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Tracking the trends 2022

Redefining mining¹

Deloitte released, the 14th annual edition of Deloitte Global's mining and metals report, Tracking the Trends 2022, which explores key trends facing mining and metals companies which could redefine how these companies prepare for the energy transition and meet decarbonization and environmental, societal, and governance (ESG) goals. The report takes a look at what the mining sector is doing right and what needs to improve in addition to offering best-practice examples.

Deloitte Global has identified ten trends that could impact the industry over the next 12 to 18 months. Each of these trends has a role to play in guiding companies to success beyond the pandemic and towards a more sustainable future.

Trend 1 - Aligning capital allocation to ESG: While much of the focus today is on climate change and decarbonization, companies should think holistically and ensure their capital-allocation decisions reflect their ESG commitments.

Trend 2 - Reshaping traditional value chains: The energy transition is reshaping the traditional mining value chain creating new challenges and opportunities for miners. There is likely to be a realignment of portfolios to position for the energy transition.

Trend 3 - Operating in the post-COVID regulatory and tax environment: With commodity prices soaring in 2021, many countries are looking to regulations and resource nationalism to recoup lost revenue during COVID-19. This can range from the expropriation and nationalization of assets to states implementing new forms of taxation.

Trend 4 - Embedding ESG into organizations: Mining and metals companies should be functionally set up to respond to and address ESG-related opportunities, challenges, and risks.

Trend 5 - Evolving mining's world of work: For several decades, miners have found themselves starved of talent, but COVID-19, among other issues, has intensified this challenge. Facing this increasingly competitive labor market requires mining and metals companies to position themselves as an attractive sector and employer, capable of meeting evolving priorities.

Trend 6 - Establishing a new paradigm for Indigenous relations: Indigenous communities around the world are often keen to establish a new type of understanding and connection with mining and metals companies that participate in their environment. Issues such as decarbonization and natural-resource management, securing diverse talent and leadership, are all potential subsets of how Indigenous peoples may help mining and metals companies better relate to and fulfill responsibilities as actors within a landscape. When planning new projects, mining companies should look for opportunities that align with local communities' own goals and priorities.

Trend 7 - Continuing the journey toward innovation-led organizations: While the need for innovation has long been a key trend in mining, a number of recent factors should motivate organizations to intensify their efforts. This includes new remote work practices spurred by COVID-19, the need to find new ways to decarbonize, and the latitude that high commodity prices can bring.

Trend 8 - Unlocking value through integrated operations: Mining and metals companies should make better use of digital transformation to drive effective integrated decision-making. This is more important than ever as the current heightened focus on ESG measures has placed pressure on companies to manage not only their operational environment, but also social and regulatory challenges. The insights and visibility digitalization provides can help companies empower employees across levels to make decisions as well as enable them to respond to ambiguous and complicated situations thereby unlocking significant value.

Trend 9 - Closing the Information Technology (IT)- Operating Technology (OT) vulnerability gap: Mining companies' cybersecurity has traditionally focused on functions like finance or human resources rather than on the ground at mine sites. However, with more devices being connected, some of the industry's biggest cyber vulnerabilities are around operational technology, industrial control systems, and sensors.

Trend 10 - Preparing operations for a changing climate: Mitigation is only one piece of the puzzle when it comes to climate change. Mining companies should prepare for the physical impacts a changing climate can produce across their businesses and operations as well as beyond their own sites—such as meteorological events that disrupt key transport corridors. Digital tools can offer insights that can help address these risks as well as provide transparency of complex procurement networks.

Critical Raw Materials

German auto industry alarmed over lack of raw materials²

Critical raw materials from Russia and Ukraine could become increasingly scarce as a result of the conflict. Car industry experts called on the EU to seek new markets and boost the domestic extraction of key metals.

Volkswagen, Europe's largest carmaker, told that the issues have been "virulent" and "volatile" for some time and may take some time to play out.

"One should not underestimate the threat of supply shortfalls for important raw materials for car manufacturers and their suppliers," auto industry expert Stefan Bratzel from the Center of Automotive Management (CAM) told. "This ultimately leads to rising prices, even longer waiting times for new cars for customers and slows down the ramp-up of electromobility."

Ukraine is one of the most important suppliers of neon, a noble gas needed for semiconductor production. Palladium, which is required for catalytic converters in gasoline engines, has been imported from Russia, with a global market share of 38%, Russia is the second-most-important supplier after South Africa with 39%.

There are even more extreme price developments for the heavy metal nickel, which is required for alloys and the production of lithium-ion batteries. Nickel shortages from Russia would push up electric vehicle (EV) prices, slowing Western economies' progress in reducing carbon emissions.

Electric car and battery manufacturers in China, on the other hand, could benefit from the sanctions against Russia by offering to buy raw materials from Russia at lower prices.

According to the car industry association VDA, the Ukraine crisis clearly highlights how Germany and the EU must reduce their dependency.

Western economies need to future-proof battery value chains back in the spotlight³

Russia's belligerence against Ukraine has highlighted again the theme of national security and energy independence for the EU and the United States, in light of the steps that both are taking toward a future-proof energy transition.

Modern economies currently rely on fossil fuels, so the energy transition will depend on key materials such as cobalt, lithium, nickel, graphite and copper, which are needed to support targets such as the electrification of mobility.

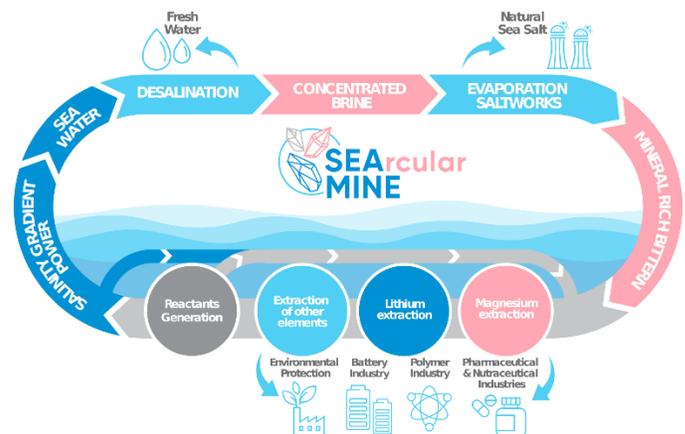
The EU has set ambitious targets for its sustainable energy transition by 2030, intending to cut greenhouse gas emissions by 40% from their 1990 levels, and with renewable sources providing at least 32% of the energy mix and at least a 32.5% improvement in energy efficiency.

"With the transition of Europe's industry to climate-neutrality, there is the risk of the dependence on fossil fuels being replaced with reliance on non-energy raw materials," a recent EU industrial strategy update said.

"Access to resources is fundamental for the entire EU industry, and central to Europe's ambition to deliver on the Green Deal, and to ensure the digital transformation of the EU economy," it added. "Because the EU does not produce all the raw materials that are necessary to meet our demands, EU industry faces global competition in access to raw materials."

Critical minerals extraction from seawater⁴

European Union funds "SEArcular Mine" project to extract critical minerals from seawater.



SEArcularMINE builds on the ancient and still widely used process of saltworks, where seawater goes through natural evaporation and crystallization in shallow basins. The resulting brine (bittern) contains high concentrations of valuable trace elements. The project will develop sustainable and cost-effective technologies that will contribute to securing European access to CRMs through a circular processing of the abundant bittern resources. The consortium brings together leading experts from academia and industry to:

- Develop 3 innovative technologies to target the extraction of Magnesium (Mg), Lithium (Li), and other trace-elements (Rb, Sr, Cs, Ga, Ge, Co).
- Establish multiple auxiliary processes to provide full circularity during the production process.

- Produce the required energy from salinity gradient power and on-site solar and wind energy.
- Generate modeling tools for simulation, sizing and evaluation of the processes to ensure optimal use of the resource for given framework conditions.
- Characterise and map bittern availability in Europe and the whole Mediterranean basin.
- Pave the way for further development, ensuring wide adoption and acceptance

US Senators urge action on critical minerals⁵

A group of influential US Senators, including the head of its natural resources committee, has urged President Joe Biden to end the country's dependency on critical minerals imports, especially from China. Senators called on Biden to invoke the Defense Production Act in order "to rebuild the capacity of key sectors and value-chains by domestically producing and processing critical minerals, such as battery metals like lithium and graphite."

A letter sent by the Senators to Biden says; "The time is now to grow, support, and encourage investment in the domestic production of graphite, manganese, cobalt, lithium, nickel, and other critical minerals to ensure we support our national security, and to fulfill our need for lithium-ion batteries - both for consumers and for the Department of Defense,"

Biden Invokes Cold War Statute to Boost Critical Mineral Supply⁶

Following the above-mentioned call from Senators, President Biden took steps to try to increase domestic production of critical minerals and metals needed for advanced technologies like electric vehicles, in an attempt to reduce America's reliance on foreign suppliers.

Mr. Biden invoked the Defense Production Act, a move that will give the government more avenues to provide support for the mining, processing and recycling of critical materials, such as lithium, nickel, cobalt, graphite and manganese.

The Defense Production Act is a Cold War-era statute that gives the president access to funding and other enhanced powers to shore up the American industrial base and ensure the private sector has the necessary resources to defend national security and face emergencies.

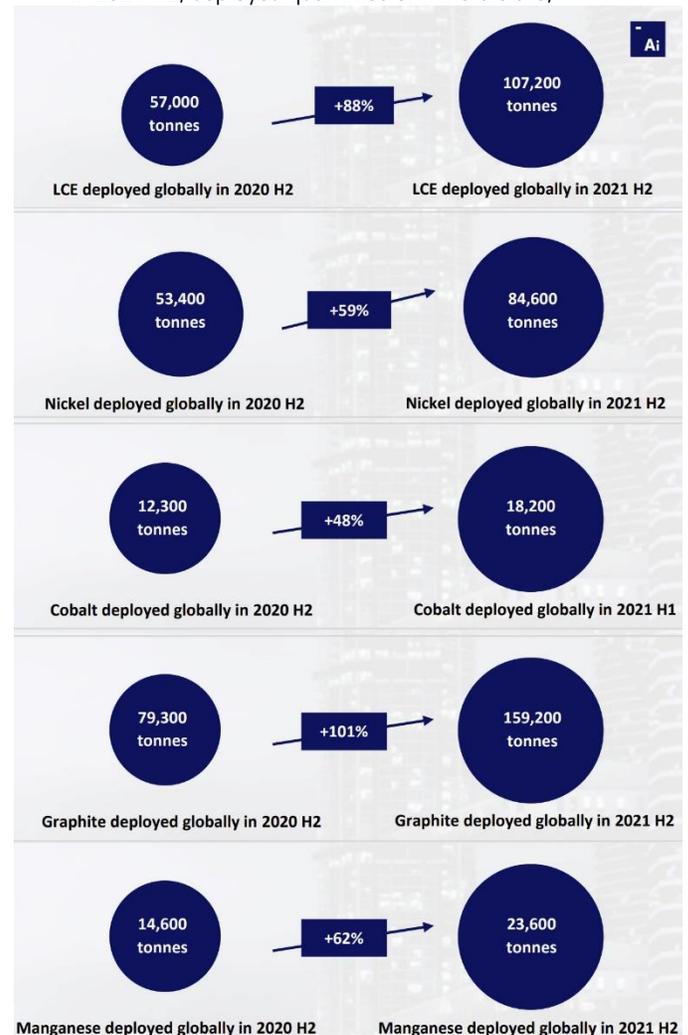
Mr. Biden directed his secretary of defense to bolster the critical mineral supply by supporting feasibility studies for new projects, encouraging waste reclamation at existing sites, and modernizing

or increasing production at domestic mines for lithium, nickel, cobalt, graphite and other so-called critical minerals.

Adamas Intelligence biannual 'State of Charge' report⁷

Adamas Intelligence published its biannual 'State of Charge' report. Among the findings of the latest report:

- In 2021 H2 global passenger EV registrations jumped 62% over the same period the year prior, amounting to 5.84 million units versus 3.60 million units in 2020 H2
- In 2021 H2, total global battery capacity deployed onto roads in all newly sold passenger EVs combined amounted to a hefty 177.2 GWh, 92% more than was deployed globally in 2020 H2.
- In 2021 H2, deployment of LFP cells (in watt-hours) increased 426% over 2020 H2 leading to a drop in the average amount of nickel (-2%) and cobalt (-9%) consumed per EV sold.
- In 2021 H2, deployed quantities of minerals are,



Global lithium-ion battery capacity to rise five-fold by 2030⁸

Global cumulative lithium-ion battery capacity could rise over five-fold to 5,500 gigawatt-hour (GWh) between 2021 and 2030, says Wood Mackenzie. The Asia Pacific region, led by China, accounted for 90% of the world's battery manufacturing in 2021. By the end of decade, the region is expected to reduce its share to 69%. While North America's cell capacity could expand 10-fold by 2030, it still lags behind Europe which is on track to overtake North America in 2022 and will account for over 20% of global capacity by 2030 through more rapid expansion.

Another trend to watch is the growing prominence of lithium iron phosphate (LFP) batteries as nickel-cobalt-manganese (NCM) batteries lose market share. Historically, the EV and energy storage system markets have mostly deployed NCM batteries given their availability and maturity

Nationalization Risks over Critical Minerals⁹

Chile's constituent assembly, in charge of writing the country's new Constitution, approved an early-stage proposal that opens the door to nationalizing some of the world's biggest copper and lithium mines.

The environmental committee gathered wrap up proposals looms,, targeting mostly large-scale mining of copper, lithium and gold has yet to be approved by two thirds of the full assembly to become part of Chile's new charter, which will be put to a national referendum later this year.

Analysts consider the motion a direct attack on private interests since the Chilean state already owns the underlying mineral rights, gives the government one year to nationalize companies. These firms, which work with metallic and non-metallic minerals, as well as hydrocarbons, would likely not receive indemnification for losing their mining rights. The comptroller would determine this based on the book value of the companies, paid over a maximum of 30 years, the proposal states.

Russia is a mineral powerhouse¹⁰

Russia is a mineral powerhouse — and its war with Ukraine could affect global supplies. Many of these minerals are important for critical infrastructure, clean energy, and military uses, including aircraft frames, jet and helicopter engines, satellites, ships, submarines, and ground vehicles.

While there's a little titanium almost everywhere on earth, including in the human body, only a few countries commercially produce the metal, and Russia is one of them. Russia is a mineral powerhouse beyond titanium, too, mining everything from platinum and gold to cobalt and lithium. While there's much discussion of

the Russian influence over global oil and gas markets, the attack on Ukraine could have a significant impact on the global supply of these materials — and on the US economy, because the United States is "heavily dependent" on imports. Many of these minerals are also important for critical infrastructure, clean energy, and military uses. In the case of titanium, military uses include aircraft frames, jet and helicopter engines, satellites, ships, submarines, and ground vehicles.

Lithium

Lithium carbonate vs lithium hydroxide¹¹

Lithium chemicals are in high demand due to the rise of electromobility and the surging need for lithium-ion batteries.

The two main lithium chemicals used as a lithium source in the cathode material production are lithium carbonate (Li₂CO₃; LC) and lithium hydroxide monohydrate (LiOH·H₂O; LHM).

LC is widely used in the fabrication of lithium ion cathode active materials (CAM) and is employed in the established cathode material supply chain. These materials involve lithium cobalt oxide (LCO), lithium manganese oxide (LMO), lithium nickel manganese cobalt oxide (NMC 111, NMC 532) and lithium iron phosphate (LFP).

Lithium hydroxide is typically produced as LHM for desired battery applications, due to its better shelf life and handling compared to the anhydrous form. Specifically long range and thereby high energy and power density requirements in electric transport make use of higher nickel chemistries such as lithium nickel cobalt aluminium oxide (NCA) or NCM 811 which favors the use of LHM.

In the cathode production the constituents are very finely ground to achieve a homogeneous and intimate mix of the materials. Then they are heated to a temperature sufficiently high to allow for solid state diffusion between individual particles which cannot be achieved otherwise.

Lithium carbonate has a very high melting point (723°C) compared to LHM (460°C) and therefore lithium hydroxide reacts at lower temperature. At these temperatures the crystal growth of the yielded cathode active material can be limited to prevent the formation of large crystals. A finer CAM (NMC 811 or NCA) is beneficial for the performance in the later power application of the battery.

Posco to invest \$4 bln in lithium¹²

South Korean steelmaker Posco will invest \$4 billion in a new lithium mining project in Argentina, as the company seeks to tap into soaring demand for the key rechargeable battery metal.

Posco expects to initially produce 25,000 tonnes of lithium hydroxide, an especially high-demand lithium product for battery makers, there per year, reaching 100,000 tonnes once the venture is completed. Posco was initially expected to invest \$830 million in the venture, but changes in the original project led it to increase the amount.

The energy transition may be slowed by a shortage of materials¹³

Electric vehicle battery makers will need to raise prices by almost 25% due to soaring lithium carbonate prices, leading to crimped margins and possibly demand destruction, according to Morgan Stanley. Chinese prices for lithium carbonate, the key ingredient in many batteries, have jumped fivefold over the past year.

Lithium carbonate prices have surged as demand from car-makers has outstripped supply, highlighting how the energy transition may be slowed by a shortage of materials and refining capacity.

Most battery manufacturers in China -- which dominates the lithium-ion battery industry -- buy the material on the spot market, rather than through long-term contracts, Morgan Stanley said.

Lithium price rally continues¹⁴

Lithium prices have jumped across the board over the past year on the back of heavy demand from the automotive sector, but inside China there is a mad scramble, particularly for carbonate.

Carbonate continues to soar in 2022 after more than quadrupling in value last year. The mid-March assessment shows battery grade lithium carbonate (EXW China, $\geq 99.5\%$ Li₂CO₃) averaging \$76,700 a tonne. That's up 10% over just two weeks and 95% since the start of the year. In March last year it was trading at \$13,400 a tonne.

The rally in lithium hydroxide, used in high-nickel content cathode manufacture, is accelerating, up 120% so far this year, narrowing the discount to carbonate, which historically is priced below hydroxide.

Rock Tech Lithium could build 400 mln euro plant in Romania¹⁵

Canada's Rock Tech Lithium could invest 400 million euros (\$436.16 million) to build its second European lithium converter and refinery in Romania, the state's energy ministry and the company said.

The company, which aims to start construction of its first European facility in Germany in April, plans a second site in Romania.

It signed a memorandum of understanding with Romania's energy ministry. The plant would generate some 700 direct and indirect jobs and produce enough to supply 500,000 cars with lithium-ion batteries per year.

Rio Tinto has completed the acquisition lithium project for \$825 million¹⁶

Rio Tinto has completed the acquisition of the Rincon lithium project in Argentina for \$825 million, following Australia's Foreign Investment Review Board (FIRB) approval of the transaction.

The world's second-largest miner saw its lithium ambitions partially crushed in January after Serbia revoked Rio Tinto's licence for the \$2.4 billion Jadar project over environmental protests.

The Argentinean asset could help the company reignite its plans and strengthen its portfolio for the global energy transition.

Rincon is a large undeveloped lithium brine project located in the heart of the lithium triangle in Argentina's Salta Province, an emerging hub for greenfield projects. The project has reserves of almost 2 million tonnes of contained lithium carbonate equivalent, sufficient for a 40-year mine life.



Price of lithium has gone to insane levels! Tesla might actually have to get into the mining & refining directly at scale, unless costs improve.

There is no shortage of the element itself, as lithium is almost everywhere on Earth, but pace of extraction/refinement is slow.

Elon Musk¹⁷

US facing major domestic lithium shortfall by 2025: Piedmont CEO¹⁸

The US' battery and electric vehicle industries will face major lithium hydroxide supply shortfalls by the middle of the decade as the buildout of domestic battery-making capacity outpaces reliable raw material production growth in North America, Piedmont Lithium CEO Keith Phillips said March 30.

Phillips said domestic battery producers in the US will require over 500,000 mt/year of lithium hydroxide supply in the second half of the decade, based on the current slate of gigafactories that have been announced. The US' domestic lithium hydroxide capacity will only reach an estimated 151,500 mt/year by 2025, according to Phillips. The country currently has about 15,000 mt/year of lithium hydroxide conversion capacity, but Piedmont could become the largest domestic producer with its plans to build 60,000 mt/year of capacity by 2030, he added.

Graphite

Graphite anode gaining ground¹⁹

The world is going to need more graphite, both in natural and synthetic forms, to meet the demands from the energy transition. Graphite is a critical raw material in the anode battery mix but it is seeing shifts in its supply chain which could lead to a bottleneck, against a backdrop of rocketing demand from the new electric vehicles (NEV) sector and with competing requirements for synthetic material for graphite electrodes.

Synthetic graphite has been dominating the anode market for the past couple of years, with natural graphite battling to increase market share. Currently, synthetic graphite makes up around 80% of the anode market in China, and has needle coke as its largest ingredient, according to sources. Nevertheless, 2021 might see a supply shift in graphite anode raw materials amid China's decarbonization efforts and given downstream manufacturers' awareness of supply chain diversification.

Demand for synthetic graphite from the steel industry for graphite electrodes is still the major market, but the share taken by the battery sector is rising, demand for needle coke from anode material producers accounted for 45% of total Chinese needle coke production.

Both graphite electrodes and synthetic anode material use needle coke as raw material. While electrodes and anode materials are mostly processed via different procedures, they share the Acheson furnace graphitization process before the product is finished.

The latest graphitization cost of anode material stands around 20,000-25,000 yuan [\$3,135-3,919] per tonne while the cost for graphite electrodes is 5,200 yuan per tonne. The wide gap in processing cost is leading to the gradual conversion from graphite electrodes capacity to the anode sector.

Nickel

What happened to Nickel in March?²⁰

The nickel price was especially volatile during March, with rising concerns that Russia's invasion of Ukraine could result in sanctions on nickel exports from major primary producer Russia, which accounted for 15.2% of global production of class 1 nickel, a primary nickel product used to make nickel sulfate to manufacture lithium-ion batteries.

The volatility came to a head on March 8, when the LME suspended trading after the three-month spot nickel price reached an all-time high of \$101,365/mt in early trading, after closing at \$48,078/mt on

March 7. It had dropped back to \$80,000/mt as of 08:15 GMT on March 8 when the suspension took effect, although all trades after 00:00 GMT on March 8 were then canceled. The short squeeze gathered momentum as China's Tsingshan Holding Group Co. attempted to cover its massive short position, which is reportedly equivalent to between 100,000 mt and 200,000 mt of metal.

Trading resumed on March 16 with a preset daily limit of 5%. The limit was then increased to 8% from March 17, 12% from March 18 and 15% from March 21, with the lower end hit each day. March 22 marked the first day of normal trading, however, both March 23 and March 24 saw the price hit the upper 15% limit. Since then, trading has been normal albeit at low volumes. The LME three-month spot nickel price was trading at \$32,085/mt at 18:17 GMT on March 31, down 2.5% on the day, but up 52% year to date.

Volkswagen will form joint ventures to secure nickel and cobalt²¹

Volkswagen will form joint ventures with Huayou Cobalt and Tsingshan Group to secure nickel and cobalt supplies for electric vehicles in China. The move is part of a 30 billion euro (\$33 billion) push by the world's second-largest carmaker to build a network of battery cell factories and secure more direct access to vital raw materials that are needed to supply them.

Volkswagen, Huayou Cobalt, and Tsingshan have signed a memorandum of understanding for a joint venture in Indonesia, where more than 10% of the world's laterite nickel ore reserves are located, to focus on nickel and cobalt raw material production. The venture will be able to supply raw materials for 160 gigawatt-hours worth of electric vehicle batteries, Volkswagen China Group said in a statement. This corresponds to an annual output of around 120,000 tonnes of nickel and 15,000 tonnes of cobalt.

Volkswagen's second joint venture will be formed with Huayou in China's southwestern Guangxi region for the refining of nickel and cobalt sulfates, precursor and cathode material production

Global nickel demand for battery use will be 410,000 in 2022²²

Global demand for nickel used in batteries is expected to rise more than 20% this year on solid demand for electric vehicles (EVs), Japan's biggest smelter of the metal Sumitomo Metal Mining said.

Sumitomo Metal, which supplies cathode materials for the Panasonic lithium-ion batteries used in Tesla EVs, said demand for nickel used in rechargeable batteries will climb to more than 410,000 tonnes in 2022 from nearly 330,000 tonnes in 2021. Nickel is mainly used in stainless steelmaking but is also a vital ingredient for the lithium-ion batteries used to power EVs, where demand is set to accelerate over the coming years.



Cobalt

Battery technology and recycling alone will not save the electric mobility transition from future cobalt shortages²³

The global cobalt demand, increased by more than 5 times between 1995 and 2019, and almost half of the global cobalt use in 2019 was for batteries. Such an escalating demand is expected to continue due to the fast diffusion of electric vehicles (EVs) to combat climate and pollution challenges in the coming decades. However, global cobalt mining and refining are very unevenly distributed (e.g., 70% of mine production came from the Democratic Republic of Congo (DRC) and 67% of refining occurred in China in 2019), which raises enormous concerns about future demand–supply imbalances among governmental and industry decision-makers.

In recent years, increasing attention has been given to the potential supply risks of critical battery materials, including cobalt, for electric mobility transitions. While battery technology and recycling advancement are two widely acknowledged strategies for addressing such supply risks, the extent to which they will relieve global and regional cobalt demand–supply imbalance remains poorly understood.

By simulating historical (1998-2019) and future (2020-2050) global cobalt cycles covering both traditional and emerging end uses with regional resolution (China, the U.S., Japan, the EU, and the rest of the world), cobalt-free batteries and recycling progress can indeed significantly alleviate long-term cobalt supply risks. However, the cobalt supply shortage appears inevitable in the short- to medium-term (during 2028-2033), even under the most technologically optimistic scenario.

Rare Earths

Poland Becomes a Hub for Rare Earths²⁴

Canadian mining company Mkango Resources announced last June that it would build a rare earths separation plant in Puławy, Poland. The European Raw Materials Alliance (ERMA) announced it would help secure financing for the project.

The raw material processed in Puławy will come from Malawi in East Africa. Mkango is conducting a rare earth mining feasibility study there, which is nearing completion, according to the company. Results so far have been positive, Mkango reported this week.

According to ERMA's press release, the plant will also be able to process material from other companies. Poland could then become

an important center for supplying Europe with critical raw materials.

Chinese rare-earth firms' capacity was cut by at least 25%²⁵

The capacity of rare-earth companies in Ganzhou, East China's Jiangxi Province - one of China's biggest rare-earth manufacturing bases - has been cut by at least 25 percent compared to last year, after major border gates for rare-earth minerals from Myanmar to China shut down again at the beginning of the year, which has largely affected raw material supply.

Myanmar accounts for about half of China's rare-earth mineral supply, and China is the world's largest rare-earth products exporter, claiming a leading role from the middle to downstream industrial chain.

Industry insiders warned of a potential price hike in the near future, as major border ports, including one in Yunnan's Diantan township, that are regarded as major channels for rare-earth mineral shipments, remain closed.

Manganese

Tesla May Consider Manganese Battery, According To Elon Musk²⁶

Musk recently delivered a lengthy speech to Tesla factory workers at the grand opening of the company's new Gigafactory near Berlin, Germany. During the speech, Musk shared that an industry focus on battery supply chain materials is paramount to the future of EVs. He also mentioned the potential for using manganese. Musk said "I think there's an interesting potential for manganese."

While this may have come as a surprise Musk talked about manganese back at the company's Battery Day in 2020, when he was revealing Tesla's 4680 battery cell concept. Musk shared: "It is relatively straightforward to do a cathode that's two-third nickel and one-third manganese, which will allow us to make 50% more cell volume with the same amount of nickel."

Beyond the earlier comment and the mention of manganese in his recent speech, not much is known about Tesla's potential for future manganese-based batteries. However, the CEO did make it abundantly clear that in order for Tesla to scale in a massive way, it needs to use materials that are common. Tesla isn't the only company looking into the use of manganese for batteries. Many research groups have already published studies about the use of manganese-based cathodes for higher energy density and reduced costs.

The impact of the raw material prices on the EVs

Year on Year Change in Costs of the Battery Cell Cathode Materials of Tesla Model 3 (60 kWh)



Credit: Roland Zenn

The above graphic shows the increase in raw material prices is significantly affects the EV cost. Every big player (or region) in the battery industry must secure raw materials volumes and prices and must think about serious involvements in the upstream supply chain in order to develop new sources (mining, refining,

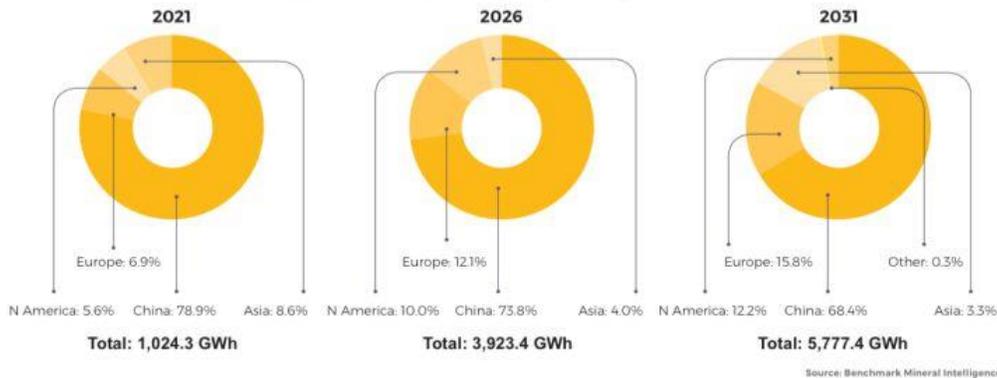
Chart of the Month

**BENCHMARK | LITHIUM ION BATTERY
GIGAFACTORY ASSESSMENT
MARCH 2022**



■ LITHIUM-ION BATTERY GIGAFACTORY TRACKER CONTINUED...

Lithium ion Battery Cell Capacity by Region



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