

The background of the slide is a close-up photograph of a stack of old, worn books with dark covers and yellowed pages.

Russia's and Ukraine's metal- and mineral production and their importance for EU and the world

A small teal-colored circle is positioned to the left of the text, with a thin vertical line extending downwards from it.

A study for Svemin - the Swedish Association
of Mines, Mineral and Metal Producers
April 2022

Introduction

The import dependency of the EU for metals like iron ore, copper and bauxite/aluminium as well as Critical Raw Materials (CRM) is well known. When the Russian invasion of Ukraine runs into its third month the question arises: How is EU's supply situation affected by changing trade links and by the destruction of mines and smelters in Ukraine.

This study covers:

- Russia as a mining country historically
- Russian, Ukrainian and Belarussian production of metals and minerals
- Russian exports of these metals and minerals
- EU's import dependence on Russia and Ukraine
- The most important Russian and Ukrainian mining companies
- **Russia's importance as a supplier of metals and minerals for certain branches of industry**
- Results of potential sanctions against Russian metals and minerals production and effects of destruction in Ukraine

Summary I

- Historically Russia has been an important mining nation. Its role on a world scale has however diminished after the Soviet Union collapsed.
- Russia is still an important producer and exporter of nickel, palladium and other metals in the platinum group of metals (PGM), vanadium, gold and a host of other metals. Among the industrial minerals potash and phosphates are the most important, both raw materials to produce feretilizers.
- As a former world power Russia , as the only country except China, mines most if not all of the CRMs.
- Metals and minerals from Russia are much less economically important for the EU than the Russian exports of oil and gas.
- Nickel and palladium (and other PGM) are the most important metals for which Russia accounts for a major share of EU's imports.
- Since 15th of March it is prohibited to import certain steel products and luxury goods from Russia to the EU. "Strictly necessary" transactions of fossil fuels, titanium, aluminium, copper, nickel, palladium and iron ore are still possible.

Summary II

Short term consequences for the EU

- Gold is the largest item in EU's metal trade with Russia (marginally less than 20 billion dollar). Stopping the trade in gold would have certain effects on Russia, but only limited ones for the EU.
- For all metals and minerals, which Russia mines and exports, alternative suppliers exist at least in the slightly longer term. In the short term some problems might arise if Russian exports would stop.
- If the export from Ukraine of high-quality iron ore products would stop completely shortages in the EU could arise. Ferrexpo, the Ukrainian iron ore miner, has already been forced to stop some of its exports. The Swedish LKAB and other suppliers of competing products could benefit from new customers and possibly higher prices. The production of green steel could be affected by a lack of suitable raw materials.
- Metal prices, which are already today at an elevated level could remain high in the short term. In the longer run the market will probably reach a new equilibrium at lower levels than today.

Long term consequences for the EU

- Investments into new mines outside of Russia might increase. Mineral rich developing countries could benefit.

- Russian production of nickel and PGM is using high quality ores from the Kola peninsula and Siberia. If these mines would be replaced by ores from other mines the carbon dioxide foot print would increase considerably. Partly because other ores have a different composition and often lower grade and partly as transports to the EU would be longer.
- Suppliers of mining equipment have put their trade with Russian customer on hold temporarily. If business with Russia will stop completely an important market will be lost in particular for underground equipment as the Russian mines are more often underground operations than the world average.
- Chinese OEMs and Chinese importers of ores could benefit if Russian trade with the EU declines.

Long term consequences for Russia

- Russian mining companies will continue to lose market shares and Russia's importance as global supplier and exporter of metals and minerals will continue to decline.
- Oligarchs are controlling almost all major mining and smelting companies in Russia. The effects of diminishing economic returns on the support of these oligarchs for the present regime in Russia are an important unknown in the present political situation.
- China and other potential buyers of metals and minerals could benefit from trading with Russia as prices will most probably be discounted. If leading global equipment producers opt out of Russia Chinese producers might fill this space and increase their market shares.

Summary III

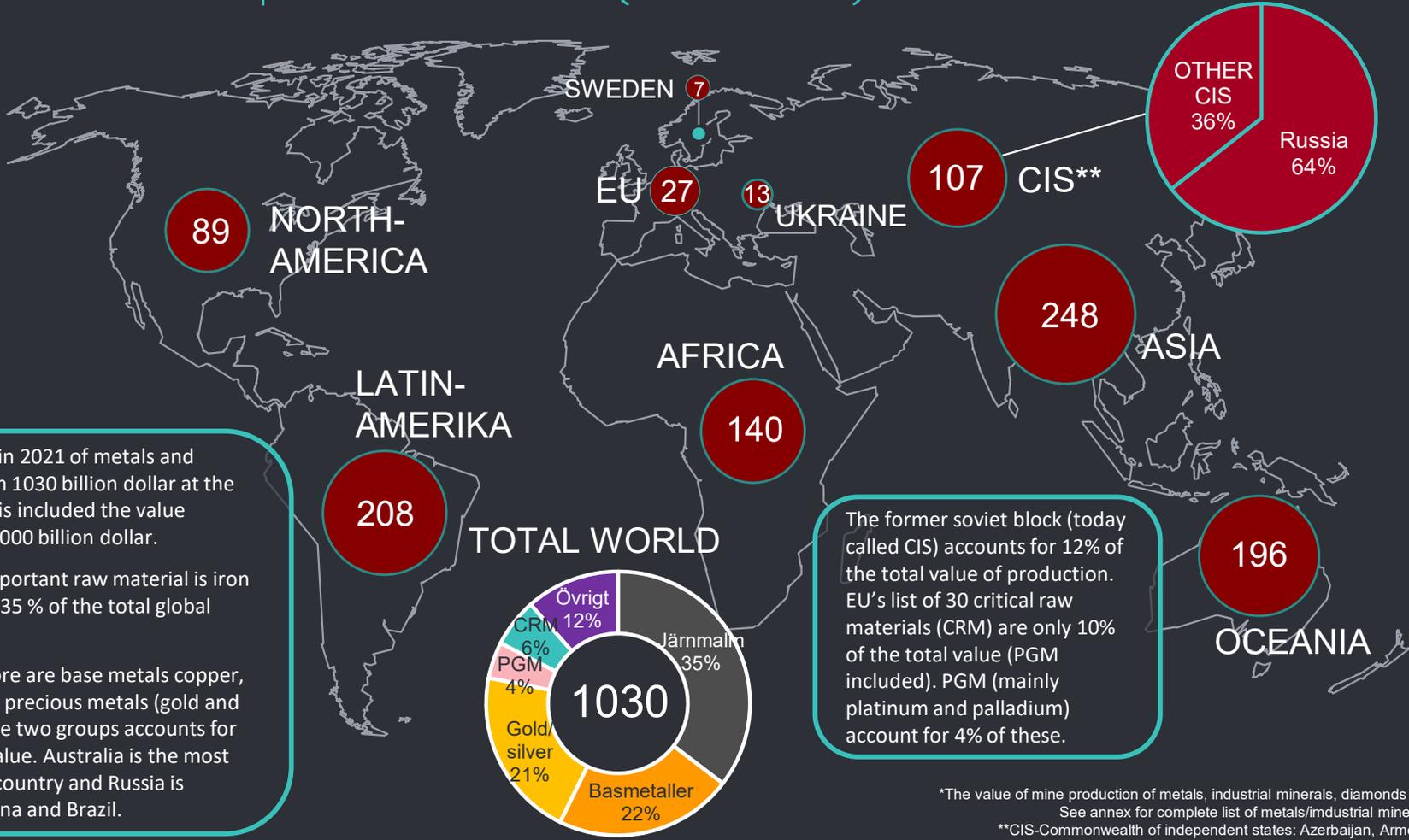
Consequences for Ukraine

- The bombing and destruction of mines and smelters as well as energy plants, distribution networks and other infrastructure will make it very difficult for Ukraine to keep present production levels of metals and minerals.
- Many mines and smelters have already been forced to reduce their production and many employees might lose their jobs. The country will also lose export income.

Consequences for Belarus

- Belarus is a world class producer of potash. Potassium is one of the three constituents of fertilizers. The production is under sanctions from the US already since the violations of human rights during the 2020 presidential elections.
- After the Russian invasion of Ukraine Lithuania has stopped the exports of potash from Belarus, which is transited on its way to the Lithuanian port of Klaipeda. This export income is crucial for Belarus.
- Sanctions will push Belarus closer to Russia the only potential buyer of Belarussian potash.

● Value of mine production* 2021 (billion USD)



Global production in 2021 of metals and minerals was worth 1030 billion dollar at the mine stage. If coal is included the value increases to over 2000 billion dollar.

The single most important raw material is iron ore accounting for 35 % of the total global value.

Second after iron ore are base metals copper, lead/zinc and third precious metals (gold and silver) each of those two groups accounts for 20 % of the total value. Australia is the most important mining country and Russia is number 4 after China and Brazil.

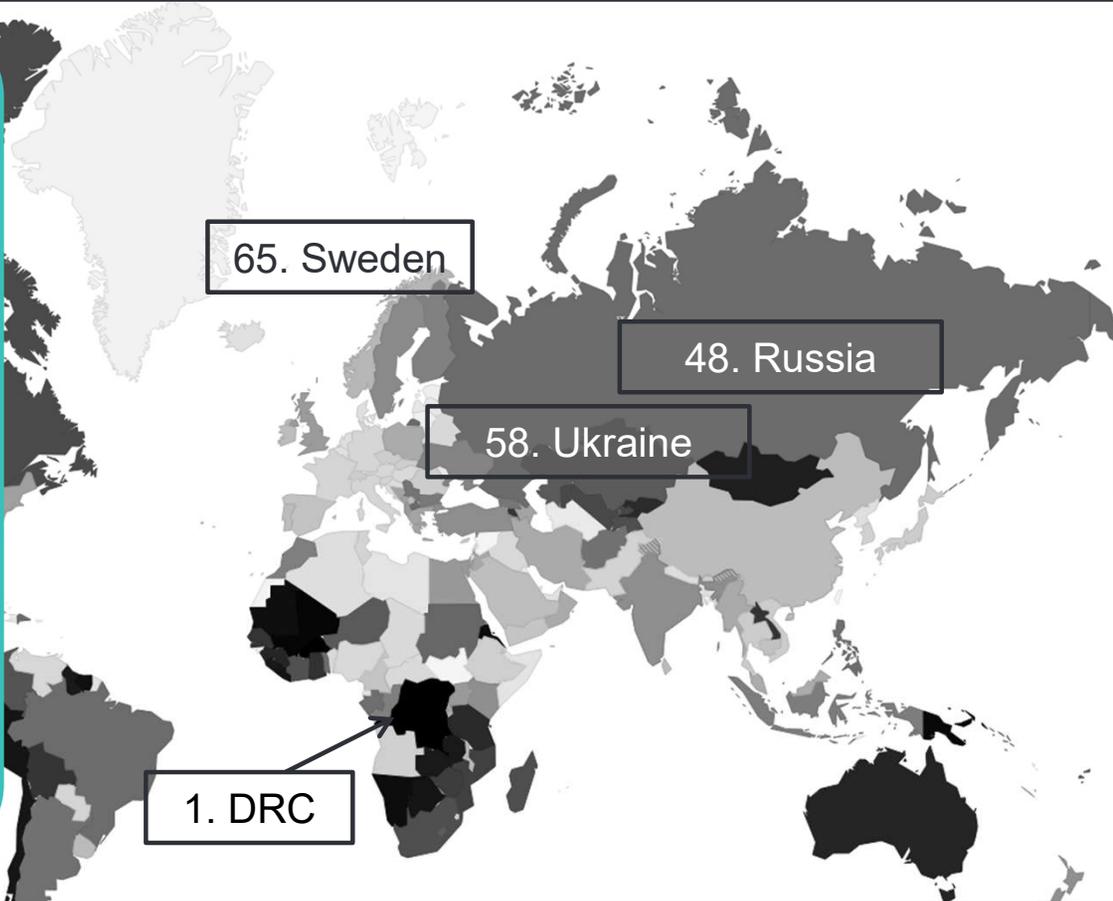
The former soviet block (today called CIS) accounts for 12% of the total value of production. EU's list of 30 critical raw materials (CRM) are only 10% of the total value (PGM included). PGM (mainly platinum and palladium) account for 4% of these.

*The value of mine production of metals, industrial minerals, diamonds and uranium. See annex for complete list of metals/industrial minerals included.
 **CIS-Commonwealth of independent states: Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan

Gmining's contribution to national economies

The map shows mining's contribution to national economies. In countries that are colored in black on the map, the mining industry contributes greatly to the economy. DRC (Congo Kinshasa) is the country where the mining industry contributes the most to the economy. In Russia, the value of mining production of minerals and metals is: 2.2% of GDP and minerals and metals represent 10.8% of exports. Ukraine: 2.9% of GDP and 9.5% of exports. Thus, Russia ranks 48th out of all countries and Ukraine 58th in terms of the importance of mining. Sweden ranks 65th in comparison. Just as in Sweden, the mining industry is regionally important in both Russia and Ukraine.

Read more about how the index behind the map is structured in the annex.



High contribution to wealth



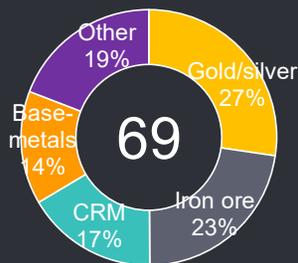
Low contribution to wealth

Russian mine production

Metall/ mineral	Värde \$" 2021	Russian share of total	CRM
Coal	56.6	5.4%	
Gold	17.65	9.1%	
Iron ore	15.50	4.3%	
Palladium	7.21	40.9%	x
Potash	6.64	16.3%	
Copper	5.84	3.9%	
Diamonds	4.12	30.4%	
Nickel	2.92	8.4%	
Asbest	1.58	64.4%	
Rhodium	1.42	7.7%	x
Silver	1.10	5.2%	
Phosphate rock	1.04	6.1%	x
Platinum	0.75	11.6%	x
Zinc	0.58	2.5%	
Lead	0.48	4.7%	
Vanadium	0.28	22.7%	x
Kaolin	0.24	6.2%	
Antimony	0.19	16.9%	x
Bauxite	0.18	1.6%	x
Chrome	0.15	1.8%	
Uranium	0.14	5.3%	
Magnesium	0.13	1.4%	x
Cobalt	0.09	4.5%	x
Molybden	0.07	0.7%	
Tin	0.07	0.8%	

Metall/ Mineral	Value \$" 2021	Russian share of total	CRM
REE	0.06	1.2%	x
Tungsten	0.05	3.1%	x
Salt	0.04	0.3%	
Talk	0.04	2.0%	
Gips	0.03	2.3%	
Fältspat	0.03	0.9%	
Bor	0.03	3.8%	x
Graphite	0.03	1.5%	x
Tantalum	0.01	1.4%	x
Zircon	0.01	0.5%	
Mercury	0.00	1.8%	
Tellurium	0.00	8.0%	
Svavel	0.00	1.0%	
Flourspar	0.00	0.1%	x
Mica	0.00	1.6%	
Bismuth	0.00	1.4%	x
Aluminium	*	5.8%	
Gallium	*	6.3%	x
Germanium	*	6.3%	x
Baryte	*	0.0%	x
Hafnium	*	0.5%	x
Silicon	*	8.6%	x
Niobium	*	1.2%	x
Indium	*	0.5%	x
Titanium (sponge)	*	13%	x

*Biprodukter och/eller utvinns i smältverk
"Miljarder USD

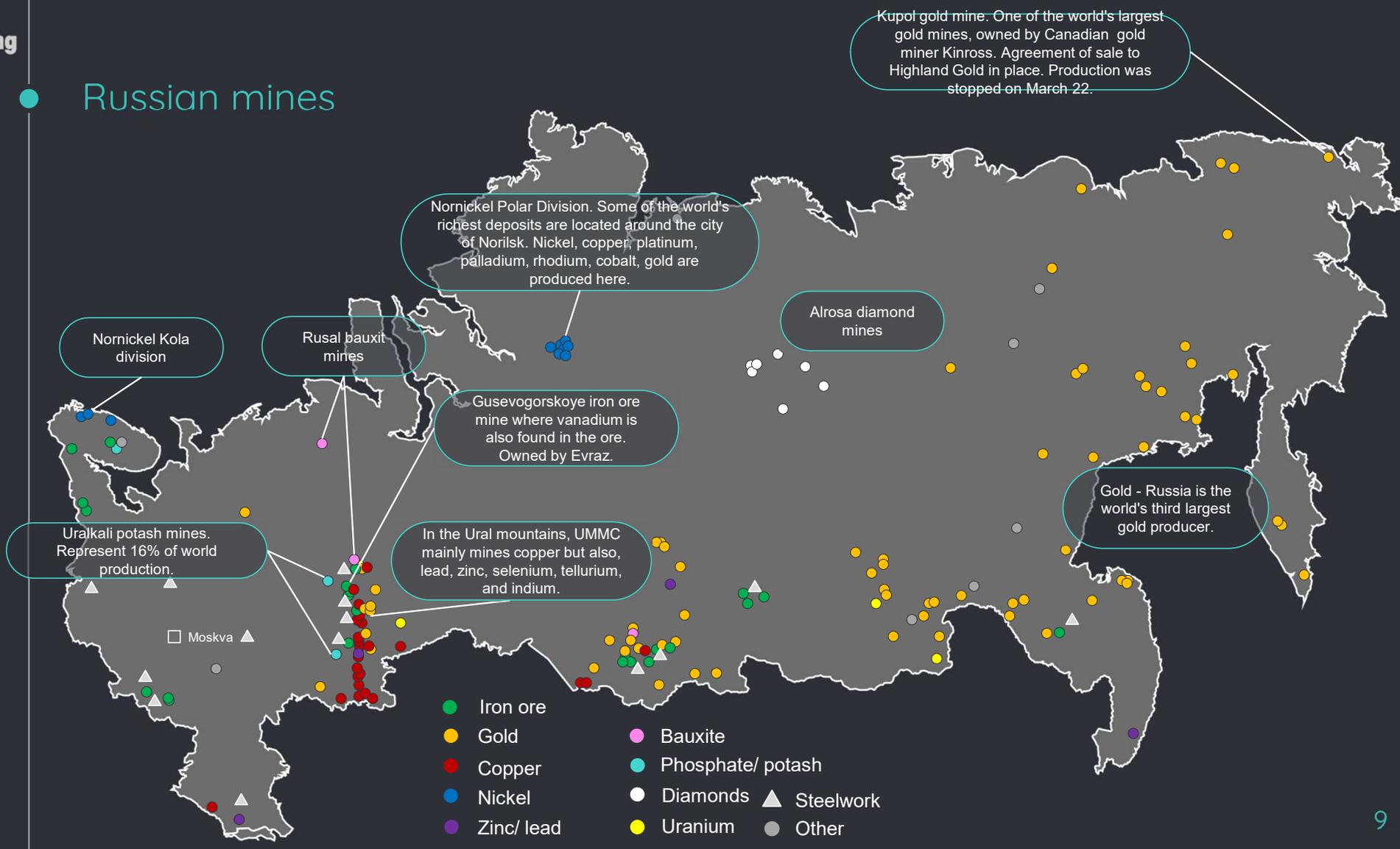


Billion USD

Russia a major mining country. Ranked by the value of its metal and mineral production at the mine stage the total value is 69 billion USD number four in the world (7% of the total value), same order of magnitude as Brazil and South Africa. Gold and iron ore accounts for roughly half of the Russian production. Iron ore 98 Mt/4% of the total world production, gold 305 ton/9%, copper 813 kt/4%, nickel 226 kt/8%. Russian companies are also major producers of vanadium (23%), PGM (20%), and phosphates (6%). During the cold war Russia/Soviet Union developed capacity to produce more or less all metals and minerals including the CRM. The demand of the military industrial complex was the main driver of this development.

Russia mines most of the metals/minerals on EU's list of critical materials. Russia is the largest producer of palladium. Other critical metals mined in Russia are among others vanadium titanium, cobalt, tungsten (see table to the left). Except palladium and vanadium Russia is not a major producer of any of the other CRM.

Russian mines



Ukrainian mine production

Metall/ mineral	Value \$" 2021	Ukraine share of total	CRM
Iron ore	11.97	3.3%	
Coal	3.3	0.3%	
Mangan (malm)	0.36	3.3%	
Kaolin (lera)	0.29	7.5%	
Titan (ilmenit, rutil)	0.24	7.7%	x
Salt	0.12	0.7%	
Uran	0.04	1.5%	
Zirkon	0.03	1.6%	
Grafit	0.02	1.3%	x
Gips	0.01	0.8%	
Fältspat	0.00	0.1%	
Hafnium	*	1.6%	x
Kisel	*	0.7%	

*Biprodukter och/eller utvinns i smältverk
"Miljarder USD



Billion USD

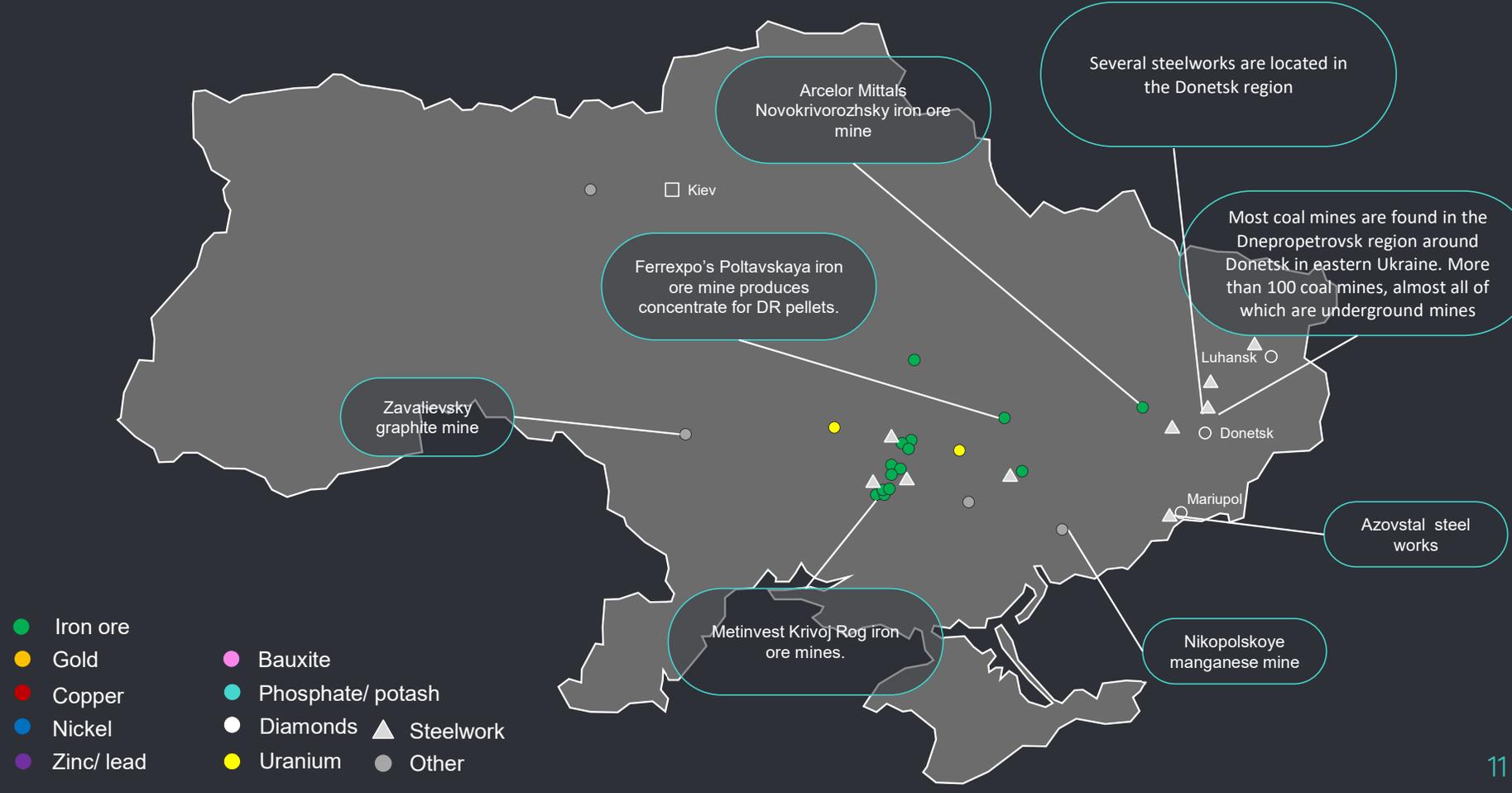
Ukraine is by far the most important mining country of Europe (Russia excluded). Iron ore is the main product, 77 Mt or 3% of total world production. It is the sixth largest producer. Manganese ore 2 Mt, eighth largest producing country. The iron ore products of Ukraine are of high quality including pellets. It is the seventh largest pellet producer (4%). The steel and mining industries are mostly controlled by oligarchs in very much the same way as in Russia. ArcelorMittal owns one steel work with captive iron ore mines.

Iron ore is mined in several areas mainly in the Krivy Rih area. Coking coal for the blast furnaces is mined in the Donbass. Important steel centres are found in the Dnepropetrovsk region and in the neighbourhood of Donetsk in eastern Ukraine. Azovstal steelworks in Mariupol has been almost completely destroyed by Russian bombardment. The manganese and ferro alloy production are located in and around the city Nikopol in an area already hit by the war.

Russia and Ukraine are major coal mining countries producing 439 Mt and 255 Mt respectively annually.

Ukraine also produces limited amounts of the critical raw materials titanium, graphite, silica, zirconium and uranium.

Ukrainian mines



Belarussian mine production

Metall/ mineral	Value \$" 2021	Belarus share of total	CRM
Potash	7,20	18%	
Salt	0,14	0,9%	

"Miljarder USD



Billion USD

Belarus is the world’s second largest producer of potash, which is used in the production of fertilizers, trailing Canada. The third largest producing country is Russia and together they mine 2/3 of global production. 2020 Belarussian production was 7.4 million ton valued at 7 billion dollar. This is equal to 18% of total global production. Belaruskali is the fully state owned company mining potash. It is one of the most important companies in Belarus. The company is the single largest tax payer and an important source of foreign currencies for the Belarussian regime.

More than 50 % of EU’s import of potash originates in Belarus and Russia (2020). Restrictions on trade with Belarussian potash and fertilizers were introduced already in June 2021. This was a protest against the violations of human rights and the violent oppression of civil society.

Belaz, one of the largest producer of trucks including mine trucks is based in the vicinity of Minsk.

Belarussian mines

Lithuania has stopped shipping Belaruskali's products via the port of Klaipeda. Previously, about 12 million tonnes per year were shipped to international markets via Lithuania.



- Iron ore
- Gold
- Copper
- Nickel
- Zinc/ lead
- Bauxite
- Phosphate/ potash
- Diamonds
- Uranium
- Other

Locus of mine production historically

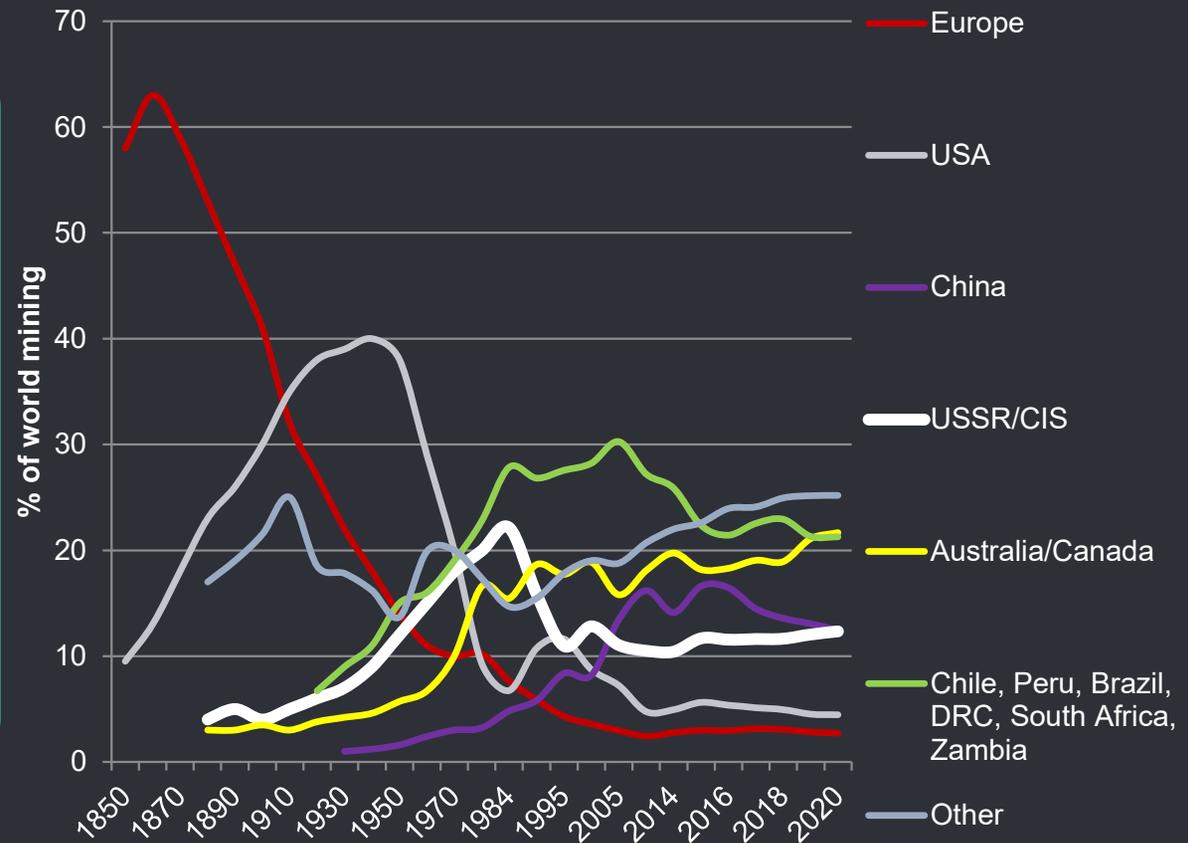
Russia's importance as a supplier of metals and minerals has declined since Soviet times.

In the 1980s the Soviet Union (the white line in the graph) accounted for over 20 % of the value of total world metal and mineral production.

Towards the end of the 2010s the value of total CIS countries mine output was only around 10% of the total world figure. A quick decline.

The Russian/Soviet share has sunk during this period for two main reasons:

1. Russian mine production stagnated after the collapse of the Soviet Union in the 1990s. For certain metals and minerals production has declined and the peak levels of the mid 1980s have not been reached again.
2. Investments in mining in other parts of the world have been increasing steadily.

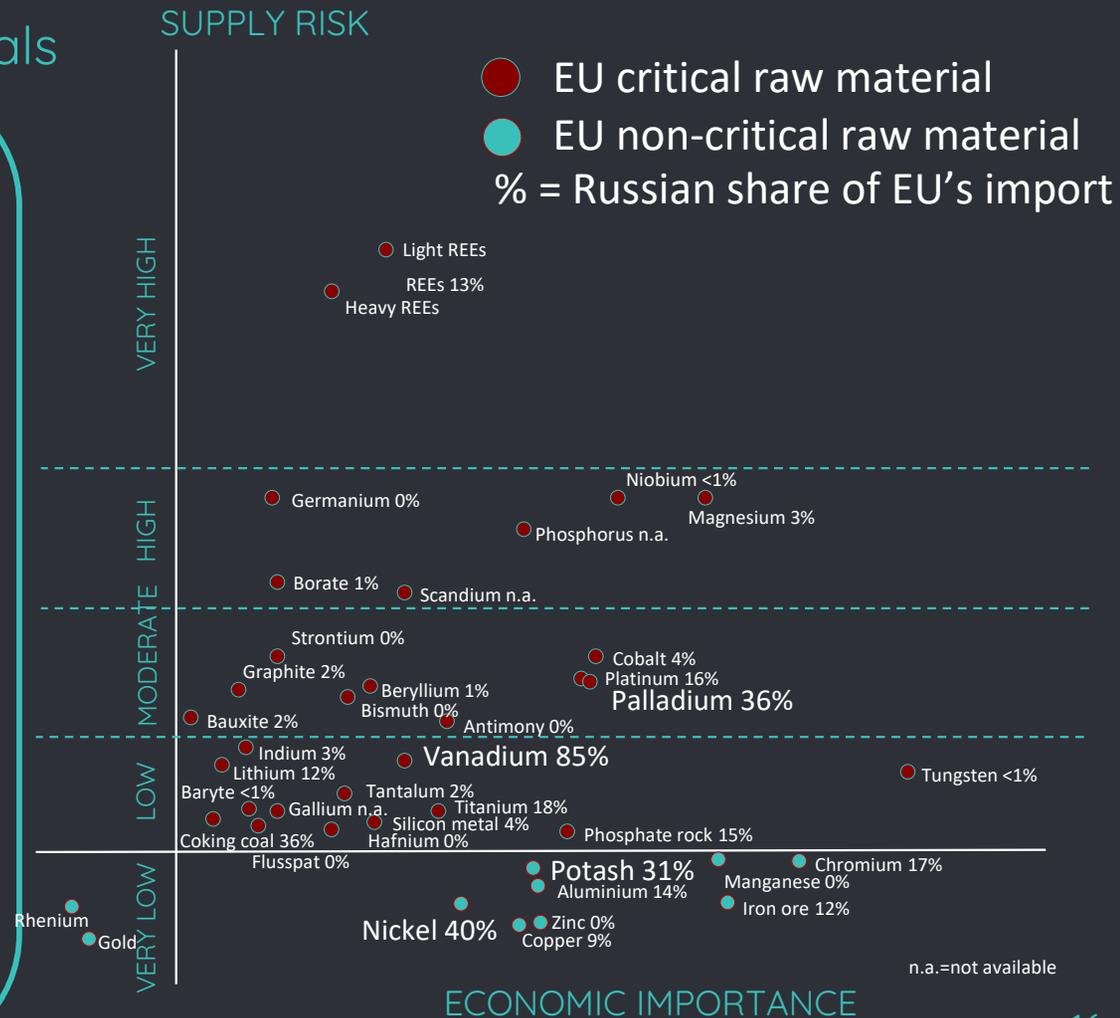




- CRITICAL RAW MATERIALS

EU list of critical raw materials

Mines in the EU produce only 1% of the critical raw materials. The largest supplier of critical raw materials to the EU is China, with a share of almost 40%, followed by South Africa, Russia, DRC and Brazil. What and how large share of each individual raw material the EU imports from Russia is shown in the matrix to the right. Vanadium is the metal for which European dependence on Russia is greatest, 85% comes from Russia. However, the imported volumes are relatively small. Alternative producing countries are South Africa, Brazil and China, which dominate world production with just over 60% of total production. The Russian steel company Evraz previously controlled parts of the South African vanadium production, but in recent years the company has withdrawn and sold its operations. Most of the Russian production of nickel and the by-products platinum, palladium and cobalt are controlled by Nornickel (formerly Norilsk). The company is one of the largest nickel companies in the world and operates mines and smelters on the Kola Peninsula and in northern Siberia. All three main raw materials for fertilizers are produced in Russia: nitrogen, phosphorus and potassium. Nitrogen is obtained from the air using natural gas in the process. Phosphorus and potassium are mined. The Russian company Uralkali has facilities in the Ural mountains where most of the Russian production takes place. The largest phosphate producer is the vertically integrated company Phosagro, which is a major global producer of fertilizers.



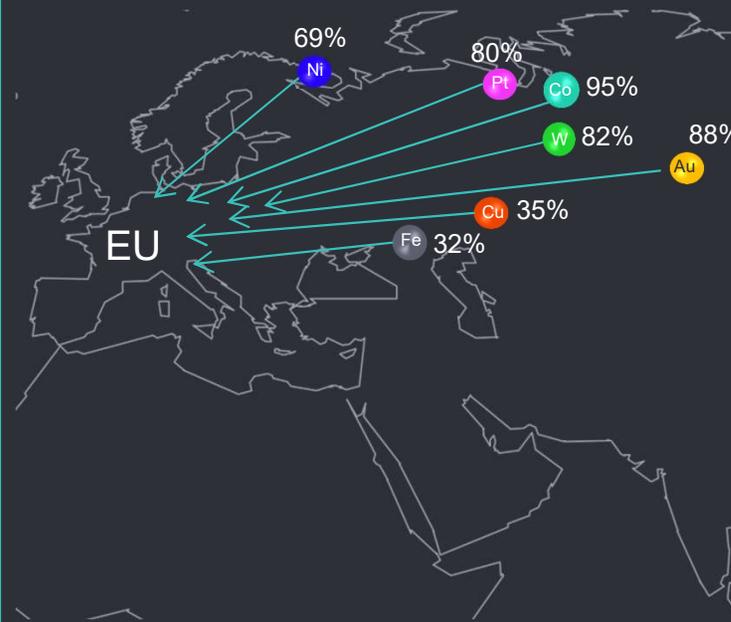
Russia's metal and mineral exports

During the Soviet times part of Russia's power and influence over the entire "East bloc" was built on supplies of metals and mineral most importantly fuel minerals. The parallels to the present situation are obvious and exports of minerals of all types remain an corner stone for the Russian economy. Oil and gas represent over 50% of its total export, metals and minerals around 10%.

The EU is the single most important receiver of Russian exports of metals and minerals. In the list to the right 52%, in value terms, is exported to the EU. Gold is the single most important item valued at more than 19 billion dollar. Coking coal is second most important at almost 11 billion USD followed by PGM, nickel, copper, aluminium and diamonds.

The EU buys more than 80% of total Russian exports of cobalt, beryllium, gold, tungsten and platinum. Slightly less but still around 2/3 of the Russian exports of nickel, vanadium and REE end up in the EU.

In conclusion EU is a very important market for Russian exports of metals and minerals.



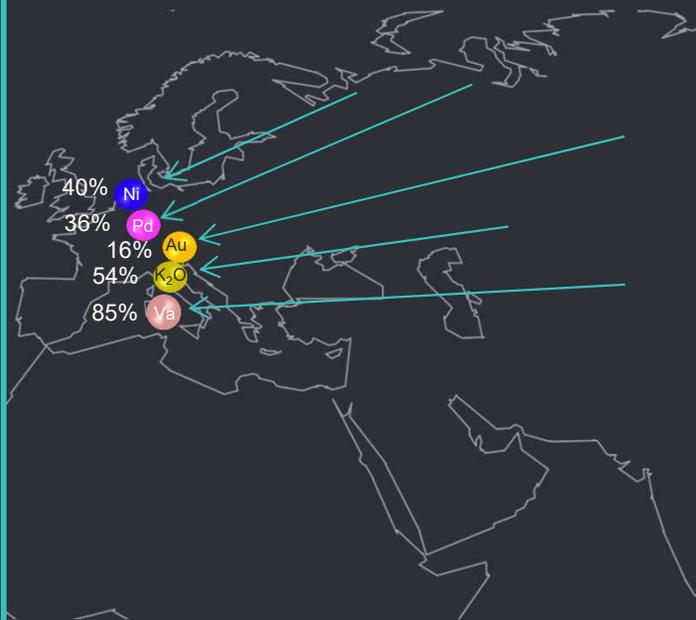
Metal/ mineral	Value of export (MUSD)	Share of Russias export to EU
Cobalt	83	95%
Beryllium	22	91%
Gold	19292	88%
Tungsten	22	82%
Platinum	688	80%
Nickel	3077	69%
Vanadium	89	66%
REE	17	65%
Phosphate	439	57%
Silver	428	57%
Chrome	135	54%
Titanium	414	52%
Silicon	73	51%
PGM other	707	45%
Diamonds	3189	45%
Palladium	6449	38%
Aluminium	5224	36%
Copper	6337	35%
Iron ore	1980	32%
Met. Coal	10743	22%
Potash	1776	20%
Pig iron	1325	19%
Zinc	234	16%

EU's imports of metals and minerals from Russia

The EU is a net importer of metals and minerals and its self sufficiency is low for most metals. The import dependency is 100% for 13 of the 30 raw materials on EU's list of CRM.

Gold dominates in terms of value EU's import of metals from Russia 17 billion USD. However 85% of EU's imports of vanadium comes from Russia, nickel (40%), palladium (36%), coking coal (36%) och potash (31%) are the metals for which the dependence of Russia is highest. For Russia the EU is an important customer of its cobalt, beryllium, silica and tungsten while for the EU each of these deliveries is less than 5% of EU's total imports.

In the case of a complete loss of metals imports from Russia of the CRM the effects on the EU would not necessarily be dramatic, at least not in the mid term perspective. There are many other exporting countries that could fill the gap and export to the EU.



Metall/mineral	Valuet av import från Russia (MUSD)	Russias andel av EUs import
Vanadium	56	85%
Potash*	461	54%
Nickel	1693	40%
Palladium	2600	36%
Met. Coal	2213	36%
Titanium	465	18%
Chrome	38	17%
Diamonds	1393	16%
Gold	17099	16%
Platinum	578	16%
Phosphate	282	15%
Aluminium	2279	14%
REE	11	13%
PGM other	385	13%
Iron ore	1098	12%
Copper	1200	9%
Silver	241	8%
Cobalt	17	4%
Zircon**	3	4%
Indium	2	3%
Silicon	31	2%
Beryllium	1	1%
Borate	3	1%

*Russia & Belarus

Källa: OECD

**Importerat från Ukraina

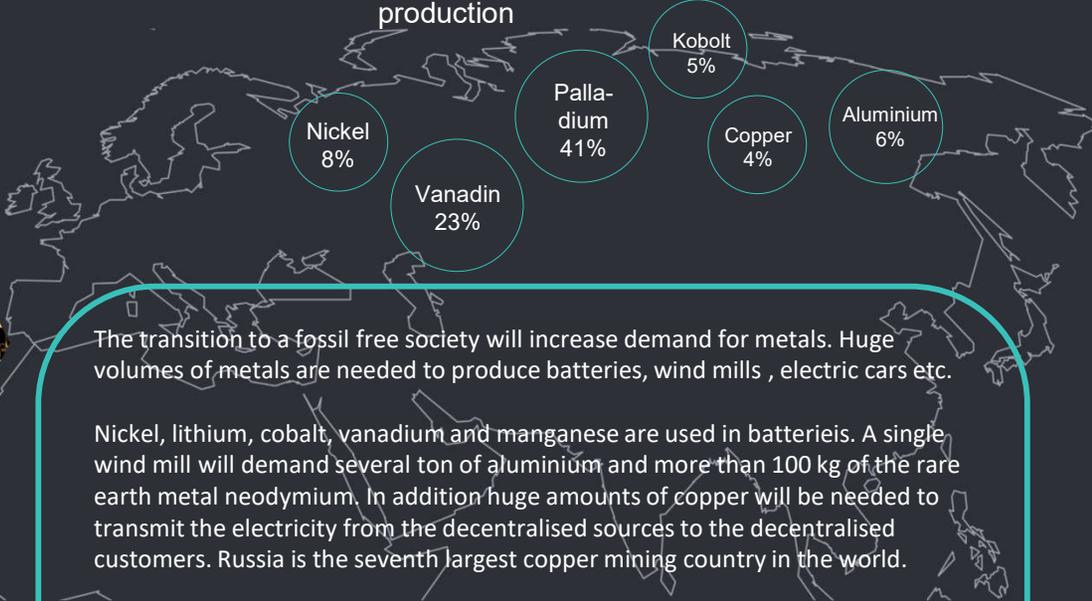
● The transition to a fossil free future is a transition from hydro carbons to metals



The green transition



Russia's share of world production



The transition to a fossil free society will increase demand for metals. Huge volumes of metals are needed to produce batteries, wind mills , electric cars etc.

Nickel, lithium, cobalt, vanadium and manganese are used in batterieis. A single wind mill will demand several ton of aluminium and more than 100 kg of the rare earth metal neodymium. In addition huge amounts of copper will be needed to transmit the electricity from the decentralised sources to the decentralised customers. Russia is the seventh largest copper mining country in the world.

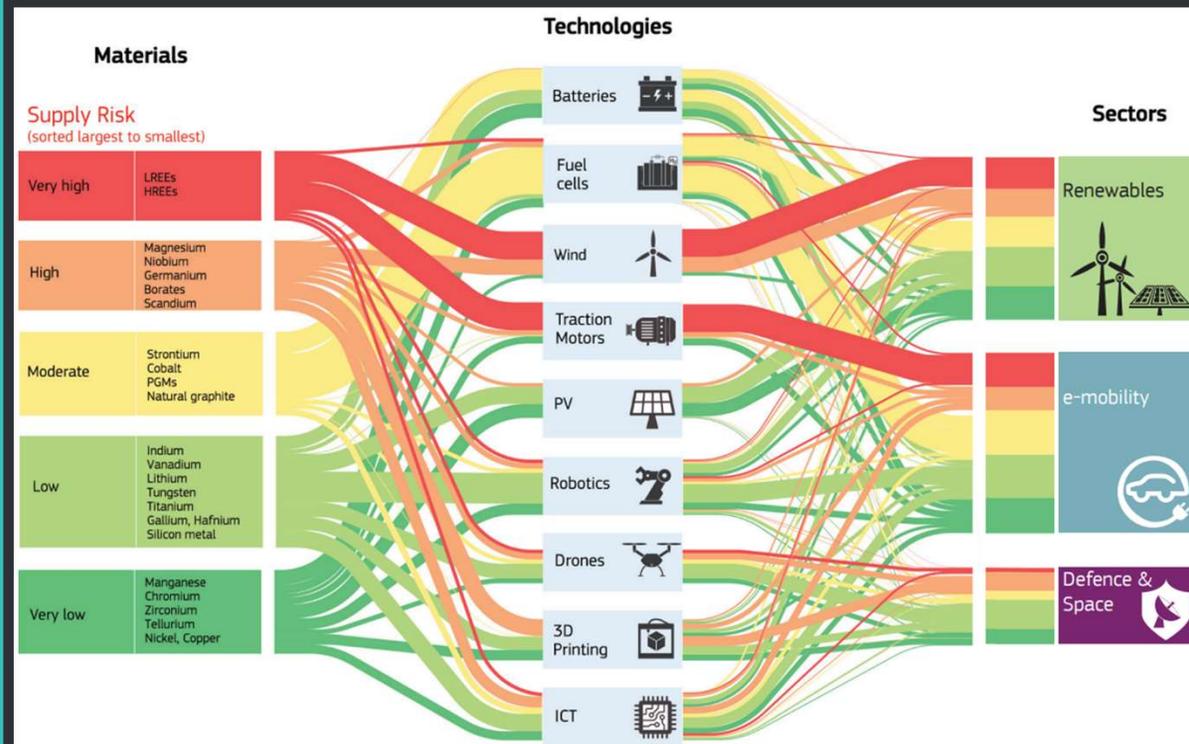
Russia is a major producer of several metals. For example it is the third largest nickel miner. The nickel mined in Russia leaves a relative small carbon dioxide foot print. Nickel is extensively used in batteries depending on battery type more than any other metal. There is a trend towards increasing the nickel content in batteries in order to reduce cobalt where the dependence on mining in one country Congo and refining in another China is problematic.

Platinum/palladium are used in fuel cell technologies. Russia also mines cobalt, vanadium, and REE.

Ukraine mines a small amount of graphite which is used in battery cells.

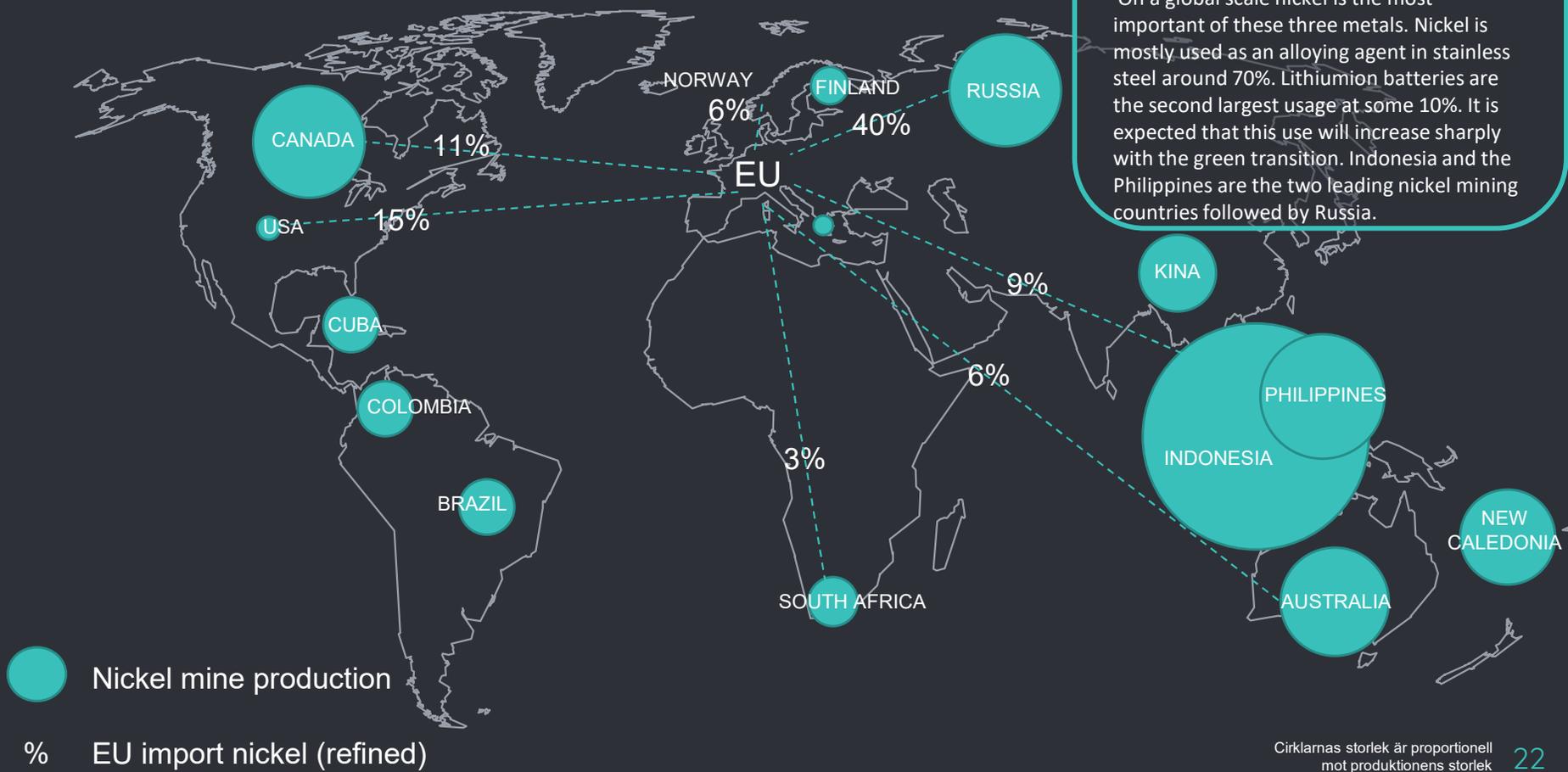
Critical Raw Materials (CRM) for the EU industry including defense industry

The EU report *Critical Raw Materials for Strategic Technologies and Sectors in the EU* defines different areas that all use the critical raw materials: advanced batteries, fuel cells, wind power, traction motors, solar cells, robotics, unmanned vehicles, 3-D printing and Information and Communication Technologies (ICT). These strategic areas are also important for Europe's defense industry. EU defines the term "critical" as the commodities of major importance to the economy of the Union as a whole and whose availability is associated with high risk. When it comes to the need for critical raw materials for the different areas, drones require the most with 23 critical raw materials, followed by robotics (19), fuel cells (11), 3-D printing (8) and lithium-ion batteries (5). The most widely used critical material in all nine selected technologies is cobalt. Demand for cobalt is expected to increase sharply, especially with the transition to a fossil-free society. Russia and mainly the company Nornickel produce cobalt, about 5% of world production and almost everything, 95%, is exported to the EU. Nornickel has a metals refinery in Finland.



Source: "European Commission, Critical materials for strategic technologies and sectors in the EU - a foresight study, 2020"

Nickel



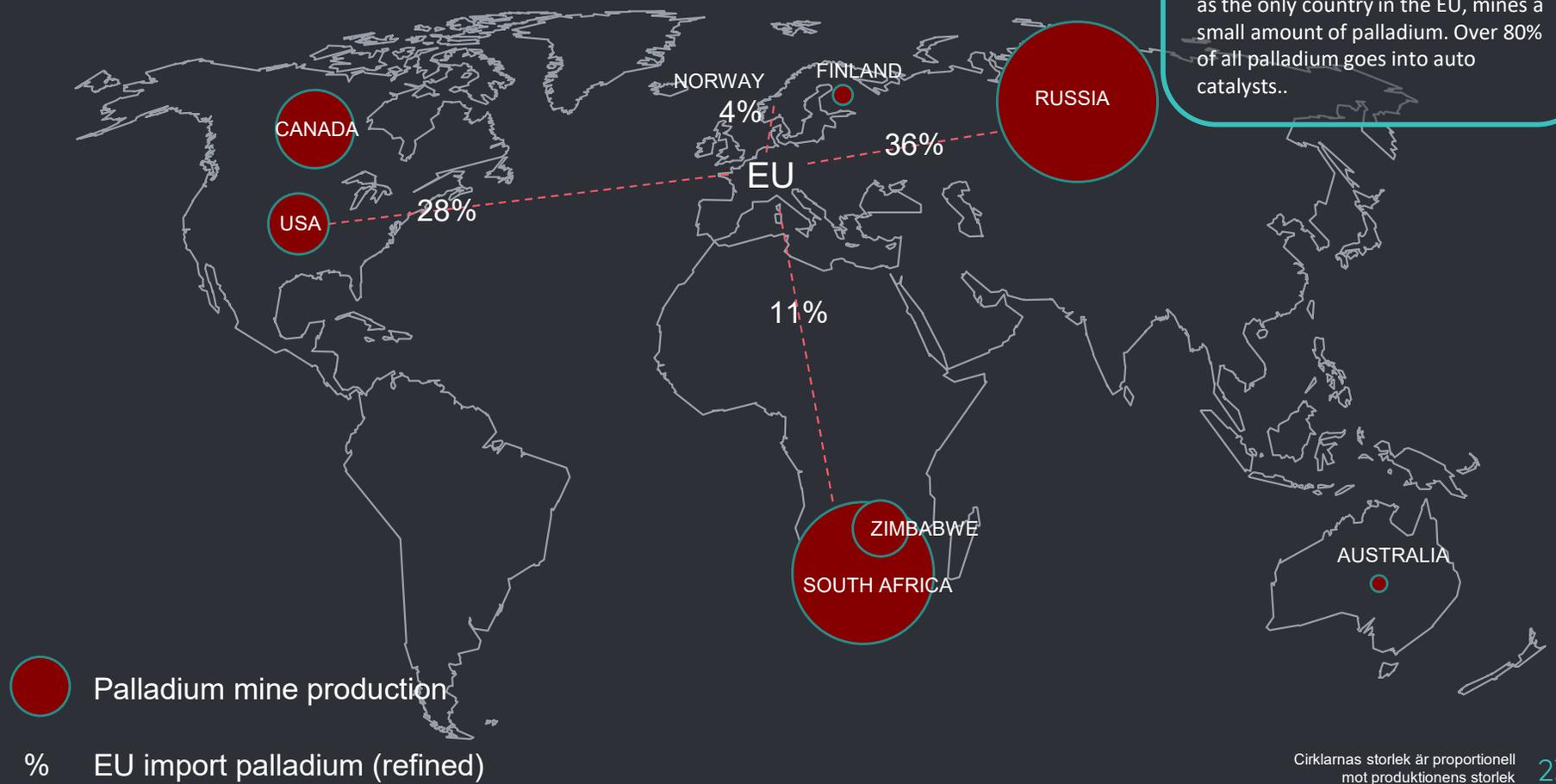
● Nickel mine production
% EU import nickel (refined)

Vanadium, nickel and palladium are the key metals which the EU imports from Russia. In this and the following maps are shown the largest mining countries of each of these metals. The figures show how much of EU's import is originating from each country.

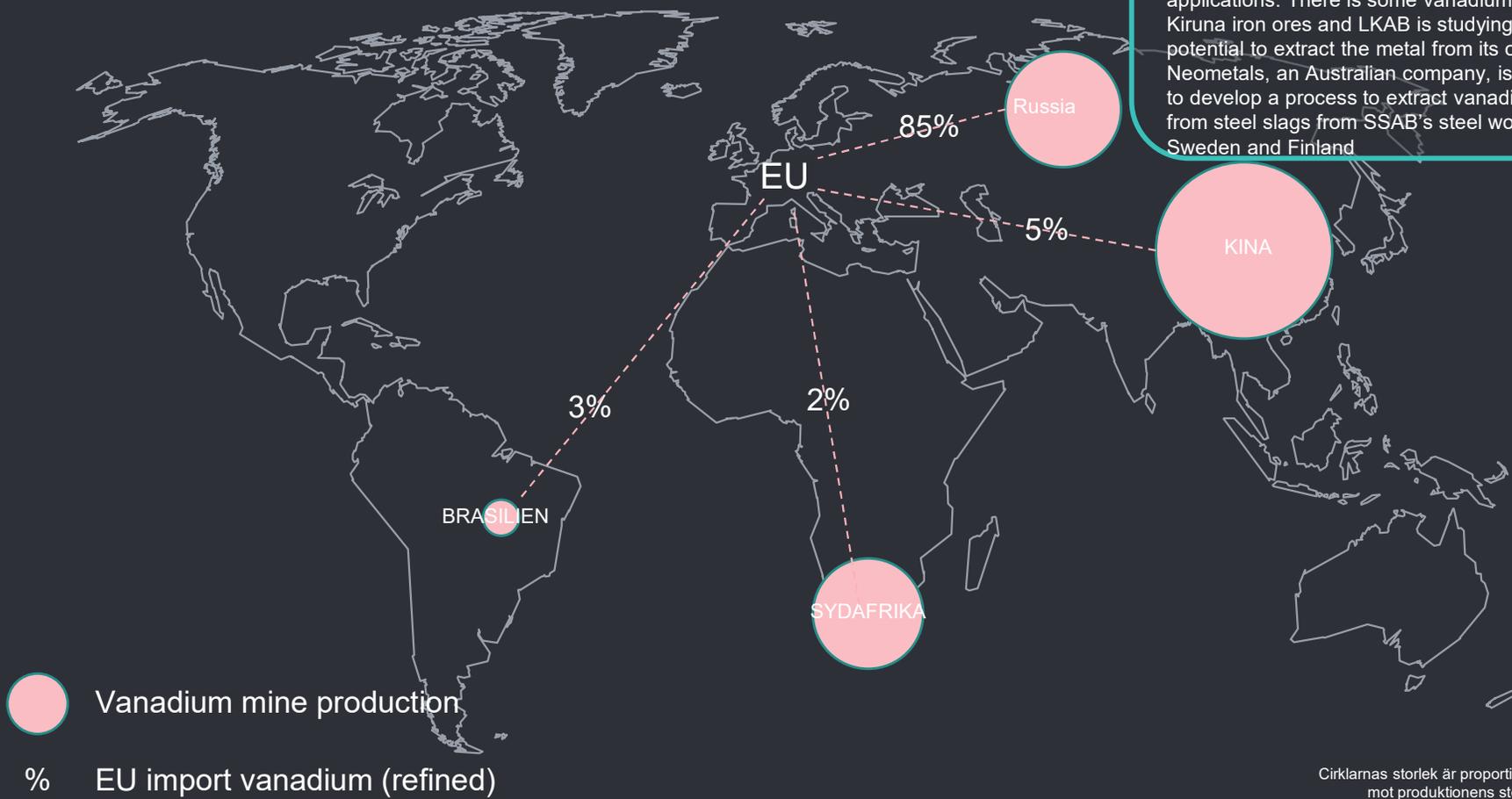
On a global scale nickel is the most important of these three metals. Nickel is mostly used as an alloying agent in stainless steel around 70%. Lithiumion batteries are the second largest usage at some 10%. It is expected that this use will increase sharply with the green transition. Indonesia and the Philippines are the two leading nickel mining countries followed by Russia.

Palladium

Palladium is one of the metals in the platinum group of metals (PGM). Palladium is mined in Russia, South Africa, Zimbabwe, Canada and USA (these countries together represent 99% of total world production. Finland, as the only country in the EU, mines a small amount of palladium. Over 80% of all palladium goes into auto catalysts..



Vanadium



Vanadium is mainly obtained from slags from steelworks using iron ores high in vanadium. Such ores are mainly mined in China, Russia and South Africa, which together produce around 90% of all vanadium in the world. Vanadium is used to create high strength steel alloys for tools and many other applications. There is some vanadium in the Kiruna iron ores and LKAB is studying the potential to extract the metal from its ores. Neometals, an Australian company, is trying to develop a process to extract vanadium from steel slags from SSAB's steel works in Sweden and Finland

● Vanadium mine production
% EU import vanadium (refined)

Potash

Potash, a mineral containing potassium, is one of the three main components of fertilizers. Russia is the third largest producer globally after Canada and Belarus. Russia and Belarus together is the source of over 50% of EU's imports of potash 2020.



Russian and Ukrainian companies in a global comparison

Bolag	Land	Huvudsaklig metall	Value gruvproduktion* 2020
BHP	UK/Australia	Iron ore	44
Vale SA	Brazil	Iron ore	38
Rio Tinto Group	UK	Iron ore	37
...			
Nornickel	Russia	Nickel/PGM	12
Belaruskali	Belarus	Potash	7.2
Uralkali	Russia	Potash	5.5
Polyus Gold	Russia	Gold	5.2
Evrax Group SA	Russia	Iron ore	4.4
Metalloinvest	Russia	Iron ore	4.4
Alrosa	Russia	Diamant	4.1
Metinvest	Ukraine	Iron ore	3.3
Polymetal International Plc	Russia	Gold	2.8
NLMK	Russia	Iron ore	2.0
Ural Mining and Metallurgical Company	Russia	Base metals	2.0
Severstal	Russia	Iron ore	1.9
Nord Gold	Russia	Gold	1.9
United Company Rusal Plc	Russia	Aluminium	1.8
Ferrexpo	Ukraine	Iron ore	1.2
Phosagro	Russia	Phosphate	0.9
Atomenergoprom (Rosatom)	Russia	Uranium	0.1
...			
LKAB	Sweden	Iron ore	2.9
Boliden	Sweden	Base metals	1.9

*Miljarder USD

BHP, VALE and Rio Tinto are the three largest mining companies globally measuring the value of their production at the mine stage. All three companies mine a range of metals and minerals but for all of them iron ore dominates. The value of mine production controlled by BHP is 44 billion dollar followed by Vale (38) and Rio Tinto (37).

Several Russian mining companies are among the largest all categories globally. Nornickel is the largest Russian mining company controlling production valued at 12 billion dollar, which renders it a ranking around 10th place.

Following the ten largest companies there are 50 companies each controlling a production value between 2 and 6 billion dollar. The largest Russian mining companies fall into this category. In the list to the left are also included some smaller Russian companies.

The two largest Ukrainian mining companies, Metinvest and Ferrexpo both in iron ore and steel, and the Belarussian potash company are also included in the list. As yet a point of comparison two Swedish companies are found at the bottom of the list (not in order of their size).

Russian mining companies



Nornickel is the world's second largest producer of nickel (both concentrates and refined metal). The world's largest producer of palladium. Also produces copper, platinum and cobalt. The mines are located in Siberia and on the Kola Peninsula. Controlled by Vladimir Potanin and Oleg Deripaska. Listed in Moscow.

POLYUS Gold is the world's third largest gold producer with 81 tonnes of gold 2020. All mines are located in Russia. Controlled by Said Kerimov. Listed in Moscow and London. The company was spun off from Nornickel just over 10 years ago.

EvrAZ is Russia's largest steel and iron ore company. Its largest individual owner is the oligarch Roman Abramovich. Produced 14 Mt of iron ore in 2020. The company is listed on the London Stock Exchange.

Metalloinvest is a steel and iron ore company and is Russia's largest iron ore producer with about 40 million tonnes annually, including pellets and so-called HBI (hot briquetted iron) a steel raw material. The company is not listed on the stock exchange.

Polymetal is one of the world's top 10 largest gold companies. They control 8 gold mines in Russia and 1 in Kazakhstan. The production amounts to 44 t gold and 6 300 t silver. Listed on the London Stock Exchange. One of the largest owners is Alexander Nesis.

Ural Mining and Metallurgical Company (UMMC) is one of the largest Russian mining producers of copper, zinc, coal, gold and silver. UMMC also produces lead, selenium, tellurium, cadmium and indium. Listed in Russia. The largest owner is Iskander Makumodov.

Severstal is primarily a steel company but also a large producer of iron ore and iron ore pellets. All mines are located in Russia. Severstal is listed on the London Stock Exchange where the majority of the shares belong to the oligarch Alexei Mordashov.

United Company RUSAL is the world's second largest aluminum producer. A fully integrated company with bauxite mines in Russia, Guinea, Guyana and Jamaica. Listed in Moscow and Hong Kong with Oleg Deripaska as major owner. Owner of Swedish Kubikenborg Aluminum (KUBAL) with aluminum smelter in Sundsvall.

Russian, Ukrainian and Belarussian companies



Uralkali is one of the world's largest producers of potassium salts for fertilizer production. The company is listed on the Moscow Stock Exchange and has Dmitry Mazepin as a major shareholder.

Nordgold is a gold company with operations in West Africa, Kazakhstan and Russia. Produced more than 31 tonnes of gold in 2020. Marina Mordashova is the largest shareholder with more than 50%. The company is based and registered in the United Kingdom.

Phosagro mines phosphates (phosphate rock) and produced 12 million tonnes by 2020. The company is one of the world's largest integrated fertilizer producers. Has an international board. Is listed on the Moscow Stock Exchange.

Ukrainian companies



Metinvest is Ukraine's largest iron ore company with a production of 30 million tonnes 2020. The company is not listed on the stock exchange. It is controlled by Rinat Akhmetov.

Ferrexpo is Ukraine's largest producer of iron ore pellets and also produces DR pellets needed to produce the so-called "green steel" with hydrogen as a reducing agent. Production about 11 Mt iron ore products. The company is the third largest pellet exporter in the world. Konstantin Zhevago controls the company, which is listed on the London Stock Exchange but is headquartered in Switzerland.

Belarussian companies



Belaruskali is one of the world's largest potash companies. 100% state controlled. 7.4 million tonnes were produced 2020 to a value of about 7 billion USD. Belaruskali accounts for 18% of global production.

Consequences for the EU: short term

Trade

The effects of boycott of Russian mineral and metal raw materials by the EU and its allies and/or a Russian lock down of exports would be much less serious for the EU and Russia than a stop in trade with oil and gas. In the short term effects on metal prices by the war have been limited, the exception being nickel. The nickel price has shot up since the beginning of the year. This is however not only the effect of the war but also of failed Chinese speculations.

Nickel

The Russian nickel production is important for the EU, 40 % of total imports originate in Russia at a total value of 1.7 billion dollar. Nickel is used in batteries and can potentially replace cobalt which is one of the most critical elements on EU's list. Hence nickel is becoming more important in recent years. Russian Nor Nickel has parts of its value chain in Finland where nickel from Russia is refined.

Palladium

Palladium is one of the PGM and used mainly in auto catalysts. Given the transition to electric motors the importance of palladium might gradually decline in the future. But in recent years the demand for palladium has increased due to more stringent legislation on exhausts from all types of combustion engines. The effect of Russia being a major producer of palladium might be that the transition to electric motors is accelerated. Mining companies outside of Russia should be able to supply palladium and other PGM. In South Africa, the second largest producer, there is already work underway to find new usages for palladium to avoid a future over

capacity when combustion motors are phased out. Fuel cells might become a new application for PGM.

Iron and steel

Ukraine is an important producer of high quality iron ore products suitable for the production of green steel. If production in the central Ukraine is hit severely by the war it will have a stronger impact in the EU than the potential impact of nickel and PGM.

Ukrainian company Ferrexpo is one of the largest producer and exporter of iron pellets with high iron grade. In the short term a stop of Ferrexpo exports could lead to increased prices for these products. Competitors of Ferrexpo such as LKAB would get a higher price for its products. There are pellet producers also in Russia for example Severstal's mine and plant in Kostamus Karelia. Their exports via a Finnish port has been stopped already.

The European steel industry will also be affected by the war. Sanctions are already in place for steel products from Russia. Since many years there is an over capacity in Europe and globally. Possibly less exports from Russia will to some extent improve the over supply situation. In addition the Ukrainian steel industry is already hit hard by destruction from Russian bombardment. The Ukrainian steel production in 2021 was 21 Mt, fourteenth largest in the world.

Consequences for the EU long term

Prices

Increased freight costs when ores have to be shipped longer distances than from Russia. Possibly two world prices will develop one in China/Russia and one for the rest of the world, which seems to be the case for oil. For metals the most likely case however is that trade with Russia will be conducted with a discount.

Long term contracts

Long term contracts might get more frequently used to secure supplies of metals. Such contracts could ameliorate some of the uncertainties the war have created and off set some of the most extreme price fluctuations. Possibly large user of metals such as battery producers and automakers might get interested in investing directly into mines in countries with low sovereign and economic risks. So far no such deals have been announced but they might come.

Already today there are long term contracts between EU buyers and Russian suppliers which are legally binding and make it difficult to stop imports from Russia.

Investments

Investments in new mines outside of Russia might be speeded up. China could potentially increase its imports from Russia particularly of nickel where the Chinese import demands are particularly large. In spite of this potential there could be room for expansion of mine production of nickel in other parts of the world including the EU. This is also the case for most of the metal- and mineral raw materials produced in Russia and Belarus and Ukraine if the destruction of its mines and smelters and infrastructure continues.

It must however be emphasised that potential new mines wherever they are located must be competitive at present world market prices.

Environment

If production by Nornickel is replaced by mines in other parts of the world CO₂ emissions will probably increase. Alternative mines, in for example Indonesia/the Philippines mining lateritic deposits often with lower nickel grades, emit considerably more CO₂ /per ton nickel produced.

Equipment suppliers

Swedish and other equipment suppliers might lose an important market in Russia and possibly in the long run also in other CIS countries. China might become a more important supplier with a strong position in these countries. The quality and productivity of Chinese equipment is however, at least today, in general lower than what comparable international suppliers offer. This is one of the many ways in which China could benefit from a decline in Russian trade with the rest of the world.

The effectiveness of Russian mine production could gradually decrease if cut off from international equipment suppliers.

Opportunities for developing countries

Some emerging economies have high quality mineral deposits which are not at present in production but which will be needed in the transition to a carbon free energy supply. Possibly some of these deposits can be developed if Russian exports of metals decline.

Consequences for Russia

Background

On the 15th of March an import ban to EU from Russia was introduced for steel products and certain luxury goods. "Strictly necessary" transactions of fossil fuels, titanium, aluminium, copper, nickel, palladium and iron ore are still possible.

Russian metal production

Russia and Russian mining companies will continue to lose market shares. Russia's importance as a mining country and exporter of minerals and metals will continue to decline. In the short term also production volumes might decrease.

The role of the oligarchs

Oligarchs are the major owners of almost all large Russian mining and smelting companies. How a decrease in profits from these companies might influence the oligarchs and their relation to the Russian regime is an open question.

Russian companies

The major Russian mining companies started to modernise after the collapse of the Soviet Union. Their businesses were gradually made more effective and they started to invest in mines outside the former Soviet, like their international peers had done. After Putin became president these companies have however contracted again and focused on deposits in Russia and neighboring countries. The modernisation process has to a large extent ground to a halt. In addition an increasing hesitation to do business with Russian companies among European suppliers and buyers due to the atrocities of the war. In the future India and China might become the only major countries willing to do business as usual with Russia.

Investments into Russia

Foreign direct investments into Russian mining have never been large but there are examples of such investments, for example the Kupol gold mine in Magadan in far east Russia. Such investments will most likely dry up completely. International board members of global Russia listed companies are withdrawing and it is likely that the Russian companies will lose competences on many levels.

Chinese investors might be willing to spread their investment and target also Russia. Chinese investments into for example South East Asia are however already important and it is unlikely that these will be abandoned.

Aluminium

Russian companies are important suppliers of aluminium; 4,3 million ton 2021, 6 % of total global production. Russia is however importing more than 50% of its demand for alumina mainly from Ukraine and Australia. Bauxite deliveries to the Ukrainian alumina production have already been seriously affected by the war. Australia recently stopped bauxite and alumina exports to Russia. As a consequence Russia has started to import alumina from China. Rio Tinto has stated they will stop bauxite deliveries also to Rusal's alumina plant in Ireland, which could affect also deliveries to Russia but also other aluminium smelters in Europe.



ANNEX



METALLER OCH MINERAL INKLUDERADE I BERÄKNING AV VÄRDET AV VÄRLDSPRODUKTIONEN PÅ GRUVSTADIET

Antimony	Iron ore	Rare earths
Asbestos	Kaolin	Rhodium
Bauxite	Lead	Salt
Beryllium	Lithium	Silver
Bismuth	Magnesium	Soda ash
Boron	Manganese ore	Sulphur
Chromite	Mercury	Talc
Coal	Mica	Tantalum
Cobalt	Molybdenum	Tellurium
Copper	Nickel	Tin
Diamond value	Niobium	Titanium
Feldspar	Other PGM	Tungsten
Fluorspar	Palladium	Uranium
Gold	Phosphate rock	Vanadium
Graphite	Platinum	Zinc
Gypsum	Potash	Zirconium

ANVÄNDNINGSMOMRÅDEN METALLER INOM ICT

Element	Symbol	Usage
Antimony	Sb	Alloying element in lead batteries.
Beryllium	Be	Springs, electrical contacts, spot-welding electrodes, and non-sparking tools. It is applied as a structural material for high-speed aircraft, missiles, spacecraft, and communication satellites
Bromine	Br	Flame retardant
Cesium	Cs	Catalyst promoters, glass amplifiers, and photoelectric cell components, drilling fluids (oil-industry)
Chromium	Cr	Alloys
Cobalt	Co	Rechargeable batteries
Copper	Cu	Electrical connections
Gallium	Ga	Integrated circuits, LED, photovoltaics
Germanium	Ge	Fibre optics, IR technology
Gold	Au	Microelectrical components
Graphite	C	Rechargeable batteries
Heavy REE (Dy,Pr, etc.)	REE	Magnets, EVs, wind power, displays
Indium	In	Displays
Light REE (Nd, Pr, etc.)	REE	Magnets, EVs, wind power, displays
Lithium	Li	Rechargeable batteries
Magnesium	Mg	Alloys
Manganese	Mn	Rechargeable batteries
Nickel	Ni	Microphone, electrical connections
Niobium	Nb	Alloys
PGM	Pa, Pt, Rh, Ru, Os, Ir	Alloys
Ruthenium	Ru	Chip resistors, electrical contacts
Selenium	Se	Photovoltaic
Silicon	Si	Integrated circuits
Silver	Ag	Microelectrical components
Tantalum	Ta	Condensators
Tellurium	Te	Photovoltaics, alloys
Tin	Sn	Lead free solder
Tungsten	W	Alloys
Vanadium	Va	Rechargeable batteries

Russia mine production

Metal/mineral	Value \$" 2021	Production 2019	World production	Russian share of total	CRM	Metal/mineral	Value \$" 2021	Production 2019	World production	Russian share of total	CRM
Coal	56.6	439	8076	5.4%		Rare earths	0.06	3	219	1.2%	x
Gold	17.65	305	3347	9.1%		Tungsten	0.05	3	92	3.1%	x
Iron ore	15.50	98	2297	4.3%		Salt	0.04	770	284508	0.3%	
Palladium	7.21	86	211	40.9%	x	Talc	0.04	150	7463	2.0%	
Potash	6.64	7	42	16.3%		Gypsum	0.03	3800	167990	2.3%	
Copper	5.84	814	20677	3.9%		Feldspar	0.03	294	31856	0.9%	
Diamond value	4.12	4117	13561	30.4%		Boron	0.03	80	2118	3.8%	x
Nickel	2.92	226	2702	8.4%		Graphite	0.03	17	1132	1.5%	x
Asbestos	1.58	790	1226	64.4%		Tantalum	0.01	26	1803	1.4%	x
Rhodium	1.42	2	24	7.7%	x	Zirconium	0.01	6	1337	0.5%	
Silver	1.10	1361	26260	5.2%		Mercury	0.00	50	2730	1.8%	
Phosphate rock	1.04	14	226	6.1%	x	Tellurium	0.00	50	625	8.0%	
Platinum	0.75	22	186	11.6%	x	Sulphur	0.00	71	6823	1.0%	
Zinc	0.58	305	12360	2.5%		Fluorspar	0.00	4	6479	0.1%	x
Lead	0.48	220	4684	4.7%		Mica	0.00	5	287	1.6%	
Vanadium	0.28	18	81	22.7%	x	Bismuth	0.00	45	3111	1.4%	x
Kaolin	0.24	2	24	6.2%		Gallium	*	6	95	6.3%	x
Antimony	0.19	22	129	16.9%	x	Bismuth	*	45	3700	1.2%	x
Bauxite	0.18	6	347	1.6%	x	Germanium	*	6	95	6.3%	x
Chromite	0.15	698	38610	1.8%		Baryte	*	163	9200000	0.0%	x
Uranium	0.14	3	55	5.3%		Hafnium	*	6300	1337000	0.5%	x
Magnesium	0.13	15	1060	1.4%	x	Silicon	*	600	7000	8.6%	x
Cobalt	0.09	6	123	4.5%	x	Niobium	*	659	57000	1.2%	x
Molybdenum	0.07	2	275	0.7%		Indium	*	5	960	0.5%	x
Tin	0.07	2	305	0.8%		Titanium(sponge)	*	31000	230000	13%	x

*Biprodukter/framställs i smältverk
"Miljarder USD

Ukraine mine production

Metal/ mineral	Value \$" 2021	Production 2019	Total	Ukraine share of total	CRM
Iron ore	11.97	76	2297	3.3%	
Manganese ore	0.36	2	57	3.3%	
Kaolin	0.29	2	24	7.5%	
Titanium (Ilmenite, Rutile)	0.24	1018	13262	7.7%	x
Salt	0.12	2093	284508	0.7%	
Uranium	0.04	1	55	1.5%	
Zirconium	0.03	22	1337	1.6%	
Graphite	0.02	15	1132	1.3%	x
Gypsum	0.01	1409	167990	0.8%	
Feldspar	0.00	30	31856	0.1%	
Hafnium	*	22000	1337000	1.6%	x
Silicon	*	50	7000	0.7%	

*Biprodukter/framställs i smältverk
 "Miljarder USD

MINING CONTRIBUTION INDEX

Mining Contribution Index (MCI-W) är ett mått på i vilken grad gruvor bidrar till länders ekonomi. Indexet baseras på fyra indikatorer:

1. produktionsvärdet som andel av BNP
2. export som andel av den totala exporten
3. prospekteringskostnader som andel av totala produktionsvärdet och
4. Mineralränta som andel av BNP. Mineralränta är ett uttryck för basen för beskattning av gruvproduktion utan att äventyra en "normal" vinst i branschen.

KÄLLOR

Rapporter

Raw materials in the European defence industry. Pavel C; Tzimas E. Raw materials in the European defence industry. EUR 27542 EN. Luxembourg (Luxembourg): Publications Office of the European Union; 2016. JRC98333

Critical Raw Materials for Strategic Technologies and Sectors in the EU A Foresight Study. Main authors (European Commission, Joint Research Centre) by alphabetical order: Bobba, S., Carrara, S., Huisman, J. (co-lead), Mathieux, F., Pavel, C. (co-lead).

Extractive dependency in lower-income countries-Evolving trends during the transition to a low carbon future. M. Ericsson, O. Löf

Extractive Industries- The Management of Resources as a Driver of Sustainable Development. Editor: Tony Addison Alan R. Roe. Oxford University Press © UNU-WIDER 2018

Mining and metals – a power base for all nations RMG Consulting (2021) Technical note 2021:1. <https://www.rmgconsulting.org/technical-notes>

Data

Raw Materials Data- RMG Consulting

World Mining Data, BGS, USGS, OECD, UNCTAD, World Bank

EU- Critical raw materials list. https://ec.europa.eu/growth/sectors/raw-materials/areas-specific-interest/critical-raw-materials_sv

Bolagens årsrapporter

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