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NATIXIS CORPORATE & INVESTMENT BANKING

COMMODITIES REPORT

22 February 2022

	Spot	Week on Week Change	MTD change	YTD change
Gold ($/oz)	1,896	-0.1%	5.5%	3.7%
Silver ($/oz)	24.0	0.5%	7.0%	3.2%
Platinum ($/oz)	1,083	1.0%	6.0%	11.8%
Palladium ($/oz)	2,364	0.6%	0.4%	24.1%
Aluminium ($/t)	3,325	0.8%	9.0%	18.5%
Copper ($/t)	9,946	-0.6%	3.8%	2.1%
Zinc ($/t)	3,582	-0.5%	-0.7%	-0.2%
Nickel ($/t)	24,871	1.1%	8.9%	19.1%
Iron ore ($/t)	141.1	-11.7%	-9.4%	5.2%
Brent ($/bbl)	98.3	5.1%	7.8%	26.4%
WTI ($/bbl)	95.2	4.5%	8.0%	26.6%
Henry Hub ($/MMBtu)	4.57	3.2%	-6.2%	22.5%
TTF ($/MMBtu)	24.54	0.0%	-18.4%	4.6%
JKM ($/MMBtu)	23.81	0.0%	-3.7%	-21.9%

	Average annual price			
	Spot price	YTD	F2022	F2023
Gold ($/oz)	1,896	1,830	1,630	1,406
Silver ($/oz)	24.05	23.2	21.1	17.5
Aluminium ($/t)	3,325	3,082	2,475	2,525
Copper ($/t)	9,946	9,851	8,488	8,600
Nickel ($/t)	24,870	22,899	19,275	19,300
Iron ore ($/t)	120.0	123.9	88.0	72.5
Brent ($/bbl)	98.3	88.5	82.8	77.8
WTI ($/bbl)	95.2	86.3	80.3	75.3
Henry Hub ($/MMBtu)	4.57	4.32	3.99	3.45
TTF ($/MMBtu)	24.54	27.16	24.64	16.43
JKM ($/MMBtu)	23.81	26.98	27.14	18.43

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GREEN ENERGY TRANSITION: IS THERE ENOUGH METAL OUT THERE?

The energy sector is currently going through a full-blown transformation, moving away from the centuries old thermal/combustion model towards electrification via low carbon sources: mechanical energy, photovoltaic, or nuclear. Simply put, in the green energy transition, metals are at the center of the production, transport and storage of energy.

In order to achieve this transition, various types of metals will be needed at an unprecedented scale and as such two questions emerge:

- Do we have the mining capacity to meet future demand? Reviewing projected demand and the current supply trajectory and investment pipeline, the simple answer is no.

- Is there enough metal in the earth's crust to meet future demand? There is an abundance of metal ore which will be more than enough to satisfy future demand. For instance, between now and 2040 it is estimated that known copper resources in the earth's crust alone are enough to cover twice demand under a 2-degree scenario. That being said, this future mined metal will require higher prices to be economic.

Going forward, scrap will play an increasingly important role given its carbon advantage over primary metal. For instance, aluminum from scrap has a 95% lower carbon footprint than primary aluminum. Finally, most governments around the world have recently been ramping up efforts to secure resources needed for the energy transition, playing catch-up with China which seems far ahead in this race.

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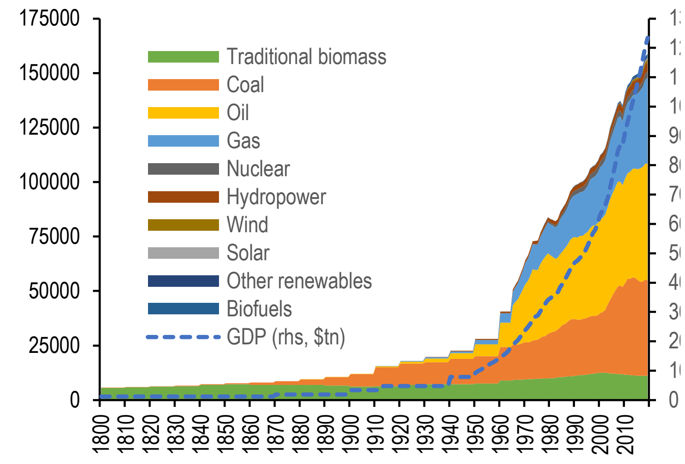
Energy is the engine of growth, with the transition from renewable & biomass fueled economies to economies that run off fossil fuels (with a higher energy density) driving significant GDP growth (chart 1).

Chart 1: GDP ($tn) vs. Energy consumption (TWh)



Sources: Natixis, Vaclav Smil (2017), BP

The energy sector is currently going through a full-blown transformation, moving away from the centuries old thermal/combustion model towards electrification via low carbon sources: mechanical energy, photovoltaic, or nuclear. Simply put, **in the green energy transition, metals are at the center of the production, transport and storage of energy.**

In order to achieve this transition, various types of metals will be needed at an unprecedented scale. For instance, the steel intensity for wind turbines is an order of magnitude above that of a coal or gas power plant. Wind turbines require 7.8 times more steel than a coal power plant and 10.3 times more than a natural gas fired plant *(source: UNSCEAR 2016 report and Natixis)*. We should also remember that wind turbines have around half of the life span of fossil fueled power plants. Another straightforward example are EVs vs. Internal Combustion Engines (ICEs): an EV consumes 30% more aluminium *(source: CRU)* and 3.5x more copper *(source: Woodmac)* than an ICE car.

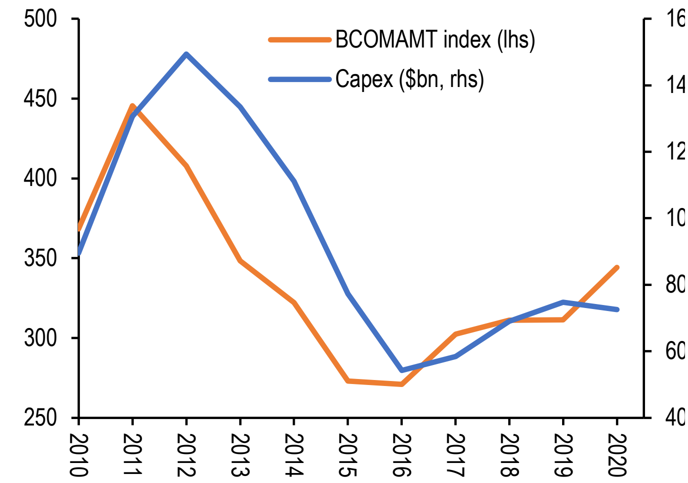
In such a metals intensive energy transition, there are some well-founded questions ranging from the sustainability of mining, from both an environmental and social perspective, to the ability of the mining industry to meet that surge in demand both in terms of timing to develop new mines and overall quantity.

Do we have the mining capacity to meet future demand?

Reviewing projected demand and the current supply trajectory and investment pipeline, the simple answer is no.

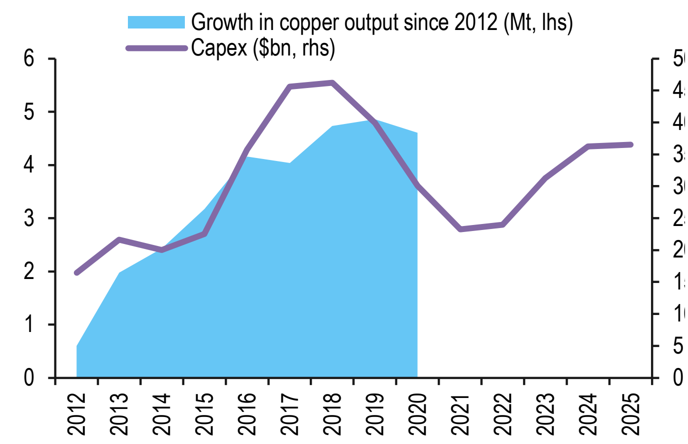
The market is expected to remain tight over the next few years. This is because of severe underinvestment, the result of the sharp downturn in prices a decade ago (chart 2). There is roughly a five-year lag between a miner's drop in capex and the consequent drop in output (chart 3), meaning subsequent increases in capex will take time to be reflected in new supply capacity. **So, although metal prices have surged over the past year and are well above the price incentive for miners, it takes at least five to ten years to develop a mine project and see the impact on supply.**

Chart 2: CAPEX of the 60 largest mining companies



Sources: Natixis, Bloomberg

Chart 3: Copper output vs. CAPEX of copper miners (adjusted, 5 year lag)



Sources: Natixis, Bloomberg

Table 1 : Mineral resources vs. Future demand for metals

(tonnes)	Mineral resources[1]				Demand	
	Reserves	Identified resources	Undiscovered resources	Total	Accumulated refined consumption (excluding scrap)	Total accumulated consumption (including scrap)
Copper	880 000 000	2 100 000 000	3 500 000 000	6 480 000 000	572 574 000[2]	739 546 000[2]
Nickel laterite	95 000 000	180 000 000		275 000 000	59 824 000[2]	85 423 000[2] (of which 25 845 000 for battery precursors)
Nickel sulfide		120 000 000		120 000 000		
Lithium	22 000 000	89 000 000		111 000 000	13 337 000[3]	
Cobalt	7 600 000	25 000 000		32 600 000	2 521 000[3]	
Manganese	1 500 000	large				889 700[4]

Sources: [1]Woodmac (period 2022 to 2040), [2]IEA (period 2022 to 2030, sustainable development scenario) , [3]BNEF (period 2022 to 2030 manganese sulfide)

Is there enough metal in the earth's crust to meet future demand?

The short answer is: There is an abundance of metal minerals in the earth's crust which will be more than enough to satisfy future demand (table 1). For instance, between now and 2040 it is estimated that reserves and identified copper resources in the earth's crust alone are enough to cover twice demand under a 2-degree scenario.

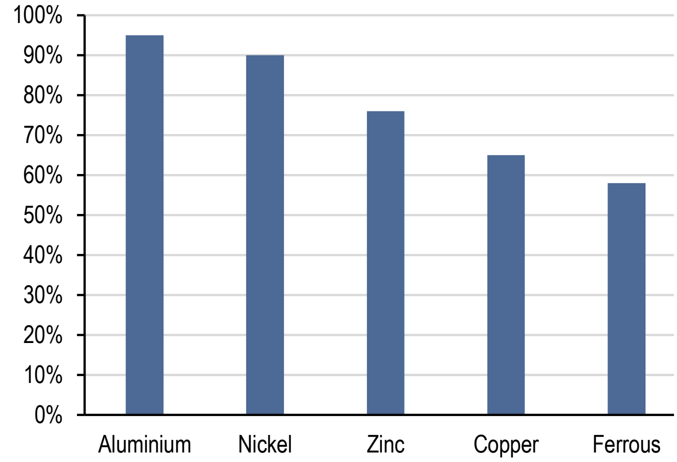
Nevertheless, this future mined metal won't come cheap, resources are going to get more and more complicated to exploit because of lower ore grades, depth, and tighter regulations. Key for the acceptance of the increased usage of metals will be to put environmental, sustainability, and social responsibility at the core of the miner's preoccupations.

In terms of primary supply, high enough prices will render previously uneconomical resources profitable and incentivize new discoveries. For decades already, previously uneconomic so-called waste piles and processing residues, known as tailings, have been re-mined: for example, in some cases South African gold ore has been re-mined three to four times.

Looking at secondary production, **recycling presents a key advantage of metals over fossil fuels**. While the energy transition is dependent on the capacity to quickly ramp up primary supply; secondary supply is gaining in importance and will further develop especially in countries where the carbon footprint will be taxed (for example Europe's CBAM). The key is to limit energy consumption **as metal from scrap has a considerably lower carbon footprint than primary production (chart 4)**. However, in the short to medium term, further primary production is inevitably necessary to meet electrification needs.

As for the demand side, the shared economy, thrifting via technological improvement and the general slowdown in world population growth will eventually contribute to the slowdown in the growth of demand for metals.

Chart 4: Primary vs. secondary metal, CO_2 saving



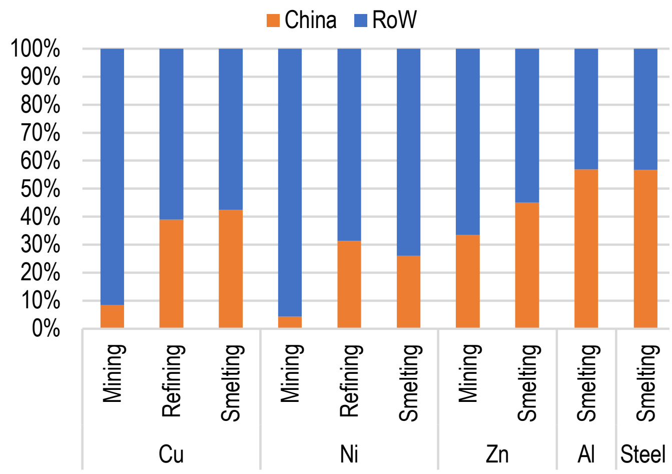
Sources: EuRIC, (Grimes,Donaldson&Gomez)

How are governments preparing?

As it currently stands, **over the past few years there has been a growing realization by governments of the strategic and economic importance of securing base metals**. The first alarm bells rang when China halted the export of rare earth metals to Japan on the back of a political conflict. Nevertheless, it wasn't really until EVs kicked off and countries put in place plans to decarbonize their economies that initiatives such as the European Raw Materials Alliance, the CBAM, European Battery Alliance, COMES, (to cite a few) emerged. The latest example of this awakening is France's Varin report.

China is far ahead, the country refines and smelts more than half of the world's aluminum and steel (chart 5), and pretty much produces all the rare earth metals in the world. The picture is much more impressive if we are to add Chinese ownership of mines spanning from Africa and Indonesia all the way to south America. In a fossil fuel driven economy China relies on outside sources but under an electric model economy the country could be widely considered as the most independent and vertically integrated.

Chart 5: China's share of the world's metal production



Sources: Natixis, Woodmac

For countries with not enough local mineral resources to satisfy at least local demand, such as the case of Europe, the reshoring of metal refining and end product production (such batteries) is rapidly taking place. One such example being this year's announcement that the Saltend Chemical Plant in the UK aims to meet 5% of global demand for rare earth metals. Governments do seem to be more open to the idea of responsible mining on their territory that in the past, such as the case of lithium production throughout Europe from Finland to the Iberian Peninsula. That being said there is still some reluctance from locals as the pullout of Rio from Serbia's lithium project showed. All in all, it can be said that most countries in the world are "late to the party".

In conclusion, heightened perception of scarcity in the short term, and the need for the end user to have some assurance on the sustainability and environmental footprint of their goods and energy supply will profoundly change the extraction industries' landscape in a short period of time.

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