

Global (Dis)Order
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Rewriting the rules: critical minerals and the politics of global trade

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Abstract

Surging demand for critical minerals (CMs) such as lithium, cobalt, nickel, rare earth elements, and copper is being driven by their essential role in clean energy technologies such as electric vehicle batteries, wind turbines, and energy storage. This increase in demand has propelled critical mineral policies (CMPs) to the forefront of national and international agendas as enablers of the global energy transition. This discussion paper maps and compares major CMPs across national, bilateral, and plurilateral levels, highlighting the contrasting strategies of resource-dependent and resource-rich countries. It also discusses the underlying ‘trilemma’ of CM governance: balancing economic welfare, sustainable development, and security objectives. It then analyses how CMPs are reshaping global trade governance through new institutional arrangements, club-based cooperation, and shifting supply chain geopolitics. In doing so, the paper situates CMPs as a pivotal arena of both opportunity and contestation in the emerging global economic (dis)order and the evolving landscape of resource governance.

Introduction

The global economy is undergoing profound changes driven by the urgent imperative of climate action and the accelerating digital revolution. At the centre of this transformation are critical minerals (CMs),¹ which are essential inputs for clean energy, defence systems, and information technologies. For instance, manufacturers use lithium, cobalt, and nickel to produce electric vehicle (EV) batteries and energy storage systems. They also use copper and aluminium in EV components, power transmission lines, and renewable energy installations, such as wind turbines and solar panels (Hund et al. 2020). The International Energy Agency (IEA) (IEA 2025) forecasts that the demand for CMs in clean energy technologies alone could double by 2030 under current policies and nearly quadruple by 2040 in a net-zero emissions scenario.

The challenges posed by rapidly escalating demand are compounded by the highly concentrated geography of mining and, more acutely, refining of CMs. For instance, Australia and Chile lead in lithium mining and the Democratic Republic of the Congo (DRC) in cobalt. China controls more than half of the world’s refining capacity for lithium, cobalt, and rare earths, and Indonesia accounts for over 40 per cent of refined nickel. These concentrations – projected to remain high or even increase by 2040 (IEA 2025) – create dependencies and supply chain vulnerabilities, amplifying the risks of price volatility, market disruptions, and geopolitical tensions.

These trends, coupled with the intensifying race among countries to secure CMs, have propelled critical mineral policies (CMPs) to the forefront of global resource governance. CMPs take many forms, from national strategies and bilateral agreements to plurilateral clubs and alliances. This discussion paper argues that CMPs are rewriting the rules of trade and resource governance as countries attempt to reconcile economic, sustainability, and security concerns, thereby driving new institutional practices while carrying a significant risk of contestation in the emerging global economic (dis)order.

¹ While definitions and methods for assessing mineral criticality vary, most focus on the material’s significance for national or economic security and the risk of supply disruptions (Srivastava & Kumar 2022, 2).

The evolving landscape of CMPs

CMPs can be defined as domestic or international policy instruments adopted by countries with the primary objective of governing CMs. This broad definition encompasses stand-alone national strategies, bilateral agreements, and plurilateral partnerships focused on: ensuring supply reliability and resiliency; promoting exploration, production, and innovation; or encouraging sustainable and responsible CM mining practices.² Although these policies differ in scope and form, they all have trade implications. This is due to the uneven distribution of mineral reserves, production, and processing across a limited number of countries, often not the same for different stages of the value chain, which creates significant trade dependencies for other countries (Srivastava 2023). CMPs centre on resource access, therefore, unlike traditional free trade agreements (FTAs), which are primarily designed to enhance market access through the reduction of tariffs and trade barriers, CMPs centre on resource access.

The number of CMPs has grown quickly over the past few years, driven by efforts to reduce supply chain vulnerabilities that were particularly exposed by the Covid-19 pandemic and Russia's invasion of Ukraine in 2022 (Allam et al. 2022). In this context, resource-dependent countries tend to adopt a proactive strategy focused on securing access, whereas resource-rich countries pursue a more defensive strategy aimed at maximising the benefits and strategic value of their mineral reserves (Crochet & Zhou 2024). These different priorities have led to diverging CMP approaches, albeit with some areas of overlap.

As a resource-dependent economy, the European Union (EU) has taken a leading role in the development of CMPs. It has identified 34 critical raw materials and in 2023 introduced the Critical Raw Materials Act (CRMA).³ The CRMA sets 2030 targets for the EU to extract 10 per cent, process 40 per cent, and recycle 25 per cent of its annual CM consumption, while capping reliance on any single country at 65 per cent per material. These targets illustrate the EU's ambition to curb its reliance on foreign suppliers, most notably China, which currently provides 100 per cent of the EU's heavy rare earth elements, alongside other dominant sources such as Turkey for 98 per cent of its boron and South Africa for 71 per cent of its platinum (European Council 2025). The EU has also signed strategic partnership agreements on sustainable raw materials with 16 resource-rich countries across six continents, including Argentina, Australia, Canada, Chile, the DRC, Namibia, Norway, and Rwanda.⁴

The United States (US) has likewise elevated CMs to a strategic priority. In 2022, the Biden Administration released America's Strategy to Secure the Supply Chain for a Robust Clean Energy Transition,⁵ a national plan to expand domestic mining and processing, invest in R&D for substitutes and recycling, and work with allies to ensure stable supplies. It also introduced the Inflation Reduction Act,⁶ which provides EV consumer tax credits conditional on the CMs in EV batteries being sourced from the US or countries with which the US has an FTA. This led to negotiations of new bilateral critical mineral agreements (CMAs) to extend 'FTA-like' status to

2 These policy areas are based on the IEA's Critical Minerals Policy Tracker, which currently counts 450 CMPs. IEA, 'Critical minerals policy tracker', last updated 21 May 2025, <https://www.iea.org/data-and-statistics/data-tools/critical-minerals-policy-tracker>.

3 Regulation (EU) 2024/1252 establishing a framework for ensuring a secure and sustainable supply of critical raw materials, 11 April 2024, <https://eur-lex.europa.eu/eli/reg/2024/1252/oj/eng>.

4 The full list of EU memoranda and partnerships can be found at: European Commission, 'Raw materials diplomacy', accessed 16 February 2026, https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/raw-materials-diplomacy_en.

5 US Department of Energy, America's Strategy to Secure the Supply Chain for a Robust Clean Energy Transition, 24 February 2022, https://www.energy.gov/sites/default/files/2022-02/America%E2%80%99s%20Strategy%20to%20Secure%20the%20Supply%20Chain%20for%20a%20Robust%20Clean%20Energy%20Transition%20FINAL.docx_0.pdf.

6 Inflation Reduction Act, 8 April 2022, Public Law No. 117-169, <https://www.congress.gov/bills/117th-congress/house-bill/5376/text>.

trusted partners' CM exports (Lawder 2023). For instance, the 2023 US-Japan CMA⁷ pledges to refrain from export restrictions between the two countries and to cooperate on supply chain security, fair trade practices, and investment screening in the sector. The current US administration has redoubled efforts to conclude bilateral CMPs. For instance, at the Critical Minerals Ministerial held in February 2026, the US signed eleven new deals with Argentina, the Cook Islands, Ecuador, Guinea, Morocco, Paraguay, Peru, the Philippines, the United Arab Emirates, the UK, and Uzbekistan.⁸

Other import-dependent economies have taken comparable steps. Japan, for example, has invested heavily in diversifying away from China, including through partnerships with Australia,⁹ the UK,¹⁰ and the US.¹¹ It also maintains strategic stockpiles of CMs. This comprehensive CM strategy was triggered by China's 2010 embargo on rare earth exports (Evenett & Fritz 2023), after which Japan's reliance on Chinese rare earths fell from 90 per cent in 2010 to 60 per cent by 2013 (Terazawa 2023). In 2022, Japan also adopted the Economic Security Promotion Act, identifying 11 goods – including rare earths, semiconductors, and medical supplies – as 'specifically designated important supplies' to strengthen supply chain resilience (Jochheim 2023; Koyu et al. 2022).

At the plurilateral level, the Minerals Security Partnership (MSP),¹² a US-led coalition launched in 2022, brought together Australia, Canada, Estonia, Finland, France, the EU, Germany, India, Italy, Japan, Norway, South Korea, Sweden, the UK, and the US to co-ordinate investing in CM projects and share information. Although not a formal treaty, the MSP represented a club of (mostly) resource-dependent countries aiming to collectively secure CMs in a way that upholds environmental, social, and transparency standards. A similar plurilateral effort, the Sustainable Critical Minerals Alliance, launched in 2022 by a subset of MSP partners, seeks to drive the global uptake of environmentally sustainable, socially inclusive, and responsible mining, processing, and recycling practices.¹³ At the 2026 US-led Critical Minerals Ministerial, Secretary Marco Rubio announced the creation of the Forum on Resource Geostrategic Engagement (FORGE) as the successor to the MSP.¹⁴ The G7 has also placed CMs on its agenda, tasking the IEA with producing regular outlooks to improve transparency, agreeing in June 2025 on a Critical Minerals Action Plan,¹⁵ and with Canada calling for a CM "buying group" (Rajagopal 2026).

Countries with substantial mineral reserves take a different approach to CMPs. Their priority is to capture more value from their resources, assert control over extraction, and use their mineral wealth to advance development or strategic goals. Many are no longer willing to export

7 Agreement between the Government of the United States of America and the Government of Japan on Strengthening Critical Minerals Supply Chains, 28 March 2023, <https://ustr.gov/sites/default/files/2023-03/US%20Japan%20Critical%20Minerals%20Agreement%202023%2003%2028.pdf>.

8 US Department of State (4 February 2026), '2026 Critical Minerals Ministerial', <https://www.state.gov/releases/office-of-the-spokesperson/2026/02/2026-critical-minerals-ministerial>.

9 Minister for Resources and Minister for Northern Australia (22 October 2022), 'Australia-Japan strengthen critical minerals cooperation', <https://www.minister.industry.gov.au/ministers/king/media-releases/australia-japan-strengthen-critical-minerals-cooperation>.

10 Memorandum of Cooperation between the Department for Business and Trade of the United Kingdom of Great Britain and Northern Ireland and the Ministry of Economy, Trade, and Industry of Japan on Critical Minerals, 28 October 2023, <https://www.gov.uk/government/publications/uk-japan-critical-minerals-memorandum-of-cooperation/memorandum-of-cooperation-between-the-department-for-business-and-trade-of-the-united-kingdom-of-great-britain-and-northern-ireland-and-the-ministry-o>.

11 See footnote 7.

12 US Department of State, 'Minerals Security Partnership', <https://2021-2025.state.gov/minerals-security-partnership/>.

13 Natural Resources Canada (12 December 2022), 'Countries commit to the sustainable development and sourcing of critical minerals', <https://www.canada.ca/en/natural-resources-canada/news/2022/12/countries-commit-to-the-sustainable-development-and-sourcing-of-critical-minerals.html>.

14 See footnote 11.

15 G7 Critical minerals action plan, 17 June 2025, <https://g7g20-documents.org/database/document/2025-g7-canada-leaders-leaders-language-g7-critical-minerals-action-plan>

raw ores for processing abroad. Instead, they are introducing policies to move further up the value chain and claim a larger share of the benefits, often through export restrictions on unprocessed minerals, increased taxes or royalties, and requirements for local processing or joint ventures (Weldegiorgis et al. 2021).

Indonesia, the world's top nickel producer, is a striking case of such resource nationalism (Wijaya & Sinclair 2024). In 2020, it imposed a full ban on nickel ore exports to compel foreign firms to invest in domestic smelters and battery metal facilities (Widiatedja 2021). The EU, which depended on Indonesian nickel for its steel industry, challenged the policy at the World Trade Organization (WTO) and won.¹⁶ However, Indonesia appealed the panel's decision into the void due to the paralysis of the WTO Appellate Body, and therefore maintained the restriction (Rohmah 2024).¹⁷ The policy has had a significant economic impact: within a few years, Indonesia's nickel exports shifted from \$1 billion in raw ore to over \$20 billion in higher-value processed products (Reuters 2022; see also IRENA 2023: 113–15). Encouraged by these results, Indonesia's president announced plans to apply similar measures to other CMs, such as bauxite, copper, and tin (Reuters 2022). In February 2026, Indonesia finalised an agreement on reciprocal trade¹⁸ with the US, with Article 6.1 devoted to CMs and providing that "Indonesia shall remove restrictions on exports to the United States of industrial commodities, including critical minerals" (para.1).

Similarly, China, the world's biggest CM processor, has a longstanding policy of strict control over its mineral supply chain. As mentioned, in the 2010s, it imposed export quotas on rare earth elements (critical for electronics and defence) to prioritise domestic industries. These quotas were challenged twice at the WTO and were ultimately found to be inconsistent with its obligations.¹⁹ In 2023, China also announced export licensing requirements on gallium and germanium, minerals used in semiconductors and EVs (Teer & Miller 2023). In addition, China heavily supports its firms in acquiring mining assets abroad, such as cobalt mines in the DRC and lithium mines in Latin America. According to Zhou et al. (2025), however, most of China's CMPs are primarily designed to address domestic challenges and policy priorities rather than to dominate, weaponise, or deliberately disrupt global supply chains (see also Wübbecke 2013).

African and South American countries rich in CMs are also increasingly asserting their demands for a greater share of the value generated from their resources. In the DRC, an updated Mining Code in 2018²⁰ increased royalty rates on cobalt, which was subsequently designated a 'strategic substance' and made subject to additional taxes through a Ministerial Decree.²¹ In February 2025, the DRC also imposed a four-month ban on cobalt exports to address oversupply, a measure that was later extended by an additional three months (Reuters 2025). At the continental level, the African Union adopted Africa's Green Minerals Strategy

16 Panel Report, DS592: Indonesia – Measures Relating to Raw Materials, WTO Doc. WT/DS592, circulated 30 November 2022, https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds592_e.htm.

17 The EU and Indonesia are currently negotiating an FTA with a dedicated energy and raw material chapter (<https://circabc.europa.eu/ui/group/09242a36-a438-40fd-a7af-fe32e36cbbd0e/library/26847620-d033-4b8b-8171-3e33a15e4c97/details>). While the draft text does not explicitly mention nickel, it prevents parties from designating or maintaining 'a designated import or export monopoly'.

18 Agreement between the United States of America and the Republic of Indonesia on Reciprocal Trade, 20 February 2026, https://ustr.gov/sites/default/files/files/Press/Releases/2026/0219_26%20US-IDN%20ART%20Full%20Agreement%20-%20US%20Final%20for%20Website%20sanitized.pdf.

19 Panel Report, China – Measures Related to the Exportation of Various Raw Materials, WTO Doc. WT/DS394 adopted 22 February 2012, https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds394_e.htm; Panel Report, China – Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum, WTO Doc. WT/DS431 adopted 29 August 2014, https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm.

20 Loi n°18/001 modifiant et complétant la Loi n° 007/2002 du 11 juillet 2002 portant Code minier, 9 March 2018, <https://www.leganet.cd/Legislation/JQ/2018/JOS.28.03.2018.pdf>.

21 Décret n. 18/042 portant déclaration du cobalt, du germanium et de la colombo-tantalite « coltan » comme substances minérales stratégiques, 24 November 2018, <https://faolex.fao.org/docs/pdf/cng212820.pdf>.

in 2024 with the vision of an 'Africa that harnesses green mineral value chains for equitable industrialisation and electrification, creating green technologies and sustainable development to enhance the quality of life of its people'.²² Meanwhile, the countries of Latin America's 'Lithium Triangle' (Argentina, Bolivia, and Chile) have floated the idea of a lithium cartel modelled on the Organization of the Petroleum Exporting Countries (OPEC) to coordinate production and pricing, though differing national approaches have so far made this difficult (Lee 2025; Sun 2024). Chile, which holds the world's largest lithium reserves, released its National Strategy for Lithium in 2023,²³ outlining plans to establish a national lithium company and require majority state ownership in new projects. This follows Mexico's recent steps to nationalise its lithium industry (Garagarza 2023).

The proliferation of these national, bilateral, and plurilateral arrangements signals a significant evolution in global trade governance away from open, rules-based cooperation and towards more selective, state-driven arrangements grounded in strategic interests and resource control. Yet the diverging goals of resource-dependent and resource-rich countries may not only heighten geopolitical tensions but also exacerbate the complex trade-offs underpinning CMPs, which the next section explores more closely.

The trilemma of CM governance

CM governance sits at the intersection of three of humanity's most pressing concerns: economic welfare, security, and sustainable development. Economic welfare focuses on objectives such as job creation, economic growth, lower consumer costs, enhanced industrial competitiveness, and investment attractiveness. Security involves reducing strategic dependencies, diversifying supply sources, and enhancing supply chain resilience amid growing geopolitical risks (Kalantzakos 2020). Sustainable development involves transitioning to clean energy while also minimising the environmental and social impacts of CM extraction and processing, which can include deforestation, water contamination, biodiversity loss, and carbon emissions (Watari et al. 2020), as well as labour abuses and human rights violations. Berthet et al. (2024) estimate that meeting the EU's energy transition targets could expose between 15,000 and 89,000 African miners to modern slavery risks and consume up to 73 million cubic metres of water in regions already facing water scarcity. In addition, numerous scholars have warned against the adverse effects of CM extraction on local communities, ranging from damage to the surrounding population's health and income (Dou et al. 2023) to displacement and Indigenous rights violations (Amoah et al. 2024; Bofofo et al. 2024; Hine et al. 2023; Marchegiani et al. 2020).

This trilemma should not be seen as three coherent pillars, as each objective is contested in itself. For instance, there is little agreement on what counts as sustainability, with some actors emphasising carbon reduction while others prioritising labour rights. Nor is the green transition a universally accepted goal. Similarly, security can mean strategic autonomy for some, resilience and diversification for others. Likewise, economic welfare can refer to keeping input costs low for consumers and industry or to capturing greater value domestically. These divergent interpretations of each pillar make the trilemma even harder to manage, since

22 African Minerals Development Centre (2024), Africa's Green Minerals Strategy, https://au.int/sites/default/files/documents/44539-doc-AGMS_Final_doc.pdf, 16

23 Estrategia Nacional del Litio, 20 April 2023, <https://www.investchile.gob.cl/wp-content/uploads/2023/04/brochure-litio-.pdf?ga=2.154104635.2052862502.1684238137.241820973.1684238137>

advancing one objective often comes at the expense of another, generating inherent tensions and trade-offs for policymakers (Laurens 2025):

Economic welfare vs. security: This is the tension that resource-dependent advanced economies are currently focusing on in the national and international CMPs presented above. On the one hand, an open trade approach maximises economic welfare by lowering input costs for industry, which can translate into cheaper clean technologies for consumers. On the other hand, when key suppliers are seen as strategically unreliable, as is the case with China and Russia from the perspective of the EU and US, governments may prioritise national security by reshoring or ‘friend-shoring’ supply chains, even at the cost of economic efficiency (Nedumpara 2024).

Resource-rich countries face a different economic welfare vs. security dilemma. Imposing an export ban can strengthen economic security by reducing dependence on external demand and increasing control over strategic value chains. At the same time, such measures may entail short-term welfare losses by reducing export revenues. In Indonesia, for example, the nickel export ban initially reduced export income, effectively subsidising its nascent processing sector through lower domestic ore prices. The government bet that this policy would yield long-term benefits by fostering a more resilient, value-added economy, which it did but not without legal and geopolitical risks, including a WTO ruling against the measure and the threat of economic retaliation (Lederman & Barattieri 2024). Similar debates are unfolding in several African countries, where policymakers weigh the potential gains of retaining more value from CMs against the risks of trade friction and potential revenue losses (Briel 2024).

Economic welfare vs. sustainability: This tension is not new, but in the context of CMs, it takes on added complexity through a potential contradiction within sustainability itself. CMs are central to the global fight against climate change, enabling technologies such as solar panels, EV batteries, and wind turbines. However, their extraction often imposes significant local environmental and social costs, particularly in lower-income regions where mining takes place. This creates a risk of what some scholars label ‘green extractivism’ (Dunlap et al. 2024) or the ‘dark side of sustainability’ (Warnecke-Berger et al. 2022), in which wealthier countries outsource environmental degradation to resource-rich but economically vulnerable countries. As Darnal et al. (2023) explain:

On the one hand, existing international and national standards set by mineral-consuming countries are either insufficient or lack effective enforcement and monitoring. On the other hand, relatively lax – or simply absent – regulatory systems in place in some producer countries allow companies to skirt responsibility by exploiting loopholes.

At the same time, calls to reduce CM demand to mitigate adverse impacts on sustainability (e.g. EU Raw Materials Coalition 2024) may constrain economic growth and industrial competitiveness.

Security vs. sustainability: As countries seek to secure stable supplies, they may fast-track mining approvals, subsidise extraction, or pressure producer countries to scale up output, potentially putting sustainability at risk. As Leonelli (2025, 245) notes, ‘national security-centred discourses on decarbonization translate into an inward-looking, adversarial, and short-term approach to the governance of the trade and climate change mitigation nexus,’ which can undermine decarbonisation efforts. Conversely, when resource-dependent countries insist on stringent sustainability standards, tensions may arise with producer or refiner countries, some of which perceive these requirements as obstacles to development or infringements on sovereignty, which in turn may constrain CM supply.

On paper, many CMPs explicitly integrate the economic, security, and sustainability pillars. For instance, the US-Japan CMA's stated objective is to:

strengthen and diversify critical minerals supply chains and promote the adoption of electric vehicle battery technologies by formalizing the shared commitment of the Parties to **facilitate trade, promote fair competition and market-oriented conditions for trade in critical minerals**, ensure robust **labor and environmental standards**, and cooperate in efforts to ensure secure, sustainable, and equitable critical minerals supply chains (art. 1, emphasis added).

Similarly, the EU frames its raw materials partnerships as win-win instruments designed to support local value addition in developing countries while securing European supply and promoting sustainable mining practices. For instance, the 2022 Memorandum of Understanding between the EU and Namibia aims:

to advance the **value, security, and sustainability of trade and investment into resilient raw materials** and downstream value chains across both Namibia and the European Union; to support the development of renewable energy sources taking into account its contribution to energy security, as well as **the impact on the environment and water resources in Namibia and the decarbonisation of the energy sector** with a particular focus on renewable hydrogen's potential; to create a well-functioning renewable hydrogen market and **promote new channels for investment and trade opportunities**, and in cooperation between Namibia and the EU (emphasis added).²⁴

In practice, however, operationalising these multiple goals is challenging. For example, when the US signed a CMA with Japan without congressional approval, several US lawmakers criticised the deal as 'unacceptable' for lacking enforceable labour and environmental standards (Lawder 2023). The EU's CM partnerships have come under even stronger scrutiny. For instance, the partnership with Rwanda has been criticised for legitimising the ongoing extraction and trade of conflict minerals from eastern DRC, given allegations that Rwanda supports the M23 insurgency and contributes to regional instability (Zimmermann 2024). Additional ethical concerns have been raised by Global Witness, which has denounced EU CM partnerships with Australia, Argentina, Uzbekistan, and the DRC, citing violations of Indigenous rights, environmental harm, labour abuses, and corruption (Stewart 2024).

The trilemma may be complicated by the fact that there is no single institution governing CMs. Instead, a 'regime complex' is emerging (Srivastava & Kumar 2024). This regime complex encompasses a multitude of policy initiatives and international organisations from different domains. This includes, for instance, the WTO, which currently focuses on trade disputes related to CM export restrictions (Bronckers & Maskus 2014; Van Calster 2013); the International Labour Organization, which adopted its Strategy on Decent Work in Supply Chains in 2023;²⁵ various United Nations (UN) bodies, such as the UN Secretary-General's Panel on Critical Energy Transition Minerals launched in April 2024; and energy institutions, such as the IEA and the International Renewable Energy Agency. The result is overlapping rules and potential gaps – a classic regime complex scenario wherein coherence is lacking and countries can forum-shop for more favourable venues (Alter & Raustiala 2018). While CMs

24 Memorandum of Understanding on a Partnership on Sustainable Raw Materials Value Chains and Renewable Hydrogen Between the European Union, Represented by the European Commission, and the Republic of Namibia, 8 November 2022. https://single-market-economy.ec.europa.eu/document/download/56b5fdff-bc0e-4b3a-8e0f-6b9fc907617b_en.4.

25 ILO strategy on decent work in supply chains, 27 February 2023. <https://www.ilo.org/resource/gb/347/ilo-strategy-decent-work-supply-chains>.

now bring together ministries and stakeholders that historically operated in separate spheres, this overlap also increases the risk that disruptions in one area, such as geopolitical conflict, may spill over into trade restrictions on CMs. In April 2025, for instance, China imposed export controls on several rare earth elements in response to tariff hikes by the Trump administration (Matthews 2025).

Domestic political economy dynamics also shape how the trilemma plays out. Governments bargain not only with other countries but also with companies and civil society at home (Hailes 2022). Firms usually press for secure and affordable supplies, while community groups and non-governmental organisations demand stronger social and environmental protections. This has led to direct conflict between corporations and local communities, such as in Serbia, where Rio Tinto's planned lithium mine triggered mass protests in 2021–2022 (Faggionato 2024), and in Panama, where public opposition over environmental damage and corruption forced the closure of a copper mine (IEA 2025). Overall, Global Witness (2024) reports that CM mines are tied to 111 violent incidents and protests on average each year. Similar tensions are also emerging in deep-seabed mining projects, including those beyond national jurisdiction (Alger et al. 2025; Havice et al. 2025; Schmidt & Rivera 2020; Van Putten et al. 2023).

Ultimately, the trilemma is not an impossible triangle but rather one of difficult compromises. Pursuing all three goals requires governments to accept partial rather than absolute gains. In practice, this may mean higher consumer costs or industrial subsidies to reconcile security with economic welfare, or slower and more expensive supply diversification to uphold sustainability standards. While 'win-win-win' outcomes are rare, trade-offs can be managed through sequencing (short-term sacrifices for long-term resilience), institutional design (embedding binding and enforceable sustainability standards in CMPs), and international cooperation (pooling risks and resources across countries). So far, however, governments have focused narrowly on the economic welfare–security nexus and treated sustainability as secondary, a pattern that risks eroding legitimacy and fuelling domestic or international resistance.

CMs and the transformation of the global trade order

Global trade rules under the WTO discourage discrimination and export controls in favour of open markets. Accordingly, quantitative export restrictions on CMs are generally prohibited under GATT Article XI (General Elimination of Quantitative Restrictions), with some exceptions. Both the US and the EU have launched several WTO disputes challenging such measures.²⁶ Yet dozens of countries have imposed, and continue to impose, export restrictions on CMs (Korinek 2019; Kowalski & Legendre 2023). According to Crochet & Zhou (2024, 154), this has to do with the fact that WTO rules 'leave abundant policy space' for WTO Members to restrict CM exports. Instead of reforming WTO rules – a slow and uncertain process (Hoekman & Mavroidis 2021; Sasmal 2024)²⁷ – countries are increasingly bypassing them by creating new venues and agreements (Cotula 2023; Sasmal 2024). For instance, plurilateral groups such as FORGE or the potential G7 buying group are not open to all WTO members. These are

²⁶ See footnotes 16 and 19.

²⁷ The WTO is nonetheless beginning to adapt to the growing importance of CMs, as illustrated by the launch of the Trade in Critical Minerals database in 2024 (WTO & Asia Development Bank, 'Trade in critical minerals', last accessed 10 March 2026, <https://critmin.org/>). Some scholars even argue that the WTO is 'an ideal forum for inclusive deliberation' on CMs (Gao et al. 2024).

voluntary coalitions of strategically aligned countries. This type of club governance enables closer cooperation among a subset of countries but inherently excludes others (Brandt 2019) and has been criticised in the context of CMs (Hendrix 2023).

The growing competition over CMs has also led to the emergence of new language in trade instruments. For instance, the US-Japan CMA explicitly references 'non-market policies and practices of non-Parties affecting trade in critical minerals' (art. 3.4) and cooperation in determining how best to review investments (art. 3.5). Similarly, in December 2022, the EU and Chile announced the conclusion of the modernisation of their trade agreement, in force since 2003.²⁸ This FTA, like recent EU agreements with Mexico, New Zealand, and Kazakhstan, includes a dedicated 'energy and raw materials' (ERM) chapter,²⁹ which, among other actions, prohibits Parties from designating or maintaining a designated import or export monopoly (art 8.4) and requires them to 'ensure that the supply of energy goods shall be based on market principles' (art. 8.6, para. 2) and to conduct an assessment of environmental impact 'prior to granting authorisation for a project or activity relating to energy or raw materials that may have a significant impact on population; human health; biodiversity; land, soil, water, air or climate; and cultural heritage or landscape' (art 8.8, para. 1) (see also Cotula 2023, 36). Despite these innovations within FTAs, most international CMPs remain non-enforceable,³⁰ marking a turn away from FTAs and WTO agreements, whose negotiation processes are often lengthy and politically fraught, and towards more flexible forms of cooperation.

Beyond rule-changing, state responses to CMs are also accelerating the erosion of multilateralism, as resource alliances create new geopolitical blocs (Vivoda et al. 2024). As former High Representative of the EU for Foreign Affairs and Security Policy Josep Borrell puts it, 'achieving a fair distribution of efforts between countries is particularly complex because climate change, and its antidote, the green transition, are making losers and winners and shaking up the global balance of power.'³¹ In this emerging order, economic interdependence is no longer seen as a guarantee of political stability but a source of vulnerability (Kalantzakos et al. 2023, 3). On one side, we see US- and EU-led initiatives trying to integrate allies and selected producers into a secure supply network, a strategy often referred to as 'friend-shoring' (Maihold 2022; Nedumpara 2024; Vivoda 2023). On the other side, China is consolidating its sphere of influence. China's Belt and Road Initiative (BRI) has become a major vehicle for expanding the country's access to CMs by financing and building infrastructure in CM-rich regions (Kalantzakos 2020, 11). This includes direct investment in mining operations, long-term supply agreements, and support for local processing facilities (Yongtao & Sining 2024). These efforts are concentrated in countries rich in cobalt, copper, lithium, nickel, and rare earths, particularly in Africa, Southeast Asia, and Latin America.³²

According to Vivoda et al. (2024), the geopolitical contest over CMs will thus pit a US-led Western coalition against a China-led BRICS+6 bloc.³³ These developments illustrate how CMs are becoming new bargaining chips, much as coal and steel underpinned industrial power and regional integration in the post-war era and oil and gas enabled geopolitical influence

28 EU-Chile Interim Trade Agreement, 13 December 2023, https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/chile/eu-chile-agreement/text-agreement_en.

29 Chapter 8. The draft FTA between the EU and Indonesia, currently under negotiation, includes a similar chapter (see footnote 17).

30 For instance, the EU's strategic partnerships take the form of memoranda of understanding and expressly do not create binding obligations (Cotula 2023, 39, see also Sasmal 2026).

31 EU External Action, 'The geopolitics of climate change' (6 December 2023). https://www.eeas.europa.eu/eeas/geopolitics-climate-change_en.

32 While these overseas investments are often portrayed as a bid to lock down resources, research points to a more complex picture. As Klinger (2020) notes, the BRI is less a monolithic strategy than a collection of heterogeneous projects shaped by China's domestic political economy, the agency of host governments, and grassroots environmental pressures.

33 BRICS+6 refers to the original BRICS countries (Brazil, Russia, India, China, and South Africa) plus Egypt, Ethiopia, Iran, Saudi Arabia, and the United Arab Emirates, following the 2023 expansion. Argentina declined its invitation.

through, for example, OPEC's and Russia's use of energy dependence in Europe (European Commission 2022). This logic is echoed in a 2025 statement by the European Commission's lead on industrial policy, Stéphane Séjourné: 'We do not want to replace our dependence on fossil fuels with a dependence on raw materials ... Chinese lithium will not be the Russian gas of tomorrow' (Di Sario 2025). However, unlike oil and gas, for which state practice centred on producer cartels alongside consumer stockpiling, CMs have prompted governments to use export bans, subsidies, and outbound investment screening more routinely. They have also encouraged the creation of consumer-driven clubs and the negotiation of new forms of trade agreements narrowly focused on CMs.

These developments are not limited to consumer countries. Historically, trade policy was often driven by demand-side countries seeking market access, but resource-rich, often developing countries are now gaining significant leverage and transforming from passive suppliers to active shapers of global value chains. Nevertheless, this emerging economic order remains shaped by power asymmetries (UNCTAD 2024). In the words of Sasmal (2024, 10), as CMPs 'involve funding conditionalities for projects in resource-rich countries, the powers reside with resource-hungry countries to decide which resource-rich countries benefit from investments and how.' Critics argue that this dynamic risks reproducing neocolonial patterns (Crochet & Zhou 2024; Malam et al. 2024; Weizman & Ahmatović 2025). Much will depend on how international CMPs are implemented in practice – whether they foster technology transfer, local employment, environmental protection, and equitable revenue sharing or primarily serve to secure affordable resource supplies for industrialised economies.

Overall, the transformations driven by CMs contribute to a more fragmented and multipolar trade governance. At the same time, these changes open avenues for institutional innovation and possibly more resilient governance. If club initiatives succeed in setting higher social and environmental standards, these could create *de facto* global norms if enough major players adhere. Conversely, if clubs evolve into buyers' cartels, they may trigger retaliatory measures from excluded producer countries, including efforts to co-ordinate prices or assert greater control over supply chains.

Policy recommendations

CMs and the policies governing them have become a defining feature of the current global (dis)order. As this paper has discussed, CMPs are rewriting the rules of engagement in international trade. This ongoing instability of trade rules presents both an opportunity to rewrite them more equitably and a risk of fragmenting into competing and potentially conflicting systems.

The trilemma of economic welfare, sustainability, and security shows that there are no simple 'win-win-win' solutions. The three broad recommendations that follow from this overview of CMPs should not be read as denying these tensions but instead be seen as tools to help sequence and manage compromises in less destabilising ways.

First, **CMPs must embed binding sustainability provisions and circular economy measures.** This is a chance to bring environmental justice into trade by setting higher standards that prevent clean-energy supply chains from reproducing the social and environmental harms of fossil fuels (UN Secretary-General's Panel on Critical Energy Transition Minerals 2024). Meeting rising demand will require not only recycling and reusing (Calvo & Valero 2022; IEA 2024; Jowitt et al. 2018) but also broader strategies to reduce overall material

use. Strengthening international cooperation on these fronts could also create important synergies with global climate action, for instance by linking CMPs and ongoing work under the UN Framework Convention on Climate Change to align resource governance with mitigation and adaptation objectives.

Second, **CMPs should be built on collaboration with partners on an equal footing** to ensure benefits are shared fairly. One major concern is the prospect of green extractivism, where, in the name of advancing the green transition, wealthier countries or multinational corporations engage in exploitative mining practices in economically weaker countries, leaving behind environmental degradation and social disruption (Arezki & Van Der Ploeg 2025). Without robust and inclusive governance frameworks, the CM boom could reproduce neocolonial dynamics (Sasmal 2024). One proposal is a Global Minerals Trust, envisioned as a collectively governed resource-sharing mechanism that would act as a neutral broker to ensure fair pricing for producers and consumers, prevent protectionist measures and cartel formation, support developing countries with technical assistance, and stabilise supply chains by co-ordinating mineral flows for the green transition (Ali et al. 2025). Another proposal is an international CM treaty “based on principles of justice such as distributive, procedural, recognition, restorative, and cosmopolitan justice” (Heffron 2026, 3).

Multilateral institutions can reinforce the meaningful inclusion of countries with significant production or refining capacity in shaping the rules of CM governance. The WTO could modernise its rules or at least provide a forum for addressing how security and sustainability concerns might be integrated without further weakening the foundations of the multilateral trading system (Gao et al. 2024), while development banks and climate finance mechanisms could expand support for sustainable mining and value addition in resource-producing countries.

Third, **policymakers should adopt a flexible, data-driven approach and ensure broad participation** in CM policymaking. Because this is new terrain, CMPs will need regular adjustment as conditions change. Rather than locking in rigid arrangements that may soon prove unworkable, it is wiser to invest in knowledge. Better data, foresight exercises, and scenario planning can help governments navigate uncertainty and make more informed choices (Wittenstein & Stuermer 2023). This process must also involve civil society organisations, affected communities, academics, and industry from the outset. Engagement should be integrated into decision-making, and contributions documented and made publicly available to ensure transparency and accountability.

The coming years will determine whether global rules on CMs support cooperation or lead to further fragmentation. A global (dis)order shaped by unilateral action or geopolitical turf wars between rival blocs could put climate goals at risk and entrench global inequalities. By contrast, a more orderly transition regime that takes both national interests and global fairness into account could make CMs part of the foundation of a more just and sustainable global economy. Achieving this will not be easy, especially in the current geopolitical climate. It will require careful diplomacy, innovative policy thinking, and a recognition that security, economic welfare, and sustainability are interdependent rather than mutually exclusive.

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