Evidence Submission

Foreign Affairs Committee inquiry on critical minerals

28 February 2023

About us

With about 50,000 members in over 100 countries and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK's professional body for chemical scientists, supporting and representing our members in large multinational companies and small and medium enterprises, universities, schools, government and regulatory agencies. We also draw on chemistry using professionals' expertise to provide advice to Government to help it achieve its ambitions, whether regulating chemicals appropriately and responsibly[1], identifying priorities, opportunities and challenges in the chemical sciences[2] , or supporting the development of a UK circular economy[3].

Summary

The low-carbon energy transition relies on the supply of minerals such as lithium, indium and rare earth elements (REEs) like dysprosium and neodymium. Many of these minerals are classed as 'critical' because of their supply risk and economic vulnerability, while tin, tantalum and tungsten are also considered 'conflict minerals'. The primary extraction of these critical minerals is a significant contributor to global greenhouse gas emissions and has environmental and social impacts. Some minerals are particularly water-intensive to extract and therefore extraction activities may be exposed to climate risks arising from water stress. For all these reasons, a significant part of the UK's strategic approach to securing supplies must be introducing the policies that enable a circular economy for critical minerals. Coherent and harmonised long-term policies will be essential to safeguard the UK's supply of critical minerals while reducing the social and environmental impacts of primary extraction.

Our asks to the UK Government in brief:

1. Develop policies that support the transition to a circular critical minerals economy, including investment in a domestic recycling infrastructure.
2. Incentivise resource-efficient design and production alongside assessments of criticality and substitutability of materials.
3. Map and track critical mineral streams and regularly assess the criticality of minerals and other raw materials, taking into account the needs of different sectors.
4. Invest in processes that increase efficiency and reduce the environmental impacts of primary extraction.
5. Ensure the decision-making process about deep seabed mining is underpinned by robust evidence from a breadth of scientific disciplines, sectors and stakeholders, and sufficient time is given to evaluate it.

Our response in detail

Mineral criticality is determined on the basis of supply risk and economic vulnerability. The British Geological Survey have classified 18 minerals as highly critical for the UK, with a further five minerals on a watchlist[4]. These minerals are vital to the healthcare, security, aerospace and consumer electronics sectors and find significant use in information and communications technologies. Crucially, critical minerals are also at the heart of most of the technologies that will enable us to cut our emissions and decarbonise our economies[5]. Table 1 lists key uses for a selection of these critical minerals, and the location of major producers.

Table 1: Examples of critical minerals, their current usages and location of major producers. Compiled from: *UK criticality assessment of technology critical minerals and metals*[6].

Mineral	Usage	Major producers
Rare Earth Elements (REEs)	Permanent magnets of wind turbine generators, catalysts	China
Lithium	Lithium-ion batteries used in grid storage systems and electric vehicles	Australia, Chile
Tantalum	Capacitors in a range of electronics, super alloys	Democratic Republic of Congo, Rwanda
Indium	Photovoltaics, flat panel displays, solders	China

Tin, tantalum and tungsten are considered 'conflict minerals'[7] as well as critical minerals. Gold is the fourth in the '3TG' group of conflict minerals but is currently not classed as critical. Businesses in Northern Ireland have a statutory requirement to comply with EU Conflict Mineral Regulation, with an expectation that all companies who are importing 3TG minerals into Great Britain should be complying with OECD guidance on mineral supply chain due diligence[8]. We suggest considering the merits of formalising this requirement for the whole of the UK might help support importers and producers (e.g., compliance with standards or regulations might help to evidence their ESG credentials, or reassure investors and markets), while managing the risk of supply chains linked to human rights violations or conflict. In addition, environmental, social and governance requirements within the conflict mineral supply chain would support due diligence for these minerals.

The move to a low-carbon energy system requires a significant increase in mineral resources. This increase is anticipated in both absolute quantities of material and the relative proportion required by low-carbon development. The International Energy Agency estimates that, to meet current climate pledges, lithium demand will see at least a fourfold increase by 2030, with the proportion of demand from clean energy rising from about 50% to 80%[9].

The extraction and processing of natural resources (i.e. materials, fuels, and food) account for at least 50% of global greenhouse gas (GHG) emissions[10] and have significant impact on ecosystems and communities[9, 11]. More energy will be required to extract metals from lower grade ores due to declining resource quality, leading to increased GHG emissions and waste volumes[9]. Extraction processes for some minerals (e.g. lithium) are particularly water-intensive and so are vulnerable to water stress, making the processes potentially exposed to climate risks. In addition, the extraction and processing of minerals can lead to long-term pollution of water sources[12, 13].

The clean energy transition is essential to reaching net zero emissions, but it is vital that the environmental and social risks of increased mineral demands are managed carefully while also safeguarding supply chains. It is therefore important to move away from only considering primary extraction on its own to considering the whole system, including resource efficiency and recycling. This will require long-term, coherent policies and co-ordination and alliances with global partners.

We welcome the publication of the *Critical Minerals Strategy,* and the way it highlights the importance of a circular economy for critical minerals. We look forward to further detail and timescales for its implementation, as well as to the Government's consultation on Waste Electrical and Electronic Equipment (WEEE) originally announced for 2022. The UK should aim to keep pace with other nations in addressing supply security, including in light of the imminent ratification of the EU Critical Raw Materials Act and new EU batteries regulation.

Taking a systemic approach to diversifying the UK's critical mineral supply chains, we suggest:

a) Moving from a linear, take-make-waste economy to a **circular economy for critical minerals** will reduce reliance on overseas sources of critical minerals by reducing price volatility and reliance on primary extraction. These approaches also help to cut waste and reduce embodied energy of second-life products while also reducing the energy requirements and environmental impacts associated with mining and refining of primary materials, by orders of magnitude in many cases[14]. In addition, WEEE has economic value – estimated to be US$ 62.5 billion annually due to the precious metals and critical minerals that are contained in products[15].

b) A circular critical minerals economy requires greater recovery of the materials from end-of-life batteries and WEEE and the chemical sciences have an important role to play in this. However, enabling policies will be required, including building and investing in UK waste collection and **recycling infrastructure** to enable the recovery of critical minerals from secondary sources. An important part of enabling a greener circular economy for critical minerals will be empowering consumers to use and dispose of electric and electronic devices in more sustainable ways, emphasising the importance of repairing and reusing devices before recycling them. A nationally-representative survey by the Royal Society of Chemistry revealed a concerning trend in consumer habits regarding their household electronics[16]. At the time of the survey, 68% of UK households with unused devices, including mobile phones, computers, smart TVs, MP3 players and e-readers, have no plans to recycle or sell these after they fall out of use. In a follow-up survey[17] which highlighted the importance of public engagement in this area, just over half of respondents said they worry about the environmental effect of the unused devices they have at home, but either do not know what to do with them or are unconvinced the current processes available in their local area deal with e-waste effectively.

c) Incentivising **resource efficiency**[18] in design and production of products is key to reducing overall resource demand. **Product design** that enables efficient and simple deconstruction, reuse and recovery is also important for achieving a circular economy, and may need to be incentivised via regulation**. Material choice and substitution decisions** based on assessment of criticality in terms of resource availability, lifecycle and social impact as well as product performance should also be incentivised. This will require investment in research in the substitution of critical minerals. The chemistry research community is already active in these areas, and within industry and academia partnerships exist. However, further **coordination and collaboration** should be actively supported by government.

d) The UK needs to **map and track critical mineral streams,** as well as regularly re-assess the criticality of minerals and other raw materials, taking into consideration the needs of different sectors. Members of our community have raised concerns about the supply of critical minerals because of their crucial importance to the chemical sciences sector. Examples of these are the lanthanides, which are used in a variety of applications including in healthcare, and palladium, which forms the basis of many catalytic processes.

e) The environmental and social impacts of primary extraction should be addressed with clear and coherent **environmental, social and governance** (**ESG)** requirements at all points in the supply chain. The chemical sciences (including environmental chemists and chemical oceanographers) can contribute to better and more coherent environmental monitoring as part of ESG.

f) Investment in more efficient and less environmentally degrading primary extraction and processing – including novel hydrometallurgical approaches to extraction and refinement of materials from primary and secondary sources – is required, underpinned by life cycle assessment of products and services from 'cradle to cradle' to ensure informed decisions are made[19].

g) The impact, both temporal and spatial, of deep seabed mining is poorly understood at present, although it is likely to be significant[20, 21]. While a lot of progress has been made towards understanding the chemical environment in the deep sea, multiple knowledge gaps exist at the moment, including basic information about deep sea species and what the environmental baseline is. A cautious and comprehensive approach to decision making is suggested[20, 21, 202122, 23]. We recommend the **decision-making process about deep seabed mining is underpinned by robust evidence from a breadth of scientific disciplines, sectors and stakeholders**. Sufficient time should be given to evaluate the existing evidence, and address evidence gaps. Understanding the impacts of deep seabed mining may require investment in interdisciplinary research and presents an opportunity for the UK to show scientific leadership in this area. Science can, and should inform, international approaches to global challenges, and the chemical sciences have a role to play in doing this. There may be some learnings from United Nations Science Policy Panel (SPP) on Chemicals, Waste and the Prevention of Pollution that is currently being established. The RSC is involved in advising the United Nations Environment Programme on this and would be happy to discuss the role science has informing UN discussions on chemicals, waste and the prevention of pollution.

Contact

The Royal Society of Chemistry would be happy to discuss any of the issues raised in this submission in more detail. Any questions should be directed to policy@rsc.org.

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[1] A chemicals strategy for a sustainable chemical's revolution. Royal Society of Chemistry, 2020.
[2] Science horizons – Leading-edge science for sustainable prosperity over the next 10-15 years. Royal Society of Chemistry, 2019.
[3] Progressive Plastics. Royal Society of Chemistry, 2020-2022.
[4] Resilience for the Future: The UK's critical minerals strategy. UK Department for Business, Energy and Industrial Strategy, 2022.
[5] Decarbonisation: materials and circularity challenges for clean technologies. Royal Society of Chemistry, 2021.
[6] UK criticality assessment of technology critical minerals and metals. British Geological Survey, 2022.
[7] According to guidance on the EU Conflict Minerals Regulation, tin, tantalum, tungsten and gold trading in politically unstable areas can be used to 'finance armed groups, fuel forced labour and other human rights abuses, and support corruption and money laundering'.
[8] Importing 'conflict minerals' into Northern Ireland. Foreign, Commonwealth and Development Office guidance, 2021.
[9] The Role of Critical Minerals in Clean Energy Transitions. International Energy Agency, 2021.
[10] Global Resources Outlook 2019: natural resources for the future we want. UN Environment Programme, 2019.
[11] Critical raw materials in waste electrical and electronic equipment. Institute of Materials, Minerals and Mining, 2020.
[12] Metal mine water pollution. Natural Resources Wales, 2021.
[13] River Wear catchment metal mine water pollution investigations. UK Coal Authority, 2023.
[14] Report on Critical Raw Materials and the Circular Economy. European Commission, 2018.
[15] A New Circular Vision for Electronics. World Economic Forum, 2019.
[16] Elements in danger. Royal Society of Chemistry, 2019.
[17] Precious Elements. Royal Society of Chemistry, 2022
[18] Resource efficiency involves 'adding greater value to resources, maintaining that value by keeping resources in use for longer, and reducing the environmental impacts associated with the whole life cycle of resources, from their extraction to their disposal'. Resource Efficiency: Potential and Economic Implications. International Resources Panel, 2017.
[19] Life Cycle Assessment. Royal Society of Chemistry, 2022.
[20] Deep-sea mining evidence review. British Geological Survey, 2022.
[21] Decision-making on Deep-Sea Mineral Stewardship: A Supply Chain Perspective. World Economic Forum, 2022.
[22] Harmful marine extractives: Deep-Sea Mining. United Nations Environment Programme, 2022.
[23] UNCLOS: The law of the sea in the 21st century. UK House of Lords International Relations and Defence Committee, 2022.