Recycling of "future facing metals" – the key to sustainable supply chains for the green revolution

Investing in speciality metals recycling plants alongside primary production

Baker Steel Capital Managers LLP

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It is now well understood that the forthcoming green energy revolution is built upon a range of technologies such as wind turbines, solar panels, grid storage, electric vehicles, and lower carbon steels. As a result, demand for speciality metals that enable these technologies is forecast to surge in the years ahead and sustained market deficits are predicted. There is no escaping the fact that a huge increase in primary production is needed to meet the forecast demand for speciality metals, and accordingly our strategies focus overwhelmingly on producers, yet it is clear that recycling must be incorporated into supply chains. Exposure to recyclers is a key theme for investors in mining and metals for a sustainable future, and one that will grow in importance over time. Baker Steel is one of the few specialist natural resources investors that routinely invests in recycling and downstream metal processors, which can offer lower risk, sustainable and flexible exposure to the speciality metals sector.

Why invest in recycling?

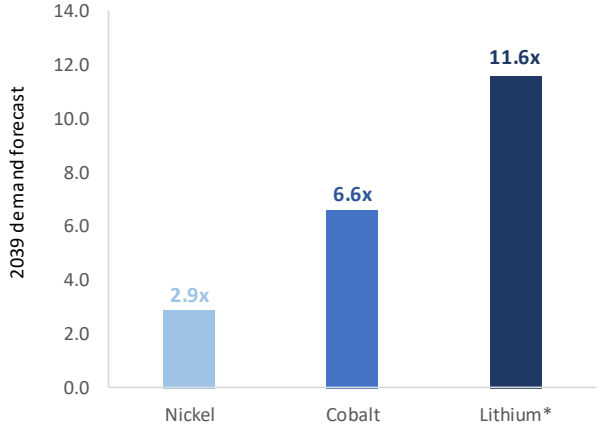
1. **Lower operational risk, lower costs,** and greater flexibility relative to miners.
2. **Low environmental footprint** compared to primary production.
3. **Margins protected** and referenced on the prevailing commodity price

Recycling is key for sustainable supply chains

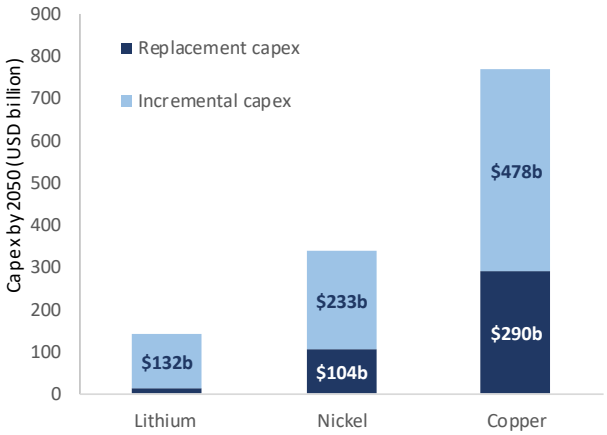
1. **Environmental benefits,** reducing shipping and environmental risks in the supply chain.
2. **Closed loop recycling** is already well established in some industries.
3. **More recycled battery metals** will enter the market over time.

The metals and mining sector is poised for transformation by the green revolution in the coming years, supported by ambitious net zero policies by governments worldwide. The impact on the sector is particularly significant given the intensity of metal use, the current market size for many metals, and the limited known reserves of such metals. To meet this once in a lifetime demand event hundreds of billions of capex will need to be spent on developing the next generation of mines. Unlike iron ore or fossil fuels however these future facing metals will not be lost when the product life ends and can be recycled, often at a fraction of the cost and emissions output of primary production.

The green revolution has caused a surge in demand forecasts for key metals



A once in a lifetime surge in demand will require new mines and vast capex



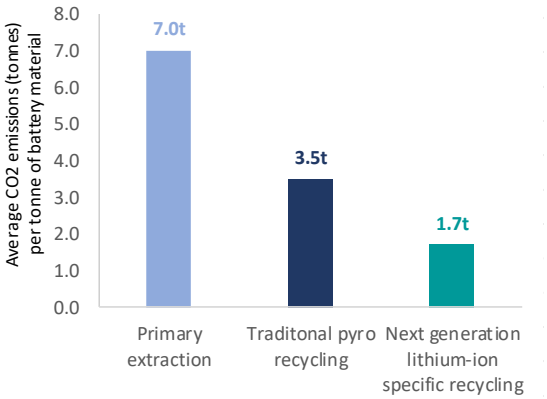
Source: Baker Steel Capital Managers LLP, BMO, Canaccord, BNEF. Capex chart note, growth rates to 2050: copper 3.3%, nickel 4%, lithium 9%. * Lithium carbonate equivalent.

Closed loop systems are already well established with auto catalysts and some of the world's biggest consumers of niche metals such as Apple have set an objective "not to have to remove anything from the earth to make the new iPhones" as part of its pledge to be carbon-neutral by 2030. With regards to electric vehicles, we expect and hope that by 2050, lithium-ion batteries for all applications including automobiles are made from majority recycled materials.

Why invest in recycling and downstream processing companies?

Recycling companies can offer a range of advantages for investors, relative to direct investments in miners. Recyclers tend to have a low environmental footprint and can be set up anywhere in the world and so can create the most efficient operation possible, based on a combination of good infrastructure, low power costs, lower political risk, lower staffing costs, and proximity to both the supply of scrap metal and the end user. Recycling companies typically have a lower operational risk as they have minimal staff and a proven, industrialised process. Margins can be protected and referenced on the prevailing commodity price, while set up costs are lower than mining operations and operations can be put into production very quickly. Plants can be closed and reopened quickly and holding costs are low.

Lower CO2 emissions from next generation recycling technologies

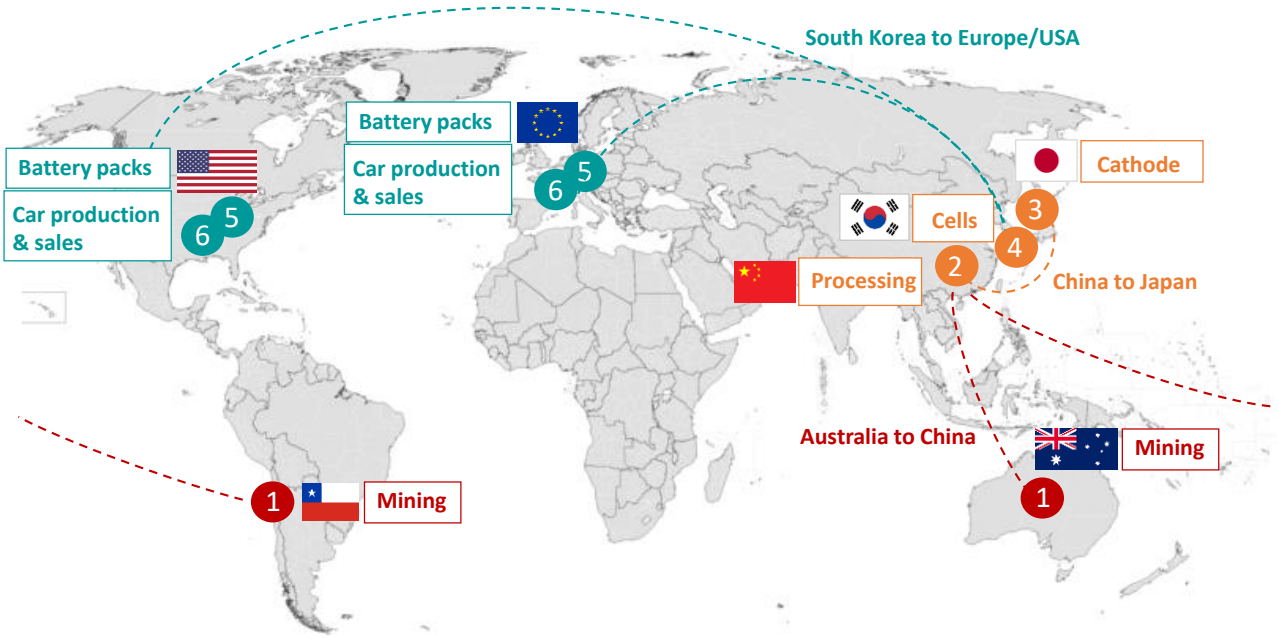


Source: Baker Steel Capital Managers LLP.
Note, based on Argonne National Laboratory-everblatt model.

The possibility exists for closed loop recycling where manufacturers effectively retain ownership of the metal content in the product through multiple life cycles. This helps reduce upfront costs for the consumer and vastly reduces price volatility for the manufacturer. Because of the selective nature of the plant's feed source and the ability to decide on location, it is much easier to capture value of the metal upstream in the product cycle. This opens up the possibility of alloying the metals or refining them to a much higher purity than is possible at many mining operations.

Alongside being increasingly attractive for investors, recyclers bring clear advantages for the sustainability of the speciality metals industry. Global supply chains for lithium-ion batteries highlight the extent of shipping and processing involved in supplying critical commodities required for the growth of the electric car industry.

Lithium-ion battery – Global supply chain



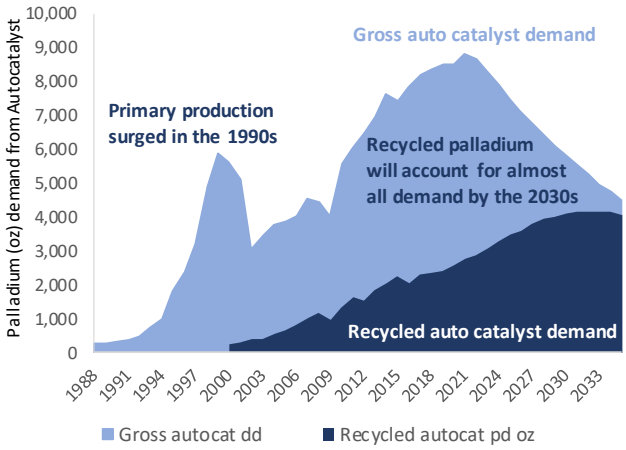
Source: Baker Steel Capital Managers LLP.

Recycling Platinum Group Metals ("PGMs") – A lesson from history

Platinum group metals ("PGMs"), which consist of platinum, palladium and rhodium, provide a highly relevant illustration of how the supply chain for critical metals can evolve from high levels of primary production to a market dominated by recycled material.

In 1980 about 1.8Moz of PGMs were used globally in auto catalysts and none of this came from recycled material. By 2020, due largely to tighter emissions standards requiring higher PGM loadings, about 12Moz were required by the auto industry, with recycling counting for about half of that total. It is forecast that the percentage of recycled material used for auto catalysts will continue to increase over the coming years, ultimately dominating supply of PGMs for this industry.

Palladium recycling is critical for the auto industry



New York City: 1973 vs. 2013

Source: Baker Steel Capital Managers LLP, Ivanhoe Mines.

Without a dramatic ramp up in primary production of PGMs throughout the 1990's, following a worldwide collection and recycling program, many more lives would have been blighted by chronic diseases caused by air pollution. Moreover, the auto industry has been able to mitigate some of the risk in its supply chain, despite over 90% of mined PGMs production coming from South Africa and Russia.

There are other lessons to be learnt by producers of speciality metals, and by investors, from the share price performance of South African PGM producers during the last decade. Just as these companies had spent billions on new shafts, a wave of recycled material began to hit the market in the early 2010's because of increased loadings in the early and mid-1990's. At the same time PGM demand disappointed, as aggressive thrifting took place across the auto industry (eventually the diesel gate scandal proved that the car companies were cheating) and metal prices came under pressure. Moreover, technological change afforded car manufacturers much greater flexibility in the ratios of PGMs used, and the product mix being produced in South Africa was sub optimal in many cases. The result was that billions of dollars was wasted on mines that never delivered a return, employment was reduced as shafts shut early and the potential positive impacts of those jobs in desperate communities disappeared.

We clearly see from this example that for products which are highly sensitive to a single technological change, it is far better to partner with your customers ahead of spending large capex so at least that initial investment can be paid back.

Finally, we note that reliance on the invisible hand can be costly. As car companies continued to act in-line with their own short-term interest, even in the wake of the emissions testing scandals, they cost themselves more money in the long-term, a decision which decimated some South African mining communities. An important lesson for speciality metals investors was the auto industry's failure to engage with rhodium heavy PGM producers to sign long-term price stability or price ratio contracts, despite strong indications the price of rhodium was unsustainably low. The result was a price spike from around USD 600/oz in 2016 to almost USD 30,000/oz in March 2021

(Bloomberg). The same flawed thinking is repeating itself in many of the metals we follow which we have written about **here**.

Ownership models are key for a more sustainable supply chain

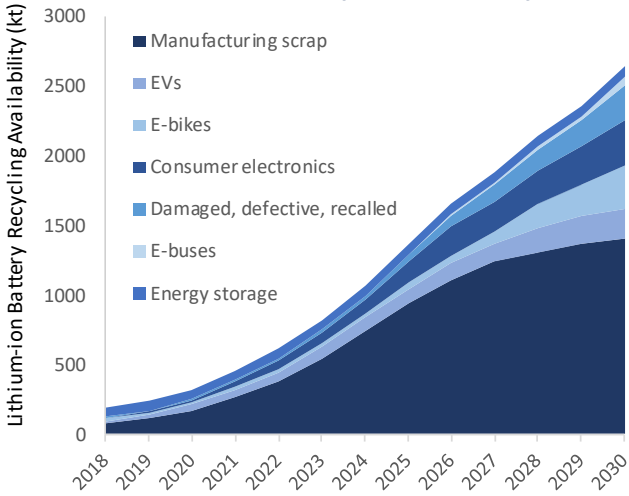
It is worth noting the market dynamics in several of these niche metals allow for greater integration of the value chain and for easier tracking of the metals throughout the life of the product. This ability creates opportunity for producers to retain ownership of the metal even after a ten-to-twenty-year product life.

In some cases where producers lease a portion of their metal production rather than sell it outright, we believe such deals could be value accretive to shareholders as new markets can be developed where it would not be possible without a price incentive; the prime example of this being in vanadium redox batteries. In many other markets though the rate of return on the lease doesn't compensate for the high degree of market risk the company is taking on over the longer term.

Baker Steel – Investing in speciality metals recycling alongside primary production

As an active investment manager in the natural resources sector with a strong focus on environmental, social and governance ("ESG") factors, recycling is a natural theme to exploit within our **BAKERSTEEL Electrum Fund**, which invests in the speciality and precious metals sectors. The Fund's investment approach is to invest in solid businesses which have growth potential in strategically important commodities. Most of the time there is the potential for a superior return doing this in primary producers as they can expand their resource base and multiply their margins with higher commodity prices. Occasionally we invest in intermediate processors or refiners usually in very niche products where there are high barriers to entry and abnormal profits can be sustained over a long period.

Lithium-ion battery recycling is projected to rise substantially in the next 10 years



Source: Baker Steel Capital Managers, BNEF, Benchmark.

Typically, the Electrum Fund has around 10% of its portfolio in recycling and downstream processing related companies. We tend to invest in pure recyclers where the commodity is a by-product of other mining activity or where they were able to earn abnormal profits due to the structure of the contracts in place or large inventory holdings. We have also invested in special situations where volumes of recycled material were forecast to increase markedly, and we believed this would offer transformational opportunities to an established recycler which was ideally located to capture these volumes.

Over time we expect and hope more recycled battery metals will enter the market. As an industry we are going to need all the metal we can get in the coming years as demand really starts to take off. While we believe that the best opportunities will come from primary producers in the battery metals sector over the next decade, we want to see producers and consumers start to work together with coherent strategies to ensure sustainability within the supply chain.

About Baker Steel Capital Managers LLP

Baker Steel Capital Managers LLP manages the ***BAKERSTEEL Precious Metals Fund, ES Baker Steel Gold & Precious Metals Fund, Baker Steel Gold Fund****, the* ***BAKERSTEEL Electrum Fund****, and the* ***Baker Steel Resources Trust***

Baker Steel has a strong track record of outperformance relative to its peers and relative to a passive holding in gold or gold equities. Fund Managers Mark Burridge and David Baker have been awarded ***two Sauren Gold Medals for 2021*** *and were awarded* ***Fund Manager of the Year*** *at the* ***2019 Mines & Money Awards****.*

BAKERSTEEL Precious Metals Fund is a ***2021 winner*** *for the fourth year running of the* ***Lipper Fund Awards*** *while Baker Steel Resources Trust has been named* ***Investment Company of the Year 2020 & 2019****, Natural Resources, by Investment Week.*