Battery Metals Report 2022

Everything you need to know about the battery metals lithium, nickel, cobalt and copper!

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Preface

Dear Readers,

We hereby present the latest edition of our Battery Metals Report.

Our special report series started in the fall of 2016 with lithium, as we see this metal, along with cobalt, nickel and copper, as one of the great energy metals of the future and as a great opportunity with a lot of potential. E-mobility has really taken off and registration figures have doubled worldwide in 2022. This can be seen in the absolute record price level of the lithium prices where meanwhile 72,000 US$ are called for a ton in China. Lithium now has an enormous supply deficit. By 2030, global lithium production must triple! Rio Tinto estimates that current supply and promised production expansions can only meet 15% of demand growth through 2050. 85% will have to be met from other sources, i.e. new mines. It also fits into the picture that two of our former report stocks (Millennial Lithium and NeoLithium) were recently taken over for a lot of money.

In the case of nickel, there was a short squeeze in March 2022 that was quite a surprise and shook the foundations of the LME. But this too is likely to be just the beginning of an unstoppable upward spiral in battery metal prices. According to one study, we need 26 new nickel mines by 2035 to match supply with demand.
This is because the electric car has become established and has won a place among consumers, partly because politicians have recognized that a world that is as CO_2-free as possible will only be possible with electric mobility.

Lithium, nickel and cobalt are the main components of all batteries and accumulators available in large series and thus the main link in the electric vehicle dream. The movements in Germany are interesting, where not only Tesla was able to open a factory (Gigafactory) only recently, but in the meantime several well-known battery manufacturers have pitched their tents.

All these factories will be enormous drivers of demand for lithium, cobalt and nickel, but also for copper. Millions of tons of copper will be needed in the future not only for cars, but especially for the charging infrastructure. 2020 was clearly the start of a decade for raw materials, as they are – and will remain – the basis of everything we do economically.

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My team and I hope you enjoy reading the Battery Metals Special Report and we hope to provide you with lots of new information, impressions and ideas.

Yours, Jochen Staiger

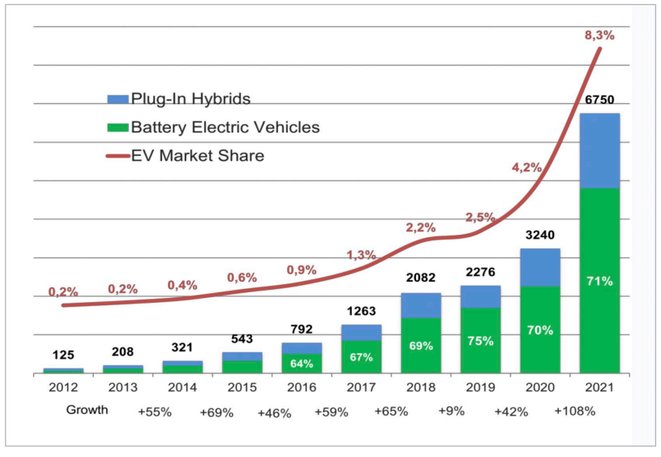
Jochen Staiger is founder and CEO of Swiss Resource Capital AG, located in Herisau, Switzerland. As chief-editor and founder of the first two resource IP-TV-channels Commodity-TV and its German counterpart Rohstoff-TV, he reports about companies, experts, fund managers and various themes around the international mining business and the correspondent metals.

Tim Rödel is Manager Newsletter, Threads & Special Reports at SRC AG. He has been active in the commodities sector for more than 15 years and accompanied several chief-editor positions, e.g. at Rohstoff-Spiegel, Rohstoff-Woche, Rohstoffraketen, the publications Wahrer Wohlstand and First Mover. He owns an enormous commodity expertise and a wide-spread network within the whole resource sector.

Battery metals are running into a supply deficit of unimagined proportions! – More than a hundred new mines will be needed by 2030!

Electromobility is still in its infancy, but demand for the necessary materials is already beginning to explode

For many years, Tesla Motors was alone in researching, developing and finally building electric cars and the batteries needed for them, but today virtually every well-known automaker has hybrids or pure electric vehicles in its range. Nevertheless, the industry is still in its infancy in terms of unit sales, even though registration figures have picked up noticeably recently. While only around 125,000 pure electric vehicles and (plug-in) hybrids were registered worldwide in 2012 (market share of all registrations: 0.2%), by 2020 this figure had risen to 3.24 million (market share: 4.2%). In 2021, registrations then exploded by over 100% to 6.75 million newly registered e-cars (market share 8.3%). For 2022, the British battery sector analyst Rho Motion expects a further fulminant increase in e-car registrations to 10.3 million units (market share 12.6%). By 2025, e-car registrations are expected to double again, to 20.9 million units per year. At the same time, the capacities of the lithium-ion batteries required continue to rise, from around 46 KWh in 2022 to around 54 KWh in 2025. Figures that make one thing quite clear: In the coming years and decades, the demand for the elements and especially metals required for battery production will develop in an almost explosive manner. Corresponding, massive supply deficits are therefore inevitable, since the mining industry will no longer be able to keep up with production.



(Source: Alpha Lithium)

The demand for battery metals is already higher than the existing supply and the gap will continue to widen

For nearly all elements that go into batteries, such a supply shortfall is already becoming apparent, even before the big jumps in unit sales come.
These include primarily the battery metals lithium, nickel, manganese and cobalt, as well as copper and graphite. Some of these materials have so far hardly been used in conventional models with internal combustion engines, or in some cases in significantly smaller quantities. The prices for most of these materials and metals have therefore already skyrocketed. In the case of lithium and nickel in particular, the mining industry is miles away from being able to satisfy the coming demand volumes. This became all the more apparent when Tesla CEO Elon Musk literally begged corresponding mining companies to develop new nickel mines in 2020.

The International Energy Agency (IEA) goes even further, recently stating in a high-profile report that the industry will need to bring 50 more lithium mines, 60 more nickel mines and 17 more cobalt mines on stream by 2030 to meet global net carbon emission targets. It is important to note that such mines take 10 years from the initial discovery of a relevant deposit to first production. Accordingly, the de facto supply deficit already existing for battery metals is expected to widen massively in the coming years, which will inevitably lead to higher prices for these metals.
For investors, therefore, there is an excellent entry opportunity into the world of battery metals right now, as we will explain in detail below.

Basic information about the lithium-ion battery

The lithium-ion battery is the heart of every electric vehicle

In addition to the engine, the heart of every electric vehicle is the energy storage unit, i.e. a rechargeable battery. In order to be operated economically in the long term, electric vehicles, but also increasingly emerging decentralized storage systems – such as for photovoltaic or wind power plants – require ever more powerful rechargeable batteries. The lithium-ion battery has emerged as the most efficient, mass-market type of energy storage currently available for vehicles. One of the reasons for this is that within a lithium-ion battery, the voltage is achieved by exchanging lithium ions. Because of their high energy density, lithium-ion batteries deliver constant power over the entire discharge period and do not exhibit any so-called memory effect, i.e. successive loss of capacity over many years of use or frequent partial discharge. The name „lithium-ion battery“ is only the generic term for a whole range of possible chemical structures, such as the lithium-cobalt (dioxide) battery, the lithium-manganese (dioxide) battery, the lithium-iron phosphate battery and – less commonly – the lithium-titanate battery and the tin-sulfur lithium-ion battery. The most common battery is currently the lithium-nickel-manganese-cobalt (abbreviated NMC) battery.

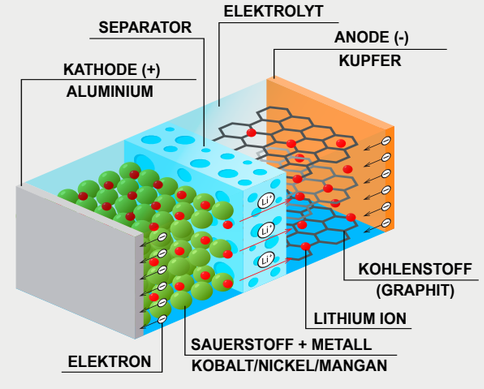
Cobalt will be largely replaced by nickel in future battery generations

Although the basic principle of the lithium-ion battery has not changed much over the past few years, development is continuing steadily. The main focus is on efficiency and charging capacity (in the case of electric vehicles, this is often referred to as range), but also on the use of metals and elements. In this respect, a transformation is currently taking place away from high proportions of cobalt (NMC 111, where the numbers indicate the ratio of nickel, manganese and cobalt) to a higher proportion of nickel (NMC 811), although development is currently still at corresponding intermediate stages (NMC 622 / NMC 532). NMC 111 is considered the simplest battery version, based on an equal number of atoms of the three elements, NMC 532/622 have a higher energy density and a lower price than NMC 111 due to a lower cobalt content, and NMC 811 is the newest and most advanced battery version with the highest theoretical lithium and cobalt performance.

Structure and function of a lithium-ion battery

Essentially a lithium-ion accumulator consists of the following components and materials:

- **Positive electrode (cathode):**
  Lithium-Cobalt(III)-oxide, Lithium-Nickel-Manganese-Cobalt-Oxide, Oxygen, Aluminum as conductor material
- **Negative electrode (anode):**
  Graphite or related carbon materials, Silicon, Tin dioxide, Copper as conductor material
- **Electrolyte (solution)**
- **Polymer membrane separator**



How a lithium-ion battery works

In simple terms, a lithium-ion battery generates an electromotive force through the displacement of lithium ions. During the charging process, positively charged lithium ions move through an electrolyte and the separator from the positive to the negative electrode. In the process, lithium ions can move freely within the battery through the electrolyte between the two electrodes. Unlike the lithium ions, the transition metal and graphite structures of the electrodes are stationary and protected from direct contact by a separator. The mobility of the lithium ions is necessary to balance the external current flow during charging and discharging so that the electrodes themselves remain (largely) electrically neutral. The negative electrode is a so-called graphite intercalation compound, with lithium present as a cation. During discharging, the intercalation compound emits electrons that flow back to the positive electrode via the external circuit. At the same time, an equal number of Li+ ions from the intercalation compound also migrate through the electrolyte to the positive electrode. At the positive electrode, it is not the lithium ions that accept the electrons from the external circuit, but the structures of the transition metal compounds present there. Depending on the type of accumulator, these are cobalt, nickel, manganese or iron ions, which change their charge.

Basic information about the battery sector

The number and production capacity of global gigafactories is growing rapidly

After Tesla Motors popularized the name „Gigafactory“ in 2014, it came to stand for large manufacturing plants that produce lithium-ion batteries for electric vehicles. Since the beginning of the new decade, the construction and commissioning of such gigantic production facilities has multiplied. China in particular has shone with ever new production facilities and capacity expansions. Currently, about 160 of the world‘s 215 gigafactories in the pipeline are in China, while Europe has about 40 and North America only about 15 gigafactories in the pipeline. Globally, about 140 gigafactories are already in operation, of which only about 10 are currently producing in the EU. Global lithium-ion cell production capacity is expected to reach 1,250 GWh by the end of 2023 – a fourfold increase compared to 2018, with an additional expansion of production capacity to around 2,000 GWh in 2028 and 3,000 GWh in 2030. However, this would only cover the demand from the electric vehicle sector expected by then. Added to this is demand from the stationary storage sector and other industry (batteries for small appliances, etc.).

Asia is clearly ahead in battery production

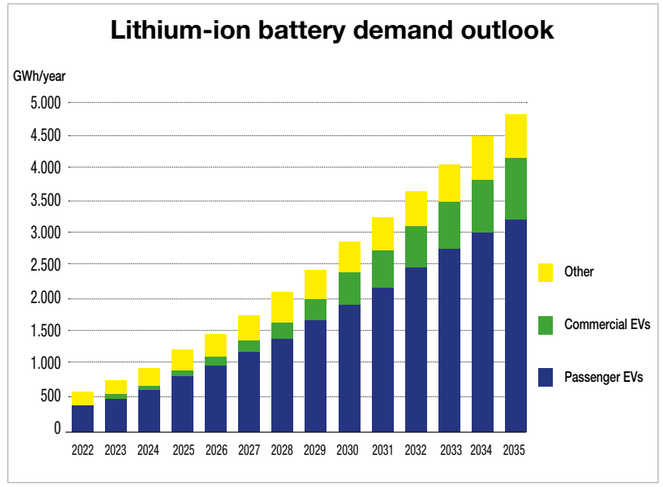
Today, China alone provides a large share of the total demand for lithium-ion batteries. China is expected to continue to see the strongest annual increase in battery metal demand of any major market player over the next 5 to 10 years, largely due to an expected multiplication in the number of units of rechargeable batteries. Other major suppliers of lithium-ion batteries, including South Korea and Japan, are also expected to guarantee robust increases in lithium and cobalt demand. Foremost among these are electronics giants Panasonic, Samsung, LG Chem, BYD, CATL, SK innovation, and Great Wall, which accounted for 78% of global lithium cell production in 2020.

The EU launches major funding programs

The EU, which seemed to sleep through the development of battery production for years, has been able to catch up powerfully with China thanks to many governmental and also private support programs and not least thanks to its strong industrial base. Tesla‘s Gigafactory near Berlin and Northvolt‘s Gigafactory in Skellefteå in northern Sweden are just a taste of what is to come in the next 10 years. By 2030 alone, more than 40 corresponding production sites for batteries and/or cathode materials are planned. At the same time, there is currently a planned battery capacity of at least 600 GWh by 2030. The established automakers in particular are driving European lithium-ion battery production.

North America is slowly emancipating itself from Tesla

In North America, Tesla holds the dominant position in lithium-ion battery production. The company has been operating the so-called „Gigafactory 1“ in Nevada since 2016. Lithium-ion batteries, battery packs, electric motors and drive units for up to 500,000 electric vehicles per year are built there. „Gigafactory 5“ was opened in Austin/Texas in April 2022 and is by far the largest gigafactory in North America.
Tesla, however, is far from the only lithium and cobalt consumer planning major lithium-ion battery production. LG Chem already started production for Chevy in Michigan in October 2015 and is currently working with General Motors on a larger battery production. Foxconn, BYD (the world‘s largest producer of rechargeable batteries, especially for cell phones), Lishen, CATL and Boston Power are also working on the construction of their own gigafactories, including for so-called power banks, i.e. decentralized power storage systems, which are likely to become increasingly important in the future.



(Source: own representation)

The most important battery metals are lithium, nickel and cobalt – copper provides the component linkage

In addition to the already mentioned raw materials lithium, cobalt, nickel and manganese, a lithium-ion battery essentially also consists of aluminum, graphite, zinc, tin and steel. The majority of (lithium-ion) batteries currently on the market are lithium-cobalt (dioxide) batteries, which is why this report deals primarily with the battery metals lithium, nickel and cobalt. We will also take a look at copper, which is becoming increasingly important.

Lithium as a brine deposit (Source: florian-delee by unsplash.com)

Lithium

The element lithium

Lithium is a light metal from the group of alkali metals. It has the lowest density of all known solid elements. It is only about half as heavy as water, naturally silvery white and relatively soft. Lithium is highly reactive, which is why it basically always occurs as a lithium compound in the wild. It tarnishes rapidly in air, due to the formation of lithium oxide and lithium nitride. In pure oxygen, it burns with a bright red flame at 180°C to form lithium oxide. Lithium reacts very strongly with water to form lithium hydroxide.

Lithium extraction is either lengthy or expensive

Global lithium production is divided into several different variants, producing the following types of lithium compounds:

1. Lithium carbonate,
2. Lithium hydroxide,
3. Lithium chloride,
4. Butyllithium and
5. Lithium metal.

Metallic lithium is usually produced from lithium carbonate in a multi-stage process and is usually traded with a purity of 99.5%. This metallic lithium is used as a catalyst in the chemical and pharmaceutical industries as well as for the production of aluminum-lithium alloys.

The industry essentially distinguishes between three types or qualities of lithium compounds:

1. „Industrial Grade“, with purity over 96%, mainly for glass, casting powder and lubricant,
2. „Technical Grade“, with a purity of about 99.5%, mainly for ceramics, lubricants and batteries, and
3. „Battery Grade“, with purity above 99.5%, mainly for high-end cathode materials in batteries and rechargeable batteries.

There are two types of lithium deposits

Lithium is generally obtained from two different sources.

1. So-called „brine“, i.e. (salt) sheet or brine deposits: Mainly in salt lakes, lithium carbonate is extracted from lithium-containing salt solutions by evaporation of the water and addition of sodium carbonate. To extract metallic lithium, the lithium carbonate is first reacted with hydrochloric acid. This produces carbon dioxide, which escapes as a gas, and dissolved lithium chloride. This solution is concentrated in a vacuum evaporator until the chloride crystallizes out.
2. So-called „hard rock spodumene“, i.e. hard rock pegmatite deposits: Here, lithium compounds are not extracted from the salt of lakes, but from spodumene, a lithium-bearing aluminum silicate mineral. Mined by conventional mining technology, the concentrate obtained is often converted to lithium carbonate with a purity of more than 99.5%. The intensive thermal and hydrometallurgical process required for this is considered to be very costly. Such deposits are currently exploited almost exclusively in Australia, with most of the further processing taking place in Chinese facilities.

Three quarters of the world‘s lithium deposits are located in just three countries

Lithium accounts for about 0.006% of the Earth‘s crust, making it slightly less abundant than zinc, copper and tungsten, and slightly more abundant than cobalt, tin and lead. Estimates from the U.S. Geological Survey (USGS) in 2021 suggest that about 22 million metric tons of lithium are recoverable as reserves and 89 million tons are recoverable as resources worldwide. About 51.8% of the reserves are located in the South American countries of Chile and Argentina alone, and 25.9% in Australia. The largest lithium carbonate production currently takes place in the Salar de Atacama, a salt lake in the northern Chilean province of Antofagasta. In addition, significant lithium deposits are found mainly in North America and China.

Lithium mining takes place in a few countries

Australia, Chile, China and Argentina recently accounted for around 95 percent of the world‘s total lithium production, which is shared among only a few companies. As a result of this supply oligopoly, lithium is currently not traded on the stock exchange, and the actual trading prices are kept strictly confidential. One reason for this, which the few suppliers always like to give, is that the available and required lithium qualities are too different for a standardized exchange trading place.

Main applications have been alloys and lubricants and will be batteries in the future

Its above-mentioned special and versatile properties make lithium a sought-after material in very many different areas of application. It should therefore come as no surprise that the main area of application for lithium has changed constantly in the past. Initially used mainly in medicine, the element began its triumphant advance in the 1950s as a component of alloys. Its low weight, but also its positive properties in terms of tensile strength, hardness and elasticity, made it an integral part of aerospace technology in particular. In the past 20 years, this picture has changed once again. As the electric revolution got underway, it was quickly recognized that its low normal potential made it almost perfect for use as an anode in batteries. Lithium batteries are characterized by a very high energy density and can generate particularly high voltages. However, lithium batteries are not rechargeable. Lithium-ion batteries, on the other hand, have this property, with lithium metal oxides such as lithium cobalt oxide connected as the cathode. However, as a raw material for the production of accumulators and batteries, purity grades higher than 99.5% are required. Lithium hydroxide in the „Industrial“ grade is used, among other things, as a raw material for lubricants and coolants; with the higher „Technical“ grade, it is also used in accumulator and battery production. Lithium carbonate – crystalline, granulated or in powder form – is used, for example, in the electrolytic production of aluminum, in the ceramics and pharmaceutical industries, and in alloying technology. Special purity grades of lithium carbonate in the form of very fine powder (battery grade powder) are suitable as a raw material for the production of lithi-

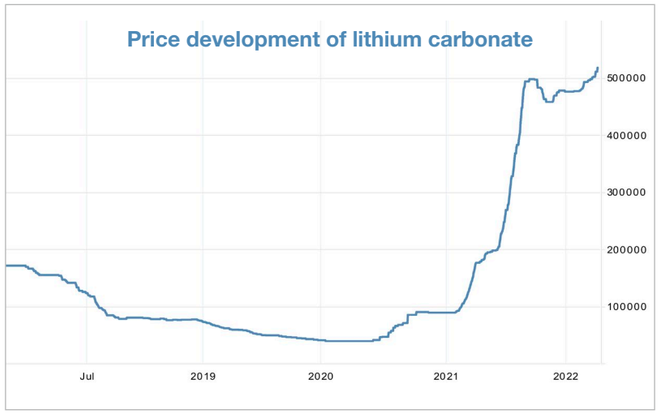
um-ion batteries. The extraction and processing of (especially high-grade) lithium is considered very costly.

The production of lithium-ion batteries requires a large amount of lithium

A large amount of lithium is required for the production and operation of lithium-ion batteries. Each smartphone contains between 5 and 7 grams of LCE (lithium carbonate equivalent; conversion factor LCE: pure lithium = 5.323:1). For a notebook or tablet, this is already 20 to 45 grams. Power tools such as cordless screwdrivers or electric saws require about 40 to 60 grams for their batteries. A 10 KWh storage unit for household use requires about 23 kilograms of LCE, while batteries for electric cars need between 40 and 80 kilograms. An energy storage system with 650 MWh capacity needs about 1.5 tons of LCE.

Lithium production will increase sharply

In 2021, global lithium production was around 560,000 tons of LCE. Projections assume that this figure could be increased to a maximum of about 700,000 tons LCE with today's mining activity, whereby only limited efforts have been made so far for concrete mine expansions or new mines, so that lithium is practically running into a huge supply deficit. In addition, recent reports about several postponed mine starts caused additional uncertainty on the supply side.



Lithium Carbonate Price in Yuan/Ton

(Source: own representation)

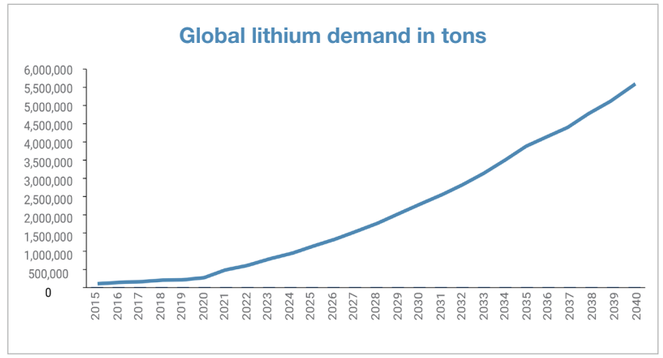
The price explosion of lithium in early 2022 is relatively insignificant for battery manufacturing!

Ultimately, the price alone will determine the economic extractability of the existing lithium deposits. While the price was still around US$6,000 per ton of lithium carbonate in mid-2015, it shot up to around US$78,700 (500,000 yuan) at the beginning of 2022. Despite all the prophecies of doom, it remained just above the 500,000-yuan mark until recently. This is a lucrative business for the producers, as the pure extraction costs for the current projects are only around US$2,500 (Chile) to US$8,000 (China) per ton. This is similarly the case for lithium hydroxide. **Since lithium makes up a significant part of a battery in terms of volume but is only responsible for less than 10% of the costs of a battery, the lithium price is ultimately relatively insignificant for the production of lithium-ion batteries and should therefore be able to be maintained at an economic level for the lithium producers.**

Demand for lithium is increasing rapidly – high supply deficit foreseeable from 2023!

The demand for lithium appears to be almost gigantic, not only due to, but primarily because of the new boom sector of electromobility! While in the case of lithium this was still around 65,000 tons of LCE in 2000, in 2020 there was already 305,000 tons of LCE in demand per year. Experts expect LCE demand to rise to over 600,000 tons in 2022, to around 1 million tons by 2025 and to around 2.5 million tons per year by 2030.

The main driving factor will be demand from the battery sector and the associated automotive industry. Assuming that a maximum of 700,000 tons of LCE per year can be extracted from existing mines and that new mines cannot be brought on stream in the short term, a supply deficit of well over 300,000 tons is indicated for 2025 alone! For 2030, the outlook is even bleaker. A bottleneck of unimagined proportions is looming here.



Global lithium demand in tons

(Source: own representation)

Ore containing copper, cobalt and nickel (Source: paul-alain-hunt by unsplash.com)

Nickel

The element nickel

Nickel is a metallic, silvery shiny transition metal. It is medium hard, malleable and easily polished. Like cobalt, nickel is ferromagnetic and also highly resistant to air, water, hydrochloric acid and alkalis at room temperature, which makes it ideal for use in lithium-ion batteries.

Extraction

Most of the nickel is extracted from nickel- and copper-bearing iron ores. A multi-layer process is used to produce copper-nickel fines, which consist of about 80% copper and nickel and about 20% sulfur. To obtain the crude nickel, the nickel must be separated from the copper. To obtain pure nickel,

the crude nickel is electrolytically refined. The purity of electrolytic nickel is about 99.9%.

Occurrence and extraction

Nickel occurs in the earth‘s crust with a content of about 0.008%, i.e. with about twice the amount of cobalt and somewhat more frequently than lithium. Solid nickel, i.e., in elemental form, occurs only rarely. As of 2020, only about 50 occurrences of native nickel were known worldwide. The most important deposits are found in Canada, New Caledonia, Russia, Australia and Cuba.

The majority of nickel production comes from sulfide ores. In addition, lateritic nickel ores are also mined as raw materials for nickel production. Due to the exploitation of the classic sulfide deposits, mining is increasingly shifting to lateritic nickel ores, which, however, means more expensive extraction.

In 2021, around 2.7 million tons of nickel were mined worldwide. The largest producer was Indonesia with around 1,000,000 tons. However, the country imposed an export ban on nickel at the beginning of 2020, mainly to promote its own stainless-steel industry and conserve its own resources. Other major producers include the Philippines (370,000 tons), Russia (250,000 tons) and New Caledonia (190,000 tons). These countries account for around 60% of total nickel production worldwide.

Main application: steels and nickel alloys

Most of the annual nickel production (around 85%) goes into the production of stainless steels and nickel alloys. Nickel is one of the most important alloying metals, used mainly for steel refining. It makes steel corrosion resistant and increases its hardness, toughness and ductility. Steels highly alloyed with nickel are used in particularly corrosive environments. Around 20% of the nickel mined is used to produce nickel alloys such as constantan, nickel silver and monel.

Other uses

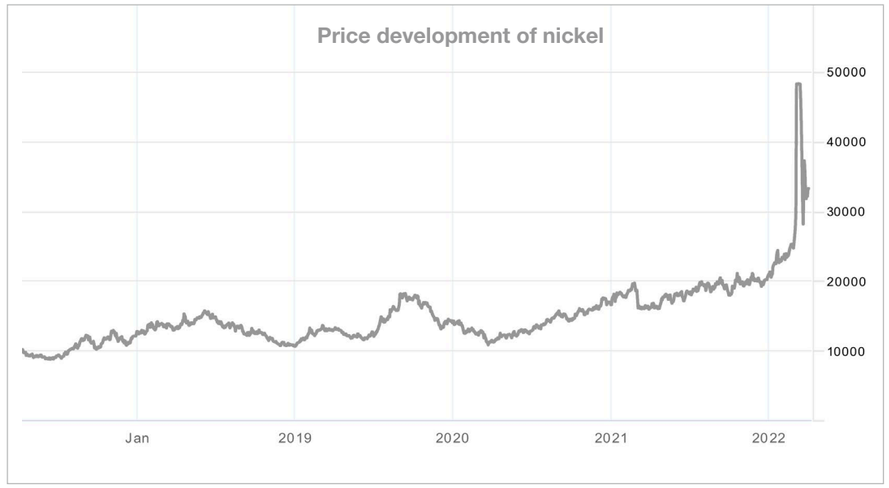
Pure nickel metal is used in finely divided form as a catalyst in the hydrogenation of unsaturated fatty acids. Due to its chemical resistance, nickel is used for apparatus in chemical laboratories and the chemical industry, such as nickel crucibles for digestions. Nickel alloys, for example for coins, are produced from nickel metal. Nickel-based superalloys are alloys specially designed for use at high temperatures and under corrosive media. They are used, for example, in aircraft turbines and gas turbines in power plants.

High-purity nickel is needed for accumulators and batteries

So-called class 1 nickel with a purity of at least 99.98% is required for batteries and accumulators. Only about 45% of the total nickel production of about 2.7 million tons per year is suitable for the production of class 1 nickel. Of this, more than half is required for alloys and other applications. Less valuable Class 2 nickel is used exclusively in steel production.

A supply deficit has already prevailed since 2016

The nickel market has been in a supply deficit since 2016. Only the corona year 2020 produced a supply surplus. In 2021 the supply deficit amounted to 168,000 tons. In 2030, the nickel shortfall is expected to be 900,000 tons. In 2040, the supply deficit is expected to widen to as much as 2 million tons per year – and this includes new nickel projects. Estimates suggest that demand for nickel from the automotive sector alone will increase more than tenfold from 130,000 tons in 2020 to 1.5 million tons in 2030.



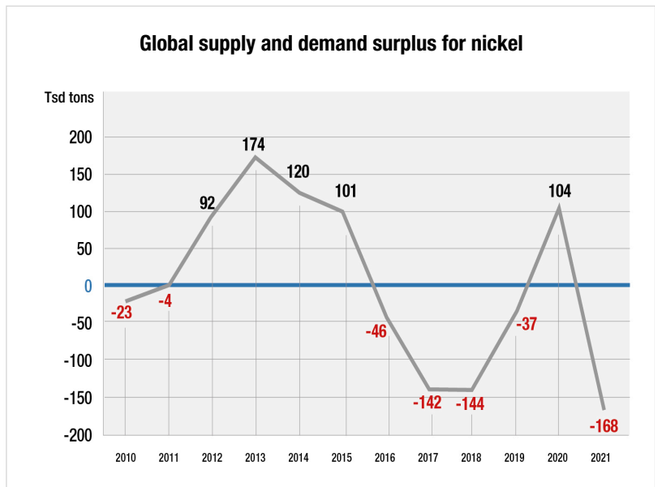
Nickel price development over the last 5 years (Source: own representation)

Stocks fall to dramatic level – nickel short squeeze

A foretaste of what may lie ahead was provided by LME inventories, which have known only one direction since mid-2021: down! Since June 2021, LME inventories – after remaining at a level of around 250,000 tons for a good year and a half – have fallen continuously to a level of around 80,000 tons and since mid-2022 further to around 50,000 tons. In March 2022, one of the most spectacular short squeezes of all time also took place. The nickel future, which had already risen by 66 percent the previous day, March 7, 2022, moved vertically early in the morning. In a few minutes, it went up by US$30,000 until the price broke through the US$100,000 per ton mark after a few minutes. Within less than 20 minutes, an entire commodity market was unhinged. The main player was the Chinese Tsingshan Group, which had built up a large short position of about 150,000 tons over months in order to hedge its own expected future production increase.

All in all, it looks as if nickel and the corresponding producers and developers will be the next big beneficiaries of the electric (mobility) boom! It is not for nothing that Elon Musk called nickel the „New Gold“ in the middle of 2020 and literally begged the corresponding mining companies to develop new nickel mines.

nickel supply (+) or demand (-) surplus (Source: own representation)



Benjah-bmm27, CC BY 3.0

Cobalt

The element cobalt

Cobalt is a steel-gray, very tough heavy metal (ferromagnetic transition metal) with a density of 8.89 g/cm3. As a typical metal, it conducts heat and electricity well, the electrical conductivity is 26 percent of that of copper. In chemical behavior it is similar to iron and nickel, resistant to air by passivation; it is dissolved only by oxidizing acids.

Cobalt extraction is relatively simple and inexpensive

Cobalt extraction is a well-known, relatively simple process. Cobalt is mainly extracted as a by-product from copper and nickel ores. First, some of the iron sulfides present are converted into iron oxide by roasting and slagged with silicon dioxide as iron silicate. The result is the so-called crude stone, which contains nickel, copper and other iron as sulfide or arsenide in addition to cobalt. Further sulfur is removed by further roasting with sodium carbonate and sodium nitrate. In the process, sulfates and arsenates are formed from some of the sulfur and arsenic, which are leached out with water. The corresponding metal oxides remain, which are treated with sulfuric or hydrochloric acid. Only copper does not dissolve, while nickel, cobalt and iron go into solution. With chlorinated lime, cobalt can then be selectively precipitated as cobalt hydroxide and thus separated. This is converted to Co3O4 by heating and then reduced to cobalt with coke or aluminum powder.

The majority of global cobalt deposits lie beneath the seabed

Cobalt is a rare element with a frequency of 0.004 percent in the earth‘s crust. This puts it in thirtieth place in the list of elements ordered by frequency. Cobalt is found in many minerals, but usually occurs only in small amounts. The element is always associated with nickel, often also with copper, silver, iron or uranium.
The world‘s known cobalt resources are about 25 million tons, reserves 7.6 million tons, with the largest deposits located in the Democratic Republic of Congo, Zambia, Canada, Morocco, Cuba, Russia, Australia, Uganda and the USA. Cobalt deposits of more than 120 million tons have been identified in polymetallic nodules and crusts on the floor of the Atlantic, Indian and Pacific Oceans.

Cobalt mining mainly takes place in „problematic“ regions

The majority of the annual cobalt production of 160,000 tons in 2021 came from mines in the Democratic Republic of Congo. Around 70% of the total production volume in 2021 came from the Central African civil war country. Russia accounted for a further 4.5% at last count, the Philippines for 2.6% and China for 1.3%. All countries that are not necessarily considered to inspire confidence. The remaining production is split between Canada (2.5%), Australia (3.3%) and several other countries, some with even lower production volumes.
Future security of supply appears to be extremely critical based on current producers, which is why more and more attempts have been made recently to develop new mines and increase production accordingly, especially in Canada, Australia, the USA and Finland.

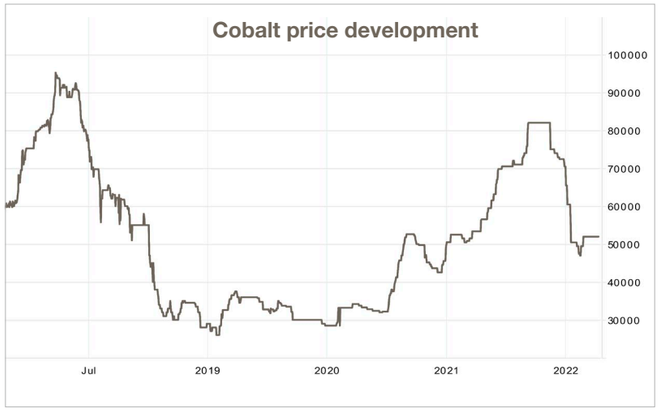
Main applications are paints, alloys, medicine, magnets and rechargeable batteries

Historically, cobalt has been used in the form of oxides, sulfates, hydroxides or carbonates for heat-resistant paints and pigments. Probably the best-known decorative application is blue cobalt glass. Today, cobalt is used primarily as an alloying component to increase the high-temperature strength of alloyed and high-alloy steels, especially high-speed steel and superalloys, as a binder phase in hard metals and diamond tools, as a component of magnetic alloys, as a drier for paints and coatings, as a catalyst for desulfurization and hydrogenation, as a hydroxide or lithium cobalt dioxide (LiCoO2) in batteries, in corrosion- or wear-resistant alloys, and as a trace element for medicine and agriculture. In addition, cobalt is used in the production of magnetic data carriers such as tape and video cassettes, where it improves magnetic properties through doping. Since the 1990s, cobalt has served as an anode material in the anode of lithium-ion batteries.

Electric vehicles require a lot of cobalt ...

As with lithium, the quantities of cobalt used in the corresponding batteries are similar. Depending on the model, between 5 and 10 grams of cobalt are used in a single smartphone. For a notebook or tablet, the figure is 30 to 100 grams. Power tools need about 50 grams for their batteries. A 10 KWh storage unit for home use (such as Tesla‘s Powerwall) requires about 7 kilograms of cobalt, while the batteries for hybrid vehicles need about 4 kilograms and for purely electric cars 10 kilograms of cobalt. Tesla‘s Model S even comes in at 22.5 kilograms. A passenger plane gobbles up about 4,000 kilograms of cobalt.

One passenger plane alone gobbles up about 4,000 kg of cobalt. (Photo: david-preston, unsplash.com)



Cobalt price development (US$/ton) over the last 5 years (Source: own representation)

... even if the quantity per vehicle will decrease

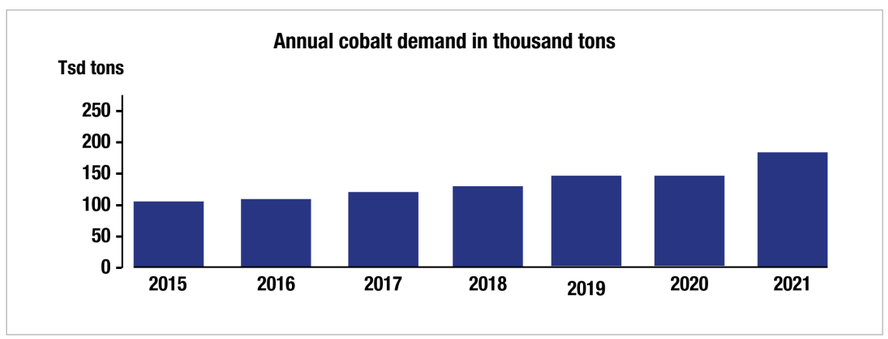
The automotive sector will demand ever greater quantities of lithium-ion batteries in the coming years – even if the further development of batteries suggests that cobalt will increasingly be replaced by nickel – and thus also ever greater quantities of cobalt. Leading experts believe that it will be difficult to expand production above 180,000 tons per year with the current mines. The fact is that despite this, Congo will remain the absolute world market leader for the time being and will even expand its market share to over 75%. The two largest cobalt mines in the world, Kamoto and Kolwezi, which alone can produce about 50,000 tons of cobalt per year, have a large share in this. Outside Congo, several companies are working to expand their existing mines (including Glencore, Norilsk, Umicore, Sumitomo and Vale).

Cobalt price fluctuates strongly

Many market participants have already recognized that cobalt production cannot be expanded quite so easily from one moment to the next. For example, the price of a metric ton of cobalt exploded from US$20,000 at the beginning of 2016 to US$95,000 in March 2018. After an interim low of around US$27,000 in July 2019, it fell back to around US$80,000 in March 2022. Currently, the price of cobalt has leveled off at around US$52,000 per metric ton. A further sharp rise is expected as soon as the leading automakers drastically expand their model ranges.

Cobalt is already in a supply deficit

The demand for cobalt will almost certainly explode in the coming years! While this was still around 60,000 tons in 2008, in 2017 it was already 125,000 tons that were demanded per year. In 2021, about 173,500 tons of cobalt were in demand, of which about 34% came from the automotive sector. Experts expect cobalt demand to rise to over 270,000 tons per year by 2025.
The main driving factor will be demand from the battery sector. In fact, cobalt already had a supply deficit of around 13,000 tons in 2021. This is likely to multiply again in the coming years.



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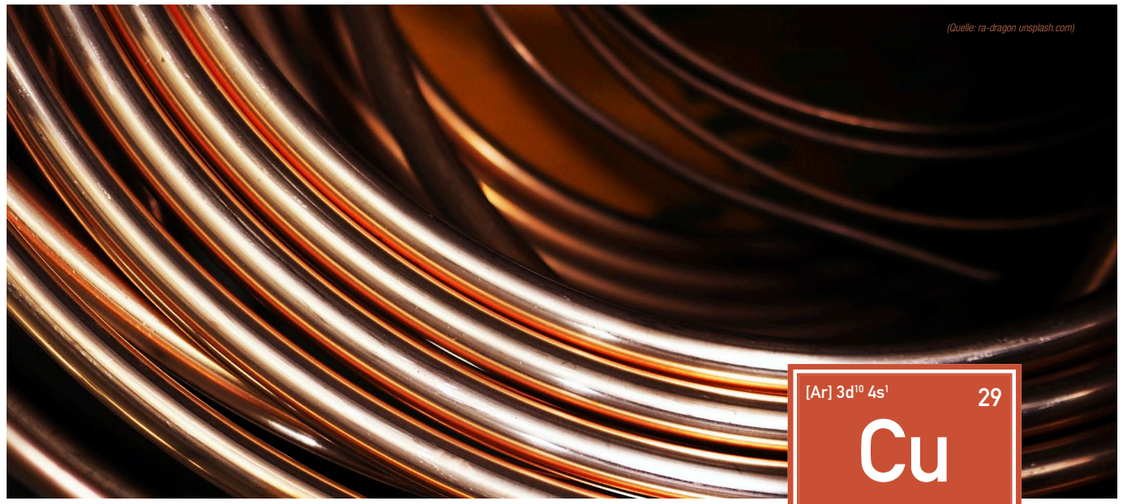


Copper

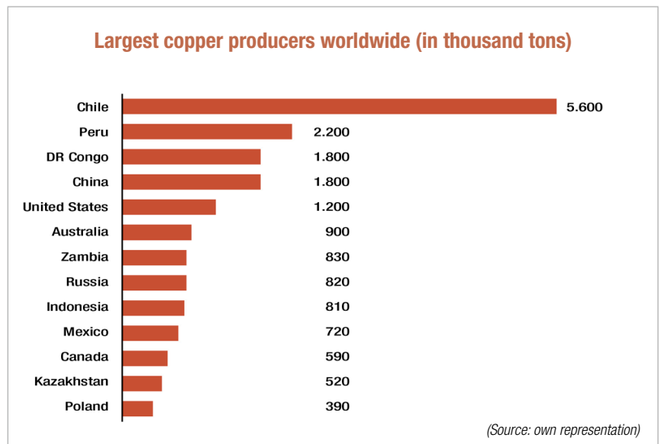
Although copper is not a classic battery metal, nothing works without the red metal in the implementation of the electric revolution. After all, copper has the property of being the most conductive of all known metals after silver. And without reliable interconnection of the individual electrical components, a world of electromobility and electrical storage cannot function.

The element copper

Copper is a chemical element with the element symbol Cu and the atomic number 29. Like silver and gold, it is one of the transition metals that occur naturally in pure form, i.e. in elemental form. The name copper comes from the Latin cuprum, which is derived from Cyprus, where the most important copper mines were located in ancient times. It is the 26th most common element in the earth‘s crust (share of about 0.006%) and has been mined for about 7,000 years. Copper has a reddish luster and, as a relatively soft metal, is easily malleable and ductile. It has a very high thermal and electrical conductivity.

The deposits are concentrated in a few areas worldwide; extraction is simple

There are several thousand sites around the globe. Significant copper production, however, exists in only a few regions. By far the most recent leader in copper production was Chile, with an annual production of 5.6 million tons in 2021. It was followed by Peru (2.2 million tons), China (1.8 million tons), the Democratic Republic of the Congo (also 1.8 million tons) and the USA (1.2 million tons). Together, these five countries account for around 60% of world production of around 21 million tons per year. In smelting, China (10 million tons) is by far the leader. In addition, there is recycled copper of about 900,000 tons per year.
Copper is extracted by smelting and refining. The corresponding processes have long been perfected, and processing is correspondingly simple and relatively inexpensive. The USGS estimates that around 5.6



(Source: own representation)

billion tons of copper are available worldwide as resources and 880 million tons of copper are mineable as reserves.

Main features: High thermal and electrical conductivity, soft, antibacterial, red.

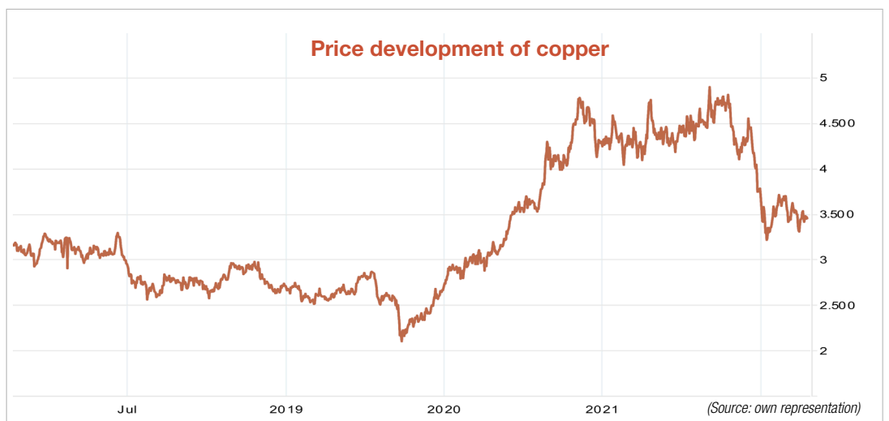
By far the most important ability of copper is its high electrical conductivity. Its conductivity is only slightly worse than that of silver and significantly better than that of gold, but copper is far less expensive than the other two metals. Since all admixtures dissolved in copper, especially impurities such as phosphorus and iron, greatly reduce its conductivity, the highest degrees of purity are often sought for conductor materials. Its softness and red color also make it interesting for the jewelry and art industries, among others in the form of alloys (brass, bronze, nickel silver, red gold). In addition, it has an antibacterial and partially antiviral effect and can render bacteria, viruses and fungi harmless within a few hours.

Main fields of application: Electrical engineering, piping, art, construction

By far the largest area of application for copper is electronics and electrical engineering as well as piping, i.e. infrastructure. It is used, among other things, for electrical lines, switching wires, power cables, overhead lines, conductors on printed circuit boards, wire windings in transformers, chokes/coils and in electric motors. Furthermore, as cable connection between electrical components like accumulators, motors and applications. Other applications include water piping, roofing, glass coatings, tableware, and in the arts and crafts sector for the production of printing plates for copper engravings and etchings, and in the jewelry sector for alloys.

Supply deficit already exists – Drastic expansion is to be expected

The International Copper Study Group calculated a supply deficit of around 300,000 tons for 2020. Due to the fact that in the future more and more copper will be used in electromobility (an electric car requires about 90 to 100 kilograms of copper, while a combustion vehicle often gets by with 20 kilograms), but also in the connection of regenerative power generators to the power grid (an onshore wind power plant requires about 5,4 tons of copper per megawatt, an offshore wind power plant even 15.3 tons of copper per megawatt), experts reckon that by 2035 there will be a gap of no less than 15 million tons per year, i.e. about 75% of current production. Furthermore, infrastructure and electric vehicle support programs of many governments are likely to lead to a further boom in demand for copper. Experts predict that copper demand from the automotive sector alone will increase to over 4 million tons per year by 2030.



Mining activities can no longer meet higher demand

In addition to an expected increase in demand from the current level of around 21 million tons of copper per year to 25 million tons in 2030 and 28 million tons by 2035, copper production with the current mines is expected to fall to less than 15 million tons at the same time. This is because at present it is mainly the expansion of existing mines that accounts for the bulk of new copper production, which is expected to come on stream by 2025. After that, new projects will be needed to close the growing gap expected by analysts. However, this will require significant investment. Goldman Sachs estimates that over US$150 billion will have to be invested in mining projects worldwide by 2030 alone in order to be able to handle the expected increase in demand. Many copper projects benefit from the production of valuable by-products such as gold, silver, cobalt and molybdenum, without which copper mining would often not even be possible, i.e. profitable. Another aspect is the lack of exploration for large copper projects, which has been extremely sparse over the past ten years. In addition, strikes, mine closures and nationalization tendencies have increasingly hampered mining activities in South America.

60% of current copper mines are in deficit, so the price MUST rise

As a result, there is currently a shortage of high-quality development projects. Since the quality of many new copper projects is far inferior to that of current mines, an increase in production, i.e. exploitation of mines of poorer quality, can only be achieved by adjusting the price. The fact is that at the current copper price level of around US$7,800 per ton, 60% of the current copper mines cannot be operated economically. According to Goldman Sachs, the current incentive price for building a new copper mine is around US$9,000 per ton. If the expected wave of demand from the automotive industry, renewable energies and the power infrastructure comes soon, the copper price could make unprecedented price jumps.

Conclusion: The electric revolution is at the beginning of a demand explosion, with which several metals slip into supply deficits – upward price adjustments ahead!

The demand for lithium, cobalt, nickel and, to a lesser extent, copper will be determined by three different parties in the future:

1. From the (Asian) electronics companies, which are mainly targeting the mass production of powerful lithium-ion batteries and accumulators for everyday use, in multimedia devices, etc.
2. From almost all established car manufacturers worldwide.
3. From the manufacturers of decentralized energy storage systems, which are used wherever electricity is generated by means of photovoltaic or wind power plants and is to be used later by means of storage.

This constellation will cause demand for lithium, cobalt and nickel to increase many times over in the coming years in some cases, and for copper it will also increase sharply, with decentralized storage in particular generating the greatest growth in demand and likely to dwarf even the other two areas.

A look at the most important number estimates is basically enough to come to this conclusion. The number of electric vehicles will multiply in the coming years: From 1.2 million electric cars in 2017 to at least 20 million electric vehicles per year from 2025. From 2030, 30 million electrically powered vehicles are expected annually, and from 2040, as many as 60 million vehicles per year. In parallel, the lithium-ion battery capacity in demand will increase from 290 GWh in 2018 to 3,000 GWh in 2030!

Large portions of (future) funding comes from uncertain jurisdictions

In the EU and thus also in Germany, lithium, cobalt and graphite belong to the so-called „red group“, i.e. materials with a very high supply risk. In the USA, lithium is also considered a „critical mineral“. Currently and in the future, however, many of these metals (in the case of copper, around 50% of the most advanced projects) will come from countries with dubious mining methods or high political risk, such as the Democratic Republic of the Congo, Russia or Papua New Guinea. Moreover, in addition to the actual procurement risk, issues such as lack of environmental compatibility or lack of social acceptance also play a role here.

China controls global lithium processing

Another crucial point is that China currently controls a large part (about 80%) of the lithium refining. A circumstance that will and must lead to either more projects outside China‘s sphere of influence or to higher prices in the future. Recycling currently plays no role at all for lithium and cobalt and therefore cannot be seen as a source of needed materials.

The impending supply shortfall for all battery metals will reassess producers and advanced developers in particular

Overall, there are signs of a supply deficit in the near future for the lithium, cobalt, nickel and copper markets, as the increase in demand is likely to (far) exceed the expansion in supply in the future. It can be assumed that the supply shortage for individual metals will be brought forward from around 2025/26 to 2023. This is strongly indicated by recent reports of projects stalling, production being curtailed, and expansion plans being delayed.

Since demand growth will continue to increase strongly beyond 2025 and, in addition, there are still no significant large production projects in the pipeline, this situation is likely to continue for the foreseeable future.

Especially producers and development companies, which have already advanced their respective projects, should offer the greatest share price opportunities in the coming months and years, also with regard to a possible consolidation, i.e. through takeover scenarios.

Some of these dedicated development companies, as well as prospective producers, are presented below.

Interview with Tobias Tretter –
Managing Partner of Commodity Capital AG

Tobias Tretter

As Managing Partner, Tobias Tretter has led Commodity Capital AG since its foundation in 2009 and supports it with his many years of experience and expertise in the commodities sector as Portfolio Manager and Chief Investment Officer (CIO). He is responsible for the investment advice for the Commodity Capital Global Mining Fund and establishes the basis for the long-term success of Commodity Capital AG with his analyses on mining companies.Tobias Tretter obtained his predicate degree at the University of Bayreuth, where he wrote his diploma thesis on a practical basis on the life cycle analysis of commodity companies. This study as well as various further education such as the DITA (diploma of international technical analysis) form the theoretical background and thus the basis for his daily work. Tobias Tretter started his career at Credit Suisse Asset Management and applied his practical experience in advising and supporting the DJE Gold und Ressourcen Fonds of the Dr. Jens Ehrhard Group. The result was the award as "best gold fund 2003" as well as a self-employment in the consulting of commodity funds. Together with the fund management of Stabilitas Fonds he again achieved the award as "best gold fund 2006".

Mr. Tretter, battery metals have been going completely crazy lately. Lithium in particular recorded massive price increases. What do you think was the reason for this?

The price increases for lithium were already foreseeable in recent years and we have certainly not yet reached the end of developments here. The success of electromobility cannot be stopped and it will ultimately be a question of speed. But this is precisely the problem on the production side. New production facilities for batteries can be set up in 1 to 2 years, and the automotive industry can also react relatively quickly, if it wanted to. The problem, however, is on the production side for lithium. Despite the enormous margins and the efforts of all companies to build up new production capacities as quickly as possible, there was exactly one new producer in 2022. The problem, which is always overlooked, is that rising lithium prices do lead to rising exploration spending. However, it takes 10 or more years from discovery to commercial production. And this time gap is causing significant headaches for the industry and is the main reason why lithium prices continue to rise from one all-time high to the next. In the process, there is no hope for a short-term solution to the supply shortage either.

In addition to special effects such as the Russia-Ukraine crisis, the expected demand forecasts will certainly play an important role. What do you expect in this respect in the coming months and years?

Since we launched our lithium fund in 2009, there was one constant. And that was that the demand forecast was seen as far too conservative every year and the build-up of new production was seen as too positive every year. Currently, we also see little reason for the forecasts to become more accurate in the coming years. In our view, demand in the coming years is still being significantly underestimated. We are currently at the beginning of a new era, and it is perfectly normal that it will take a decade or two for the industry to adjust to the increasing demand resulting from electromobility. We are primarily looking at the construction and expansion of new battery factories to estimate the future demand for lithium and the other metals. I don‘t think anyone can estimate future demand better than the battery manufacturers themselves. And here we continue to see a clear trend – an exponentially increasing expansion of capacity. The war in Ukraine or even a global recession is likely to have only a very short-term impact on the expansion of electromobility and thus the demand for lithium. Politicians worldwide have committed themselves to the expansion of electromobility and, in our opinion, will no longer leave this path. A global recession as a result of the interest rate hikes by the U.S. Federal Reserve, for example, is thus likely to even lead to an accelerated expansion of infrastructure and additional subsidies for electromobility in order to stimulate the economy and lead it out of a possible recession. The biggest problem I currently see for the demand for lithium is that there could be such a massive undersupply of lithium in the coming years that ultimately it is no longer decisive what price you have to pay for lithium, but whether and where you can get the necessary lithium at all.

Is a move away from lithium-based batteries to other storage technologies expected in the foreseeable future, and if so, what impact would this have?

The developments in lithium batteries are enormous and a wide variety of compositions are being worked on and researched. However, all batteries have one constant and that is the proportion of lithium, which changes only marginally. Ultimately, we believe the solid-state battery will prevail as the „ideal“ battery, but it will still take a few years before commercial production. Alternatives such as hydrogen or synthetic fuel will certainly find their niche, but we do not believe that the success story of electromobility can be stopped. The efficiency of a lithium battery is clearly superior to the two alternatives and is also preferred by politicians.

Although copper is not a classic battery metal, it is considered an important link between the battery and the corresponding control units. What can we expect from the red metal in the future?

Copper plays a crucial role in electromobility. Not only does an electric car require significantly more copper than a car with an internal combustion engine, but the entire charging infrastructure will need vast amounts of copper. Not to mention the consumption for wind turbines, solar cells and their connection to the power grid. Copper has historically doubled its demand every 10 years regardless of economic crises or wars and we expect at least a doubling of demand in the next 10 years. Knowing full well that this forecast is almost certainly too conservative. In recent years, the industry has primarily lived off existing storage capacity and, while not in the short term, we see a significant undersupply of copper over the next 5 to 10 years. Finding and developing new projects is becoming more difficult every year and it will be almost impossible to adequately replace the old mines that will be phased out in the coming years. Let alone to serve an increasing demand. For us as investors, however, it is difficult to invest in copper mines because most of the „new“ projects are located in unstable regions such as Africa or South America, or the initial investment is too high for smaller or even medium-sized companies to bring into production themselves.
However, this is also where the opportunity lies. Much of the „new“ production in recent years has come from new projects in politically unstable regions such as Mongolia, Africa or even South America. Here, however, we see considerable difficulties in the coming years. If it is already difficult to bring other raw material mines in South America into production, it will be almost impossible to finance a copper project in South America, because the political security is not given and it makes a difference whether you as an investor invest a few hundred million, which are amortized after 1 to 2 years, or whether you invest 4 or 5 billion dollars, which are amortized after 5 or more years. Who knows if you will still own the mine in Chile or Bolivia in 5 years and how high the taxes will be at that time.

Many investors still see battery metals as a hot potato. What advice do you have for investors who want to get involved in this sector? What should they pay attention to?

Electromobility and therefore battery metals are still in their infancy, and it is therefore normal for investors to expect higher volatility. We have been investing in lithium stocks since 2009 and in our investments we stick to Andre Kostolany‘s stock market wisdom of buying the shares, taking a sleeping pill and looking at the shares again in many years to find that they are worth much more. That‘s not really possible for us as fund managers, however, I think the best strategy is to pick companies with excellent management, invest early and benefit from the sector‘s long-term prospects. Timing short-term fluctuations correctly is almost impossible and is not in line with our investment philosophy. The primary goal is to participate in the success of e-mobility and the best way to do this continues to be lithium stocks. And this year alone, the lithium sector was one of the very few sectors to suffer only very small losses.
The outlook and the growth figures of the companies are so good that even volatile stock markets have done little to harm the sector. It was astonishing that Australian companies were able to perform significantly better than North American companies. The main reason for this is probably that Australian investors have more experience in the sector and can see from the examples of Allkem or Pilbara how much potential there is in a budding new producer. North America is still in its infancy here and we are curious to see when the first new company in North America will go into production and how the share price will develop. However, there is certainly significant catch-up potential.

Alpha Lithium

High lithium resource and with big steps to a production plant

Alpha Lithium is a Canadian mining development company specializing in the discovery and development of high-grade lithium projects in Argentina. Alpha Lithium has found projects in the South American lithium triangle, an area with a large number of high-caliber lithium deposits in the border region of the three countries Argentina, Chile and Bolivia. There, the company is developing several projects surrounded by several major lithium mines.

Tolillar Salar – Location and infrastructure

Alpha Lithium‘s flagship project is called Tolillar and is located in the Tolillar Salar salt lake of the same name. The acquisition was made in March 2020, essentially through the acquisition of a private Canadian company through the issuance of treasury shares. The project comprises 10 concessions covering a total area of 27,500 hectares. Tolillar Salar is thus located in the well-known lithium triangle of Argentina, Bolivia and Chile and within the Puna geological region in northwestern Argentina. Tolillar Salar is surrounded by multi-billion-dollar lithium assets.

Tolillar Salar is located approximately 3 hours by car from San Antonio de los Cobres (presence of all major services including fuel and medical supplies) and 6 hours by car from the provincial capital of Salta. The project site is served by a well-maintained paved and unpaved road network, as well as a gravel and dirt road that runs within 10 kilometers of the project.

The nearest rail line in the region is an existing narrow-gauge railroad between Salta, Argentina and the Pacific Coast port of Antofagasta, Chile. A 600-megawatt, 375-kilovolt power line between Salta and Mejillones, Chile runs approximately 150 kilometers north of the property. A natural gas pipeline runs less than 10 kilometers east of the project area.

Tolillar Salar – Own exploration activities ...

In November 2020, the Company announced that a VES survey suggests that the brine body that predominates in the northern part of the salar extends far to the south and also supports the concept that the basin in the Tolillar salar is similar to the neighboring prolific Hombre Muerto salar. Similar to Hombre Muerto and other nearby lithium-rich salar basins in the region, Tertiary sedimentary rocks form the basin-bounding rocks to the west of Tolillar Salar and likely resulted in similar basin-filling conditions. The potentially favorable aquifer target identified in the VES study extends beyond the southernmost extent of the surveyed area and appears to extend deeper than what the instruments could measure, yielding a thickness of at least 170 meters. In addition, the VES results showed that the brine body, which was identified as pervasive during the initial geophysical survey, extends an additional 10 square kilometers into the southern portion of Tolillar Salar. It is measured to be between 73 meters and at least 267 meters thick and extends deeper than what the VES equipment was able to measure.

...lead to a first resource

Based on these findings, Alpha Lithium initiated a three-phase drilling campaign in December 2020, the purpose of which is to collect lithium brine samples from depth and use them to begin evaluating the Direct Lithium Extraction (DLE) process that the Company intends to deploy. By November 2021, the drilling campaign was completed with a total of 6 production holes. Drilling results showed continued improvement and the most recently tested holes showed consistent lithium grades between 345 and 351 mg/L. The first three exploration wells returned lithium grades between 194 and 218 mg/L on pump tests at flow rates between 55 and 100 m3/hour. In the last well with a

(Source: Alpha Lithium)

lithium concentration of 351 mg/L, the flow rate reached 130 m3/hour. A higher pumping rate was feasible but was limited by the maximum achievable capacity of the pumping equipment. In addition to the high flow rates and lithium concentrations, the Tolillar Salar also produced brine with very low impurities. For example, the magnesium to lithium ratio ranged from 4.90 to 5.37, with an average of 5.0 across the five holes, a result that is in the upper quartile of salars in Argentina. Based on promising historical data in the Tolillar Salar, Alpha Lithium elected to drill all holes as production holes rather than core holes. Core drilling, while faster to drill, does not result in pumpable wells where traditional aquifer testing can be conducted to obtain hydraulic parameters. Core samples provide lithologic data that can take months to analyze, with the goal being simply to improve knowledge of reservoir properties, such as drainable porosity. Production wells are immediately ready for production, can be logged to determine effective porosity and permeability, and can be flow tested to determine brine pumpability parameters and the chemistry of the composite brine that will ultimately be required for lithium processing. In August 2022, Alpha Lithium released an initial preliminary resource statement for its Tolillar Brine Project. The resource estimate includes 2,119,000 tonnes of indicated and 1,158,000 tonnes of inferred lithium carbonate equivalent (LCE). The resource estimate also includes 7,387,000 tonnes of potassium equivalent (KCl) in the indicated category and an additional 4,786,000 tonnes of KCl in the inferred category. It is important to note that only 9,000 (33%) of the 27,500-hectare site has been explored. The resource does not include results from two holes that were drilled, completed, flow tested and sampled; however, the results have not yet been received back from the laboratory. In addition, lower lithium grades were used in two drill holes, lowering the overall average lithium concentration, as final lab test results have not yet been received.

(Source: Alpha Lithium)

(Source: Alpha Lithium)

Pilot plant and economic evaluation

In July 2022, Alpha Lithium engaged an experienced, specialized firm to provide detailed engineering for a lithium pilot plant to be constructed at Salar Tolillar. In addition, the company has conducted a tender process to provide a preliminary economic assessment for a scalable commercial production facility capable of producing up to 40,000 tons of high purity lithium carbonate per year.

Hombre Muerto

As of March 2022, Alpha Lithium owns more than 5,000 hectares in Argentina‘s Hombre Muerto Salar, widely regarded as one of the highest-grade producing lithium brine salars in the world, comparable only to Chile‘s Salar de Atacama. The Company will be surrounded by key players in the Hombre Muerto Salar, which is known for its high-grade brine with record high lithium concentrations and exceptionally low impurities. It hosts Livent Corp‘s Fenix operation, which has been in commercial production for over 25 years. Hombre Muerto is also home to the Sal de Oro project of Korean giant POSCO, which it acquired from Galaxy Resources Limited for US$280 million. In addition, the southern part of Hombre Muerto is home to Galaxy, which recently announced an AU$4 billion merger with Orocobre Limited. A VES survey was initiated on the property which confirmed the presence of the known underlying productive zones of the Hombre Muerto Salar. The results of the VES assessment indicate the presence of three large units, all of which are expected to be productive.

Summary:
Takeover fantasy due to large movements and financing in the vicinity

Alpha Lithium has immediately stepped on the gas in the Lithium Triangle and, in addition to exploration, immediately evaluated the possibility of processing. The management around CEO Brad Nichol and Country Manager David Guerrero, who knows the area very well and already has successes to show in the Hombre Muerto Salar, must be incredibly sure with the not yet determined resource base, if they immediately let production drillings be carried out. Just as confident as a dozen or so high-profile lithium investors who helped Alpha Lithium raise a whopping CA$23 million in fresh capital in February 2021 instead of the originally planned CA$10 million. In November 2021, Alpha Lithium attempted to generate another CA$13 million in fresh funds, which ultimately turned into CA$25 million. This provides Alpha Lithium with sufficient funding for the upcoming development steps. Several acquisitions in the immediate vicinity of Alpha Lithium‘s projects also raise the acquisition fantasy at Alpha Lithium, especially since POSCO, one of the largest chemical companies in the world, owns more than 10,000 hectares in Hombre Muerto, much of which is adjacent and connected to Alpha‘s properties in the same salar. Earlier this year, POSCO announced plans to invest an additional US$4 billion in its 10,000 hectares in Hombre Muerto after meeting with local government officials.

Exclusive interview with Brad Nichol, CEO of Alpha Lithium

Brad Nichol, CEO

What have you and your company achieved in the past 12 months?

1. Received US$770 million offer for one of our assets, Tolillar, which we declined, since the asset was still very immature
2. Drilled 10 more production wells and published an early draft resource estimate for Tolillar: 2.1 million tonnes of indicated and 1.2 million tonnes of inferred LCE. Combined with other factors, such as access to existing pipelines, powerlines, highways, people, equipment, and a highly favorable regulatory regime, rank us well above our peers
3. Closed second $25 million Bought Deal and raised corporate treasury to $45 million
4. Built a 5,000 hectare position in the world‘s best and one of the most sought-after salars, Hombre Muerto (home to Livent, POSCO, Allkem, etc)
5. Started exploration and development work in Hombre Muerto salar
6. Upgraded listing to Canada’s senior stock exchange

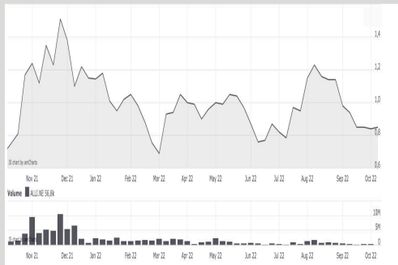
What are the most important company catalysts for the next 6 to 12 months?

1. Complete drilling 10 more production and core wells in Tolillar to finalize the initial draft resource estimate and improve both the (i) quality and (ii) quantity of the resource through horizontal (i.e. areal extent) and vertical (i.e. depth of investigation) drilling
2. Complete the construction of pilot plant and commence lithium production
3. Continue to improve our extremely successful lithium refinement process, which has already returned incredible results: starting with brine containing less than 200 mg/L of lithium, our process produced a concentrate of 16,000 mg/L, which was refined to then produce both battery-grade lithium carbonate and lithium hydroxide
4. Complete Feasibility Study for Tolillar
5. Potentially sell, or partner with industry major in, Tolillar
6. Add more land to our 5,000 hectares in Hombre Muerto – hoping to more than double our current position, which would make us a bigger landowner than POSCO, our contigous neighbor in Hombre Muerto
7. Continue geophysical investigation and hydrogeological understanding of our properties in the Hombre Muerto salar
8. Drill significant number of wells (initial stage of 10) in Hombre Muerto
9. Complete an initial resource estimate for Hombre Muerto

How do you see the current situation on the market for battery metals?

The market for, and interest in owning, battery metals has reached an unprecedented level, which will only continue to strengthen and exacerbate the already undersupplied market for the next 5+ years. At Alpha, this is evidenced by the overwhelming interest we continue receiving weekly from the major global players to acquire or partner with us on our property(ies).

Alpha Lithium Corp.



ISIN: CA02075W1059
WKN: A2PNLY
FRA: 2P62
TSX-V: ALLI

Fully diluted shares: 214.1 million

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Canada Nickel

Establishment of a huge nickel district in Canada with steady full hits

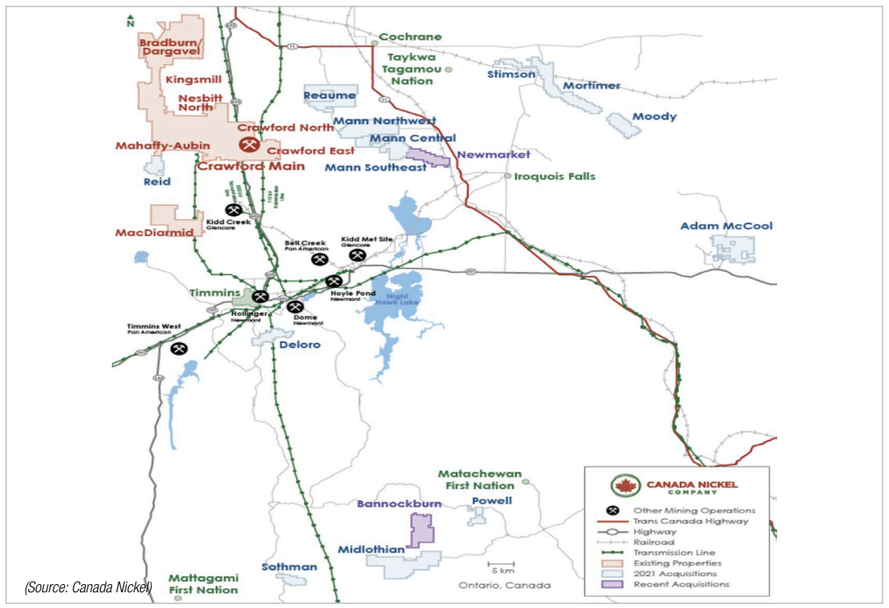
Canada Nickel is a Canadian mining development company focused on developing the Crawford nickel-cobalt sulfide project, which hosts one of the world's largest nickel deposits in an established mining camp and is adjacent to existing infrastructure north of Timmins, Ontario, Canada. An initial economic assessment recently showed robust numbers. The company is working hard to establish a new nickel district and net zero CO_2 footprint. Most recently, they have also been able to demonstrate larger nickel footprints on several other project areas very close by.

Crawford project – Location and infrastructure

Originally about 2,300 hectares in size, the Crawford Nickel-Cobalt Core Project is located about 35 kilometers north of the mining town of Timmins, within the Timmins Mining Camp of the same name, which has a history of more than a century as a mining area. Highway 655 runs directly through the project site, as does a 550 kV power line. The Lower Sturgeon Falls hydroelectric power plant is just three kilometers away. Glencore's Kidd Creek mine and mill, including train service, is only about 10 kilometers away, and the Hoyle smelter/refinery is about 40 kilometers by road and 25 kilometers by rail from Kidd Creek. Timmins itself has sufficient experienced mining personnel.

Crawford Project – Resource

In July 2022, Canada Nickel published a resource estimate based on the Canadian NI43-101 resource calculation standard. According to the estimate, total M&I resources more than doubled to 1.43 billion tonnes at 0.24% nickel and inferred resources are 0.67 billion tonnes at 0.23% nickel. The East Zone M&I resource increased more than 14-fold to 701 million tonnes at 0.23% nickel and the Main Zone resource increased 17% to 724 million tonnes at 0.25% nickel. With 3.48 million tons of contained nickel in the M&I resources, the company believes Crawford has the fifth largest contained nickel sulfide resource in the world. The M&I resources also include 93.9 million tonnes of iron, 8.5 million tonnes of chromium, 183,000 tonnes of cobalt and 1.06 million ounces of palladium + platinum.
This makes the Crawford resource one of the 5 largest nickel deposits in the world!



(Source: Canada Nickel)

Crawford Project – Preliminary Economic Assessment

In May 2021, Canada Nickel published a preliminary economic assessment (PEA) for Crawford. This showed robust economics, supported by, among other things, an after-tax net present value (NPV) of US$1.2 billion and an after-tax economic rate of return (IRR) of 16%. Crawford could yield an annual average nickel production of 75 million pounds (34,000 tonnes) over a mine life of 25 years. It would also produce significant iron and chrome by-products of 860,000 tons per year and 59,000 tons per year, respectively. In total, production over the mine life would amount to approximately 842,000 tons of nickel, 21 million tons of iron and 1.5 million tons of chromium with a total value of US$24 billion. Net all-in sustaining costs were estimated at US$1.94 per pound of nickel, including by-products. Crawford would have annual EBITDA of US$439 million and free cash flow of US$274 million. The use of autonomous trolley trucks and electric shovels would reduce diesel consumption by 40%, contributing significantly to achieving a net zero CO_2 footprint.
With this PEA, the Company has been able to confirm the economics of Crawford, notwithstanding that they arguably have much greater potential.

Massive expansion of the Crawford project

In March 2020 and April 2021, Canada Nickel announced that it had entered into an agreement with Noble Mineral Resources to expand the Crawford project whereby Canada Nickel acquired 100% of the previous option areas, Crawford-Nesbitt-Aubin, Nesbitt North, Aubin-Mahaffy, Kingsmill-Aubin and MacDiarmid and Bradburn-Dargravel. This was done on the basis that Canada Nickel has already identified a total of 7 nickel-bearing structures on the new concessions in mid-2020, extending over a strike length of approximately 30 kilometers.
In November 2021, Canada Nickel acquired an additional 13 exploration projects around Timmins, covering a total of 37.7 square kilometers – 40 times larger than the current Crawford Main Zone resource. Most of these new project areas are close to Crawford, with the most distant still within a 100-kilometer radius. Ten of the areas have a larger footprint than Crawford and nine are proven to contain the same basement mineralization as Crawford.

Projects Reid and Deloro could yet surpass Crawford

The company hit another bull's eye with the Reid project, located just 16 kilometers southwest of Crawford and featuring a series of folded ultramafic bodies extending 3.3 kilometers north-south and 2.1 kilometers east-west. Already with the first drillings one could prove a new discovery there. These included 354 meters of 0.24% nickel, 15 meters of 0.39% nickel and 6 meters of 0.57% nickel. This was recently followed by drilling of 394 meters of 0.26% nickel.
Another high-grade resource is hosted by the Deloro Project. There, assays included 0.38% nickel and 0.22g/t PGM over a core length of 15.5 meters within 0.28% nickel

and 0.09g/t PGM over a core length of 299 meters. Further, 487 meters of 0.25% nickel were encountered, including 91 meters of 0.28% nickel. Mineralization was successfully traced over a strike length of 1.1 kilometers ranging from 100 to 400 meters wide to a depth of 420 meters.
The recent Bannockburn project indicates further high exploration potential.

Crawford project – Glencore deal

In January 2020, Canada Nickel announced a sensational deal with Glencore that should greatly improve the economics of the Crawford project. This allowed for the signing of a non-binding letter of intent for the potential use of Glencore‘s Kidd concentrator and metallurgical site in Timmins, Ontario, for the treatment and processing of material from Crawford. Crawford is located 40 kilometers north of Glencore‘s operations. The facility has a rated capacity of 12,500 tonnes per day and has a full water intake and discharge permit and a thickened tailings storage facility. The site has inbound and outbound rail access via the Ontario Northland Railway.

NetZero Metals

In July 2020, a wholly owned subsidiary, NetZero Metals, was formed to begin research and development of a processing facility in the Timmins region to leverage existing technology to produce carbon-free nickel, cobalt and iron products. The Company has applied for trademarks for the terms NetZero NickelTM, NetZero CobaltTM and NetZero IronTM in the United States, Canada and other jurisdictions in connection with the carbon-free production of nickel, cobalt and iron products. Canada Nickel will explore the potential to produce nickel and cobalt products from existing pyrometallurgical processes such as roasting, sulfation and reduction using electric arc furnaces (which use natural gas as a reductant instead of coke or coal), capturing and discharging off-gases to capture CO_2 through waste rock and residues from the Crawford Nickel Cobalt Sulfide Project.

Summary: New feasibility study should generate takeover fantasy

Canada Nickel owns 100% of the Crawford nickel-cobalt sulfide project, a brand-new nickel discovery with huge potential in an established mining camp, one of the best infrastructures in Canada. Crawford and many other license areas continue to have significant expansion potential as only a fraction of the existing anomalies have been tested to date, as recent discoveries have clearly demonstrated. The newly acquired regional exploration targets are exciting as they share the same geophysical signatures that led to the Crawford discovery. Given Crawford‘s proven track record, this provides much larger areas for full development of Crawford and additional exploration targets that could potentially host similar nickel-cobalt deposits to Crawford. A feasibility study is expected to be released by the end of 2022. At that point, potential suitors should not be long in coming. By means of a $12 million financing in mid-2021, an extended financing of CA$51.6 million in March 2022, and a CA$10 million line of credit, Canada Nickel is currently adequately funded. Very good relations with the First Nation groups Taykwa Tagamou Nation, Matachewan First Nation and Mattagami First Nation round off a successful 2022.

Exclusive interview with Mark Selby, CEO of Canada Nickel

Mark Selby, CEO

What have you and your company achieved in the past 12 months?

Canada Nickel has rapidly advanced its 100% owned Crawford Nickel-Sulphide Project, located in the world-class Timmins-Cochrane mining camp. There are a number of substantial improvements in project economics since our PEA in May 2021, which will be included in the feasibility study, which continues to be on track for completion by year-end and we remain well-funded into early 2023

On July 6th of this year, we announced an updated resource estimate for Crawford, more than doubling the project’s Measured & Indicated mineral resources which we believe is the fifth largest nickel sulphide resource globally.

We also identified a new method for accelerated CO_2 capture, that could allow production of Net Zero nickel and generation of 21 tonnes of CO_2 credits per tonne of nickel produced after offsetting all emissions. Our Crawford Project could produce an estimated average of 710,000 tonnes of CO_2 credits annually and 18 million total tonnes of CO_2 credits over expected life of mine.

The initiation of our federal permitting at Crawford was another important milestone this year. Additionally, we are further unlocking the district scale potential of our regional properties with significant discoveries made at Deloro and Reid. Our current drilling has delineated a mineralized footprint at Reid already 90% of the size of Crawford footprint of 1.6 km2.

What are the most important company catalysts for the next 6 to 12 months?

The most significant catalysts will be the completion of a Feasibility Study by the end of 2022. We are also advancing discussions with various offtake groups and strategic shareholders, advancing our carbon capture work, and completing milestones as we advance our permitting process.

How do you see the current situation on the market for battery metals?

Nickel demand growth continues to be underestimated by most analysts – nickel demand was up 17% in 2021(3-5X other base metals) driven by a combination of demand from the EV sector growing by more than 100% and demand from stainless steel growing by more than 10%. This demand growth is leading to the largest nickel market deficit ever in 2021 – contrary to most analysts who forecast the market at the start of the year to be in a 3-5% surplus and consistent with our view of the emergence of a nickel super cycle by the middle of this decade.

Canada Nickel Company

ISIN: CA13515Q1037
WKN: A2P0XC
FRA: 4E0
TSX-V: CNC

Fully diluted shares: 123.4 million

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Cypress Development

Feasibility study almost complete and production of battery-grade lithium carbonate in own plant successful

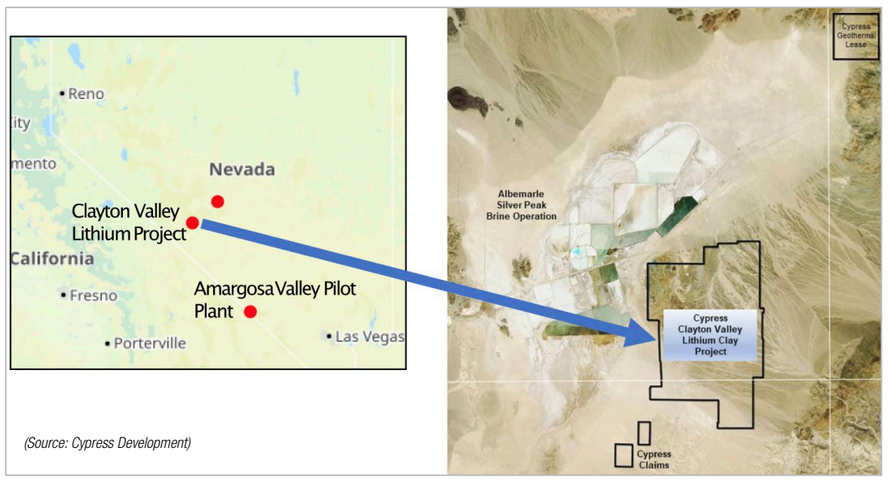
Cypress Development is a Canadian mining development company specializing in the mining of lithium in the United States. The company is focused on the development of its 100% owned Clayton Valley Lithium Project in Nevada. Cypress Development was able to announce a world-class resource of lithium-bearing mudstone near Albemarle‘s Silver Peak Mine, North America‘s only lithium brine operation, at its project site, which is also immediately adjacent to several other advanced lithium projects. A 2021 enhanced prefeasibility study certified the project as having excellent economics. Currently, the company is working on optimizing the processing with the help of its own pilot plant, resulting in the production of battery-grade lithium carbonate. A feasibility study is expected to be completed by early 2023.

Clayton Valley Lithium Project – Location and Infrastructure

The Clayton Valley Lithium Project is located in the eponymous Clayton Valley, in the southeastern U.S. state of Nevada, adjacent to the east of Albemarle‘s Silver Peak Lithium Mine, which has been in operation since 1966. Cypress Development‘s project covers approximately 6,558 acres and is located amidst very well-developed infrastructure. Several state highways connect Silver Peak to the main road network in Nevada. Gravel roads connect Silver Peak to the southern half of Clayton Valley. Connection to the electric grid is available at the substation in Silver Peak.
In February 2022 Cypress Development announced that it had expanded the Clayton Valley Project. They were able to acquire Enertopia Corporation‘s Clayton Valley Lithium Claystone Project from their immediate neighbor. Enertopia‘s project includes 17 unpatented mining claims totaling 160 contiguous acres.

Exploration, Geology and Resource

Cypress Development acquired the first project claims in 2016 and conducted extensive drilling campaigns and metallurgical testing over the next three years. Exploration and development work conducted by the Company quickly led to the discovery of a world-class resource of lithium-bearing mudstone near the brine field east and south of Angel Island, an outcrop of Paleozoic carbonates that outcrop from lake-bottom sediments. Lithium mineralization occurs within the montmorillonite clays in the sediments to a depth of at least 150 metres. Metallurgical tests have shown that low-cost processing is possible by leaching with low acid consumption and high lithium recovery of over 85% Li. These high extractions prove that the predominant lithium-bearing minerals are not hectorite, a refractory clay mineral that requires roasting and/or high acid consumption to liberate the lithium. The flat-lying deposit allows mining with a low overburden ratio. Open pit mining does not require drilling or blasting during excavation. Currently, Clayton Valley has a resource of 1,304 million tonnes of rock averaging 905 ppm lithium (6.28 million tonnes LCE - lithium carbonate equivalent) based on a cut-off grade of 400 ppm lithium. Reserves total 213 million tonnes averaging 1,129 ppm lithium (1.28 million tonnes LCE). Recent drilling encountered exceptionally high-grade lithium intercepts of 70.1 meters with 1,336ppm lithium, among others.



(Source: Cypress Development)

Clayton Valley Lithium Project – Positive PEA and Pre-Feasibility Studies

2021 Cypress Development published the most recent pre-feasibility study to date. It showed very good economics, even for a moderate base case lithium carbonate price of only US$9,500 per ton. Based on an average production rate of 15,000 tonnes per day, the pre-feasibility study calculated an annual production of 27,400 tonnes of lithium carbonate equivalent over a 40-year mine life. The estimated capital cost of this is US$493 million, with estimated pre-production and operating costs averaging US$3,387 per tonne of LCE. An after-tax NPV-8% of US$1.03 billion and an after-tax IRR of 25.8% were also determined. For a, 50% higher lithium carbonate price of US$14,250, the NPV would be US$2.142 billion and the IRR would be 41.3%.
A further bankable feasibility study is currently underway and is expected to be completed by early 2023.

Clayton Valley Lithium Project – Metallurgical Studies

The lithium in the deposit is associated with illite and smectite clays and can be leached with dilute sulfuric acid, followed by filtration, solution purification, concentration and electrolysis to recover high purity lithium. Extensive metallurgical work determined optimal conditions for leaching, including time, acid concentration and temperature. Testing showed that there was little difference in sample depth, oxidation, or weathering state of the clays. Extensive leaching tests were performed on samples to obtain slurries for rheology, filtration, and lithium recovery tests. The tests gave

Delivery of the thickener tanks for the pilot plant (Source: Cypress Development)

average results of 86.5% recovery of lithium with only 126.5 kg/ton of acid consumption. Tests were conducted to identify a commercial means of solid-liquid separation, with specific conditions and equipment identified. Solids from filtration tests simulating the final cycle were generated. Solids after single-stage washing are suitable for transport via conveyor belt to a conventional dry tailings storage facility. NORAM Engineering & Constructors Ltd. and CMS designed and tested the flowsheet for recovering the lithium from solution. A very successful test program that delivered a purified, concentrated lithium solution suitable for the production of high purity lithium hydroxide (LiOH).

Clayton Valley Lithium Project – Pilot plant delivers first very good results

With the knowledge gained from the extensive metallurgical testing, Cypress Development was able to design its own pilot plant. This utilizes an existing metallurgical facility near Beatty, Nevada. The plant could be commissioned in November 2021. This will operate at a rate of 1 ton per day and is designed to properly interact and test the major components within the extraction process and evaluate the resulting lithium products.

Then, in September 2022, a breakthrough was achieved when Cypress Development was able to announce that a major milestone had been reached with the production of 99.94% lithium carbonate from lithium-bearing claystone from its Clayton Valley Lithium Project. The Li_2CO_3 was recovered from an intermediate concentrated lithium solution produced at Cypress' lithium extraction plant. Following direct lithium extraction at the plant, Saltworks Technologies Inc. completed the processing system design and pilot work to produce the Li_2CO_3.

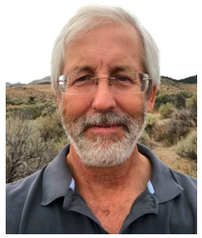
Clayton Valley Lithium Project – Water Rights Secured

In May 2021, Cypress Development announced that it had entered into a letter of intent to acquire water rights. In early November 2021, the Nevada Division of Water Resources approved a term extension to the seller Nevada Sunrise Gold Corp for its Nevada Water Right Permit 44411, which was a key condition of the water rights purchase. The permit allows for the use of 1,770 acre/feet of water per year for mining, milling and other uses, and is an important milestone towards meeting the water supply requirements and development of the Clayton Valley Lithium Project. Finally, in December 2021, the Company successfully completed the purchase of Permit 44411 and Certificate 13631 from Intor Resources Corp, a subsidiary of Nevada Sunrise Gold Corp.

Summary: Completion of feasibility study likely to attract takeover bidders

Cypress Development has a very advanced lithium project in one of the best mining jurisdictions in the world. The company is already in the definitive feasibility phase. A bankable feasibility study has been commissioned. Furthermore, a pilot plant is already running which could produce battery grade lithium carbonate. The important water rights could also be secured. All in all, this is a top development that Cypress Development has to show and will complete in the coming months. The next important milestone will be the feasibility study, which should be completed by the beginning of 2023. By then, at the latest, takeover bidders will no longer be able to bypass Cypress Development.

Exclusive interview with William Willoughby, CEO of Cypress Development



William Willoughby, CEO:

What have you and your company achieved in the past 12 months?

- In December of 2021, Cypress acquired its water rights permit that has secured the Project's future water requirements. This significantly separated us from the pack. Because now we have access to production. By February we closed a C$18.1 M bought financing that brought our treasury over $40M and secured the Company's financial requirements for the next 24 months. In other words, we are fully financed until a constructive decision can be made. We completed the assembly of our Lithium Extraction Facility (Pilot Plant) and tested its operation for up to a 30 day continues run; acquired our neighbours strategic land position, that confirmed our geological model and increased our pit size by 25%; announced positive Direct Lithium Extraction (DLE) results from our Lithium Extraction Facility of 99.5% lithium recovery from the DLE portion of the Plant; and achieved a significant milestone with the production of enhanced battery grade (99.94%) lithium carbonate made from our Project.

Confirmed: Battery Grade Lithium Carbonate 99.94% Purity (Source: Cypress Development)

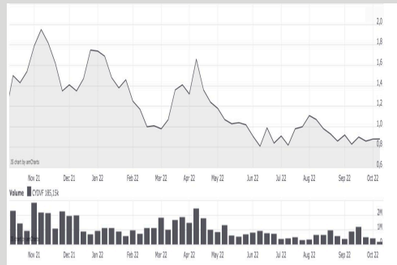
What are the most important company catalysts for the next 6 to 12 months?

- Complete and announce results of our Feasibility Study in Q1 2023; complete our Plan of Operations; kick start our EIS permitting and formally apply for various government grants and loans available for our Project and produce lithium carbonate on-site. So, our plant will run from clay to product.

How do you see the current situation on the market for battery metals?

- There could not be a better time for an advanced stage lithium company such as us moving towards production. The demand for lithium in electric vehicles and battery storage is strong and only growing stronger! Europe, Asia and of course North America all realize the potential benefits of lithium as an alternative. Everything aligns with our goal of becoming a domestic producer of lithium for the growing electric vehicle and battery storage market. Simply put, we have the right commodity, at the right stage in the right jurisdiction

Cypress Development Corp.



ISIN: CA2327492005
WKN: A14L95
FRA: C1Z1
TSX-V: CYP

Fully diluted shares: 174.5 million

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Hannan Metals

On track for next big discovery with world-class partner

Hannan Metals is a Canadian mining development company focused on the discovery and development of high-grade battery and precious metals projects in secure jurisdictions. In Peru, they hold one of the 10 largest land packages of any foreign mining company and were able to secure JOGMEC as a joint venture partner. While JOGMEC has been financing the main project for years, Hannan Metals can put its own capital into the other two prospective projects and has already made a find.

San Martin Project – Location and Infrastructure

The flagship project, which is called San Martin, covers 938 square kilometers and is located northwest of the city of Tarapoto.

The concessions cover a total of 120 kilometers of the prospective host horizon. Hannan Metals has already received an exploration permit for much of the project area. Access to the project is excellent via a nearby paved highway, while elevations range from 400 to 1,600 meters in a region of high rainfall and predominantly forest cover.

San Martin Project – Geology

San Martin hosts a newly identified, high-grade copper-silver system that extends across the eastern Andes in Peru and adjacent countries. Geologically, this has striking similarities to sedimentary copper-silver deposits, including the giant copper shale deposits in Eastern Europe and the African Copper Belt deposits in sub-Saharan Africa, two of the largest copper areas on Earth. Hannan recognized the exceptional potential for large copper-silver deposits in this part of Peru and has aggressively staked out a dominant land position.

San Martin Project – JOGMEC Joint Venture

In November 2020, Hannan Metals entered into a binding option and joint venture agreement with Japan Oil, Gas and Metals National Corporation (JOGMEC), an independent administrative agency of the Japanese government. Under the agreement, JOGMEC has the option to acquire up to a 75% interest in the San Martin project by spending up to US$35,000,000 to provide a feasibility study to the joint venture. This is not Hannan Metal‘s entire San Martin project, but approximately 660 of the 938 square kilometers of area.
Pursuant to the Agreement, JOGMEC is granted the option to earn an initial 51% interest by funding $8,000,000 in project expenditures over a four-year period, which may be accelerated at JOGMEC‘s discretion.
Should JOGMEC fail to complete a pre-feasibility study or spend a total of US$20,000,000, Hannan Metals has the option to buy back a two percent interest for as little as US$1.00, returning a 51% majority interest in the joint venture.
After JOGMEC has spent US$35,000,000 and before a feasibility study has been completed, both parties will fund the expenditure on a pro rata basis or dilute through an industry standard dilution formula. If either party‘s interest in the joint venture is diluted to less than 5%, that party‘s interest will automatically convert to a 2% net smelter royalty.

San Martin – JOGMEC Joint Venture: Exploration Successes

On the JOGMEC project area, Hannan Metals has already identified several potentially high-grade copper-silver zones. For example, in July 2020, they completed a 17,500 square kilometer regional remote geological survey that highlighted prospective mineralized trends over a strike length of 120 kilometers, as well as identifying several new stratiform copper-silver targets.
This led to the discovery of copper-silver mineralization over a strike length of 73 kilometers. There, trenching intercepts included 2.0 meters of 5.9% copper and 66 g/t silver, 0.6 meters of 8.7% copper and 59 g/t silver, 3.0 meters of 2.5% copper and 22 g/t silver, and 0.2 meters of 6.9% copper and 32 g/t silver. In another sub-area called Tabalosos, the combination of seismic and modern remote sensing of the surface from high resolution satellite imagery led to the discovery of 4 mineralized zones. This included trenching detecting 2.0 meters of 4.9% copper and 62 g/t silver, 1.3 meters of 3.5% copper and 86 g/t silver, 1.0 meter of 6.3% copper and 101 g/t silver, 1.8 meters of 3.7% copper and 42 g/t silver, and 2.2 meters of 2.4% copper and 29 g/t silver. During 2021, Hannan Metals was able to report further very good results from the soil geochemical sampling program on the Tabalosos East Prospect, demonstrating copper-silver mineralization over a combined length of 24 kilometers.
The Company also completed a large-scale LiDAR survey within the JOGMEC JV San Martin project in the third quarter of 2021. Further trenching returned 2.8 meters of 3.0% copper including 1.6 meters of 5.3% copper and 83g/t silver. In the Tabalosos East area, 42 of 53 trenches averaged 1.0 metre at 2.1% copper and 29g/t silver over a systematic survey area of 8 kilometers by 1 kilometer. 3 kilometers to the south, 17 trenches averaged 1.1 meters of 2.1% copper and 29g/t silver. Samples contained up to 10.8% copper. For the 12 months since April 2022, JOGMEC has an exploration budget of US$2 million for further development of San Martin. This will be spent mainly on drilling in the Tabalosos East area.

San Martin Hannan Copper Silver Project

The remaining 278 square kilometers of the entire San Martin Project, continues to be 100% owned by Hannan Metals and is not part of the JOGMEC Joint Venture. A boulder discovered during initial exploration grading 1.4% copper and 21 g/t silver on the Ochique property was located 20 kilometers northwest of the JOGMEC JV project. This was the first indication of sediment-hosted copper mineralization in the northwestern Huallaga Basin. The boulder source represents only a small portion of the Hannan area, which covers a total of 55 kilometers of prospective strike of the mineralized host unit. Field teams are currently actively conducting stream sediment sampling.

Valiente Project – Exploration success all along the line

The Valiente project, comprising 1,354 square kilometers of mining concession applications, consists of several sub-projects, with Previsto the current primary focus. Hannan Metals believes Previsto is highly prospective for alkaline porphyry copper-gold systems. Ingemmet, Peru‘s geological, mining and metallurgical institute, has previously proven intrusions on the project area.
2021 Hannan Metals has been able to report initial exploration success and a real bull‘s eye from Previsto. Initial reconnaissance work has identified a large-scale hydrothermal system within a 6 kilometer by 3-kilometer area on the project site that has the potential to host a porphyry copper-gold mineral system with an associated skarn. Several copper and gold mineralized float samples were taken in the process, with the best float sample returning 25.6% copper and 28 g/t silver in an interpreted supergene enrichment zone. The work carried out focused on an area extending 10 kilometers north south and remaining open to the north, west and south. Copper and gold mineralized porphyritic intrusive rocks were also detected within flotation samples in streams, along with iron oxides, copper oxides and pyrite. Uranium-lead zircon dating at four porphyritic intrusive centers in a 140 by 50-kilometer area has been used to define a previously unrecognized Miocene metallogenic belt associated with significant copper-gold geochemical anomalies in the BLEG, float and outcrop areas of the project.
In total, Valiente appears to have at least four significant mineralized systems. Each of these covers up to 2,300 metres by 800 metres and has produced up to 3.2g/t gold and 0.6% copper, as well as traces of other elements. The Belen sub-area in particular shows several potential high grade mineralized systems, with Belen representing just 4% of Valiente‘s total area.

Summary: Will Valiente become a game-changer? – Teck Resources gets on board

Hannan Metals was able to secure mega-partner JOGMEC in the early stages of exploration at San Martin. Even a major player in the industry doesn‘t spend US$35 million just for fun. The company‘s own due diligence must have been correspondingly promising. While JOGMEC is initially pushing the development of San Martin financially alone, Hannan Metals can use its own money for the development of the second promising project Valiente and thus possibly land an additional top-class project. Several major anomalies on both projects, as well as initial trenching successes, strongly suggest that Hannan Metals has literally only scratched the surface of something big. Several exploration campaigns should provide a lot of news in the coming months. Valiente, in particular, could be a game changer, as it already has several real bull‘s-eyes in a small sub-area. The company secured CA$2.57 million in strategic financing from Teck Resources Limited in September 2022.

Breccia boulder with 0.9 g/Au and >100 g/t Mo

(Source: Hannan Metals)

Exclusive interview with Michael Robert Hudson, CEO of Hannan Metals

Michael Robert Hudson, CEO

What have you and your company achieved in the past 12 months?

Hannan is a Peruvian exploration company opening up search spaces in new frontiers to find the next generation of large-scale global copper-silver and copper-gold deposits. We hold a commanding top 10 tenure position in Peru. This bold grassroots strategy has attracted some of the largest players in the industry, with both Teck and JOGMEC now involved at equity and joint venture levels, respectively.
We are well funded for the next year, with 10 geologists and support teams actively exploring across the country building on our initial discoveries.
At the San Martin Project we are in a US$35m joint venture with JOGMEC, the Japanese government arm that is tasked to source future metals for their industry. The project covers a new, basin-scale high-grade sediment-hosted copper-silver system situated along the foreland region of the eastern Andes Mountains.
At the 100% owned Valiente Project we have discovered a new Miocene age porphyry copper-gold belt in the Peruvian back-arc where we have discovered seven mineralizing systems over 140kmx 50km area.

What are the most important company catalysts for the next 6 to 12 months?

Hannan’s exploration programs are fully funded through 2023 with the support of JOGMEC at San Martin and the entry of Teck onto the register more broadly.

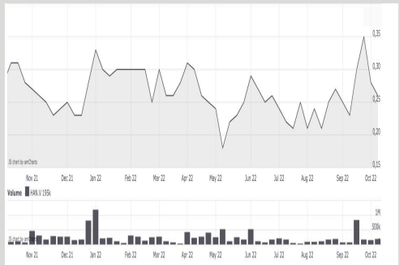
At San Martin, the primary focus will be drill testing the target at Tabalosos East where a diamond drill program of up to 3,500 metres for 40 drill platforms covering an area approximately 9 kilometres long and 3 kilometres wide (2,700 hectares) is planned to commence in 2023 as well as work to expand known mineralization within and outside the area.

At Valiente, the recent discovery we made was on only 4% of the total landholding we have at the project (more than 1,000 km2 under 100%-owned tenure) so we will continue field work including detailed grid sampling and hand trenching into surrounding areas to have at least three porphyry systems drill-ready over the next year.

How do you see the current situation on the market for battery metals?

Amazingly bullish. Copper consumption, driven in part by the electrification of everything will double over the next 20 years. We have attracted two of the largest players in our industry by boldly exploring in new frontiers, before we have drilled a drill hole. This demonstrates that new mineralized terrains, just like what Hannan have found, will become incredibly valuable.

Hannan Metals Limited



ISIN: CA4105841064
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FRA: C8MQ
TSX-V: HAN

Fully diluted shares: 97.6 million

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Kutcho Copper

Positive feasibility study and financially strong partner on board

Kutcho Copper is a Canadian mining development company specializing in the development of high-grade copper deposits in British Columbia. There, the company was able to secure the eponymous Kutcho Copper project, which already hosts an appealing reserve. A fresh feasibility study already came to an extremely positive result and could take a lot of risk off the project. Kutcho is thus already very advanced and also has a strong development partner in Wheaton Precious Metals.

Kutcho Copper Project – Location and Infrastructure

The flagship Kutcho project is located approximately 100 kilometers east of Dease Lake in northern British Columbia and consists of a mining lease and 46 mineral exploration claims covering an area of approximately 17,060 hectares. The site is accessible by a 900-meter gravel airstrip for small aircraft located 10 kilometers from the deposit and a 100-kilometer seasonal road from Dease Lake suitable for tracked and low-use vehicles. A deepwater port is located at Stewart, approximately 400 kilometers from Dease Lake. Existing infrastructure has been greatly improved over the past 10 years with numerous infrastructure improvements. Among other things, Highway 37 runs through northern British Columbia.

Kutcho Copper Project – Geology and Mineralization

The Kutcho Copper Project lies within the King Salmon Allochthon, a narrow belt of Permo-Triassic Island arc volcanic rocks and Jurassic sediments that lies between two north-dipping overthrust folds: the Nahlin fault to the north and the King Salmon fault to the south. The belt of volcanic rocks is thickest in the area where it hosts the VMS deposits, due in part to primary deposition but also to stratigraphic repetition by folding and possibly overthrusting. The volcanic rocks are folded, and triple repeat the mineralized horizon on the project, including the deposit. The massive sulphide deposits are oriented east-west and dip 15° to the west.

Mineralization comprises three known „Kuroko-type“ VMS deposits aligned on a west-dipping linear trend. The largest, the Main deposit, comes to surface at the eastern end, followed by Sumac at depth and Esso at the western end, which occurs at a depth of approximately 400 meters below surface.

Kutcho Copper Project – Reserves and Resources

The Kutcho Copper Project already has a high-caliber reserve and resource base, primarily from the Main Zone. A 2017 estimate indicated a potential reserve of 10.4 million tonnes averaging 2.01% copper, 3.19% zinc, 34.61g/t silver and 0.37g/t gold.

The most recent resource estimate to date, from September 2021, produced measured and indicated resources of 22.8 million tonnes averaging 1.52% copper, 2.18% zinc for 765 million pounds of copper, 1.1 billion pounds of zinc, plus 288,000 ounces of gold and 20.6 million ounces of silver. In addition, there are inferred resources of 12.9 million tons averaging 1.10% copper and 1.58% zinc plus gold, silver and lead.

Kutcho Copper Project – Exploration Potential

The Kutcho Copper Project has high exploration potential.

The Main-Sumac Gap identifies a 400-meter-wide gap between the Main and Sumac lenses that has not yet been drill tested. A conductive geophysical anomaly coincides with this area and is 360 meters long. The easternmost hole, which intersected the Sumac lens and is located on the western edge of the gap, returned 5.12 meters at 1.29% copper, 0.49% zinc and 7g/t silver. The Footwall Zone is stratigraphically below the Main Zone and represents a stacked massive sulphide horizon open in all directions. The last hole drilled to the east and down dip intersected 1.5 meters of 3.54% copper, 6.94% zinc, 316.9g/t silver and 1.47g/t gold.

Overall, 36% of the Main Zone, 50% of the Esso Zone and 100% of Sumac remain open down dip and outside of the current resource model.

In addition to the deposits located close to the Main Zone, the project area hosts a number of other greenfield targets that remain to be explored.

In addition, there are several other promising target areas.

In October 2021, Kutcho Copper indicated that there are several open pit and underground targets at the Main, Sumac and Esso deposits that have the potential to expand the open pit and underground mineral resources beyond those being considered for inclusion in the Feasibility Study.

Kutcho Copper Project – Feasibility Study

In November 2021, Kutcho Copper published a positive feasibility study for the Kutcho Copper Project. The study was based on a copper price of US$3.50 per pound and a zinc price of US$1.15 per pound. For a production capacity of 4,500 tonnes per day (tpd) and a production capacity of 3,900 tonnes tpd, the study resulted in an after-tax NPV 7% of CA$461 million and an after-tax IRR of 25%. Initial capital costs were estimated at CA$483 million and all-in sustaining costs at US$1.80 per pound of copper equivalent. An estimated mine life of 8 years and production life of 10.75 years would result in after-tax cash flow of CA$841 million. The payback period was calculated to be 3.4 years.

Assuming higher prices of US$4.50 per pound of copper and US$1.57 per pound of zinc, this would result in an after-tax NPV of CA$931 million and an IRR of 41%.

Development deal with Wheaton Precious Metals

To rapidly develop the Kutcho Copper Project, Kutcho Copper was able to enter into a development deal with silver streaming company Wheaton Precious Metals. As part of the acquisition of the Kutcho Project from Capstone Mining in 2017, Kutcho Copper, still under its former name Desert Star, received a commitment from Wheaton Precious Metals to receive a total of up to US$100 million. In return, Wheaton Precious Metals is entitled to acquire 100% of the silver and gold production from the Kutcho project. Wheaton Precious Metals will make an ongoing cash payment equal to 20% of the respective spot price of silver and gold for each ounce delivered under the agreement. Since entering into the agreement, Wheaton Precious Metals has committed US$7 million to fund the feasibility study. Another US$58 million has been paid to develop the project. Kutcho Copper will receive up to US$20 million more if it expands to a 4,500 tpd operation. It is important to note that only about 8% of the estimated project revenues are impacted by the stream. 61% of the projected revenues generated will be attributed to copper, 31% to zinc, 5% to silver and 3% to gold. In February 2022, Kutcho Copper was able to eliminate all debt outstanding to Wheaton Precious Metals through a share deal.

Good (financial) framework was created

In June 2021, Kutcho Copper was able to generate CA$4.1 million in fresh capital through a financing and another CA$5 million in December 2021. Further, at the end of 2021, the Company was able to buy back an existing royalty from Sumac Mines and terminate Sumac‘s right of first refusal (ROFR) for concentrates. The termination of the Sumac ROFR thus restores the Company‘s full flexibility to freely engage in strategic discussions on offtake and customer financing arrangements. This will create a more competitive environment for concentrate offtake terms as 100% of concentrate offtake is now up for negotiation. In mid-2022, Kutcho Copper received a total of approximately CA$2.8 million in fresh funds through the redemption of warrants.

Summary: New COO hints at design decision soon

Kutcho Copper already has an attractive resource and reserve base at its eponymous copper project, although the property has yet to reveal its vast resource potential. Several potentially high-caliber exploration areas are waiting to be extensively explored. The positive feasibility study could take a lot of risk off the project and could possibly attract other interested parties besides top development partner Wheaton Precious Metals to what is arguably one of the most exciting copper-zinc projects in the world. The company is uniquely positioned with a high-grade, low-cost, feasibility-stage development project in a Tier 1 jurisdiction supported by a thriving copper market. Next milestones will be permitting and an early construction decision. Important in this regard was not only the consolidation of the royalty and offtake agreement and the simplification of the Wheaton deal, including the reduction of all liabilities, but also the engagement of Andrew Sharp as the new COO, who has already successfully established several mining start-ups.

Vince Sorace, CEO

Exclusive interview with Vince Sorace, CEO of Kutcho Copper

What have you and your company achieved in the past 12 months?

- Completed a feasibility study showcasing an after-tax Net Present Value at a 7% discount rate of $613 million and an Internal Rate of Return of 30% (at U$$4.00/lb copper), including:
  - A mine plan for a predominantly simplified open-pit mining operation. The optimized mine plan has resulted in a technically robust and capital-efficient project with a minimized footprint.
  - Annual production of 50 million lbs of copper and 78 million pounds of zinc over an 11-year mine life with cash costs of US$1.11/lb copper equivalent and all-in sustaining costs of US$1.80/lb copper equivalent.
- Expanded the Project’s high grade mineral resources to 1.1 billion pounds of contained copper equivalent. The updated mineral resource in the measured and indicated category totals 22.8 million tonnes averaging 1.52% copper and 2.18% zinc (2.26% copper equivalent (CuEq) (refer to Company press release dated Sept 13, 2021).
- Completed a buyback of the royalty held by Sumac Mines Ltd. and terminated Sumac‘s right of first refusal (ROFR) to purchase concentrates from the Kutcho copper-zinc project opening access to a greatly expanded universe of potential concentrate off-takers and financial partners.
- Entered into negotiations for economic participation agreements with the Tahltan and Kaska First Nations.
- Developed a detailed exploration plan that provides numerous opportunities to increase the open pit and underground mineral resources available for inclusion in future mine plans at the existing Main, Sumac and Esso deposit.
- Eliminated all Debt and expanded partnership with Wheaton Precious Metals.
- Appointed new COO – with a significant track record of building and operating mines around the world.

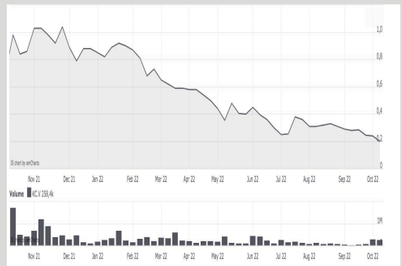
What are the most important company catalysts for the next 6 to 12 months?

- Advancing both near-resource and greenfields exploration targets.
- Re-entering the Environmental Assessment process as the next step towards completion of permitting for mine development.
- Undertaking First Nation and community engagement and consultations, supporting field visits and completing economic participation agreements with both the Tahltan and Kaska First Nations.
- Evaluating and, if warranted, execute on a number of accretive and strategic opportunities.
- Continuing to evaluate and, if warranted, execute on identified opportunities to lower capital costs through strategic arrangements, enhanced engineering studies (including additional ore sorting studies).
- Continuing to de-risk and advance the Project towards a production decision.

How do you see the current situation on the market for battery metals?

The battery metals market will continue to drive demand in the Copper market over the next decade driven primarily by the renewable energy and electric vehicle sectors. Coupled with supply side constraints, we believe we can expect much higher copper prices in the years to come.

Kutcho Copper Corp.



ISIN: CA5013771053
WKN: A2JAMG
FRA: 1QV
TSX-V: KC

Fully diluted shares: 139.4 million

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Surge Copper

New resource estimate confirms billion-pound resource

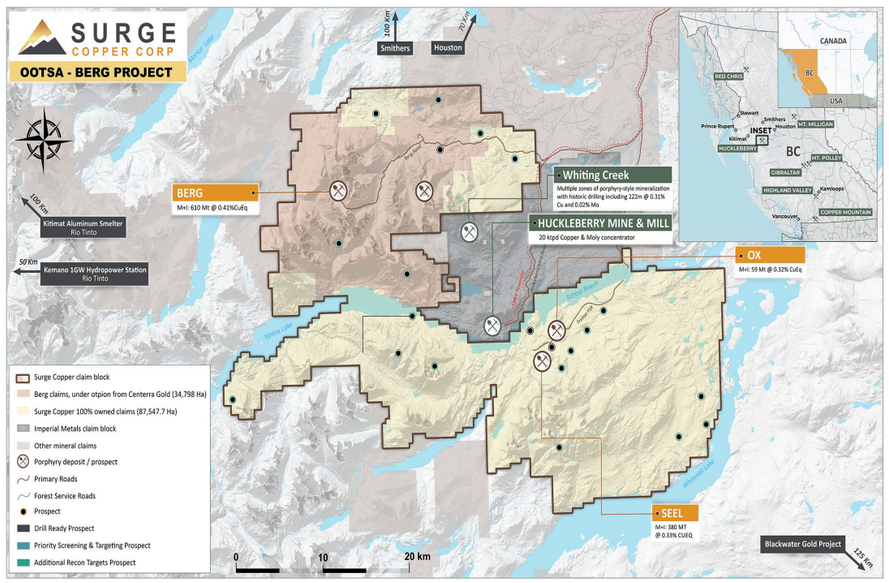
Surge Copper is a Canadian mining development company specializing in the development of high-grade copper deposits in British Columbia. There, it holds majority interests in two large copper projects that are directly adjacent to each other and cover a total of about 122,000 hectares. The entire area is rich in copper, molybdenum, gold and silver and is also well developed in terms of infrastructure. Surge Copper was recently able to further increase its already very large resource base. In total, the two projects, Ootsa and Berg, host 1 billion tons of rock with a total metal content in the two projects of 5.3 billion pounds of copper, 586 million pounds of molybdenum, 1.6 million ounces of gold and 89 million ounces of silver.

Ootsa – Location and infrastructure

The Ootsa project, which is 100% owned by Surge Copper, is located approximately 120 kilometers south of the city of Houston, British Columbia and has good all-weather road access. The claims, totaling approximately 87,500 hectares, contain a network of logging roads that provide excellent road access through the central and eastern portions of the claim block. Ootsa is bordered to the north by the Huckleberry mine and mill complex, which is owned by Imperial Metals Corporation, is currently in care and maintenance status, and hosts only minor remaining reserves. Ootsa has a 35-man exploration camp that is typically operational from May through November. However, the relatively mild climate allows for year-round exploration activity.

Ootsa – East & West Seel

Ootsa hosts several advanced copper-gold-molybdenum-silver porphyry deposits located in the northeastern portion of the project area.



(Source: Surge Copper)

The East and West Seel deposits represent two distinct styles of porphyry mineralization that form a large contiguous mineralized zone. The deposits are located in a gently dipping area of confined bedrock, only about 6 kilometers from Huckleberry Mill.
The East Seel deposit is a smaller, higher-grade zone of mineralization containing copper-gold mineralization associated with quartz-magnetite-chalcopyrite veins.
The West Seel deposit is a large zone of copper-gold-molybdenum-silver mineralization associated with quartz-pyrrhotite-chalcopyrite-molybdenite veins that extends from surface to a depth of over 1000 meters and is not yet fully delineated. Both deposits have high tonnage and copper mineralization, some of which extends for several hundred meters. For example, Surge Copper's previous drilling campaigns in the East Seel area included 238 meters of 0.73% copper equivalent and 186 meters of 0.78% copper equivalent. In the West Seel area, intersections included 817 metres at 0.45% copper equivalent, 1,013 metres at 0.42% copper equivalent, 830 metres at 0.38% copper equivalent, 432 metres at 0.61% copper equivalent, and 585 metres at 0.57% copper equivalent, 495 metres at 0.54% copper equivalent and 194 metres at 0.76% copper equivalent. Since November 2020, Surge Copper has drilled a total of 30,000 meters in the East and West Seel areas. In the process, the company recently encountered increasingly high-grade results. Among other results, the Company has intersected 52 meters of 0.71% copper equivalent, 42 meters of 0.87% copper equivalent, 28 meters of 0.90% copper equivalent including 16 meters of 1.27% copper equivalent, 80 meters of 1.16% copper equivalent including 32 meters of 2.02% copper equivalent, and 46 meters of 1.7% copper equivalent including 28 meters of 2.0% copper equivalent and 10 meters of 3.6% copper equivalent. All of these top results came from the Seel Breccia Zone, located approximately 200 meters north of the East Seel deposit.

Ootsa – Ox

The third advanced deposit is called Ox and is located approximately 4 kilometers northeast of East and West Seel and contains a crescent-shaped zone of disseminated and vein-controlled porphyritic copper-molybdenum mineralization. This mineralization contains pyrite, chalcopyrite and molybdenite occurring in hornfelsic sedimentary rocks near the western margin of a granodiorite porphyry deposit. There, the Company encountered 359.4 meters of 0.41% copper equivalent and 227.7 meters of 0.53% copper equivalent, among others.

Ootsa – Resource

For all three advanced deposits combined, Surge Copper last released a resource estimate in June 2022 based on a drill hole database of approximately 152,000 meters of diamond drilling, including approximately 50,000 meters drilled since 2018. According to the estimate, within these deposits alone, Ootsa has more than 1.7 billion pounds of copper, 167 million pounds of molybdenum, 1.6 million ounces of gold and 30 million ounces of silver in the Measured and Indicated categories, representing a 96% increase in M+I resources over the previous 2016 estimate, and an additional 138 million tonnes grading 0.28% copper equivalent in the Inferred category.

Ootsa – PEA

An initial assessment of the project's economic viability (Preliminary Economic Assessment (PEA)) also dates from 2016. This was based on – from today's perspective – extremely conservative raw material prices of US$3.00 per pound of copper, US$1,260 per ounce of gold, US$10.30 per pound of molybdenum and US$17 per ounce of silver. In addition, only about one-third of the total resource was factored in.

The result was an after-tax net present value (NPV/5% discount) of CA$186 million and an internal rate of return (IRR) of a sensational 81%. Accordingly, the mine life is 12 years, and the payback period is 1 year. This is based on the assumption that Ootsa can be exploited by contract mining and toll milling in the Huckleberry Mill, which is why the initial capital costs – for this type of mine – would be a mere CA$64 million.
At the moment, all assumed raw material prices are in part far above those from the PEA, which is why the profitability of the project can currently be estimated even better.

Berg – Location and resource

Surge Copper currently has the right to earn a 70% interest in the Berg copper-molybdenum-silver project. Berg hosts a large porphyry copper-molybdenum-silver deposit located approximately 28 kilometers northwest of Ootsa. Berg totals 34,798 hectares, is directly adjacent to Ootsa and was expanded again in April 2021 to include the Bergette Claims in the eastern area and the Sylvia Claims in September 2021. Some of the existing drilling, which includes 176 meters at 0.75% copper equivalent and 63 meters at 1.44% copper equivalent, is widely spaced. In addition, the main deposit remains open at depth and radially outward.
In March 2021, Surge Copper released a resource estimate that truly had it all. Berg has 3.65 billion pounds of copper, 419 million pounds of molybdenum and 59.1 million ounces of silver in the measured and indicated categories.

Berg – Exploration successes

In 2021, the access road to the Berg camp was expanded, making Berg accessible to heavy vehicles for the first time in 10 years. Another important item is the review of existing drill core and drill core waste for precious metals, as about half of the historical drill holes have not been assayed for silver and none at all for gold. This should better define the higher-grade zones and reveal the best geochemical and geophysical anomalies. In September 2021, Surge Copper launched an initial exploration campaign of its own, which immediately yielded significant copper intercepts. These included intersections of 325 meters at 0.42% copper equivalent, 357 meters at 0.59% copper equivalent, and 105 meters at 0.74% copper equivalent. Furthermore, in March 2022, the Company was able to prove very high-grade mineralization of 0.83% copper over 132 meters. In addition to this, a further 5-year drill license was obtained, and the latest drill program commenced with three mobile drill rigs.

Summary: Focus on drilling and metallurgical development

The Surge Claims comprise approximately 7 billion pounds of copper equivalent, with good copper grades, including over 1.6 million ounces of gold alone. The two huge project areas also have exploration potential based not only on possible additional deposits, but also on the fact that the re-evaluation of historical drill core alone could provide an additional boost in product. With a CA$6.5 million exploration budget for 2022 (including 22,000 meters of drilling), the coming weeks and months will be marked by major advances in exploration and metallurgical development, potentially yielding additional high-grade mineralized intercepts. A newly formed management team has already impressively demonstrated in the past that it can both land major new discoveries and finance large sums of money.

Exclusive interview with Leif Nilsson, CEO of Surge Copper

SURGE COPPER CORP

Leif Nilsson, CEO

What have you and your company achieved in the past 12 months?

Our major achievements over the last twelve months include a resource update at our Ootsa project, incorporating a large amount of drilling that has been completed there over the last few years, a large scale metallurgical testwork program for Ootsa, and a $7 million regional exploration program. The resource update brings our total inventory across two projects in the district to over a billion tonnes within the measured and indicated resource categories, and is a great foundation for future economic studies that we are in the planning stages for.

What are the most important company catalysts for the next 6 to 12 months?

In the coming months, we expect to see a steady stream of results from our regional exploration program. This program was designed to test a number of new exploration targets that were generated in part by an airborne EM survey we flew in 2021, so we hope to have some exciting results that will advance these targets and help determine what the scale potential of this district can look like. In addition, we expect to be providing results from some important metallurgical studies as well as further details on future project economic studies.

Drilling at Ootsa,Nov 2020 (Source Surge Copper)

How do you see the current situation on the market for battery metals?

It has been a choppy market during 2022. Many battery metals are of course also common industrial metals that find applications in general construction and fabrication, so have been sensitive to recession fears, albeit countered somewhat by continued supply tightness. The long-term outlook remains very strong though. Decarbonization of global energy conversions will be a multi decade endeavour and the metal usage intensity in nearly all of the identified solutions is expected to be very high. Our projects are extremely well positioned for this future given the metal mix and the potential to develop projects with a low carbon footprint.

Surge Copper Corp.

ISIN: CA86881M1041
WKN: A2JENX
FRA: G6D2
TSX-V: SURG

Fully diluted shares: 236.9 million

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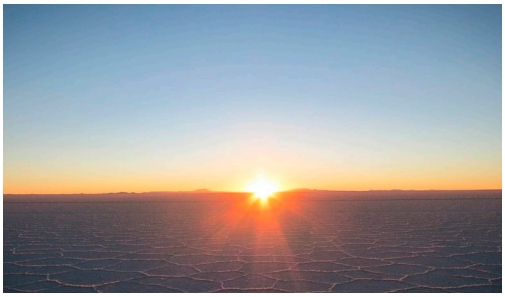
TFT DISPLAY

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