

## Russia's Challenges in Mineral Extraction

Emily J Holland  
Assistant Professor  
Strategic and Operational Research Department  
U.S. Naval War College  
[Emily.holland@usnwc.edu](mailto:Emily.holland@usnwc.edu)

Memo Prepared for Critical Minerals and the Clean Energy Transition Workshop  
Colorado School of Mines  
September 21, 2023

### I. Russia: Energy Superpower?

Russia's invasion of Ukraine in February 2022 prompted one of the most dramatic efforts to isolate a major economy in recent memory, exacerbating the global energy crisis that began in the summer of 2021. Over the past two years, the Biden Administration, the European Union and the G7 have implemented sanctions against the export and sale of Russian energy products. Between 2022 and 2023, the EU, previously the largest market for Russian energy, made great strides in reducing dependence on Russian oil, gas and coal. Previously, Russia supplied about 40% of EU natural gas imports, and over 30% of oil imports. In Q2 2023, these shares declined to 21% and 2% respectively.<sup>1</sup>

Prior to the war, Russia was the world's 11<sup>th</sup> largest economy, one of the largest oil exporters and producers, and a major natural gas, coal, and uranium exporter. In addition, it is also a market-maker in metals and rare minerals. As a result, the sanctions regime and subsequent removal of Russian energy products from Western markets has had a profound effect on both trade patterns and energy security strategies. On 18 May 2022, the EC published REPowerEU, its comprehensive strategy to gain full independence from Russian fossil fuels by 2027—accelerating the transition to net zero by over twenty years.<sup>2</sup> A major component of this plan involves ensuring EU access to a secure, diversified, affordable and sustainable supply of critical raw minerals. The current and previous U.S. administration also implemented a number of important initiatives to improve U.S.

---

<sup>1</sup> <https://www.reuters.com/markets/europe/russias-share-eu-trade-drops-below-2-2023-09-01/#:~:text=Russia%20previously%20supplied%20about%2040,lower%20than%20mid%2D2022%20peaks.>

<sup>2</sup> European Commission, "REPowerEU: A Plan to Rapidly Reduce Dependence on Russian Fossil Fuels and Fast Forward the Green Transition," press release, 18 May 2022, [ec.europa.eu/](https://ec.europa.eu/).

critical minerals policy, including the Bipartisan Infrastructure Law, Inflation Reduction Act, CHIPS and Science Act.

Although the main driver for minerals security has focused largely on Chinese dominance of the mineral production chain, Russia is a crucial supplier of a number of critical minerals, and its role could expand with further development and exploitation of its Arctic reserves. Currently, Russia ranks second in terms of rare earth metals reserves, but contributes only 2% of global production. This memo will review Russia's current and potential future role as a supplier and refiner of critical minerals, as well as address major structural and political challenges to its stated goal of remaining a market leader in the export of strategic minerals and metals.

## II. Soviet Legacies and Russian Mineral Production

The Soviet Union was one of the world's leading suppliers of mineral raw materials. But after the collapse of the Soviet Union, many leading reserves, mines, and processing enterprises were "stranded" outside of Russia in former SSRs including Ukraine, Kazakhstan, Estonia, and the Central Asian republics. In addition, since at least the mid 1980s, the Soviet and Russian development strategy focused heavily on oil and natural gas production to the detriment of the production of other raw materials. During the late Soviet period and 1990s, proceeds from hydrocarbons exports were spent on the purchase of imported food and other consumers goods, leading to a decline in industrial production, and thus domestic demand for minerals and metals.

In 1991, the Soviet federal agency responsible for the creation and maintenance of the mineral resource base, the Ministry of Geology, was abolished and replaced by the Ministry of Ecology and Natural Resources (later the Ministry of Natural Resources and Ecology of Russia). Throughout the 1990s, the Ministry of Natural Resources focused on hydrocarbon production. Many of the most profitable raw materials enterprises, including gold, platinum group metals, nickel, and fertilizers were sold for pennies to the domestic private sector or to foreign investors because it was more profitable than developing domestic deposits.

But as Russia began to invest in military modernization, it became clear that the defense, as well as aviation, space, electronics and automotive industries could not be developed without a raw metals base. In 1996, the Russian government classified 29 minerals as strategically important, noting that fifteen (oil, natural gas, gold, copper, nickel, lead, molybdenum, tungsten, tin, zirconium, cobalt, platinoids, silver, diamonds, pure quartz) were secure. The remaining fourteen—uranium, manganese, chromium, titanium, bauxite, tantalum, niobium, scandium, beryllium, antimony, lithium, germanium, rhenium, and rare earths from the yttrium group—were almost fully imported.<sup>3</sup>

---

<sup>3</sup> Владислав Стрекопытов. "Перспективнее нефти. Россия сделала ставку на другое сырье" 19 April 2023. Ria Novosti.

### III. Russia's Mineral Strategy

In recent years, the Kremlin has paid increasing attention to the fact that it is import dependent on raw materials that it could produce domestically. Over the past decade, Russia fell behind other advanced economies, particularly in the fields of microelectronics, hardware engineering and renewable energy. To address this issue, in June 2022 the Kremlin instructed the government, the Russian Academy of Sciences and Rosatom, the state nuclear corporation, to “develop and implement a set of priority measures to create demand for domestic solid minerals, including rare and rare-earth metals, titanium, lithium, manganese, beryllium, tantalum, and tungsten,” in strategic economic sectors. As part of this call, the Kremlin emphasized expanding the full production cycle from extraction of raw materials to the final product.

In August 2022, the Russian government approved a new list of the main type of strategic minerals, adding helium, graphite, rubidium, cesium, indium, gallium, hafnium, vanadium, apatite ores, potassium salts, fluorspar, all seventeen rare earth elements, and groundwater. Several of the strategic minerals, including manganese, chromium, titanium, and lithium, are 100% imported.<sup>4</sup> Andrey Shevchenko, Director for Technological Development of Rosatom, stated bluntly, “the current situation in the industry does not make us euphoric, but we do not consider it hopeless and we are working on it. Currently, there are still problems in terms of industrial scale separation capacity to produce individual REM oxides.”

At a 2022 National Mining Forum, Rosatom set forth a set of goals, including reducing import dependence on REM production to fifty percent by 2025, and increasing REM production to 2.7 thousand tons. According to Rosatom's roadmap, Russia should be able to fully support its domestic REM needs by 2030 by producing 7.5 thousand tons of REM per year.<sup>5</sup>

---

<sup>4</sup> <https://interfax.com/newsroom/top-stories/84133/>

<sup>5</sup> Владислав Стрекопытов. “Это отразится на всем”: в России возродят важнейшую отрасль промышленности” RIA Novosti. December 6, 2022.

## Основные виды стратегического минерального сырья

В соответствии с распоряжением Правительства РФ от 30 августа 2022 г. № 2473-р

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
		*	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
		**	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

■ Стратегически важные металлы и элементы

□ Прочие виды сырья

In March 2023, the Ministry of Natural Resources prepared a draft strategy for the development of Russia's mineral resource base until 2035. According to Minister of Natural Resources Alexander Kozlov, the forthcoming strategy envisages two scenarios—one in which the availability of reserves and extraction remain at current levels with a slight increase, and the target scenario which focuses on an advanced, rapid expansion. The strategy is designed to ensure meeting the needs for growing domestic demand for minerals, particularly in the military-industrial complex. Notably, the document emphasizes that in order to meet domestic needs, the main focus should be on “strengthening the pace of government exploration of scarce raw materials such as manganese, uranium, chromium, titanium and tungsten.”

While the new document does emphasize the rapid need to develop these resources, the previous strategy (2018) also made this point, stating that Russian deposits of chromium and REMs are competitive with foreign counterparts, making it “especially important to develop and apply special mechanisms to stimulate their development.” Over five years have passed, no new deposits have been developed, and import dependence has increased.

### Challenges

Development of these resources is hampered primarily by low domestic demand, and up to 90% of REMs required by domestic enterprises are imported from abroad. Deposits are not being

developed and separation plants not constructed because of low demand and cost concerns. Ruslan Dimukhamedov, Director of Business Development at JSC Atomredmetzoloto (Rosatom's mining division), stated, "there is still too big a gap between how much we need to produce to make it profitable and the national demand. We have technologically mastered mining, we have deposits. There are end uses, but there are no intermediate processing facilities. Now we need to build a chain: from oxides to metals, from metals to ligatures, from ligatures to products."<sup>6</sup>

In April 2023, the Russian Academy of Sciences hosted a meeting devoted to developing Russia's raw material base. They noted that due to lack of demand, since the early 1990s no major ore deposits have been located in Russia due to a lack of exploration. This may change however, as Russia is investing significant resources, including \$300b in tax incentives, to firms willing to develop and explore the viability of Arctic resources.

Russia's main reserves are located in hard to reach and relatively poorly explored deposits. Currently, only the Lovozero deposit on the Kola peninsula, with complex loparite ores containing tantalum, niobium and titanium, and REMs, is being developed.<sup>7</sup> A number of deposits in the Murmansk region containing REMs as associated components of apatite-nepheline ores are also being explored.

Enriched ores in Russia are sent to the country's only refinery, the Solikamsk Magnesium plant, where an intermediary product, a collected REM carbonate concentrate, is produced. In order to extract the metals, it must then be separated into oxides. There are currently no industrial scale enterprises capable of this in the country. Prior to the collapse of the Soviet Union, collective concentrate was sent for processing to refineries located in the Estonian and Kazakh SSRs, but these scheme is no longer operational.

The lack of complex processing chains means that significant volumes of REMs are left stored in tailing ponds at mines and mills throughout Russia. For example, at the Khibiny deposit on the Kola peninsula, apatite-nepheline is used to process phosphate fertilizer, and approximately 120 thousand tons of REMs are extracted annually, but never produced. By comparison, the PRC, the world's main REM producer, extracted 2010 thousand tons in 2022. Another example of a failed production chain is the Chelyabinsk Electrometallurgical Plant, which processes molybdenum ores, but loses rhenium, another extremely valuable impurity metal that is used in the production of high-strength rocket alloys.

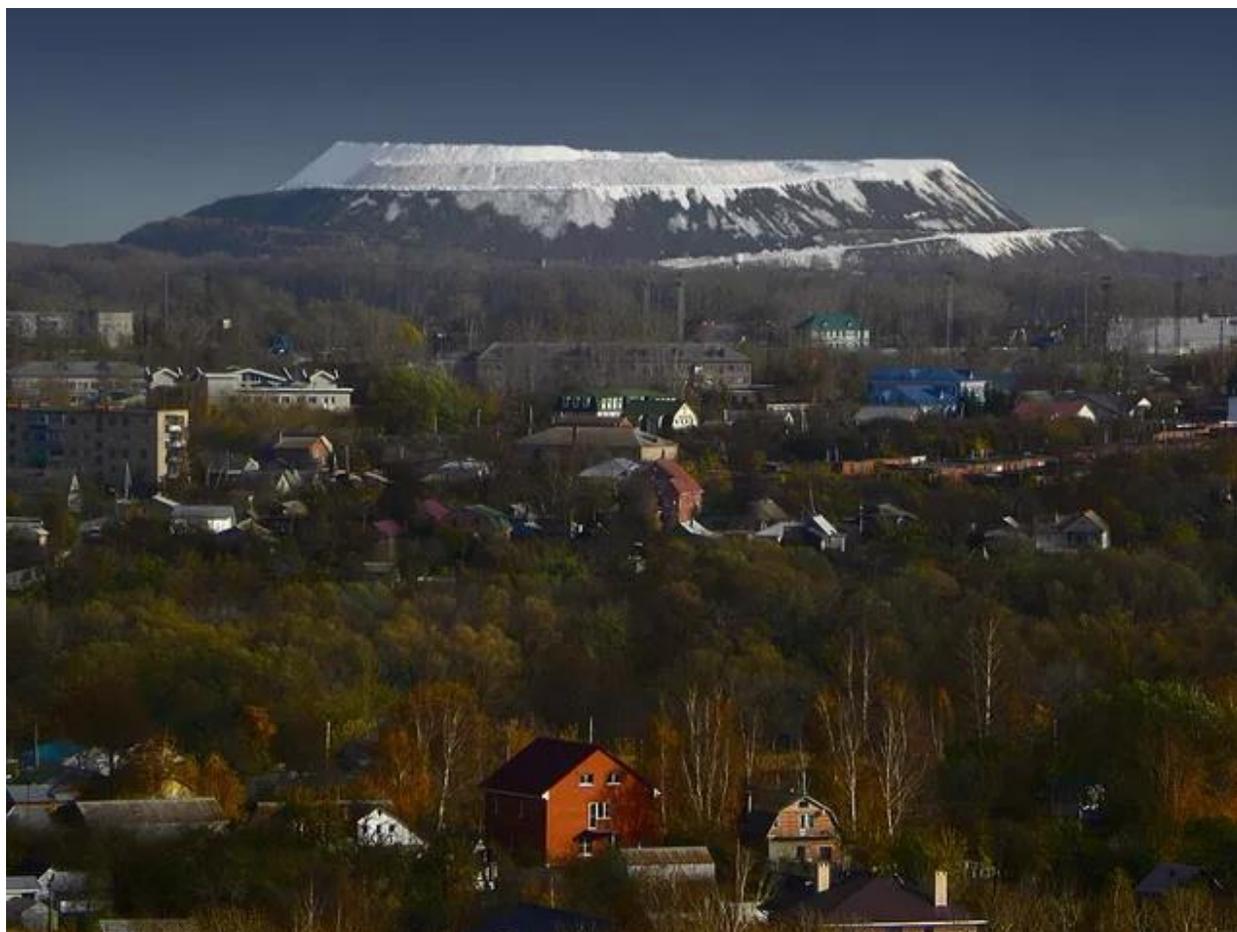
Sanctions have also directly hampered Russia's efforts to build the REM processing chain. Plans to increase production capacity involved phosphogypsum, a byproduct of phosphate fertilizer production. It contains 0.4-0.5 percent cerium group REMs, and up to 0.5 percent strontium, both of which are in high demand for Russia's expanding nuclear industry. "White mountains" of phosphogypsum are located throughout Russia, and Skyrad, the firm that launched Russia's first

---

<sup>6</sup> Владислав Стрекопытов. "Это отразится на всем": в России возродят важнейшую отрасль промышленности" RIA Novosti. December 6, 2022.

<sup>7</sup> Владислав Стрекопытов. ""Это отразится на всем": в России возродят важнейшую отрасль промышленности" *Ria Novosti*. April 19, 2023.  
<<https://ria.ru/20221206/rzm-1836479079.html?in=t>>

industrial production facility for the separation of REMs in Korolev (near Moscow), developed a technology for processing this raw material. Skyrad is currently operational, and plans to reach 500 tons of separated oxides by the end of 2023, increasing this output to one thousand tons in 2024. If realized, this would be enough to nearly cover Russian domestic demand, although it will also require developing new deposits. Skyrad's plans have been hampered by a lack of foreign investment and economic sanctions, which have made it difficult for them access certain machine parts. The Kremlin has emphasized indigenization of production for these crucial parts, but it will take several years to fully realize.



Phosphogypsum deposit near Voskresensk, RU. Photo: Evgeny Izmaylov (Ria Novosti)

#### IV. The Arctic: Russia's New Mineral Frontier

Over the past several years, the Kremlin has reprioritized its focus towards the Arctic and Asia Pacific region. In March 2023, the Kremlin published its new Foreign Policy Concept. Previously, the Arctic was perceived as part of western policy. The relevant paragraph was located between the Euro-Atlantic and the Asia-Pacific regions and followed mentions of the United States and Canada. In light of recent developments in international Arctic policy and a reassessment of regional priorities, the Arctic now occupies an honorable second place after the 'near abroad' (i.e., the Commonwealth of Independent States – CIS). As part of this strategy, major fiscal and monetary resources have been allocated towards Arctic development. In 2019, the Kremlin

provided a \$41b tax incentive to develop the Vostok field, and in 2020 it granted a \$300b incentive program for Arctic infrastructure, industrial, and hydrocarbon and mineral exploration projects.

One component of this investment strategy was the development of a production plan for titanium dioxide and rare and REMs in the Afrikandsky perovskite-titanomagnetite ore deposit in the Murmansk region.<sup>8</sup> This project, currently in development (but delayed due to sanction related issues), faces challenges related to Arctic infrastructure and the fact that the subsoil plot is located in close proximity to sensitive military infrastructure.

It remains to be seen how budget shortfalls resulting from sanctions and war related costs will affect Moscow's ability to realize its ambitious goals to become self-sufficient in terms of the REM production chain. Thus far, most Arctic related projects have been shielded from belt tightening, but as the war continues it is unclear for how long the government will be able to finance them. One option for this industry is to seek investment from China, a strategy it has increasingly relied on in the hydrocarbons industry, particularly in the far east and Eastern Arctic.

#### Conclusion/Take Aways

- Russia has vast mineral deposits and the potential to become a leader in extraction, production and export of critical minerals. However, many of these deposits are in difficult environments and will require both significant capital investment and technology to extract.
- Sanctions will reduce Russia's ability to attract this capital and technology for the foreseeable future, forcing closer cooperation with the PRC, or leaving these deposits undeveloped.
- Russia still faces the challenge of low domestic demand for REMs. Overcoming the cost challenges for firms will require greater government intervention and state-led development plans. Much of this will depend on how the Russian economy adapts and develops to a potentially long war in Ukraine.

---

<sup>8</sup> Ria Novosti. «Комплекс по производству редкоземельных металлов откроют под Мурманском» September 7, 2020.