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CRITICAL MATERIALS

How to empower Ukrainian critical raw materials sector?

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Creating a success story: how to empower Ukrainian critical raw materials sector?

The full-scale Russian invasion has drastically changed Ukraine's economic priorities and redefined its role in the global economy. One of the most underutilized yet potentially transformative sectors is the country's critical raw materials industry. With confirmed reserves of 22 out of the 34 minerals identified as critical by the European Union—including lithium, titanium, manganese, and uranium—Ukraine has emerged as a strategic node in future-proof global value chains. These reserves are not only significant in volume (for example, 500,000 tonnes of lithium, 185 million tonnes of titanium ore, and 140 million tonnes of economically viable manganese) but are also valued in the tens of billions of dollars. Recoverable uranium reserves alone are estimated to be worth between $20–30 billion at current market prices. Updated surveys and reclassified Soviet-era geological data—notably through Ukraine's collaboration with the European Union under the Strategic Partnership on Critical Raw Materials—suggest that the broader extractive asset base could exceed $15 trillion, particularly with recent re-evaluations highlighting the scale of lithium, titanium, and rare earth reserves.

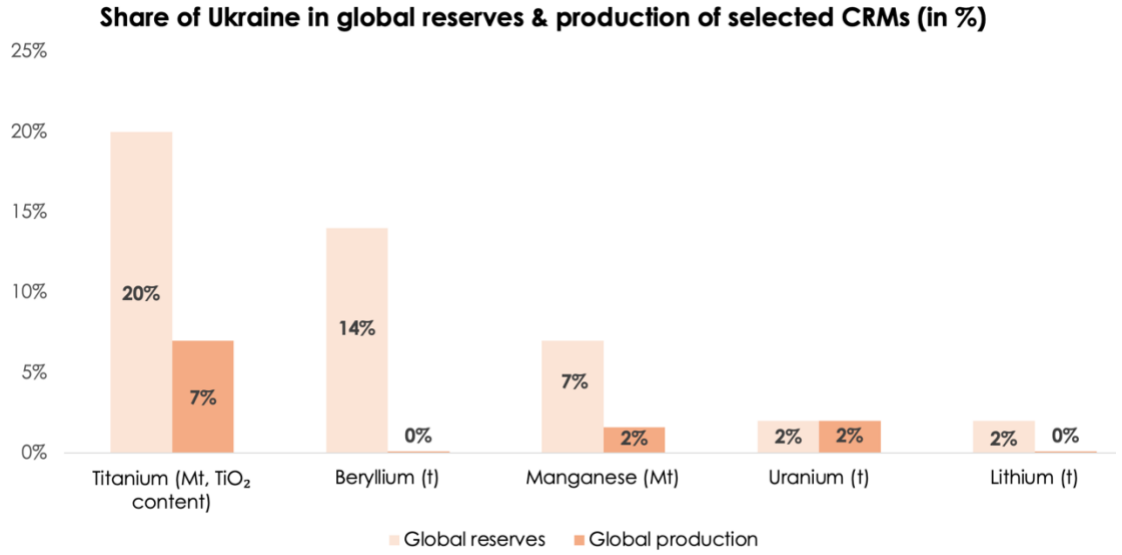

Exhibit 1. Ukraine's share of global reserves in critical minerals is significantly higher than its current production share, highlighting a substantial potential for increasing production during the exploration stage of ore extraction. *Sources: World Mining Data, UkrInvest, USGS, UGS*

1. Current context

As geopolitical competition intensifies and global supply chains seek to reduce reliance on Russia and China, Ukraine's mineral potential is being re-evaluated by both investors and strategic partners. In early 2025—amid rising commodity prices and Europe's urgent need for alternative sources of critical minerals—Ukraine and the United States launched a joint Reconstruction Investment Fund. Under this initiative, the Fund will channel 50 % of state revenues from natural-resource extraction—

specifically, revenues from licenses granted after the Agreement's entry into force and from earlier licenses not yet exploited—into a co-managed vehicle for infrastructure modernization, economic resilience, and technological upgrades in the extractive sector. Conservative valuations place Ukraine's untapped extractive asset base at over $15 trillion, and strategic management could attract $10–15 billion in annual foreign direct investment during the post-conflict reconstruction phase. Public statements by Ukraine's Ministry of Energy and discussions at regional investment forums in March–April 2025 underscore this Fund as a linchpin of the country's long-term recovery and supply-chain diversification strategy.

2. Sector-specific overview

a) Lithium

Ukraine possesses one of Europe's largest lithium reserves, estimated at approximately 500,000 tonnes of lithium content. At least three major lithium ore deposits have been identified – notably Polokhivske in Kirovohrad region and the Dobra and Kruta Balka/Shevchenkivske fields in Donetsk – with Soviet-era geological data indicating potentially over half a million tonnes of lithium metal. Recent assessments have confirmed these sizable reserves. For example, the Polokhivske deposit alone is deemed one of the largest in Europe. The permit for Polokhivske is held by UkrLithiumMining LLC, a privately owned company, which acquired a 20-year extraction license in 2017 and is leading the development of the site. Exploration had progressed by 2021, and by late 2024 environmental baseline studies were underway at Polokhivske to prepare for mining. However, no commercial lithium extraction has started yet, in part because about 20% of Ukraine's mineral deposits (including some lithium prospects in the east) lie in territories under Russian occupation. Furthermore, in April 2025, The Pechersk District Court in Kyiv has imposed a freeze on 51 plots of the Polokhivske lithium deposit, questioning the legitimacy of the special mining permit and leaving the future of the deposit uncertain.

Prior to the war, Ukraine moved to attract investors for its lithium projects. In 2021, authorities auctioned licenses for key deposits, and several foreign companies expressed strong interest. These deals stalled due to the 2022 invasion, but they signaled strong foreign interest. Ukraine's UkrLithiumMining esimated that developing Polokhivske will require significant investment, and the plan envisions producing large quantities of petalite concentrate annually, which could be further refined into battery-grade lithium carbonate. Officials project that if Ukraine's lithium resources are fully developed, the country could rank among the world's top five lithium producers, dramatically bolstering Europe's battery supply chain. Achieving this will depend on large-scale financing, technology transfer, and a stable security situation.

Lithium is in high demand worldwide for electric vehicle batteries and energy storage, and Ukraine's entry into the market could be timely. Despite recent price volatility, analysts expect demand to keep rising and supply to tighten again by the late 2020s. Ukraine's untapped lithium represents a strategic reserve that could help diversify

supply away from current dominant sources. However, it would take years under optimal conditions to go from exploration to a producing lithium mine.

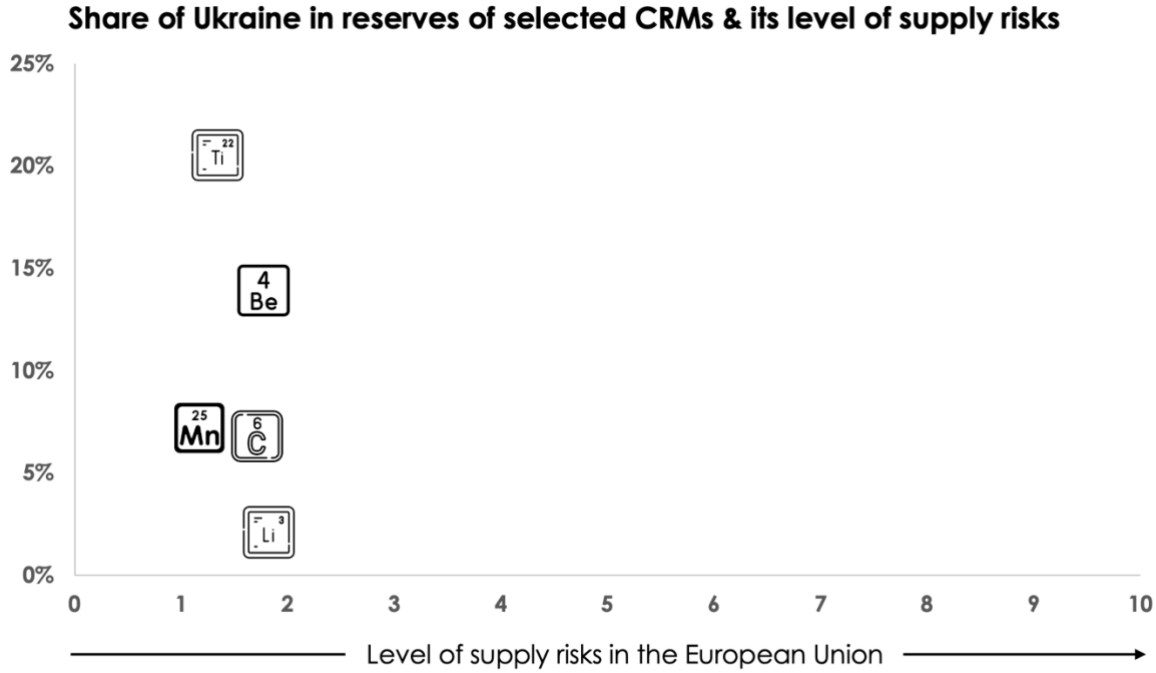

Exhibit 2. Lithium is highly attractive due to its critical role in ensuring supply stability
Sources: EU CRM Study (2023), UkrInvest, USGS, UGS

b) Titanium

Ukraine remains one of the world's key holders of titanium-bearing mineral resources, possessing around 20% of global reserves. In 2021, it exported over 550,000 tonnes of titanium ore—mainly ilmenite and rutile—from shallow deposits (up to 50 m deep) suitable for open-pit extraction. Capital investments for new titanium projects are estimated at $200–500 million, and compared to lithium projects, commercialization can occur more rapidly.

Despite these opportunities, Ukraine's downstream titanium processing sector remains underdeveloped. The Zaporizhzhia Titanium-Magnesium Combine (ZTMC)—the country's only facility capable of producing 99.7 %-pure titanium sponge—now operates under full state ownership (following a 2022 Supreme Court ruling that annulled its previous 49 % private stake). Underinvestment and outdated Soviet-era technology have left ZTMC running far below maximum production capacity, and war-related damage has exacerbated this critical gap in Ukraine's titanium value chain. Although the combine is again slated for privatization under more transparent terms—and recent management changes offer cautious optimism—a full turnaround has yet to materialize.

Titanium is essential for aerospace, defense, and medical industries due to its strength, light weight, and corrosion resistance. Ukraine's titanium resources thus present a

valuable alternative for Western markets seeking to reduce reliance on Russia. Under the EU–Ukraine Raw Materials Partnership, there are proposals to upgrade Ukraine's processing capabilities with European technology. If Ukraine can restore and expand mining operations and build modern processing facilities, it could not only reclaim its pre-war 10% share of global titanium supply but also capture greater value by producing aerospace-grade titanium and specialty products.

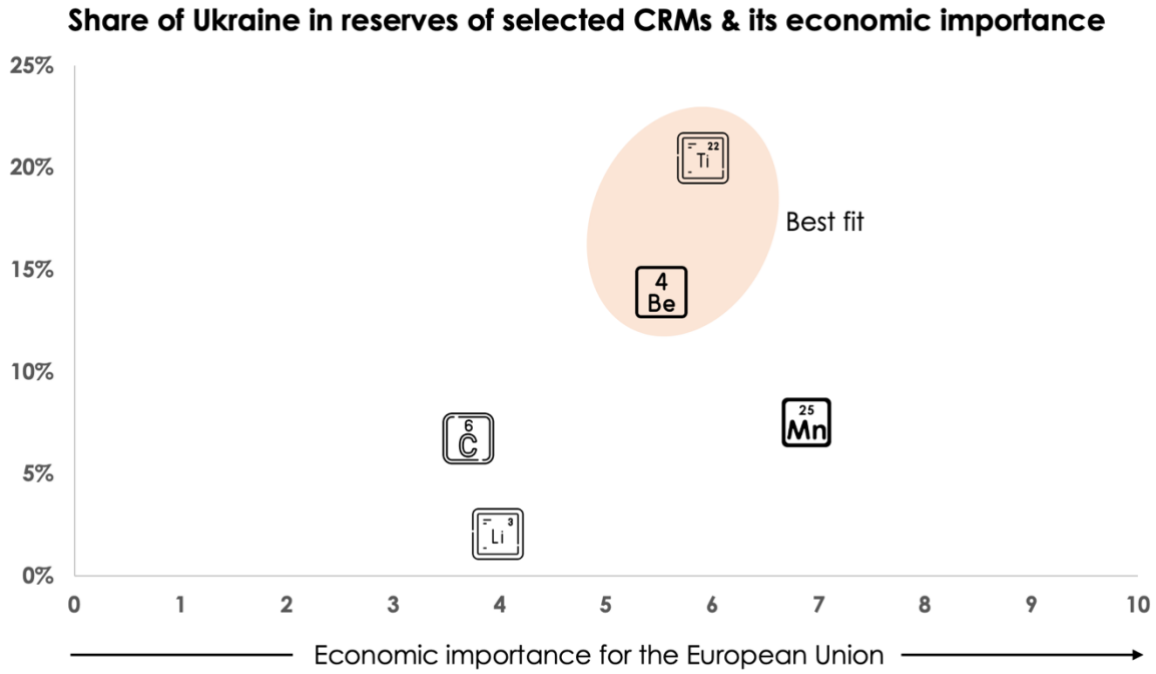

Exhibit 3. Titanium stands out as one of the most attractive investment options, thanks to its abundant resources and considerable economic significance.
Sources: EU CRM Study (2023), UkrInvest, USGS, UGS

c) Manganese

Before 2022, Ukraine's manganese industry was almost entirely controlled by domestic private players — most notably Ihor Kolomoisky's 'Privat Group', which owned the two largest ore producers, Pokrovskiy GZK and Marhanets GZK in Dnipropetrovsk Oblast. These mines fed a vertically integrated ferroalloy sector dominated by the Nikopol Ferroalloy Plant (NZF)—one of Europe's biggest ferroalloy producers and the world's second-largest manganese-alloy maker (over 11 percent of global output)—whose ownership was split between Privat Group and Viktor Pinchuk's EastOne Group. Other key smelters, like the Zaporizhzhia Ferroalloy Plant (also Privat-owned), Stakhanov in Luhansk Region and Kramatorsk in Donetsk Region, completed the integrated value chain; no major international miners participated before 2022.

The Nikopol basin holds roughly 140 million tonnes of high-grade ore, yet production had already fallen from about 600,000 tonnes in 2021 due to underinvestment and operational disruptions. The 2022 invasion compounded these issues: power outages and strikes forced NZF and Zaporizhzhia furnaces offline in late 2022 and again in winter 2023, driving silicomanganese output down ~45% and ferromanganese ~66%

year-on-year, and pushing export volumes more than 90% below pre-war levels by early 2024. In response, some industry players have since attempted restarts, but energy inefficiency and obsolete equipment remain serious challenges, making recovery both essential for Ukraine's heavy-industry revival and dependent on large-scale, post-war reconstruction efforts.

In January 2025, the Shevchenkivskyi District Court in Kyiv has ordered the seizure and transfer of assets from the NZF to the Asset Recovery and Management Agency (ARMA). The assets are part of an investigation into the misappropriation of state funds in 2014, involving former PrivatBank shareholders, including Kolomoiskyi. The seizure of NZF by ARMA paves the way for potential foreign capital influx offering hope for the asset's modernization and enhanced production capacity — crucial to maintaining its position as the world's second-largest producer of manganese alloys.

d) Uranium

Ukraine's uranium industry is almost entirely state-controlled, with the Eastern Mining and Processing Plant (known as SkhidGZK or VostGOK) at its core. SkhidGZK is Europe's largest uranium producer, holding about 100,000 tonnes of uranium reserves in its Kirovohrad mine complex and another roughly 85,000 tonnes elsewhere in Kirovohrad and Dnipropetrovsk regions—185,000 tonnes in total. Because these ores are very low grade (0.1–0.2 % U), miners work underground at depths of 500–1,300 metres.

Before the war, Ukraine produced 800–1,000 tonnes of U_3O_8 each year—enough to supply about 30 % of its nuclear-fuel needs. Today output has fallen to roughly 455 tonnes per year, highlighting the gap between what Ukraine could produce and what it actually does.

SkhidGZK has been state-owned throughout its history, and in 2021 it was placed under NAEC Energoatom to improve its finances. Even before Russia's full-scale invasion, SkhidGZK faced high production costs, growing debts and strikes by its workers. In 2022, its uranium output plunged by about 78 %—down to just 100–120 tonnes—after budget cuts and fighting forced the closure of the Smolinske mine and forced other operations to concentrate on the Novokonstantynivske site.

Since the invasion, Energoatom has proposed fully merging SkhidGZK into its organization and investing about $373 million to modernize the mines. At the same time, Ukraine has built new partnerships in the West:

- It ships uranium concentrate to Canada's Cameco for conversion and enrichment.
- The enriched material then goes to Westinghouse in the U.S. for fuel-rod fabrication.
- A UK-backed guarantee from Urenco further secures financing.

These moves break Ukraine's dependence on Russia's TVEL fuel supplier and lay the groundwork for a fully domestic nuclear-fuel cycle. Although SkhidGZK remains a

public enterprise, these Western alliances—and small, experimental private in situ-leaching projects at Safonovka—signal the start of a more resilient, internationally integrated Ukrainian uranium industry.

3. Structural and regulatory challenges

Despite Ukraine's long mining history, the technological infrastructure remains outdated. Facilities such as the Zaporizhzhia Titanium-Magnesium Combine, despite their world-class potential, operate far below capacity due to chronic underinvestment. Moreover, Ukraine lacks domestic capacity for advanced lithium processing and high-value refining, forcing the country to export raw ore rather than capture the full economic benefit of its resources. Most ferroalloy plants run below 50% efficiency due to energy shortages, antiquated machinery, and regulatory inconsistencies. Environmental and social governance (ESG) standards in the sector fall short of global investor expectations, with issues such as acid mine drainage, insufficient tailings management, and limited community engagement persistently undermining investor confidence. Although Ukraine is a member of the Extractive Industries Transparency Initiative (EITI), enforcement of ESG compliance remains weak—especially in war-affected regions. Recent government reforms initiated in mid-2024, including a push for streamlined licensing and a one-stop permitting agency, aim to correct these long-standing issues.

4. Geopolitical risks and investment climate

Geopolitical instability remains the primary obstacle to realizing Ukraine's mineral potential. Strategic regions such as Donetsk, Luhansk, and Zaporizhzhia continue to experience disruptions due to the ongoing Russian invasion. These uncertainties heighten investment risks, making the establishment of robust legal frameworks, international security guarantees, and diplomatic assurances essential for de-risking capital inflows. In April 2025, Ukraine and the United States established the US–Ukraine Reconstruction Investment Fund, into which 50 % of state revenues from new extraction licenses—and from previously issued licenses not yet exploited—are to be deposited under a 50:50 governance structure. The Agreement defines the mechanism for transferring those revenues (Articles V–VI) but does not itself specify how the Fund's resources must be used. Furthermore, fluctuating energy prices and intermittent sanctions regimes contribute additional layers of risk that must be navigated. Several international investment forums in 2024 emphasized the need for clear, enforceable legal commitments to attract long-term funding, and policymakers continue to debate the best path forward in a context where geopolitical and economic pressures intersect.

5. Strategic Policy Recommendations for Ukraine's CRM Sector

To transform Ukraine into a competitive, resilient supplier of critical raw materials—and to seize the strategic opportunity presented by 22 of the EU's 34 designated CRMs—Kyiv must move beyond ad hoc measures and adopt a unified, MECE-structured policy agenda. This begins with reshaping market fundamentals (ownership,

governance), then builds the regulatory and ESG scaffolding needed to attract investment, mobilizes financing and partnerships, and finally cements gains through domestic value-chain development and hardened infrastructure. Organized into four non-overlapping pillars, the eight recommendations that follow collectively cover every lever available to craft a globally-competitive Ukrainian CRM sector.

Pillar A. Market Structure & Governance

I. Transparent Privatization & Restructuring

An analysis of recent outcomes suggests that opening state-run and re-nationalized mines to competitive bidders can reinvigorate output. For example, a 95m$ re-privatization of the UMCC titanium operations in 2024 correlated with a measurable rise in production and fresh capital inflows. A systematic, phased divestment—accompanied by robust anti-monopoly safeguards—would likely attract strategic partners while diluting concentrated ownership. The key trade-off involves balancing revenue-raising via asset sales against the risk of undervaluation; carefully designed auctions and independent valuation mechanisms could mitigate that concern.

II. Institutional Governance and Transparency

Persistent concerns around corruption and opaque contract awards have dampened investor appetite in the past. Reforming entails fighting corruption in the permitting process, ensuring contracts are honored, and providing strong rule-of-law protections for investors. A robust independent regulator for the mining sector could be established or empowered. Public disclosure of mining contracts, adherence to EITI (Extractive Industries Transparency Initiative) standards, and digital open data on geological information would build trust. As post-Soviet oligarch-era structures are dismantled, it's crucial to prevent any new monopolies or opaque deals. Clear, fair rules will help Ukraine avoid the pitfalls of the past and reassure both domestic entrepreneurs and foreign partners that the critical minerals sector is a level playing field. Over the past decade Ukraine has passed laws to limit oligarchic influence and to improve corporate governance; these efforts must continue so that new investment in CRMs is merit-based and efficient. Strong governance will underpin all other recommendations – from privatization to ESG compliance – and is therefore a foundational step.

Pillar B. Regulatory & ESG Framework

III. Permitting and Licensing Processes

Permitting reform will make it faster and easier for reputable investors to explore and develop mineral deposits. Ukraine should cut red tape and modernize its mining cadastre processes to meet international best practices. Recent steps have been taken – for instance, Ukraine began auctioning exploration permits for lithium, copper, cobalt, nickel and other minerals to attract investors. Building on this, the government must ensure that obtaining licenses and environmental approvals for critical raw

material (CRM) projects is time-bound, transparent, and predictable. A more investor-friendly permitting regime will unlock dozens of known deposits (Ukraine currently has 20,000 known deposits, of which only ~15% were active pre-war).

IV. Strengthening ESG Standards and Environmental Safeguards

As Ukraine scales up mining, it must concurrently improve environmental, social, and governance (ESG) performance to meet EU and global standards. This includes strengthening mine safety, reducing pollution, and ensuring transparent governance of mining revenues. Permitting reforms should not come at the cost of environmental protection. Ukraine has recently aligned parts of its environmental assessment law with EU procedures, but wartime pressures have at times rolled back enforcement. Going forward, authorities should rigorously enforce environmental impact assessments, require modern pollution controls, and mandate land reclamation and community benefit plans for new projects. Adopting best-in-class ESG practices will not only protect Ukraine's environment (preventing critical mineral projects from creating "sacrifice zones") but also make Ukrainian companies more attractive to Western partners who increasingly demand responsible sourcing.

Pillar C. Financing & Investment

V. Targeted Investment Incentives

Fiscal-incentive schemes (e.g. royalty holidays, co-financing guarantees) have proven effective in frontier markets to bridge early-stage financing gaps. International support can be leveraged here – for example, the 2025 U.S.-Ukraine minerals deal not only gives U.S. firms preferential access to projects but also will fund investments in Ukraine's reconstruction. Ukraine should channel such funds into critical minerals infrastructure. By de-risking investments (through export credit agencies or development banks) and offering stable contracts, the government can spur development of mines and plants that might not proceed under normal market conditions post-conflict.

VI. International Partnerships and Market Integration

The EU and U.S. are both seeking to diversify supply chains away from reliance on China/Russia, and Ukraine is well-positioned to become a key alternative supplier. The government should capitalize on initiatives like the EU–Ukraine Strategic Partnership on Raw Materials and the recent U.S. minerals pact to secure technical assistance, investment, and guaranteed offtake agreements. Joint ventures can be formed with experienced international miners for complex projects (for example, teaming with a Canadian or Australian firm for lithium development). Closer integration with EU markets – by aligning regulations with the EU Critical Raw Materials Act and eventually joining the EU single market – will ensure Ukraine's products have ready buyers. Ukraine can also seek financing from EU recovery funds and cooperate on R&D (for instance, on new extraction technologies or recycling of critical materials). In essence, treat critical minerals as a pillar of foreign economic diplomacy. By becoming a reliable

supplier and partner, Ukraine can embed itself in Western supply chains, gain political support, and foster resilience through shared interests.

Pillar D. Value-Chain & Infrastructure

VII. Vertical Integration of Value Chains

A shift from being merely a raw material exporter to developing more of the value chain domestically is important. This means investing in downstream processing and manufacturing capabilities related to critical minerals. For manganese, that could entail modernizing ferroalloy plants and even exploring production of battery-grade manganese or steel additives in-country. For uranium, it could mean eventually establishing a domestic fuel fabrication facility or joint venture (so Ukraine can produce its own nuclear fuel assemblies in the long term). Integration also applies to other CRMs – e.g. moving up the value chain in lithium (battery cathode materials) or graphite (anode materials) rather than just shipping concentrates. Such vertical integration would create higher value exports and jobs and reduce Ukraine's vulnerability to external supply chain bottlenecks. The government can facilitate this by partnering with Western tech firms and by using some ore as in-kind investment for joint ventures. Recent permit auctions even explicitly encourage investment in refining capacity for critical minerals, not just mining, underscoring the need for value addition inside Ukraine.

VIII. Infrastructure Rehabilitation & Resilience

The reconstruction of critical infrastructure that the mining and metals industry relies on – electricity grids, transportation (railways, ports), and water systems – should be prioritized with an emphasis on resilience. The war highlighted that mines and plants cannot operate without reliable power and water; for example, ferroalloy smelters had to suspend operations when the grid was under attack. Ukraine should harden its electric grid and consider dedicated power supplies (or on-site generation, e.g. solar + storage) for major mining hubs to insulate them from future disruptions. Likewise, improving rail links and export corridors (including secure Black Sea access or alternative EU rail links) will be vital for transporting bulk minerals. Some progress is being made – iron ore exports surged once alternative sea routes opened in 2023 – but further logistics upgrades will lower costs for all mineral exports. Modern infrastructure not only aids current operations but also attracts new projects (investors need confidence that their product can reach markets efficiently).

6. Long-term strategic implications

Beyond raw extraction, the US–Ukraine agreement envisages a broader transformation of Ukraine's role in global value chains—but not by mandating the reinvestment of mineral revenues. Instead, the Fund created under Articles 7–8 of the Agreement gains joint control over the licensing and offtake of newly extracted resources and may serve as the exclusive purchaser of those outputs. Under this structure, Ukraine could still build domestic value-added capacity—processing, ESG

compliance systems, and integrated logistics networks—if and when the Fund chooses to finance such projects. With sustained capital injections and parallel regulatory reforms, Ukraine has the potential to diversify its export base to become a supplier of refined battery- and nuclear-grade materials. In this model, raw minerals would remain under the Fund's purview, while downstream investors could capture additional value through refining and specialty-materials production critical to Europe's green transition and strategic autonomy. Given Ukraine's status as a net importer of oil and gas—and its recent ban on gas exports to secure domestic supply—success in the critical-minerals sector could redefine its export identity, turning it into a high-tech, vertically integrated participant in global supply chains.

Authors: *Olena Yurkovska, Consultant at DataDriven; Artem Rybalchenko, Consultant at DataDriven; Viktor Karvatskyy, Partner & Head of Consulting*

Sources

In preparation for this study, DataDriven analyzed a variety of sources, including industry reports (such as those from CEOBS, Wilson Center, etc) that provided detailed insights into the economic, technical, and environmental of Ukraine's critical minerals. Additionally, academic articles and market analysis from platforms helped identify trends in mineral reserves and investment opportunities. To enrich the understanding, the study was further supplemented by key informant interviews (KIIs) with industry stakeholders, providing valuable real-time perspectives on market dynamics, regulatory challenges, and the outlook for Ukraine's role in global supply chains.

DataDriven Research & Consulting

L: UNIT.City, Ukraine, Kyiv, str. Dorohozhytska, 3

E: office@datadriven.group

W: https://datadriven.group

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datadriven.group