KPMG

The supercharged race for battery metals

Six powerful forces reshaping global mining and manufacturing value chains through the energy transition.

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Introduction

The global race to net zero is fueling demand for battery metals and minerals on a tremendous scale, creating opportunities and challenges across the value chain. To navigate this, miners, contractors, and original equipment manufacturers need to understand a volatile interplay of forces or risk missing out on the generational opportunity presented by the energy transition.

Extracting resources, refining materials, and manufacturing new technologies will underpin the energy transition and so much more, from health and science innovation to space travel. So many industries need critical and near-critical minerals in unprecedented quantities to meet advanced technology requirements, and manufacturers are driving an extraordinary scale-up of the supply ecosystems. The result presents an opportunity for organizations to both enable and benefit from a sea change in how we live and work.

The compelling nature of this opportunity is complicated by a social, political, and economic environment turning this global transition into a race. As minerals demand ramps up, organizations are reevaluating the economic and geopolitical wisdom of geographical concentration due to its role in creating vulnerable bottlenecks. In response, the conventional advantage provided by low-cost production has been revised by new legislation, incentives, and barriers. This is a fundamental change in the economic rationale of international trade that is impacting risk-reward trade-offs in increasingly unpredictable ways.

Critical minerals are metals, non-metals, and mineral compounds considered economically and strategically important. They are both essential for the energy transition and other societal development, and their supply is often at risk due to scarcity, geopolitics, trade policies, and other factors. Frequently named critical minerals include **cobalt, lithium, manganese, nickel,** and **rare earth elements (REE).**

KPMG, "Geopolitics and the Australian minerals Industry" (2021)

Battery metals value chains are being reshaped, and simple supply and demand dynamics are no longer a given. Poor positioning and little consideration for new realities threatens to turn previously sound strategic logic on its head. To mitigate this risk, organizations must contend with six prominent forces we address in this paper:

01 The U.S. Inflation Reduction Act (IRA)'s demand distortion

02 Geopolitical disruption to the flow of business

03 A talent drought

04 Irrational capital markets

05 Government tradeoffs between reducing debt and reaching net zero

06 Escalating capital and operational costs

01

The U.S. Inflation Reduction Act's demand distortion

The IRA's stimulus for clean energy technologies has created a gravitational pull on heavy industry. But just as U.S. demand for critical minerals is ramping up, an unpredictable political environment is layering new complexity into forecast demand.

The IRA, combined with the Bipartisan Infrastructure Law and the CHIPS & Science Act, continues to escalate demand for energy transition minerals. At its core, the legislation links energy transition incentives to domestic manufacturing capability.[1] To do this, the bills reach across the entire supply chain; the most lucrative incentives are on offer for companies utilizing materials sourced in the U.S. or in countries with U.S. free trade agreements.

The immediate impact was a wave of approximately 300 large-scale clean energy projects announced.[2] The change in administration following the 2024 U.S. election will likely shift thinking around clean energy. And while there may not be a repeal of the IRA, there could be changes to tax credits across electric vehicles and renewables, causing many organizations to reconsider how and where they invest.

Still, the ripple effect of such a massive project pipeline immediately created strain throughout supply chains that exists today as organizations attempt to source labor and critical materials that qualify for the most lucrative incentives. To add complexity, how the IRA is applied is evolving—the U.S. Internal Revenue Service alone has issued 40-plus notices since its passage in 2022[3]—and the change in the U.S. political climate has injected fresh uncertainty. In the years it takes to plan, design and build these projects, the goal posts continue to shift.

The incentives on offer in the U.S. are fundamentally changing the investment landscape for multi-national companies, prompting some to warn of a "clean energy arms race." In response to the IRA, Europe has passed its Green Deal Industrial Plan, Japan has passed a green transformation bill and other countries like the UK and Australia formulated similar policies. Each country has taken its cues from the IRA, coupling net zero objectives with incentives to expand domestic manufacturing capacity in order to develop and protect critical sovereign capabilities. Changes and revisions to the IRA, particularly those representing a more protectionist ethos, may only reinforce this desire for self-sufficiency.

The IRA is good news for supply chain participants in obvious ways, namely, unprecedented demand created by the drive to net zero. The bad news is more nuanced. The IRA has established a legislative patchwork that disrupts traditional supply-demand dynamics domestically, and globally, adds heat to the geopolitics of securing critical minerals. This will likely intensify as the priorities of the federal government shift and existing legislation is re-purposed or revised.

In the face of unpredictable and non-economic demand drivers instigated by the IRA, stability becomes crucial. Finding the right resources and labor in the right place is now more important than finding the right price.

The IRA represents roughly US$500 billion in tax credits through 2032 and will drive US demand **23x** higher for **lithium, nickel and cobalt** in 2035 than in 2021. That represents a **25%** annual increase in the need for these critical minerals.

US demand for **copper** also will increase by **12%** to **2.6 million metric tons.**

S&P Global, "Inflation Reduction Act: Impact on North America metals and minerals market" (August 2023)

[1] Source: S&P Global, "Inflation Reduction Act: Impact on North America metals and minerals market" (August 2023)

[2] Source: E2, "301 Major Clean Energy Projects Announced Since IRA; Companies Announced 1,700 Jobs, $3B for 8 Projects in March" (April 11, 2024)

[3] Source: irs.gov, Notices for the Inflation Reduction Act of 2022

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Supply chain strategy bifurcation

Sourcing requirements based on location and ownership forces organizations to structure their supply chains around specific target markets, rather than lowest cost of production. Organizations must now either localize production to address key markets or fund new capacity to quarantine their supply chains in higher-cost jurisdictions. Many of the projects spurred on by the IRA will potentially duplicate production capacity of existing lower-cost facilities.

Relationships based on tax credits

Eligibility for key incentives like tax credits will shape relationships between suppliers, forcing additional complexity into otherwise sensible partnerships based on shared risk and pooled resources. Joint venture agreements to build critical mineral refining capacity in Western jurisdictions are now being structured with variability to accommodate the evolution of the IRA.[4]

Recalculation of the cost of doing business

The IRA's incentives have changed the economics of competition by offsetting higher development costs in Western countries. Vertically integrated organizations are incentivized to establish globally diversified portfolios of assets to hedge against concentration. This is persuasive for suppliers of critical minerals looking to extend their production expertise to capitalize on unprecedented demand that will reshape the map with winning and losing nations, and that could drive substantial re-industrialization of the developed world.[5]

Case study: Boosting participation in the energy transition with a critical minerals business

Challenge

A global engineering and construction company established a goal to diversify its business model to support the transition to net zero. As part of meeting that goal, the company identified the need for a strategic assessment of its mining and metals business to understand how to increase market share in the changing environment.

Approach

The company engaged KPMG to develop a comprehensive report that could support the case for investment in a new business by the global EPCM corporation. KPMG conducted comprehensive market analysis across critical mineral supply and demand, focusing on lithium, nickel, cobalt, REEs and graphite, as well as produced competitor and customer analyses based on market perceptions and buying trends. Based on the assessment, the global EPCM ultimately decided to create a separate business focused on critical minerals in Australia.

Value

- The company gained a better understanding of the state of the market and what it would take to establish a foothold in critical minerals.
- That knowledge also helped the company uncover several options for the future and a pathway to meet its goal to adapt and grow.
- Identifying and analyzing the range of potential risks supported a successful launch.

Think about this:

- What changes to the IRA do you need to prepare for under the new administration?
- For which IRA incentives could your operations be eligible, and what is the potential value?
- In which country should you domicile what part of the value chain in order to qualify for IRA?
- Can you qualify for multiple critical mineral subsidies?
- How can you adapt an existing capital portfolio to take advantage of the IRA?
- IRA costs have nearly doubled, will the money set aside for the IRA dry up?
- What is the level of foreign ownership allowable to still qualify for the IRA?
- Have you considered the impacts of other countries/regions following suit and introducing their own potentially distortionary policies?

[4] Source: SMM, "Pilbara Minerals and Ganfeng Lithium consider a lithium chemical plant JV for IRA benefits" (March 28, 2024)

[5] Source: KPMG, "The geopolitics of oil and gas" (2023)

02

Geopolitical disruption to the flow of business

The strategic importance of critical minerals to energy, technology, and defense among other industries, is resulting in governments increasingly setting policy based on national interest rather than economic efficiency.

Trade restrictions and rules continue to evolve, and geopolitics will create new hurdles in the race to net zero. This is the inevitable result of nations connecting national security to emission reduction initiatives that duplicate production capacity and compete directly for scarce resources, leading to a complicated network of shifting relationships for multinational organizations to navigate as they look to enable the energy transition.

Decades of outsourcing production in low-cost emerging economies resulted in a geographic concentration of critical minerals and production capacity. East Asian countries in particular control significant market share in material refinement and the production of technologies key to the energy transition.

Because of rising geopolitical competition and mistrust, concentrated production has turned from a cost-effective strength to a geopolitical weakness, and more nations are nurturing domestic production. Australia—the leading producer of lithium and a top-five producer of rare earths, gold, iron ore, lead, zinc and nickel[6]—aims to develop domestic processing capabilities to capture up to 20 percent of the world's lithium refining.[7] The U.S. for its part is restricting companies from expanding advanced chip production into China.[8]

Notably, countries keen to ensure secure access to critical minerals have subsidized a global investment boom that has resulted in low commodity prices. The more subsidized projects are better able to weather these prices, but some commercially driven organizations have had to shut down critical minerals operations.

Other countries are introducing or raising royalties as the scarcity of mineral resources collides with a surge in nationalism. Indonesia's nickel export restrictions have had global impact. Australia and India have introduced new or increased mining royalties[9] while Chile and Mexico are nationalizing their lithium industries.[10] China's latest strategic plays involve sovereign ownership of all rare earths from October 1, 2024.[11] Meanwhile, where countries can't produce themselves, they're turning to "friendsourcing" or trusted partners and allies that are less likely to turn off the spigot.

Global mineral production is highly concentrated

75% of global output of lithium, cobalt, rare earth elements (REEs) and other key energy transition minerals are controlled by Australia, Democratic Republic of Congo (DRC) and China. China alone refines **35%** of the world's nickel, **50-70%** of its lithium and cobalt, and nearly **90%** of REEs.

Source: IEA

[6] Source: Australian Bureau of Statistics, "Insights into Australian Exports of Lithium," 2022

[7] Source: Australian Government, Critical Minerals Strategy 2023-2030, Power Technology, "Australia bids to end dependence on China for lithium refining," May 25, 2023

[8] Source: Center on Global Energy Policy at Columbia, "China's Latest Move in the Critical Mineral and Technology Trade War" (October 23, 2023)

[9] Source: Fastmarkets, "Australia plans tax relief to shield miners from nickel price slump" (February 26, 2024); Business Standard, "Cabinet approves royalty rates for mining of Lithium, 2 other minerals" (April 3, 2024); Reuters, "Focus: Chile miners, facing higher taxes, seek faster permits, lower energy costs" (July 13, 2023)

[10] Source: Mining.com, "Mexico nationalizes lithium mining" (April 21, 2022)

[11] Source: Reuters, "China issues rare earth regulations to further protect domestic supply" (June 29, 2024)

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Location matters

Secure access to mineral deposits helps ensure growing demand can be met consistently in the face of changing political winds. By establishing integrated operations near deposits, organizations aim to gain this access, appease domestic production demands, and offset higher development costs or less-lucrative prospects. Joint ventures are an additional means of executing this strategy, although some have found their choice of partner has exacerbated, rather than reduced, exposure to geopolitical risk.

Translating production success across borders

Building production assets in different geographies is a multi-year endeavor, but creating operational success is a multi-decade journey. Geographical diversification can be an effective hedge but requires replicating highly integrated ecosystems underpinned by decades of specialized production development experience and deep geopolitical knowledge. Organizations with technically identical assets in different countries must now devise new systems of knowledge transfer and build supplier ecosystems from scratch.

The future will be unevenly distributed

Policymakers are starting to use access to key technologies required for the energy transition as a tool to influence geopolitics. As trade restrictions, incentives and unintended consequences reverberate through supply chains, organizations will revise the target markets and sourcing for their products. This will increase the variability of products available between markets and hinder the distribution of technologically superior solutions.production expertise to capitalize on unprecedented demand that will reshape the map with winning and losing nations, and that could drive substantial re-industrialization of the developed world.

Think about this:

- How will participants along the battery minerals value chain navigate competing critical mineral policies?
- How can free market-driven assets compete against government-subsidized champions?
- How will manufacturers ensure supply of key materials needed for new components like batteries?
- How could a changing geopolitical environment change the prospects for unloved mineral deposits and technology?
- How can an organization protect its supply chain against regional instability?

03

A talent drought

While demand for battery minerals and metals escalates, the shortage in skilled labor continues.

Technology can't universally replace skilled workers, and companies will always be constrained by people—not ideas or projects. The talent drought is not new but likely to get worse, especially for the technical skills required for the energy transition. Experienced employees are retiring. And despite attractive salaries and long-term demand, the job vacancy rate in the technical fields within mining and advanced manufacturing continues to grow.

Companies need science, technology, engineering and mathematics grads including those with specialist skills such as chemical and process engineers, and metallurgists that understand the complex chemistry sets required to refine critical minerals and improve battery performance. Skills shortages are the greatest challenge to implementing the latest technologies, according to 47 percent of metals and mining executives surveyed by KPMG International.[12]

But there are fewer students in schools preparing for leadership roles in minerals and mining, and blue-collar workers are becoming scarce, particularly as fewer young people consider technical trades. Despite mining's importance to the energy transition, negative perceptions around the industry's environmental and community impacts, human rights record and lack of diversity carry increasing weight. These perceptions have compounded existing challenges such as remote location and workplace safety concerns.

Just like supply chains for resources and goods, the supply chains for labor will be affected by the geopolitical competition and volatility driven by the energy transition.

> The number of engineering graduates in North America and Australia dropped **63% in just 6 years.**
>
> Younger generations are choosing other sectors and, in many cases, actively turning their backs on mining and engineering career pathways.
>
> *The Wall Street Journal, "A 'Dirty' Job That Few Want: Mining Companies Struggle to Hire for the Energy Transition" (June 1, 2023)*

[12] Source: KPMG International, "2024 Global Metals and Mining Outlook"

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Cultural expectations and labor demands

For companies entering new markets, cultural norms and labor expectations compel them to discover innovative ways to engage local workforces. If not managed or anticipated properly, these cultural factors can undermine an organization's ability to effectively source and retain a skilled workforce. This is particularly important as organizations construct industrial facilities in countries where organized labor is closely linked to government policies or has substantive influence over key workforce groups.

Unconventional sources of talent

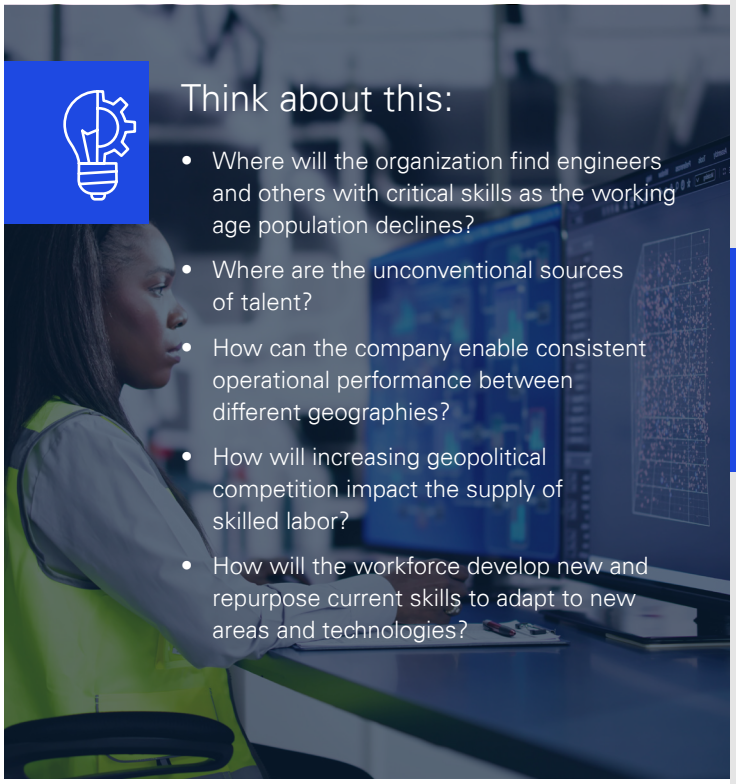
Narrow thinking about job roles and pre-requisites is a disadvantage for organizations with talent gaps. The traditionally male-dominated mining sector in Australia has seen its largest companies redefine recruitment strategies to target business and data science graduates, recruit closer to mining sites, and implement more gender diversity initiatives to widen their candidate pool.[13] This thinking is also being extended internally with more on-the-job training—including programs focused on under-represented employee populations—to redeploy skills and cross-pollinate organizational knowledge across worksites.

The truth about skills deficits

Counter to conventional wisdom, white collar work will be increasingly facilitated by technology and outsourcing models, meaning blue collar skills are likely to become difficult to find as coordinated demand impacts existing labor pools. Many of the production facilities required for the energy transition will also require niche technical skills that are not readily available outside of existing industrial centers. A more accurate assessment of skills deficits, and localized demand drivers, are required to target recruitment more effectively.

Government labor initiatives

Governments see the coming talent crisis and are starting to outline initiatives that companies can use to prepare for this transition. In the U.S., the Department of Energy in coordination with the Department of Labor and national trade unions is launching national workforce development strategy for lithium battery manufacturing that includes investment in pilot training programs.[14] As more facilities are constructed, these kinds of initiatives will play an increasingly important role.



[13] Source: Mining.com, "Rio Tinto kicks off recruitment campaign" (February 28, 2023)

[14] Source: Department of Energy, "DOE Announces $5 Million to Launch Lithium-Battery Workforce Initiative" (March 18, 2022)

04

Irrational capital markets

The energy transition is a fundamental driver of minerals demand, but its interaction with non-monetary considerations is challenging the way capital markets reward value.

Volatility results from supply and demand seeking equilibrium, but the rise of trends like environmental, social and governance (ESG) mandates, geopolitical uncertainty, energy security, emerging technologies, "sticky" inflation, and variable interest rate settings are complicating incentive structures. The net effect is that rational behavior on the part of one set of stakeholders becomes market irrationality.

The energy transition can be economically rewarding for companies that can meet growing demand thanks to global commitments, legislated targets and attractive economies of scale enjoyed by renewable energy. For carmakers, this has created a frothy market sentiment toward new entrants, yet legacy producers have reduced the scale of their ambitions in the face of slowing electric vehicle (EV) sales.[15] In some cases, end users like rental car companies have sold their electric fleet and returned to internal combustion engine (ICE) vehicles. Their decisions contrast against consistent consumer demand for EVs and hybrid vehicles (strong sales have continued in 2024[16]) and evidence that ICE vehicle sales have peaked.[17]

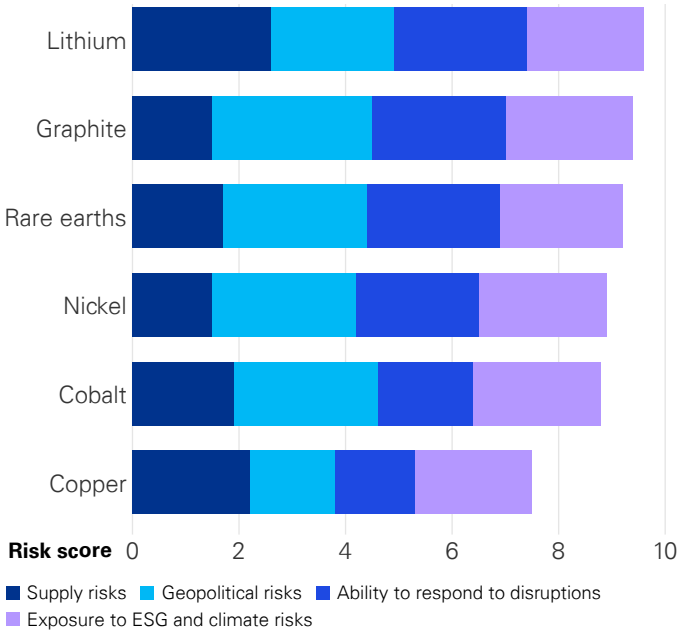
The story is similar further along the value chain as new technologies stimulate demand for previously obscure materials. Capital expenditure into nonferrous metal production has nearly doubled since 2020.[18] Despite underlying demand continuing to grow, extreme price fluctuations (in lithium's case, a 75 percent price drop in 2023 alone) caused the market size for energy transition minerals to shrink by 10 percent to USD325 billion in 2023.[19] The sourcing of these materials has also come into the spotlight as the broad considerations of ESG create greater focus on the details and methods of material extraction.

This is particularly relevant for energy transition minerals, which have high energy transition risks. Supply and volume risks are typically greater for lithium and copper, and lithium along with graphite and REE are more likely to be disrupted by geopolitical upheaval.[20]

> **66%** of global metals and mining executives report that the volatility of output prices has increased for their companies over the past two years; **53%** point to increased input-price volatility
>
> *KPMG, "2024 Global Metals and Mining Outlook"*

Risk analysis of key minerals

Clean energy transition risk score for key energy transition minerals



IEA, "Global Critical Minerals Outlook 2024"

[15] Source: Zero-Emission Vehicles Factbook: COP28 Edition | BloombergNEF (bnef.com)

[16] Source: Market review – Global Critical Minerals Outlook 2024 – Analysis - IEA

[17] Source: Zero-Emission Vehicles Factbook (bbhub.io)

[18] Source: Capital expenditure on nonferrous metal production by 25 major mining companies, 2011-2023 – Charts – Data & Statistics - IEA

[19] Source: Market review – Global Critical Minerals Outlook 2024 – Analysis - IEA

[20] Source: IEA, "Global Critical Minerals Outlook 2024"

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Timing is everything

Measuring the rate of change along with the interconnectivity of risks will become a core competency for organizations looking to weather market irrationality and invest in long-term demand. Funding is readily available for new sources of energy but is becoming increasingly scarce for legacy sources such as oil and gas, despite attractive demand-driven returns over the medium term. This kind of mismatch will create counter-intuitive winners within the energy transition as market expectations about the future outpace the reality of long-lead time investments.

Non-financial drivers of financial considerations

Most organizations have rational capital allocation strategies and processes but these can be hard to reconcile attractive rates of return being hamstrung by non-financially motivated actors. The rise of ESG considerations has prompted some to speculate about a "green premium" while at the same time others watch their development pipeline derailed by unpredictable environmental and community concerns that bleed into media and politics. Companies must find better ways to measure and quantify external risks beyond simple supply and demand drivers.

The best offense is (still) a good defense

The development of a robust margin of safety remains one of the most enduring strategies to protect against unexpected market sentiment and growing risk profiles. The reality of greater energy transition risks for critical minerals in particular will mean the financial return on projects will become more difficult to achieve consistently. Additional margin provides insulation against disruption; organizations with this advantage can demonstrate execution discipline in the face of uncertainty and contrast competitors.

Case study: Determining the value of mining technology innovation

Challenge

A diversified mining service provider had identified a simpler means of processing critical minerals. The promise of this processing innovation prompted the client to more closely evaluate potential use cases and consider how best to unlock the value of the nascent technology.

Approach

The company engaged KPMG to value the new technologies against others in the market and consider pathways to commercialization. The valuation model simulated a functioning processing facility to enable comparison to incumbent technology. KPMG then leveraged its experience in minerals processing technology transactions to establish commercialization options and use-case scenarios. Potential outcomes referenced market dynamics and commodity forecasts. Each was examined and refined to align to the company's stated goals to produce a multi-step commercialization strategy, underpinned by a variable input valuation model.

Value

Developing both a valuation model and commercial strategy to be flexible and complementary provides a robust safety margin against the variability inherent to many critical minerals. The model is a tool that can be used to continually estimate value in the context of changing market demand and further development efforts. Similarly, the multi-step commercial strategy allows for multiple scenarios to achieve stated goals and create an actionable pathway for future investment.

Think about this:

- How can the organization counter irrational behavior with demands from rational shareholders?
- How can we determine the value of something that today has no market but is likely to have a value in 10 or 15 years?
- How are the energy transition risks in a capital investment portfolio measured and quantified?
- How do companies balance the needs of today's shareholders and tomorrow's paper holders?
- What can insulate financially viable projects under development today from an uncertain future?
- How can a company convince an irrational market to believe in the future of its products?

05

Government trade-offs between reducing debt and reaching net zero

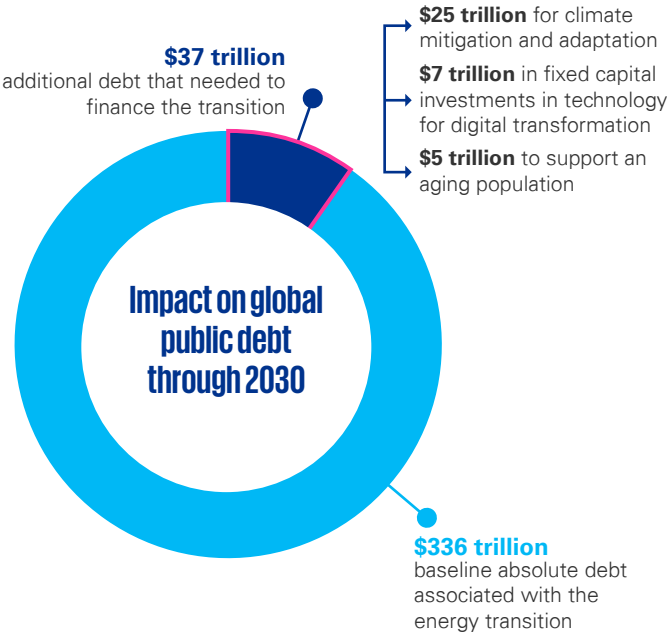
Widespread national debt and rising interest rates create a challenging environment to fund COP28 commitments.

Governments around the world have steadily increased debt levels over recent decades. Rising government debt will create a growing headwind to the energy transition and introduce an unpredictable element to existing spending commitments. The trade-offs required to manage this headwind will be driven by economic ideology alongside raw pragmatism, including the need for energy security and energy independence.

The issue is particularly acute for developing nations given lower levels of existing infrastructure to leverage, greater physical risk from climate change, and higher borrowing costs.[21] This reality will put pressure on wealthy nations to manage the equity of the energy transition alongside net zero outcomes. Without this, investment into cost-effective but carbon-intensive infrastructure will be difficult to avoid.

The follow-on effect of increasing indebtedness will be governments pursuing more dramatic policy changes to reduce spending and capture additional revenue. The rising demand for critical minerals and the emergence of friendshoring to bolster supply chains among countries with shared economic and political interests provides obvious opportunities for policy to attract investment. Less-rosy alternatives include the introduction of higher taxes, protectionism and spending cuts to key services. In an increasingly polarized political environment, spending commitments become less predictable. For private industry, this is a key concern as governments are generally seen as highly reliable counterparties.

High cost of the energy transition; global debt scenario



S&P Global, "Global debt 2030: Can the world afford a multifaceted transition?" (January 10, 2024)

[21] Source: Global Debt by 2030 | S&P Global | S&P Global (spglobal.com)

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Chosen winners

High debt, increasing servicing costs, and a need to spend on key initiatives will force governments to choose some projects to the detriment of others, rather than letting the free market reign. Existing non-recourse loans to chosen projects like rare earth refineries have not prevented substantial cost overruns, and this experience is likely to discourage similar strategies in the future. Insights into this prioritization will be fundamental to securing government investment and avoiding the construction of what may become stranded assets.

Unpredictable government requirements

Non-monetary incentives/disincentives and new taxation patterns will become increasingly appealing to governments constrained by fiscal spending commitments. Taxation of super-normal profits of coal companies in Australia and limited environmental regulation of nickel in Indonesia are two prominent examples that illustrate how changes will be highly susceptible and reactive to public sentiment.

Reliance on private funding

With high debt and limited budgets, governments are looking for deep pools of capital among industries and institutional investors. Interest in public-private partnerships will intensify as governments incentivize participation and the stable cash flows of infrastructure assets attract long term investors. Large-scale financial asset managers are already beginning to acquire infrastructure management competitors in order to establish themselves as attractive managers of both physical and digital infrastructure.

06

Escalating capital and operational costs

A significant global project pipeline is fueling price inflation.

Coordinated global policies, emissions pledges and goals are escalating the cost of projects to deliver clean energies such as solar PV, wind, grid storage, and hydrogen to power new mines and refining facilities.[22] The mineral quality required for clean energy batteries is higher than for other technologies. This results in higher construction and operations costs for new projects.[23]

Meanwhile, the tight labor market of the required specialist skills increases project costs.[24] Higher salaries and signing bonuses have become common to attract workers with the right skillsets. Commodity pricing also adds additional complexity to project costs. And finally, challenges pertaining to environmental approvals and permits are currently causing significant cost increases and schedule impacts to projects, ultimately resulting in delays to first ore.

The combined impact of commodity fluctuations, geopolitical volatility and supply chain interruptions, and lack of labor have a cumulative effect on input costs for all battery mineral mining and related operations and capital projects.

Operating costs and pressures

Key drivers of recent mining cost increases:

69% fuel/power

65% maintenance parts/repair

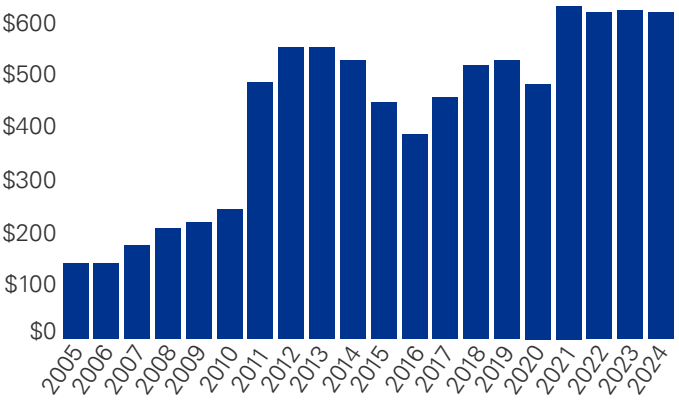
28% explosives

24% labor

Source: Mining Technology, "Rising fuel and power costs continue to affect miners" (December 18, 2023)

Operating costs of the top mining firms have increased

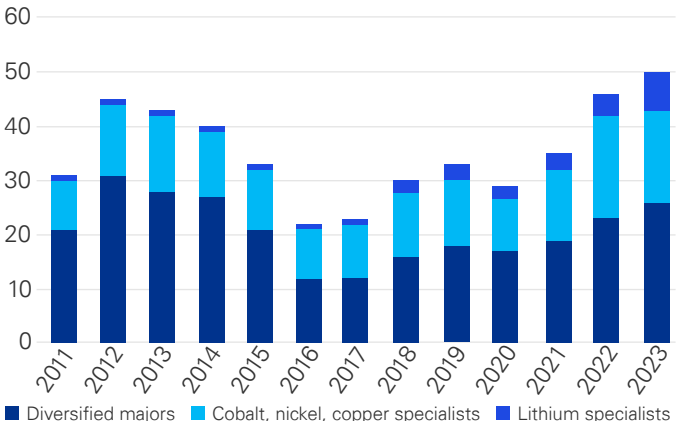
Aggregate of operating costs ($billions)



Source: "Total operation expenses of the top mining companies worldwide from 2005 to 2023, with a forecast," Statista. (This data aggregates costs for the 40 leading mining firms)

Mining capital expenditures have increased in recent years

$billions



Source: "Capital expenditure on nonferrous metal production by 25 major mining companies, 2011-2023" (IEA)

[22] Source: IEA, Critical Minerals Data Explorer

[23] Source: IEA, Critical Minerals Market Review 2023; Implications

[24] Source: US Bureau of Labor Statistics, Labor cost indexes by industry

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Escalation and risk management

Margins for most battery minerals projects are thin and increasingly threatened by escalating capital and operational costs, especially given pressure to reduce project development timelines to meet rapid market demand. Greater awareness of, and visibility into, supply chain strain is necessary to ensure manufacturers can manage the reliability of input and gauge risk. From a development perspective, establishing projects with rigorous assurance and methodical selection will provide a crucial mitigation against common pitfalls like trumpeting the projects as more green than they really are.

Vital productivity and efficiency

The lack of efficiency in construction projects amongst Western nations remains a key stumbling block for the control of development costs. Geographic arbitrage from cross-border diversification is a useful hedge against local costs, such as mining in a high-cost country and manufacturing with cheaper labor elsewhere. Over the longer term, the optimization of delivery processes using technology like AI and modern methods of construction will provide a competitive advantage.

Case study: Simultaneously expanding and finding efficiencies

Challenge

High battery metals prices accelerated the timeline for a global specialty chemicals company to complete a key project: constructing additional process trains at an existing facility. Fast-tracking the investment, which came with an expected project capital expenditure of more than $1 billion, put substantial pressure on the company's existing capabilities to deliver.

Approach

KPMG initially reviewed the project and identified a range of potential improvements to realize operational efficiencies, establish a viable structure with an EPCM company, develop documentation, identify opportunities within new requirements, and restructure the project as necessary during execution, among others. The findings also uncovered opportunities for operations and management to improve the organization more broadly.

Value

- Support from technically knowledgeable personnel was key to building rapport and securing the final investment decision for project approval.
- A practical and results-based focus allowed efforts to evolve as needs changed.
- Given the integrated approach, the combined value of each improvement is greater than the sum of its parts.

Think about this:

- Is there an accurate understanding of project risk profiles and potential for cost escalation?
- How can projects be more efficient?
- How can the development and delivery of projects be more productive?
- Will short-term margin pressure from cost escalation reduce the ability to take advantage of long-term opportunities?
- What are the right capital delivery models to control costs?

How KPMG can help

Organizations can put the right pieces in place to persevere in a complex and resource-constrained environment by understanding the impact of forces on their companies and industries, including mining, energy, transportation and manufacturing. KPMG combines a global perspective with local market and sector knowledge to provide insights and strategies that help companies thrive through change. We then bring to bear our experience in technology, finance, human capital, regulation and much more to provide actionable guidance that makes the difference.

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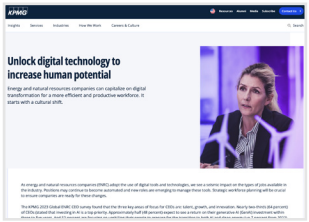

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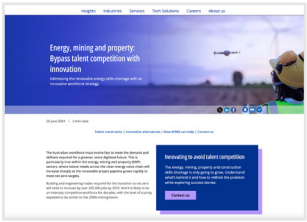

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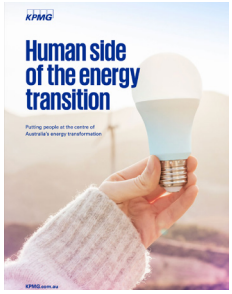

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