do this but must be underpinned by common data exchange standards to ensure interoperability. Based on UNECE's Action Pack on transparency and traceability of supply chains in textiles and footwear[5], UNECE's newly established Team of Specialists on ESG Traceability in Sustainable

[5] For more information, see UNECE Recommendation No. 46 and relevant UN/CEFACT standards developed under the project.

Supply Chains for the Circular Economy will develop standards and tools that support supply chain traceability across a range of sectors, including minerals

Circular Economy

A move towards a more circular economy, in which minerals stay in circulation for longer once extracted, is another essential part of the solutions to securing a sustainable and resilient supply, reducing demand for primary raw materials, and diversifying supply sources. For many such minerals, recycling and reuse practices are still nascent. For example, less than 1 per cent of lithium is currently recycled[6].

Extracting maximum value from secondary raw materials requires mapping and understanding of how they interact with primary resources. It requires a systems-based approach focused on stocks and flows models that integrate economic, environmental, and social considerations throughout the value chain, and a greater understanding of the vital time dimension of when supplies will be needed relative to when stocks will become available. The update of UNFC to include anthropogenic resources facilitates this process.

The nascent understanding of the system of critical raw materials remains a key challenge to building the systems-based approach. The issue lies in data availability and a lack of interoperability between raw materials data sets from different countries and primary and secondary raw materials. The Met4Tech research centre in the UK is investigating these challenges by exploring how to develop a circular economy for technology metals, guidelines, and best practices for the use of UNFC and UNRMS.

Governments and businesses are increasingly looking to international standards to support the scaling of circular economic approaches. For example, the International Organization for Standardization (ISO) is developing standards on the circular economy through its Technical Committee 323 (TC323). In addition, a new Strategic Advisory Group on Critical Minerals will look at these crucial materials from a holistic perspective, identifying gaps in the current standards landscape and promoting join-up between relevant technical committees.

International Trade and Mitigating Policy Uncertainty

Trade can be a powerful tool in accelerating circularity by enabling economies of scale and the proliferation of green technologies. Trade policy can help ensure resilient supply by reducing friction in the movement of goods across borders, lowering tariffs on key goods, and addressing market constraints for scaling clean energy solutions.

Insights from the COVID-19 pandemic have helped World Trade Organisation (WTO) to identify avenues to improve supply chain resilience. At the same time, the WTO's work programme on trade and environment provides numerous mechanisms for collaboration on trade policy issues, including supply chain traceability, that relate to environmental considerations.

To address the 'boom and bust' cycles that have previously affected the minerals

[6] Materials Advances (2021), *Technologies of lithium recycling from waste lithium ion batteries: a review,* Publishing.rsc.org, https://doi.org/10.1039/D1MA00216C

sector, speakers during the session suggested observing previous market failures, looking at distorted price signals, such as inefficient subsidies, unfriendly tariffs, and taxes, and managing 'red tape'. By providing greater stability and predictability, market operators will benefit as they galvanize the investment flows needed for the global clean energy transition.

To drive investment flows, narrowing uncertainty around government climate and sustainability policies is an important lever in signaling to suppliers the direction of travel. Government intervention is a means to drive investment in alignment with the goals of the Paris Agreement on climate change and the 2030 Agenda for Sustainable Development. Public finance and regulation are two important modes of intervention to channel necessary investment.

Finally, a just transition to a low carbon economy means accounting for the specific needs of developing countries and small and medium enterprises (SMEs). Delivering a clean energy economy will affect mining communities and workers, which needs to be considered in setting policy regulations and standards.

Conclusions

As a key condition to implement the ambitions of the Glasgow Climate Pact and the goals of the Paris Agreement, there is a need for a resilient, sustainable, and ethical supply of critical raw materials. Governments are responsible for providing an enabling environment for business and finance to act while providing a level playing field. The private sector needs to work with supply chain partners for sustainable commodity production and use while employing reliable data and modelling in economic and environmental assessments.
As discussed above, speakers identified how to drive these necessary shifts in the industry and international markets across three domains:

First, data, transparency, and traceability are vital assets to sustainable supply chains. There is a multitude of tools for governments to use to ensure it. Reliable data for tracing the supply chain and modelling for economic and environmental factors underpin an effective strategy for critical mineral production. However, there is a need to improve and propagate the data and digital tools.

Second, Environmental, Social, and Governance (ESG) standards are enablers of both more competitive extraction and production of minerals, as well as an important constrain on irresponsible practices in many parts of the world. Trade rules and standard-setting bodies are instruments for doing so. Applying ESG standards is a means for countries to reach higher recycling rates and deeper circularity. Fortunately, we are becoming more aware of the financial and ESG potential in reducing the pressure on the environment and how economies can grow their extractive industries. Lastly, governments and non-governmental actors alike need to take the lead to signal the markets on the new pathway that governments are likely to take. Regulatory signals through multilateral platforms are an essential trigger to this way forward. Stakeholders must better understand supply chain bottlenecks while reflecting on trade policies and how they can complement standards instead of contradicting them.