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Strategic Raw Materials in Ukraine: Opportunities for Strengthening EU Supply Chains?

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Key Messages

- Ukraine possesses confirmed reserves for two-thirds of the 34 raw materials classified as critical by the EU. Despite this geological richness, current extraction levels remain limited.
- The EU faces lower supply risks for raw materials currently mined in Ukraine than for those that remain part of the country's untapped resource potential.
- Ukraine currently plays a minor role in EU raw material value chains. However, it is a potential future key partner in enhancing the EU's resource security.
- Realizing Ukraine's potential as a raw material supplier requires more than mining. Significant investment in downstream capabilities is essential to create integrated value chains.
- The EU must pursue a multi-pronged strategy: deepen partnerships with resource-rich and politically stable countries, expand domestic refining capacities, and accelerate recycling, substitution, and circular economy initiatives.

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Strategic Raw Materials in Ukraine: Opportunities for Strengthening EU Supply Chains?

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Securing access to critical raw materials has become a top priority for governments worldwide, particularly in light of geopolitical disruptions and increasing demand for materials essential to the green transition and advanced technologies. Ukraine holds substantial reserves of key raw materials that are vital for European industry, offering an opportunity for supply chain diversification and resilience.

Recognizing Ukraine's strategic importance, the EU has already signed a raw material partnerships in 2021, while discussions on a potential agreement with the United States are ongoing. As the EU seeks to strengthen its strategic autonomy, reducing dependence on single-source supplier, especially from politically unstable regions, Ukraine presents itself as a valuable alternative.

This brief identifies raw materials which Ukraine has reserves for and examines Ukraine's current role in raw material production and trade. It evaluates current global supply chains of these materials as well as EU and German sourcing patterns. Lastly, it offers a perspective on how Ukraine could become a strategic partner in EU's supply chain diversification efforts.

A special focus will be on raw materials which are classified as strategic[1] raw materials by the EU (EU Commission, 2023a) and which Ukraine has put an emphasis on in its activities on attracting investors (Ukrainian Geological Survey, 2024). This leads to the following list[2]: Titanium Metal, Natural Graphite, Manganese, Lithium, Cobalt, Copper, Nickel.

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[1] A strategic raw material is a critical raw material that is not only economically important and subject to supply risk, but also particularly essential for the EU's green and digital transitions, as well as for defense and space sectors. What makes a critical material also strategic is its central role in key technologies, its expected global demand growth, and the challenges involved in rapidly increasing its production (EU Commission, 2023b).

[2] Although manganese is not included among the raw materials that Ukraine has explicitly targeted in its strategic outreach to investors, it remains economically significant for the country and is classified as a strategic raw material by the EU. Rear Earth Elements are not included in this brief, as the degree of granularity of international trade data does not allow to track the trade flows of the individual materials.

Ukraine's Raw Material Reserves

Ukraine possesses rich geological deposits of critical raw materials essential for emerging strategic technologies. The country has a long-established metallurgical and mining sector, which has historically been a pillar of industrial development and a major contributor to exports.

While precise estimates for some reserves are still required, available data highlights Ukraine's considerable resource base. According to estimates provided by the Ukrainian Geological Survey (2024), the country holds 1–2% of global lithium reserves, making it the largest holder within Europe. It ranks ninth globally for titanium reserves. Additionally, Ukraine possesses 7% of global manganese reserves, ranking fourth worldwide, and 3% of global iron ore reserves, placing it eighth globally.

Prior to the war, Ukraine played a particularly important role in titanium production, accounting for 7% of global mining output. However, by 2022, this share had dropped to 2%. Similarly, iron ore and manganese production declined, with their shares of global output falling from 3% to 1% and 2%, respectively (World Mining Data, 2024).

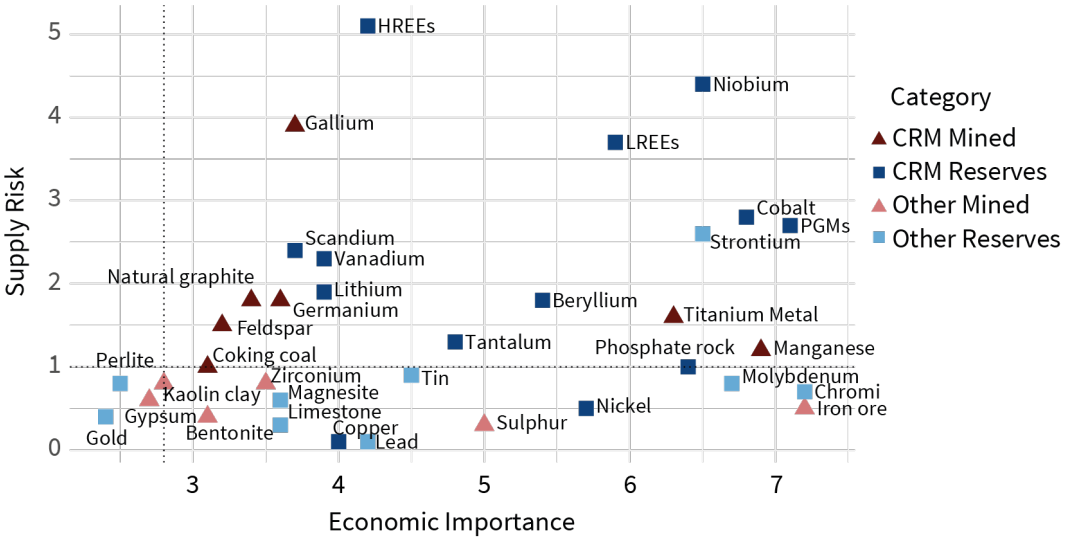
The country has one of the most geologically diverse resources in Europe. Ukraine holds reserves of many raw materials classified as critical by the EU. However, its current mining activities remain concentrated on a limited number of these materials. These untapped reserves offer opportunities for future mine exploration and development. Figure 1 displays the raw materials which are known to be available in Ukraine according to the Ukraine Geological Survey (2025) and which are among the 70 raw materials included in the EU Critical Raw Material Report for 2023.[3] The figure maps raw materials according to the economic importance index and supply risk index[4] calculated by the EU Commission (2023a). Of the 70 materials included in the list of the European Commission, Ukraine has reserves for 35 materials. Of the 34 materials classified as critical by the EU Commission, Ukraine has reserves for two-thirds.

As shown in Figure 1, the materials currently mined in Ukraine tend to be classified as having relatively low supply risk in comparison to its untapped reserves. This indicates significant mining potential for the future. However, it is important to acknowledge that many of the regions with significant resource potential are located in the eastern part of the country, which has been more heavily impacted by the ongoing war.

[3] For the Critical Raw Material Report 2023 the EU has assess 70 raw materials. It has classified 34 as critical raw materials.

[4] The economic importance indicator reflects how critical a raw material is to key EU industries based on its role in value chains and contribution to the economy. The supply risk indicator measures the likelihood of supply disruptions, considering import dependence, production concentration, and governance risks in supplying countries.

Figure 1: Overview of Critical Raw Materials (CRM) in Ukraine



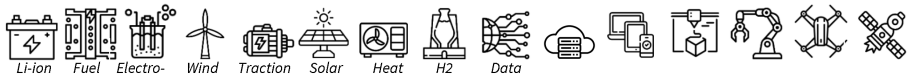
Note: Copper and Nickel are not CRM, but are classified as strategic by the EU.
Source: EU Commission; Ukrainian Geological Survey; World Mining Data.

Raw Material Demand

Ukraine's raw material base offers critical inputs for a range of technologies central to the green and digital transitions, including renewable energy, e-mobility, information and communication technologies (ICT), as well as aerospace and defense. The demand for these materials is shaped both by current industrial use and by anticipated shifts in technological pathways. The EU Commission has selected 15 strategic technologies as essential for advancing the green and digital transition (JRC, 2023). Figure 2 presents an overview of the strategic technologies that rely on raw materials available in Ukraine.

The raw materials currently mined in Ukraine are, on average, used in a smaller number of key technologies—five out of fifteen—compared to materials that the country plans to extract in the future, which are required, across seven of the fifteen assessed technologies on average. This underscores the strategic relevance of developing additional mining capacity, particularly for materials expected to play a central role in future industrial applications.

Figure 2: Ukraine's Raw Material Base as Key Inputs for Strategic Technologies



Material	Li-ion Batteries	Fuel Cell	Electro-lysers	Wind Turbines	Traction Motor	Solar PV	Heat Pumps	H2 DRI	Data Networks	Servers	Tablets	AM	Robotics	Drones	Satellites
■ **Beryllium**										x	x				x
Chromium		x	x	x	x		x	x		x	x	x	x	x	x
■ **Cobalt**	x	x	x						x		x	x	x	x	
■ **Copper**	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Gold			x				x		x	x	x		x	x	x
Lead				x		x			x		x		x	x	x
Limestone			x					x					x	x	
■ **Lithium**	x								x		x		x	x	x
Magnesite								x							
Molybdenum			x	x	x	x	x		x		x	x	x	x	x
Nickel	x	x	x	x		x	x	x	x	x	x	x	x	x	x
■ **Niobium**			x	x					x			x		x	x
■ **Phosphate R.**									x						
■ **Scandium**			x							x		x			
Strontium		x	x						x		x				
■ **Tantalum**			x						x		x			x	x
Tin			x			x			x	x	x		x	x	
■ **Vanadium**		x	x					x	x			x	x	x	x
Zinc			x	x		x	x		x	x	x		x	x	x
▲ **Feldspar**		x												x	
▲ **Gallium**						x			x	x	x		x	x	x
▲ **Germanium**						x			x	x	x				x
Gypsum									x						
Iron ore		x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kaolin															
▲ **Manganese**	x	x	x	x			x	x	x	x	x	x	x	x	x
▲ **N. Graphite**	x	x	x					x	x		x		x	x	
Sulphur															x
▲ **Titanium**											x	x	x	x	x
Zirconium		x	x					x	x			x			x

○ Raw materials already mined ■ CRM Reserves ▲ CRM Mined

Note: No reserve information is available for specific types of PMGs, LREEs, and HREEs in Ukraine.
Coking coal is not used in any of the assessed technologies.
Source: EU JRC; Ukrainian Geological Survey; World Mining Data.

Among the materials already mined, titanium and manganese are the most relevant. Titanium is especially important for aerospace and defense applications. Its technical properties—low weight, high mechanical strength, high melting point, and low thermal expansion—make it well-suited for demanding engineering environments (SCRREEN, 2023). Manganese, by contrast, is notable for its breadth of application: it is used in fourteen out of the fifteen technologies considered, placing it among the most versatile and critical materials in the dataset. In addition to its widespread use, manganese has few viable substitutes, which further increases its strategic importance (SCRREEN, 2023). Demand forecasts indicate that global demand for manganese could double or even triple by 2030, depending on the scenario (JRC, 2023)[5].

Another critical raw material already mined in Ukraine is natural graphite. Its demand is projected to increase tenfold by 2030 compared to 2020, driven primarily by battery

[5] The JRC models future material demand based on two scenarios: a High Demand Scenario (HDS) and a Low Demand Scenario (LDS). The HDS assumes rapid technology deployment and high climate ambition, resulting in strong demand for raw materials, while the LDS reflects a more gradual rollout and correspondingly lower demand.

technologies. While synthetic graphite can complement supply, natural graphite remains essential for many applications (JRC, 2023).

Looking beyond current extraction, several materials targeted for future mining show high relevance across technologies—particularly lithium, as well as nickel, copper, and cobalt, which are frequently mined together. Lithium is primarily used in lithium-ion batteries but also in aerospace and defense applications, with EU demand projected to increase seven- to tenfold by 2030. Nickel and copper are required in fourteen of the fifteen technologies examined, making them central to multiple value chains. For both materials, the EU anticipates substantial demand increases: more than fivefold for nickel, and between three- and fivefold for copper. Cobalt, mainly linked to battery technologies, is also projected to see a three- to fivefold increase (JRC, 2023).

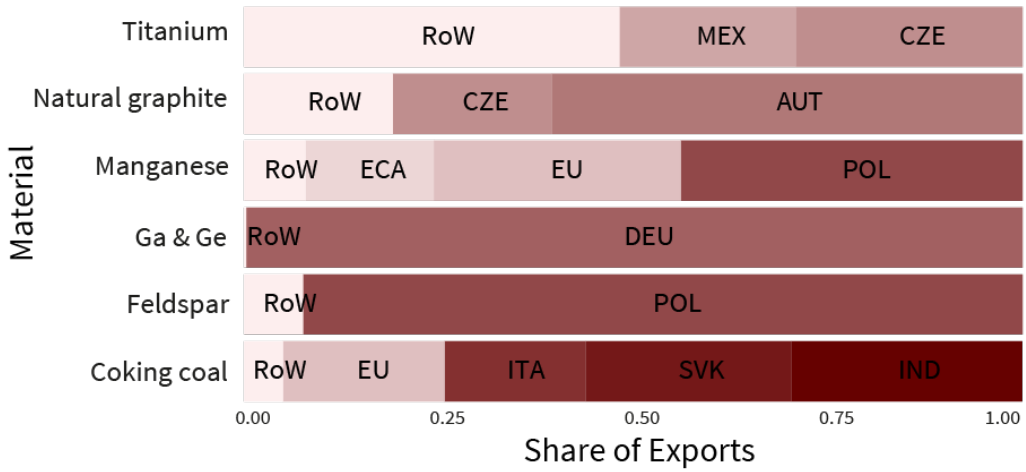
Ukraine's diverse range of raw materials is particularly relevant for renewable energy technologies, such as lithium-ion batteries. This importance is reflected in the EU-Ukraine Strategic Partnership on Raw Materials, which explicitly includes battery value chains as a key area of cooperation. Notably, Ukraine holds over 40% of the different materials required for battery production. By contrast, other technologies depend on a more varied mix of raw materials, meaning that even with Ukrainian supply, the EU would still need to source many inputs from other countries.

Ukraine's Raw Material Trade

Ukraine's exports of mined raw materials contribute significantly to its overall export revenues. In 2019, raw material exports accounted for 12.4% of total exports. This share declined slightly during the war, reaching 9% in 2023. Since the onset of the war, Ukraine has also significantly shifted its raw material exports away from Russia, redirecting them toward new trading partners. Poland has emerged as the primary destination for Ukraine's mined critical raw materials, now accounting for 25% of Ukraine exports of critical raw materials —whereas in 2019, it was not even among the top five recipients. Other key trading partners include India, Turkey, Italy, and Slovakia, each receiving roughly 8% of Ukrainian raw material exports.

Broken down by material, iron ore remains the most significant contributor to export revenues, making up over 80% of total exports of raw materials which Ukraine mines. Other key raw materials include manganese (6%), coking coal (3%), and titanium (2%), all of which are classified as critical raw materials by the EU.

Figure 3: Ukraine Exports of Critical Raw Materials



Countries shown seperately if their share is at least 15%. ECA = Europa & Central Asia (excl. EU);
RoW = Rest of World. Ga & Ge: Gallium and Germanium.
Source: BACI; calculations by the ifo Institute.

Figure 3 illustrates the distribution of Ukraine's critical raw material exports by destination country in 2023. The export composition of individual materials is highly concentrated among a few countries and varies significantly by material type. Notably, materials classified as strategic by the EU are also the most important in Ukrainian exports after iron. These materials also tend to have a more diversified range of export destinations.

Manganese and titanium are the only raw materials for which Ukraine accounts for more than 1% of global export volumes. For refined manganese, Ukraine makes up 5% of global exports and supplies 12% of the EU's imports, including 3% of Germany's. In the case of titanium, Ukraine contributes 3% of global exports of primary titanium and 1% of refined titanium. Its role is more significant in the EU, where it supplies 7% of primary titanium imports and 1% of refined titanium imports.

Although Ukraine's current share in global supply is modest, its significant reserves—as outlined earlier—present opportunities for future growth and could contribute to the prospective diversification of European raw material supply chains.

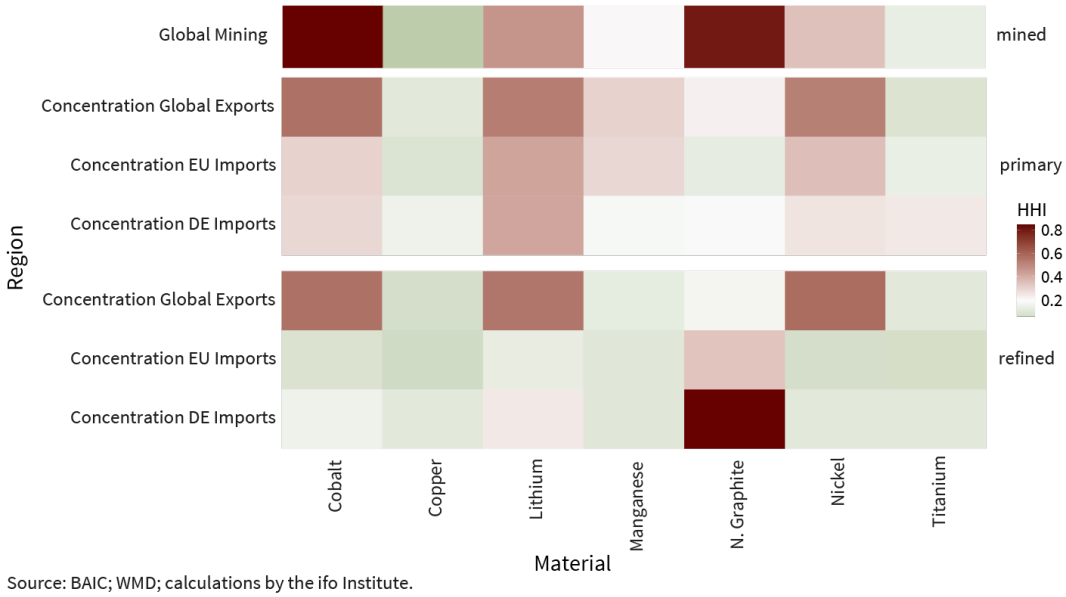
Global Supply Chains of Key Raw Materials

To assess Ukraine's prospective role in EU supply chains, it is first necessary to examine the current structure of global supply chains and the EU's sourcing patterns for these materials. The sourcing landscape of strategic raw materials shows varying levels of concentration across different stages of production, from extraction to refining. Figure

4 illustrates the supply concentration along the value chain, differentiating between global supply and specific sourcing patterns for the EU and Germany. It focuses on materials which are classified as strategic raw materials by the EU (EU Commission, 2023a) and which Ukraine has put an emphasis on in its activities on attracting investors (UGS, 2024).

This analysis draws on World Mining Data (2024) to capture global mining activity, complemented by bilateral trade data from CEPII (Gaulier and Zignago, 2010) to examine international raw material flows.[6] While the trade data distinguish between different processing stages, it does not allow to zoom in on different refining grades within materials (e.g., identify high purity-level refinement). Consequently, export shares reflect overall trade volumes but may not fully capture the concentration patterns typically discussed in the context of critical refining capabilities.

Figure 4: Concentration of Critical Raw Materials across Stages of Production: Mining, Unprocessed Materials (Primary) and Processed Materials (Refined)



Source: BAIC; WMD; calculations by the ifo Institute.

At the **mining stage**, the production of many critical raw materials is highly concentrated, with a few key countries dominating global output. This concentration often reflects underlying geological endowments, cost structures, and national regulatory environments. Materials such as cobalt and nickel are particularly vulnerable, with supply chains heavily reliant on a small number of countries. For example, the DRC accounts for around 67% of global cobalt extraction, China for 67% of natural graphite output, while Indonesia (46%) and the Philippines (11%) lead in nickel mining (World Mining

[6] The analysis is based on trade data from 2023. For mining activity, the most recent available data—covering the year 2022—are used.

Data, 2024). This creates substantial risk exposure in the event of geopolitical, environmental, or regulatory disruptions.

To quantify supplier concentration, the Herfindahl-Hirschman Index (HHI) serves as a useful measure. As discussed above, Cobalt is a prime example of a highly concentrated supply chain, reflected in its high HHI of 0.49. Similarly, lithium shows elevated concentration levels (HHI ≈ 0.32), with Australia and Chile accounting for roughly 75% of global mining output. Other materials, such as titanium (HHI ≈ 0.17) and manganese (HHI ≈ 0.20), exhibit moderately high concentration, with production concentrated in countries like China, South Africa, and Australia. In contrast, copper has a significantly lower HHI of around 0.10, indicating a more diversified supplier base. Major producers like Chile, Peru, and China contribute to this broader distribution, which helps mitigate the risks associated with regional supply shocks.

Once extracted, **unprocessed raw materials** enter global value chains, but export shares often diverge from mining activity. This misalignment is frequently driven by resource-rich countries prioritizing domestic processing over raw material exports to capture more value along the supply chain. A notable example is Indonesia's nickel policy, which has redirected raw nickel flows into domestic smelting and refining facilities by restricting exports. As a result, countries aiming to build or expand their own refining capacities—particularly to strengthen strategic autonomy and reduce dependence on dominant processors—may need to source inputs from smaller producer countries.

The **processed raw materials** segment shows considerable variation in terms of market structure. Some products are dominated by a small number of producers, while others remain more fragmented. For instance, China is the leading producer of refined lithium and controls the majority of global output of lithium hydroxide and lithium oxide—accounting for over 70% of total exports.

China also plays a dominant role in the production of battery-grade refined cobalt, nickel, and manganese. Despite limited cobalt reserves, China accounts for approximately 78% of refined cobalt production (Cobalt Institute, 2024), primarily in the form of cobalt sulfate and cobalt tetroxide, which are key inputs in lithium-ion battery manufacturing (Cobalt Institute, 2021). In the case of nickel chemicals used in battery manufacturing, China is a major producer, exporting over 70% of nickel oxides and hydroxides. China also dominates exports of manganese dioxide—used in batteries—accounting for over 41% of global trade.

Another emerging player is Indonesia. It is the leading exporter of lower-purity nickel materials used in stainless steel production—which accounts for 65% of global nickel demand (INSG, 2024). Indonesia supplies 78% of global granular ferro-nickel exports

and 46% of nickel mattes. It is also a major exporter of manganese products used in steelmaking, with over one-third of global exports.

European countries play a significant role in the export of refined metals not primarily used in battery applications. Norway, for example, is a key player in high-grade refined manganese, while France is the leading exporter of nickel chlorides—used in electroplating and chemical synthesis—accounting for over 40% of global exports.

Processed copper and titanium exhibit relatively low concentration, with HHI values below 0.1 for both. Several European countries, including Germany, France, the Netherlands, and the United Kingdom, rank among the top exporters for various refined copper and titanium products.

Except for China's dominance in the supply of battery-grade metal compounds, Germany maintains a relatively diversified sourcing pattern in most cases. For cobalt, Finland—EU's leading cobalt producer—and Belgium, a key hub for cobalt refining, have emerged as significant trading partners. Together, they account for nearly 30% of Germany's refined cobalt imports. A similarly diversified picture emerges for refined manganese: Germany's principal suppliers are EU member states, notably Norway and France, which collectively contribute close to 30% of total imports.

In summary, concentration levels of critical raw materials vary significantly across different materials and stages of production, without a consistent pattern (Figure 3). Likewise, there is no clear tendency for global supply to be systematically more or less concentrated than EU sourcing. This section has outlined various features of different supply chains, underscoring the diversity of sourcing structures. However, given the pronounced heterogeneity, supply dependencies must be assessed individually, on a case-by-case basis.

Policy Conclusions and Future Outlook

At present, Ukraine plays a limited role in the European raw material value chain. Although the country produces several key materials—including titanium, manganese, and natural graphite—the raw materials currently mined in the Ukraine are generally classified as having lower supply risks according to the EU Commission's classification. Consequently, Ukraine's current mining activities can support EU efforts to diversify supply but do not yet represent a strategic shift in addressing high-risk dependencies.

Looking ahead, Ukraine has **substantial untapped reserves** that represent an opportunity for expansion. This positions the country to become a more significant partner in

EU raw material supply chains—especially for materials where global production is currently highly concentrated. Realizing this potential, however, requires more than access to reserves. As global supply chain patterns demonstrate—most notably in the case of China—dominance in critical raw material markets is increasingly determined by refining and processing capacity rather than mining alone. China, for example, holds a leading position in the production of battery-grade metal chemicals, despite more limited involvement in upstream extraction.

This underscores an important consideration for Ukraine's future role: mining capacity alone does not guarantee integration into strategic supply chains. To maximize its potential as a key player in this sector, Ukraine should go beyond extraction and invest in downstream capabilities, such as high-purity refining. Alternatively—or in parallel—other EU member states could develop complementary refining infrastructure to ensure that raw materials sourced from Ukraine can be processed within the region, thereby reducing dependence on extra-EU actors, particularly China.

Despite its currently modest position, Ukraine could already become a more relevant supplier to Germany. Germany accounts for roughly one-third of total EU imports of titanium, manganese, and natural graphite—materials in which Ukraine has an active mining sector. Although Ukraine is not yet among Germany's primary suppliers for these commodities, it provides an opportunity for Germany to continue diversifying its supply chains in these materials.

Since the development of new mining projects are long-term undertakings, the EU should continue to prioritize the diversification of its supply chains in the meantime. As raw materials become increasingly critical, more exporting countries are imposing restrictions to retain these resources within their domestic markets (OECD, 2024). While the EU's diversification and sourcing strategies have already reduced reliance on these countries, ongoing monitoring remains essential to anticipate and respond to further trade restrictions.

To strengthen supply security, the EU should expand and deepen strategic partnerships with resource-rich but politically stable countries. This way, the EU can ensure a stable and diversified supply of raw materials while reducing exposure to geopolitical risks. By fostering stronger economic ties with reliable partners, the EU can mitigate the impact of export restrictions and maintain access to essential resources.

Beyond expanding supplier networks, the EU should also pursue alternative strategies to reinforce its supply chain resilience. Encouraging recycling and material substitution through a stronger commitment to circular economy models and investments in innovation can help reduce dependence on primary raw material imports. At the same time, investing in domestic refining and processing capabilities within Europe can decrease

reliance on external actors, particularly for materials that require advanced processing before industrial use. A combination of these approaches will be key to securing long-term supply stability while reducing vulnerability to global market fluctuations.

References

Cobalt Institute (2021) *State of the Cobalt Market Report 2020*. Cobalt Institute.

Cobalt Institute (2024) *Cobalt Market Report 2023*. Cobalt Institute.

European Commission: Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Grohol, M. and Veeh, C. (2023a) *Study on the critical raw materials for the EU 2023 – Final report*. Luxembourg: Publications Office of the European Union. Available at: https://data.europa.eu/doi/10.2873/725585.

European Commission (2023b). *Proposal for a Regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials* (Critical Raw Materials Act), COM(2023) 160 final, 2023/0079 (COD), 16 March 2023. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0160

Gaulier, G. and Zignago, S. (2010) *BACI: International Trade Database at the Product-Level. The 1994–2007 Version*. CEPII Working Paper No. 2010-23.

International Nickel Study Group (INSG) (2024) *The World Nickel Factbook 2024*. Lisbon, Portugal: INSG. Available at: https://www.insg.org.

Joint Research Centre – EU Commission, Carrara, S., Bobba, S., Blagoeva, D., Alves Dias, P. et al. (2023) *Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study*. Luxembourg: Publications Office of the European Union. Available at: https://data.europa.eu/doi/10.2760/386650.

Ministry of Environmental Protection and Natural Resources of Ukraine and Ukrainian Geological Survey *Ukraine: Mining Investment Opportunities – Critical Raw Materials*. Available at: https://www.geo.gov.ua/geo/investment-opportunities-in-exploration-production-strategic-and-critical-minerals (Accessed: 26 March 2025).

OECD (2024), OECD Inventory of Export Restrictions on Industrial Raw Materials 2024: Monitoring the use of export restrictions amid market and policy tensions, OECD Publishing, Paris, https://doi.org/10.1787/5e46bb20-en.

SCRREEN (2023) *CRMS 2023 – Factsheets on Critical Raw Materials*. Available at: https://scrreen.eu/crms-2023/ (Accessed: 26 March 2025)

Ukrainian Geological Survey and Ministry of Environmental Protection and Natural Resources of Ukraine (2024) *Ukraine: Mining Investment Opportunities – Critical Raw*

Materials. Available at: https://www.geo.gov.ua/wp-content/uploads/presentations/en/investment-opportunities-in-exploration-production-strategic-and-critical-minerals.pdf. (Accessed: 26 March 2025).

Ukrainian Geological Survey *Official Website*. Available at: https://www.geo.gov.ua/en/ (Accessed: 26 March 2025).

World Mining Data*, Reichl, C. and Schatz, M.* (2024) *World Mining Data 2024: Minerals Production*. Vol. 39. Vienna: Federal Ministry of Finance. Available at: https://www.world-mining-data.info (Accessed: 26 March 2025).