

## Renewable energy, demand for minerals and law of unintended consequences

### Synopsis

In a simple language, the move to renewables and EVs will mean that the demand for certain metals and minerals from copper to lithium will move up, for some, by an order of magnitude.



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Devina Mehra, Chairperson and Managing Director of First Global, is a gold medalist from IIMA as well as from Lucknow University where she broke several records. She had a seven-year-long stint at Citibank in Investment Banking & Corporate Credit/ Risk before becoming a member of the Bombay Stock Exchange in 1993 - her proprietorship which later corporatised and became India's leading institutional brokerage firm, First Global. She spearheaded First Global's globalisation over two decades ago, making First Global the first Asian (ex-Japan) firm to become a member of the London Stock Exchange and then the NASD.

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We all know that the world is now trying to move towards more environment-friendly technologies. It may be a bit late, but the move is towards renewables to produce electricity and towards [Electric Vehicles](#) (EVs) instead of fossil fuel burning vehicles.

We have made some progress and now aim to make more with many countries mandating that a certain percentage of energy would come from renewables over X number of years with similar targets for EVs as percentage of total new vehicles.

Sounds good? But let's dig a little deeper and that is when the famous Law of Unintended Consequences surfaces. Taking a look specifically at what moving to renewables means for [minerals](#) is a paper by the International Energy Agency ([IEA](#)), which has gone into the details of this. This piece is based on data from there.

In a simple language, the move to renewables and EVs will mean that the demand for certain metals and minerals from copper to [lithium](#) will move up, for some, by an order of magnitude.

### What are the implications?

One, there is likely to be a substantial demand supply mismatch -- more acute in certain minerals than others. Ramping up mining and production capacity may not be easy and has long lead times.

Two, this mismatch will drive prices of the minerals, and this may well offset the cost savings that come from other technological innovations.

Three, whereas the minerals are supposed to help drive more eco-friendly technologies, the mining of these minerals is often far from environmentally friendly.

Four, who controls the mines and who controls the production of the minerals? This is a fraught question, given the concentration of minerals in certain countries and [China](#)'s pre-emptive moves to control a large chunk of the production.

### Coming to specifics: How much is the change?

Solar photovoltaic (PV) plants, wind farms and electric vehicles (EVs) generally require more minerals to build than their fossil fuel-based counterparts. A typical electric car requires six times the mineral inputs of a conventional car and an onshore wind plant requires nine times more mineral resources than a gas-fired plant. As the composition has changed towards [renewable energy](#), the mineral requirement has gone up 50% for each MW capacity added over the last decade.

Lithium, [nickel](#), [cobalt](#), manganese and graphite are crucial for battery production. Rare earth elements are essential for wind turbines and EV motors. Electricity networks need a huge amount of copper and aluminium. The shift to a clean energy system is set to drive a huge increase in the requirements for these minerals. Over the last five-seven years, clean energy technologies have become the fastest growing segment of demand for these minerals.

“In a scenario that meets the [Paris Agreement](#) goals (as in the IEA Sustainable Development Scenario [SDS]), their share of total demand rises significantly over the next two decades to over 40% for copper and rare earth elements, 60-70% for nickel and cobalt, and almost 90% for lithium. EVs and battery storage have already displaced consumer electronics to become the largest consumer of lithium and are set to take over from stainless steel as the largest end user of nickel by 2040,” said the IEA.

According to the IEA estimates, the mineral requirements for clean energy technologies are said to double by 2040. If the Paris agreement climate goal requirements are to be met, the requisites will quadruple.

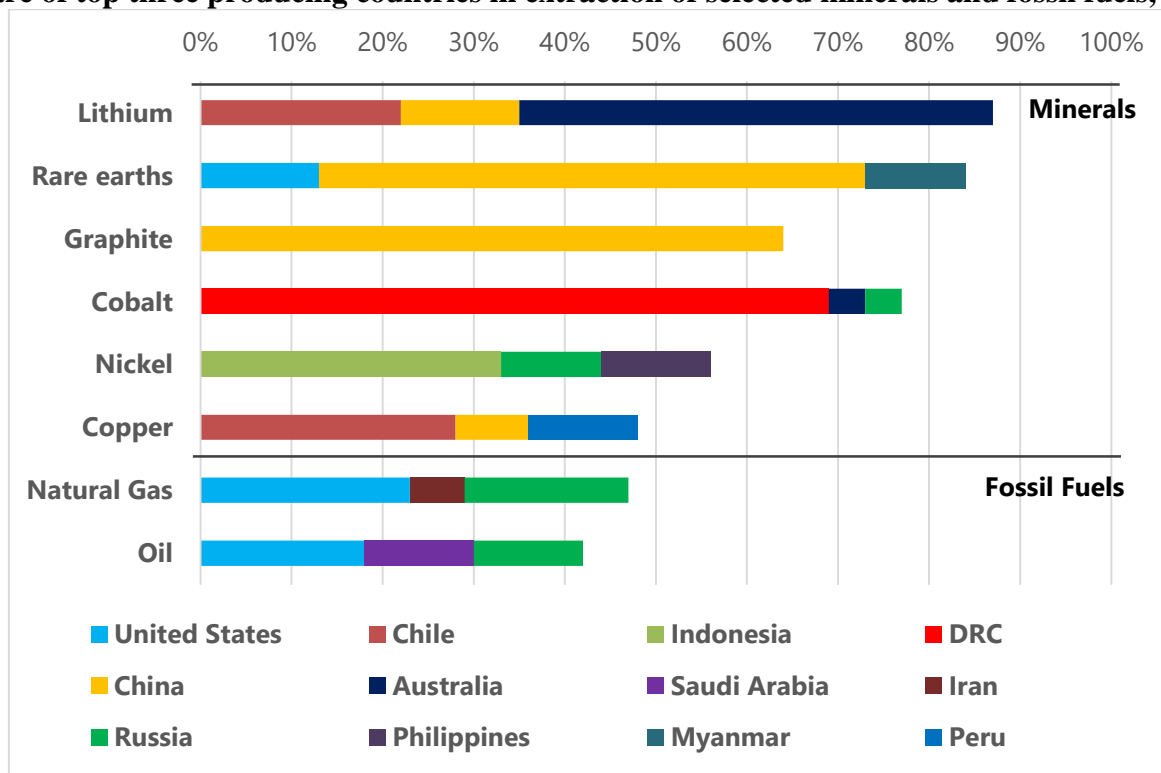
This is on the demand side. What about the supply? The following is the IEA assessment:

Some minerals such as lithium raw material and cobalt are expected to be in surplus in the near term, while lithium chemical, battery-grade nickel and key rare earth elements (e.g. neodymium, dysprosium) might face tight supply in the years ahead. However, looking further ahead in a scenario consistent with climate goals, expected supply from existing mines and projects under construction is estimated to meet only half of the projected lithium and cobalt requirements and 80% of copper needs by 2030.

Then there is the question of concentration. Skewness here can result in arm-twisting and geopolitical instability as we have seen in the case of [Europe](#)’s dependency on Russian natural gas.

For lithium, cobalt and rare earth elements, the world’s top three producing nations control over 75% of the output. The Democratic Republic of the Congo (DRC) and People’s Republic of China (China) were responsible for about 70% and 60% of global production of cobalt and rare earth elements, respectively, in 2019.

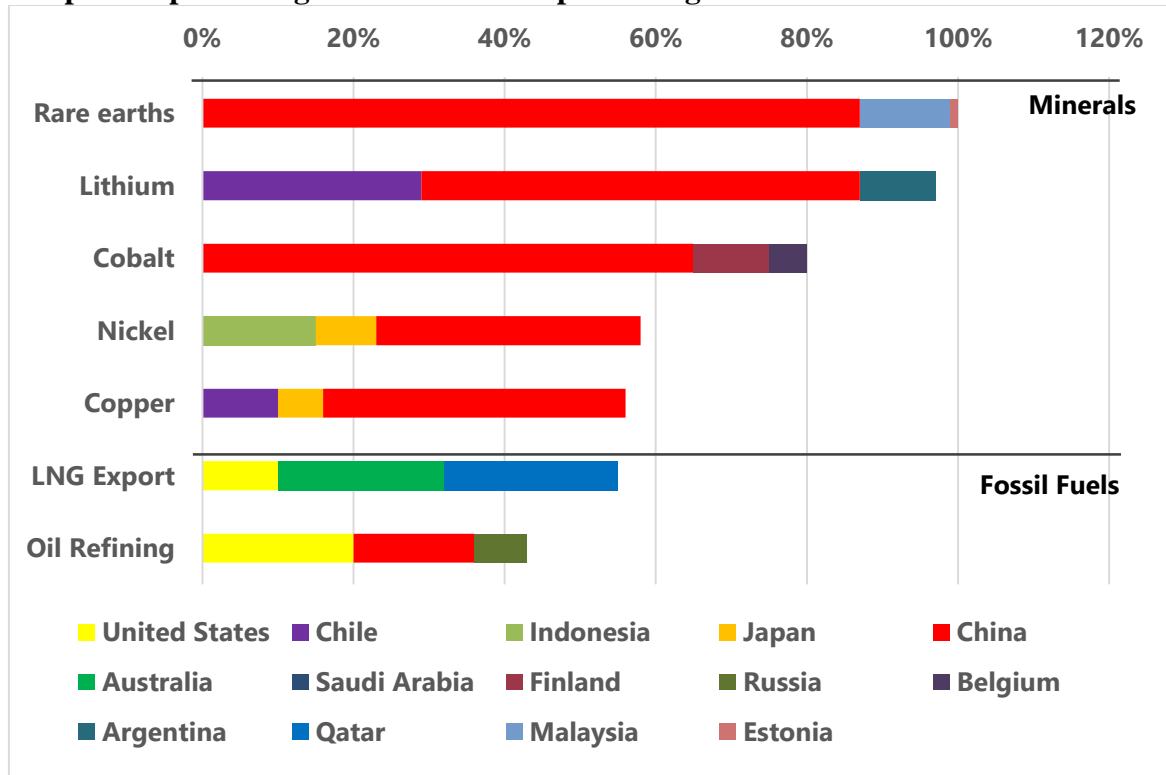
**Share of top three producing countries in extraction of selected minerals and fossil fuels, 2019**



Source: IEA

The level of concentration is even higher for processing operations, where China has a strong presence across the board. China’s share of refining is around 35% for nickel, 50-70% for lithium and cobalt, and nearly 90% for rare earth elements. Chinese companies have also made substantial investment in overseas assets in Australia, Chile, the DRC and Indonesia.

## Share of top three producing countries in total processing of selected minerals and fossil fuels, 2019



Source: IEA

High levels of concentration mean high levels of risk that isn't easy to box in. Past data shows that it takes an average of 16.5 years to move mining projects from discovery to first production, making ramping up of supply very difficult. It could lead to a prolonged period of market tightness and price volatility.

The path to clean energy is not quite as simple as it seems.

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