



# The supply of critical raw materials endangered by Russia's war on Ukraine

4 August 2022

## Key messages

- Severe disruptions to global markets caused by Russia's war on Ukraine have exposed vulnerabilities to the security of the supply of raw materials critical for industrial production and for the green transition.
- These supply chain vulnerabilities are the result of export restrictions, bilateral dependencies, a lack of transparency and persistent market asymmetries, including the concentration of production in just a few countries.
- For countries affected by supply chain vulnerabilities, there is potential to diversify sourcing through expanded production and accessing known critical raw materials reserves.
- A collective and co-ordinated approach among OECD countries can contribute to economic security, while preserving the benefits of open markets and a rules-based international trading system.

## The war in Ukraine triggered particularly severe disruptions to global markets for critical raw materials

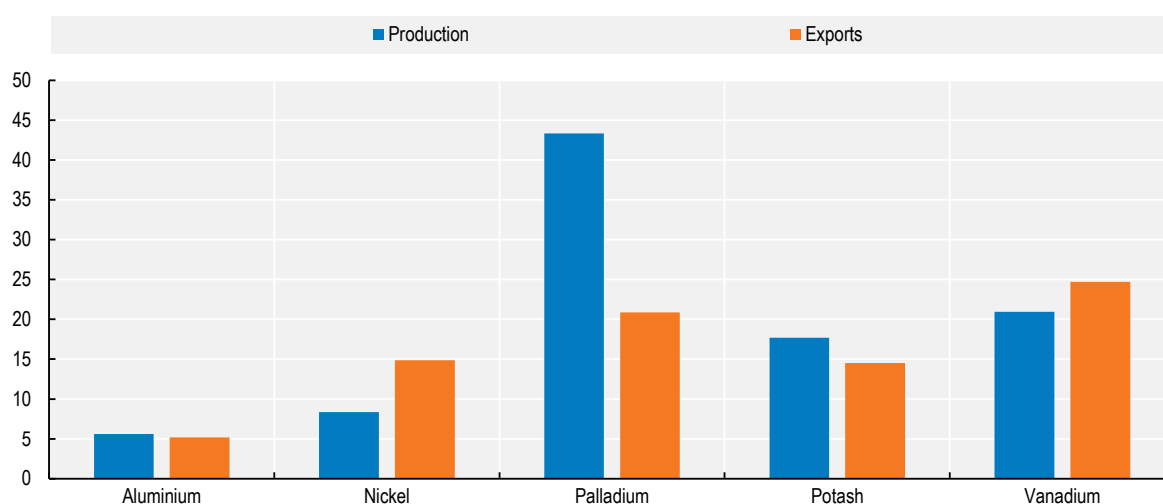
Disruptions caused by the Russian Federation's (hereafter "Russia") invasion of Ukraine, the ensuing economic sanctions on Russia and its potential retaliation have severely affected global markets. Prices of oil, gas and certain agricultural products have risen, intensifying inflation pressures and threatening food security in some developing economies (OECD, 2022<sup>[1]</sup>). Uncertainty also struck markets in relation to metals that are produced in Russia and which are indispensable to supply chains of modern manufacturing production. Aluminium, nickel, palladium and vanadium are among those raw materials (Figure 1). Moreover, trade in potash – an essential input in fertiliser production – has also been affected. Price hikes and shortages disrupt several industrial applications (see below) and severely affect the green transition.

Raw material	Industrial applications	Importance for the green transition
Aluminium	Vehicles, airplanes, construction, power sector, food and beverage packaging	Battery casing and lightweight vehicle body parts for electric vehicles <sup>a</sup> ; electricity transmission lines, solar photovoltaic <sup>b</sup>
Nickel	Stainless steel, magnets and alloys for construction, transport, medical equipment, electronic devices and power generation	Cathode materials for electric vehicles batteries
Palladium	Jewelry, dentistry, catalytic converters and in capacitors that store energy in electronic devices	Catalytic converters used to reduce emissions
Potash	Plant and crop nutrient with quality-enhancing properties for fruit and vegetables, rice, wheat and other grains, sugar, corn, soybeans, palm oil and cotton	
Vanadium	Improves the stability and corrosion resistance of steel alloys for applications in space vehicles, nuclear reactors and airplanes. Some vanadium alloys used in superconducting magnets.	Vanadium redox flow batteries used in renewable energy storage; ongoing research into the use of vanadium in electric vehicle batteries

Note: a) Aluminium content in electric models is 40% to 50% higher than in their internal combustion engine counterparts (DuckerFrontier, 2019<sup>[2]</sup>) so as to hold down the vehicle's weight despite the added weight of electric batteries.

b) Aluminium accounts for more than 85% of most solar photovoltaic components, mainly used for the frames of the panels (Hund et al., 2020<sup>[3]</sup>).

**Figure 1. Russia's share of global production and exports of selected raw materials in 2020**



Source: USGS Mineral Commodity Statistics and UN Comtrade.

Russia accounts for 5.5% of world aluminium production<sup>1</sup> and a similar share of world aluminium exports, making it the world's third largest producer after the People's Republic of China (hereafter "China") and India. This relatively small figure masks heterogeneity in the dependence of certain countries. Most notably, Türkiye sources 35% of its aluminium imports from Russia, and Japan, Poland and China import more than 10% of their aluminium from Russia. Russian aluminium is also relatively less CO<sub>2</sub>-intensive than alternatives found in China, India, and the Gulf countries as the country's smelters are largely powered by hydroelectricity.

Russia holds 11% of global nickel production and 15% of world nickel exports. It is a major supplier of nickel to Finland with an 84% import share. It also exports nickel to the Netherlands, Ukraine, and China, with 34%, 23%, and 13% import shares respectively.

Major exporters of palladium are Russia, South Africa, United Kingdom, United States, Germany, Italy and Belgium. Russia accounts for 43% of global palladium production and 21% of world palladium exports. Many countries depend on Russia for a substantial share of their palladium imports, among them Japan (43%), United States (37%), United Kingdom (30.5%), China (28.5%), Italy (26%), Germany (21%), and Korea (20%).

Russia is one of four major exporters of vanadium oxides; the others are South Africa, Brazil and China. Russia accounts for 21% of global vanadium oxides production and 25% of world vanadium oxides exports. The Czech Republic is the most reliant on Russia, with 88% of Russian import share. Russia also holds a large import share of vanadium oxides to China (31%) and India (21%). Vanadium oxides are used to produce ferrovanadium, which in turn is used as an additive in ferrous alloys. Supply chains of vanadium products differ markedly between different producers. For instance, both the Czech Republic and Austria are major exporters of ferrovanadium. Only one company accounts for all Czech exports of ferrovanadium – Evraz Nikom, which is part of Russian-owned Evraz Group. It sources all its vanadium oxides from within the group (i.e. from Russian producers) through a Switzerland-based trading arm East Metals AG, which also distributes all its ferrovanadium production worldwide. Austrian producers of ferrovanadium, on the other hand, rely on vanadium oxides imports from the United States and, through imports from the Netherlands, China, Brazil, South Africa and Germany. Both Czech and Austrian ferrovanadium is used worldwide. Some countries, such as Germany rely predominantly on Austrian suppliers while others, such as the United States, source predominantly from the Czech Republic. China's imports are equally distributed between the two exporters.

Potash exports are concentrated among Canada, Belarus and Russia. Russia holds 18% of global potash production and 14.5% of world potash exports, while Belarus (state company Belaruskali) accounts for 17% of global potash production and 19.7% of world potash exports, collectively bringing the share of global production and world exports affected by the Ukrainian crisis to 35% and 34.2% respectively. These numbers again hide a very large variation in countries' dependence on Russia or Belarus for this product. It is as high as 70% for Türkiye (55.5% from Belarus and 14.5% from Russia), 51.5% for the European Union (29.5% from Russia and 22% from Belarus, with very high dependencies in some countries, such as Estonia at 94.3%), and 40% for China (24.7% from Russia and 15.3% from Belarus). Other countries that depend on Russia or Belarus are Nigeria (84%) Sri Lanka (50%), Senegal (49%), and Brazil (27.4%).

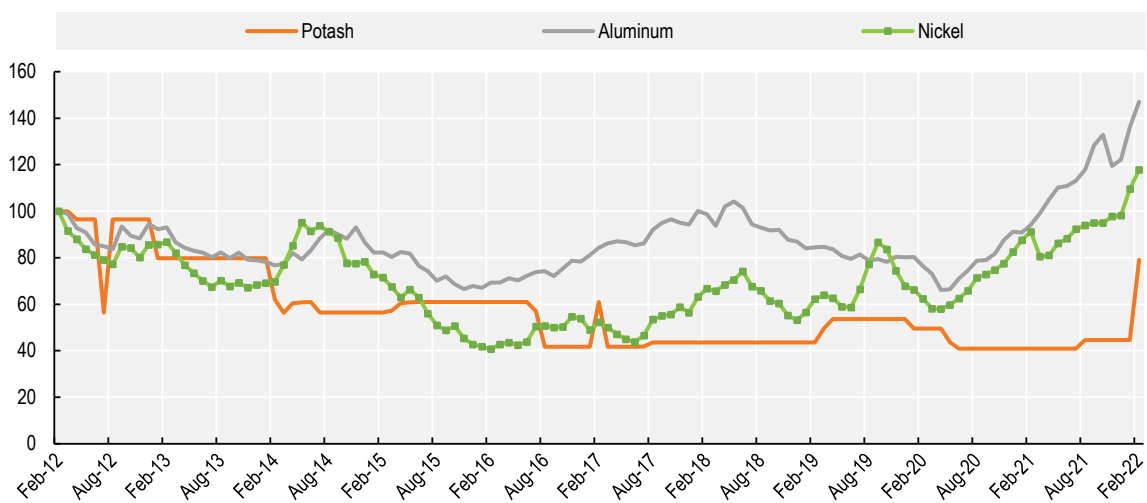
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<sup>1</sup> All figures on production and exports are sourced from the [OECD Export Restrictions Inventory](#)

## What is the impact on prices and industrial applications<sup>2</sup>?

Prices of aluminium and nickel reached their 10-year high in February 2022. The price of potash saw an especially pronounced peak when in February 2022 it jumped almost 80% compared to the previous months. Prices of palladium and vanadium have seen rapid spikes since January 2022. The market volatility caused by Russia's invasion of Ukraine is clearly visible on daily statistics. Both aluminium and nickel prices saw first signs of volatility on the 22 and 24 February, reached their all-time highs at the end of the first week of March, and then collapsed. Both prices are nevertheless still higher than before the start of the Russian aggression. Palladium followed a very similar pattern. The price of ferrovanadium has increased steadily, reaching 50% higher levels than before the start of Russia's invasion.

**Figure 2. Monthly aluminium, nickel and potash prices, February 2012 – February 2022**

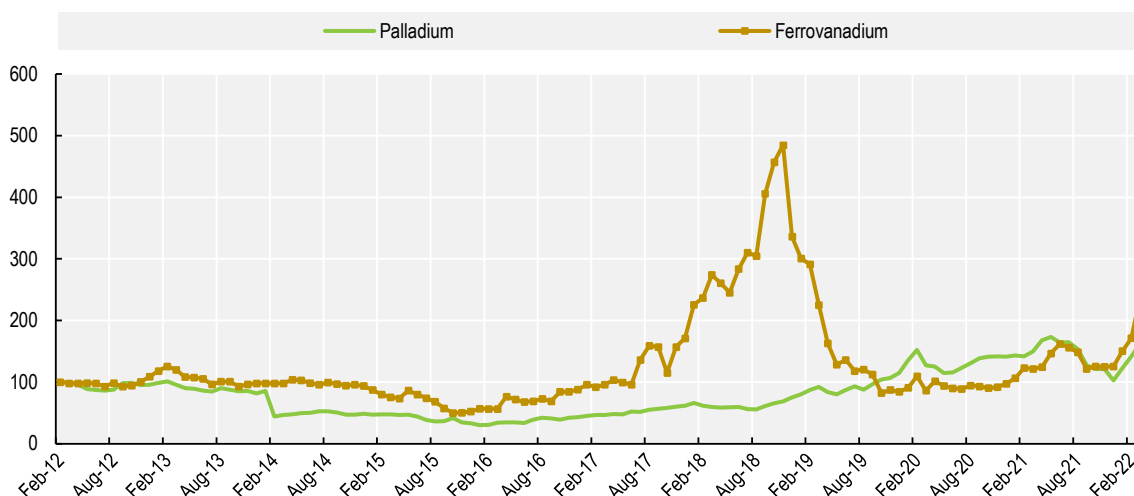


Note: Index February 2012 = 100. Aluminium - London Metal Exchange, unalloyed primary ingots, high grade; Nickel - London Metal Exchange, cathodes; Potash - f.o.b. Vancouver, potassium chloride (muriate of potash).

Source: World Bank Commodity Price Data.

<sup>2</sup> Figures on prices of aluminium, nickel and potash are sourced from the World Bank Commodity Price Data. Figures on prices of palladium and ferrovanadium are sourced from the London Bullion Market Association.

**Figure 3. Monthly palladium and ferrovanadium prices, February 2012 – March 2022**



Note: Index February 2012 = 100. Palladium - London afternoon fixing, average of monthly rates; Ferrovanadium - 80% Price Europe.  
Source: London Bullion Market Association.

### What is the outlook?

Besides Russia's dominant role as the global supplier of these raw materials, a switch towards alternative sources may be further complicated by export restrictions imposed by other large suppliers ([OECD Export Restrictions Inventory](#)). South Africa applies non-automatic licensing to palladium exports. Major alternative suppliers of vanadium oxides (South Africa and China) apply non-automatic licensing to their exports. Belarus, the second largest exporter of potash, applies export taxes, as does China on aluminium and nickel. China's incomplete rebate of value added tax (VAT) on exports of primary aluminium further discourages exports of aluminium. The export tax and the incomplete VAT rebate combined effectively tax exports to about 25-30%. The Philippines, a major producer of nickel, applies non-automatic licensing and Indonesia imposes an outright export ban.

In addition to imposed sanctions and export restrictions, the availability of the reviewed critical raw materials is affected by significant disruptions in transportation. The transport of these materials relies on rail and container ships. By the beginning of March 2022, the world's largest shipping companies suspended cargo services to and from Russian ports, severely affecting Russia's supplies to many countries. Moreover, the Russian news agency TASS reported that in response to the suspension of shipping services, Russian government has recommended to restrict exports of fertilisers, oil, gas and metals to Western countries (TASS, 2022<sup>[41]</sup>).

Questions remain about the impact of sanctions targeted at individuals. For instance, the Czech producer of ferrovanadium, Evraz Nikom, is 100% owned by Evraz Group, which is based in London but majority owned by Russian citizens. The largest share of Evraz Group's voting rights, 29%, is in the hands of Roman Abramovich. The UK sanctions on Abramovich, imposed on 10 March 2022, led to the suspension of the company's share trading in London. The company has also said that it has been blocked from making an interest payment on one of its bonds (Stubbington and Pfeifer, 2022<sup>[5]</sup>). Nevertheless, the operations of Evraz Group companies do not seem affected so far.

The world's second largest aluminium producer, United Company Rusal International, is owned partly by Oleg Deripaska (through holding En+ Group International PJSC), who has been on US sanctions list since 2018. For that reason, Rusal has sought to diversify its ownership structure even before the invasion of Ukraine. On 19 March 2022, Australia imposed a ban on exports of alumina, an essential input into the

aluminium production, to Russia. This is a loss of a second major supplier for Rusal, after its Ukraine suppliers have closed due to the invasion (Home, 2022<sup>[6]</sup>). Moreover, Western companies such as Rio Tinto have stopped supplying Rusal's third major alumina supplier, its plant in Ireland, with bauxite (the main ingredient for smelting aluminium) (Biesheuvel and Hunter, 2022<sup>[7]</sup>).

Notably, exports of Russian commodity producers depend on their trading arms, many of which are operating from the Swiss town of Zug. These include Metal Trade Overseas AG, the trading arm of Norilsk Nickel; Rusal Marketing GmbH and Rusal Products GmbH that manage aluminium exports of United Company Rusal International; EuroChem that produces mineral fertilisers; and East Metals AG, the trading arm of Evraz Group. As a result, 80% of Russia's commodities are traded through Switzerland (Illien, 2022<sup>[8]</sup>), which has also joined EU sanctions against Russian individuals and entities.

While put in place to address a variety of important policy objectives, export restrictions can have distorting effects on international markets by reducing global supply and raising prices, while creating uncertainty for importers. Furthermore, further refining and processing of raw materials are not bound to specific locations like mining and ore extraction, but often require specific technologies and know-how. Avoiding trade hampering policies, such as export restrictions, and fostering smooth functioning through reducing the costs of technical barriers to trade will be important for assuring that international supply chains for critical raw materials can work smoothly. Based on the OECD work on the security of supply for critical raw materials, the G7 committed to ongoing strategic coordination to identify, monitor and minimise vulnerabilities and logistical bottlenecks in the face of external shocks and wider risks.

## Key considerations for policy makers

- The availability of critical raw materials can be compromised by a number of factors, including production concentration, economic, political and social constraints in expanding production capacities, and pervasive export restrictions. The risks can also be compounded by lack of transparency in minerals supply chains and governance challenges in producing and processing countries.
- Unexploited reserves of such raw materials provide potential alternatives for diversification. However, there may be several reasons why some reserves have remained untapped, notably environmental implications, social concerns and economic viability. International investments will need to flow into existing and new producing countries in line with international standards on responsible business conduct. Longer-term approaches to recycling, secondary raw materials and the circular economy also have the potential to mitigate supply concentration.
- Export restrictions are the most widespread trade policy measure applied in these sectors. They can have distorting effects on international markets by reducing global supply and raising prices, while creating uncertainty for importers. Disciplining export restrictions through existing trade policy tools and new commitments at the multilateral, regional or bilateral level can ensure that domestic-oriented policies of some countries are not detrimental to the fair access to critical raw materials.
- Avoiding trade restrictions and reducing the cost of technical barriers to trade in critical raw materials is an important step in ensuring the smooth functioning of value chains relying on these raw materials. Bottlenecks to the rest of the value chain, in particular refining and processing of raw materials is also important.

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## Further reading

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