Welcome to our Chile Mining 2021 publication, where we dive deep into the challenges, opportunities and competitiveness of the Chilean mining industry, as well as ongoing trends and debates on automation, digitalization, the copper cycle, the future of lithium and potential for gold.

Our Chile Mining report of 2020 highlighted the battle the country fought with the social unrest and how the industry was impacted. Chile was hopeful at the beginning of 2020 to start the year on a clean slate. However, the world witnessed the Covid-19 pandemic unravel, plunging global economies into recessions and triggering trillion-dollar stimulus plans.

Fortunately, the Chilean mining industry has shown remarkable resilience and perseverance, as it withstood the external pressures well compared to other leading copper producers. This was facilitated by the industry’s early trial at remote work in October 2019 and the boom in commodity prices that pushed base and precious metals to record-highs that gave hope to the global mining sector.

The pandemic has also significantly accelerated technology adoption across the entire supply chain as companies adopted remote working techniques. However, there were challenges as supply chains were disrupted due to lockdowns and social distancing measures.

The pandemic aside, the industry in Chile is fighting some of the same battles we see every year with water scarcity, rising energy costs and decreasing total factor productivity. This year we are witnessing significant investments in R&D by equipment and service providers to address these challenges.

In parallel to these events, the country is undergoing a pivotal process that will dictate its future: rewriting the national constitution. Some investors and analysts remain wary of how this might impact mining investment, although regulators should be aware of the industry’s significance and its crucial role in the country’s economic growth and development.

This report is the product of over 70 interviews with major mining companies, junior mining companies, service providers, equipment and technology suppliers and government officials, as we try to paint an accurate picture of the present state of the industry and attempt to foresee its future direction.

Thanks for reading!

Alfonso Tejerina
General Manager and Director
GBR
"The challenges in the Chilean mining industry are entering a new stage as the industry matures. Today the industry is focused on sustaining operations in a complicated environment, characterised by political and economic uncertainty."

- Juan Carlos Guajardo, Founder and Executive Director, Plusmining

INTRODUCTION TO CHILE

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The world witnessed unprecedented events in 2020, and Chile, the world’s copper powerhouse, was no exception. Traditionally considered a model for political and financial stability in Latin America, the last two years have challenged this reputation. Nevertheless, the country’s solid macroeconomic framework has allowed it to withstand the pressures, cushioning the effects of the volatile internal disturbances of 2019 and the pandemic of 2020.

In October 2019, the country experienced social unrest reflecting widespread frustration with persistent inequality. Yet mining investment in the same year recorded its highest level since 2015, standing at US$10.1 billion, while total production in 2019 amounted to 5.79 million tonnes (mt) of copper and 112,600 mt of lithium, according to the Chilean Copper Commission (Cochilco). In 2020, the country was exposed to volatile copper prices and export demand, as well as prolonged Covid-19 containment measures. On 25th October 2020, Chileans held a plebiscite, resulting in a landslide majority voting to draft a new Constitution, potentially adding uncertainty to the future evolution of the regulatory framework. Yet, these factors did not prevent copper output from maintaining stable levels, with 2020 production reaching 5.73 million mt according to Cochilco.

“The pandemic has affected practically every aspect of life in Chile. Curfews, temporary border closures and reduced business hours were implemented to lower infection rates,” elaborated Christoff Janse, investment promotion officer at InvestChile. “The mining industry, however, has been resilient. The sector’s safety protocols were quickly adapted to minimize contagion risks. Some investments were delayed due to logistical challenges resulting from the lockdowns, most of which are resuming in 2021.”

The copper price was expected to enjoy an upward trajectory in 2020, but the reality was a rollercoaster of price changes. As the Covid-19 outbreak went from a public health emergency in China to a global pandemic, the copper price plunged to a three-year low in March 2020, before peaking to an eight-year high in Q1 of 2021. On the other hand, gold witnessed a bullish run as cases rose, reaching an all-time high in August 2020. Meanwhile, lithium, of which one-third of the supply is in Chile, faced downward pressure as a result of disruptions and uncertainty as electric vehicle (EV) sales decreased. “The pandemic ignited and exacerbated changes. As the Covid-19 outbreak went from a public health emergency in China to a global pandemic, the copper price plunged to a three-year low in March 2020, before peaking to an eight-year high in Q1 of 2021. On the other hand, gold witnessed a bullish run as cases rose, reaching an all-time high in August 2020. Meanwhile, lithium, of which one-third of the supply is in Chile, faced downward pressure as a result of disruptions and uncertainty as electric vehicle (EV) sales decreased. “The pandemic ignited and exacerbated changes.

What is the vision of the Pilcara administration for the mining industry?

Mining is our biggest industry. It represents over 10% of our GDP, more than 50% of our exports, 25% of total investment received, and a big chunk of fiscal revenues for the country. 2020 presented many challenges, the pandemic being the largest one, and the mining sector showed great resilience and capacity to take care of the health and safety of workers, with contagion rates much lower than the average population. That was complemented with business continuity, as we closed 2020 with a copper output in line with 2019 figures. For comparison, copper production in Peru fell by 30% in 2020, so the industry’s performance in Chile was remarkable last year.

Copper has been trading at very high levels in 2021. How can the industry take advantage of this opportunity?

The main opportunity ahead is that projected demand for copper is very big, as global economies progressively migrate from fossil fuels to renewable energies and the usage of electric vehicles continues to increase. In this context, the industry is at the core of global efforts to put a stop to global warming.

To take on this opportunity, the industry in Chile needs to solve several challenges: first, our deposits are quite mature, so mineral grades have been falling, hauling distances have been increasing, and the rock has become harder. In many cases, companies have had to invest significant amounts just to maintain on the same levels of production. If we do not solve these challenges, we could lose business continuity, as we are in a global sector with a lot of competition.

The second challenge is sustainability: the industry is already switching from coal power generation to contracts with renewable energy providers, and we expect that more than 60% of the energy used in mining will come from renewables by 2023. Related to this, another issue is water: today, 30% of the water used in the industry is seawater, and that figure should reach 50% by the end of the decade. We also need to improve relationships with the local communities, and optimize our environmental management in terms of tailings, glaciers and other aspects.

What can the industry do to maintain leadership position?

Mining is considered to be a ‘mature’ country in terms of exploration. How can the industry continue growing based on new discoveries?

For the last years our production has been stable, but we have not been able to significantly grow our copper output. Chile continues to be the fourth country in the world in terms of exploration investment, with over US$450 million in 2020 alone. However, nearly 85% of that money was spent by majors. As part of our mining policy, we are trying to promote exploration by junior companies, and that involves several aspects, including permitting, access to information, access to funding, and the right framework to incentivize concession holders to really advance their exploration work. If majors are not using their concessions, they should probably bring in partners. However, the mining industry presents a lot of risk so it is important to maintain the rules without abrupt changes.

Do you think the process to rewrite the country’s Constitution will damage investment attractiveness?

Investors understand that a country that has grown very rapidly over the last 30 years needs to update its regulatory framework to adapt to new circumstances. Interestingly, it is local investors who appear to be more worried. While the process may bring a certain degree of uncertainty, last year alone there were environmental impact assessment approvals for projects worth US$20 billion. The total project portfolio amounts to US$70 billion this decade, and the high price of copper will incentivize the development of further projects.
the upward cycle of commodity prices by triggering one of the most extensive expansionary monetary and fiscal plans in history,” highlighted Juan Carlos Guajardo, founder and executive director of Ruminmining.

The pandemic and its consequences aside, Chile’s mining industry stands at a pivotal crossroads. The industry facilitated the nation’s rise and prosperity, but is witnessing lower productivity, dormant greenfield exploration, plus greater social pressure and environmental awareness, all of which are limiting its international competitiveness. The copper giant is aware of these challenges and is forging a new trajectory in exploration and production led primarily by innovation and constant collaboration between the stakeholders in the industry to facilitate its long-term growth.

On the bright side, the pandemic could positively impact the mining industry’s future efficiency. Mining companies realized that there is space to increase productivity as they were able to maintain output with less personnel on-site.

Members. The pandemic strained relationships between mining companies and workers’ unions, as companies were accused of not taking adequate measures to reduce the risk of infection, whilst taking advantage of the crisis to reduce jobs. According to mining association Sonami (Sociedad Nacional de Minería), by July 2020, 35,000 jobs had been lost as a result of pandemic-related lay-offs. However, despite reductions in personnel, production did not suffer to a large extent. From January to May, copper production hit 2.37 million mt, an increase of 3.5% from 2.29 million mt in the same period of 2019. Only Anglo American reported a steep fall in output due to water shortages at Los Bronces. Critical to the miners’ pandemic response was minimizing physical presence at mine sites. Chile, as a hub for mining innovation, was well equipped to take this on and maintain production levels with half of the on-site staff. According to Philippe Hemmerdinger, president of the Association of Proveedores Industriales de la Minería (Apromin), the mining suppliers’ association: “Chile’s experience with the social unrest in October of 2019 gave it a trial run at remote work, so companies were to some extent prepared for the Covid-19 outbreak. Operations were smooth, as measures ensuring employees were trained and equipped for working at home were fortunately already in place.”

This smooth transition and implementation of remote control and autonomous mining techniques during 2020 allowed production volumes to be maintained. “The Chilean mining industry was already leading the way to develop more autonomous mining before the pandemic,” highlighted Dale Clayton, managing director of Liebherr in Chile. While the health crisis did not impact production to a large extent, it resulted in the delay of mining projects worth billions, since 23 projects were postponed, according to Cía. Túctian Cifuentes, strategies and policies coordinator at Cochilco. Codelco, which is in the midst of an ambitious 10-year, multi-billion dollar investment drive to open new projects, also announced an investment of US$650 million. However, it bounced back rapidly, re-creating an investment of US$74 million for this decade.

Why do you think Chile has been so resilient to the challenges posed by Covid-19? 2020 has been a year of great uncertainty, and despite variations in companies’ production projections, Chile’s mining sector has demonstrated remarkable resilience and has been able to overcome these challenges successfully. The industry’s commitment to safety and the implementation of strict protocols, together with the hard work of everyone involved in the sector, kept operations going and maintained productivity. During the pandemic, Cochilco played a fundamental role in Chile, acting as a government advisor in everything related to copper and its by-products. This organization is directed by a counsel consisting of government ministers of mining, finance, relevant individuals especially from the central bank, and people appointed by the President of the Republic from the private sector. Our activities are carried according to the council’s decisions, which is how we manage to operate with great objectivity and have been a highly valued institution, Cochilco safeguards the public interest of the state-owned mining companies Codelco, Collahuasi, among others, by auditing corporate processes and operations and compliance with the applicable laws. The compliance and environmental protection. We want to transmit our confidence to mining in Chile.

Will lithium regulation be addressed in the following years? Lithium is becoming highly relevant in sectors such as electromobility and the condensation of clean energies. According to Chile’s legislation, lithium is a non-concessory element. This means that its exploitation can be taken in public properties, which can be rented through special agreements, or it can also be done in collaboration with private companies. Taking into account that lithium is often found in water solutions under the surface, it is likely that its legislation will have to adapt to prevent its extraction from altering the aquifer basins significantly.

What is your view regarding the debates on whether we are witnessing a new commodity “supercycle”? The price of copper responds to the laws of supply and demand. A supercycle involves a long boom in demand that drives up prices until they set so high that demand collapses, pulling prices back down. Currently, we are not seeing a difference between the supply and demand of copper big enough to constitute a supercycle. It is important to be cautious, during 2000 and especially in the last months, we have seen other factors besides supply and demand that have affected the increase in copper prices, such as the increase in money supply in economies like the US.

Do you have a final message for our international readers? Chile’s mining industry will manage to overcome the challenges after the pandemic and will continue to be a world leader, making great efforts to direct its activities towards sustainability and environmental protection. We want to transmit our confidence to mining investors in Chile that mining rules will be respected and will keep progressing despite the constitutional reform, always in compliance with international treaties. The formula against uncertainty in the mining industry involves confidence and hard work.
Philippine Hemmendorfer

President
ASSOCIATION OF INDUSTRIAL MINING SUPPLIERS (APRIMIN)

How did Aprimin’s members maintain supply chain continuity in 2020?
Chile’s experience with the social unrest in October of 2019 gave it a trial run at remote work, so companies were to some extent prepared for the Covid-19 outbreak and operations were smooth as measures ensuring employees were trained and equipped for working at home were already in place. Operational continuity was a priority for mining companies and service providers and they adapted to following strict Covid-19 safety protocols. Another priority was ensuring a clear communicative channel between all the stakeholders to ensure no delays and quick decision-making. Digital practices played a significant role in the industry’s survival during the pandemic.

What are Aprimin’s initiatives for 2021 under your leadership?
We defined five axes of productivity for 2021: operational continuity of the mining sector amid Covid; continue supporting our members to work remotely efficiently and effectively; an emphasis on automation in processes, to allow remote control and the importance of incorporating technology such as artificial intelligence (AI); smart contracts and improving time on tool, and the social license to operate, as we are promoting the use of green energy sources such as green hydrogen, solar power, wind, desalinated and seawater. Another initiative we are leading is ensuring the industry is diverse and inclusive since women make up only 12.5% of the workforce for the mining suppliers in Chile. The increase in the copper price and its promising future is creating demand for the industry, which is expected to contribute an additional over budget of US$1.5 – 2.5 billion in taxes and mining royalties this year. This would help reduce the national debt or generate savings and new resources in case of need.

Do you have a final message to our international readership?
CHILE MINING 2021
How will changes to the constitution impact the Chilean mining industry?
We expect that changes will not significantly impact the mining industry, which is a pillar of the Chilean economy. Chile has parties across the political spectrum, however, they tend to be moderate and respect the rule of law and hence do not present an additional risk to the mining industry. The US dollar is expected to remain stable in the short term and increase in the medium term. The mining industry will continue to be influenced by the global economy, but it is not expected that the changes to the constitution will significantly impact the industry.

What are the barriers to innovation in the sector today?
Covid-19 reduced the barriers to innovation in Chile, but one barrier in Chile is that mining companies refuse to incorporate new technologies and practices into their operations as they risk their volume or continued operation. There are not many places to pilot technology on an industrial scale. Approximately one-third of Chilean mining suppliers do not allocate resources to innovation. Canada and Australia are ahead of Chile in mining technology development and implementation. On the other hand, financing is not a significant barrier to innovation in the sector and some government agencies also provide support to innovators in partnership with mining companies.

Sustainability trends
The mining industry is aggressively asserting and promoting sustainability across the entire value chain. Mining operators across Latin America are altering their community engagement strategies from mere transactional handouts to proactive engagement and long-term strategies that are inclusive of the local, national and broader communities. In the case of Chile, conflict with local communities is mostly a result of environmental issues. To obtain a social license to operate, companies must invest in the use of renewable energy sources, reduce freshwater use and eliminate toxic waste.
Investment in renewable energy sources is set to swell. BHP, for example, is switching to green power for its Chilean operations, thus reducing costs by 20% at the Escondida and Spence operations. Likewise, Iván Arriagada, CEO of Antofagasta PLC, explained: “Antofagasta has set a goal to reduce its forecast greenhouse gas emissions by 300,000 mt by 2022, supported by a series of initiatives including the transition of all our mining operations’ energy supply to renewables by 2022.”

According to data from Cochilco, renewable energy use in the copper industry is expected to grow to 49% of power used by 2023. “I am confident that, in the upcoming years, the industry will undergo revolutionary changes that aggressively promote the use of clean energy sources and the reduction of carbon footprints. I foresee an industry that is carbon-negative in the future, and one that produces net zero emissions over the next decade,” commented Eduardo Valente, lead consultant at Ernst & Young in Chile. “The ability to sell minerals in the future will likely depend on the extent of greenhouse gases used in the process, which will only push mining companies more towards ensuring sustainability, increasing the popularity of green copper,” he concluded.

Meanwhile, sustainability in the equipment space is driving innovation, as providers are replacing diesel engines by battery-driven electric machinery for underground and open-pit operations. The road to recovery from the outbreak of the virus has begun in Chile, as the Chilean government moved decisively and rapidly to secure enough doses to vaccinate its population twice. By February 2021, Chile was able to vaccinate 16% of the population within just 21 days, which testifies to its organisation and resolve to move past the outbreak.
After two consecutive years of uncertainty, 2021 presents an exciting year for mining in Chile amid bullish commodity prices and a recovery from the Covid-19 outbreak. Chile is forecast to produce 5.99 million mt of copper in 2021 according to Cochilco, and is welcoming major expansion into new projects such as BHP’s Spence, Codelco’s El Teniente, Teck Resources and Freeport McMoran. According to Cochilco, desalination and seawater use will likely increase by 230% by 2030, as miners battle water shortages. Anglo American, for example, developed a water reuse system at Los Bronces allowing recycling of more than 70% of available water. Meanwhile, lithium giant SQM is reducing freshwater consumption across all operations by 40% by 2030.

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EDITORIAL

2021 IS ANOTHER PIVOTAL YEAR FOR CHILEAN MINING WITH A NEW CONSTITUTION AND GENERAL ELECTIONS TO NAVIGATE

As the first Latin American country to become a member of the Organisation for Economic Co-operation and Development (OECD), Chile is the commercial and economic success story of the continent. Since free market reforms began in 1975, Chile has consistently outperformed its neighbours in multiple indices of economic development, freedom and democracy. From 1980 to 2019, GDP per capita quintupled, enabling the country to dramatically reduce the share of the population living in poverty from 30% in 2000 to 3.7% in 2017, according to the World Bank, and to create a large middle class. The opening up of the economy encouraged foreign direct investment (FDI) into the country since the 1990s, facilitating the growth of capital-intensive activities such as mining, which today accounts for 10.1% of GDP, according to Chile’s Central Bank and Cochilco.

Chile’s dependence on copper has allowed for significant development, but leaves the country exposed to price fluctuations and demand from China. Furthermore, productivity is slowing down as a result of decreasing ore grades. Throughout 2020, however, the copper industry remained a bright spot in Chile’s otherwise exhausted economy, which contracted by 14% in April 2020 year-on-year, according to Chile’s Central Bank, as Covid-19 ravaged the economy in the midst of tensions over socioeconomic inequality.

According to the IMF, throughout 2020, Chile underwent a deep recession that saw national income decrease between 4.5% and 5.5%. To attempt to mitigate the impact of the outbreak, the government injected stimulus into the healthcare system, used tax measures to provide support to SMEs, and the central bank decreased fiscal policy interest rates to 0.5% while relaxing regulatory credit requirements.

Fortunately, sovereign debt risk remains minimal due to sound regulations, while the banking sector has proven its resilience. Fiscal and monetary policy measures and the gradual opening of the economy should underpin growth in 2021 as vaccination rates increase. Real GDP growth for 2021 and 2022 is expected at 5.3% and 3.2%, respectively, according to the IMF. This, however, is conditional on the political fate of the nation. “Chile is to elect a new government this year whilst undergoing a process of constitutional reform and on the possible resurgence of new virus strains,” said Edyce’s Tomás Fischer Ballerini, General Manager, Edyce.

Drafting a new future

In the near term, Chile’s political climate will be defined by the forging of a new constitution. “The government’s swift response to allow a referendum to rewrite the constitution, and the subsequent results of the referendum, are a testament to Chile’s maturity and stability,” highlighted Timothy Beale, director of CSE-listed Pampa Metals, a junior mining company with interests in Chile. “The country appears to be on a peaceful and positive democratic path that has not affected the ability of the country in general, and businesses in particular, to continue and progress,” he added.

Nonetheless, as Chilean citizens voted overwhelmingly to rewrite the constitution, the set the stage for a dramatic reassessment of the country’s relationship with the environment, public healthcare and national security. Diego Hernández, president of Sonami (Chile’s National Mining Society), told Reuters: “Hardly any project of a very large magnitude will be carried out in the next two years until there is clarity around the new constitution.” Analysts foresee investment lagging until the new constitution is approved by late 2022. The process may also defer capex, already constrained due to Covid-19 restrictions, until investors see more clarity. According to Juan Carlos Guajardo, founder and executive director of Plussmining, a mining intelligence provider in Chile: “The new constitution will mainly tackle the role of the state in the economy and is likely to reshape it to a welfare state.”

“The country’s fiscal strength and its low level of debt as a percentage of GDP provide a financial buffer with which the government can address social demands without risking its credit rating in the short and medium-term or affecting the long-term entrenched favorable base conditions for investing.” Presidential and legislative elections scheduled for November of 2021 add to the uncertainty. If the left-wing Frente Amplio wins the election, it could significantly increase the role of the state and may promote the nationalization
The new constitution is likely to address changes to the water code and glacier protection. The debated glacier protection law has been stuck in Congress since October 2019, and calls for a better definition of glaciers. If approved, it will prohibit mining in glacial areas, hindering the construction of large mining projects by Codelco's El Teniente and Andina. The lack of a clear definition of glaciers already resulted in the controversy of Pascua Lama, an open-pit gold, silver and copper project advanced by Barrick on the Chilean-Argentine border that was forced to halt its activities in 2013 following a Chilean court order.

Water rights are also likely to be considered. "The government is drafting policy regarding water to consider giving water rights a temporary character and restricting some uses, which will affect mining operators if implemented," highlighted Iván Rayo, general manager of JRI Ingeniería, a local multidisciplinary engineering consultancy.

In addition to water rights and glaciers, the constitutional process will tackle the new constitution will mainly tackle the role of the State in the economy and is likely to reshape it into a welfare state. Environmental regulation and indigenous issues will also be addressed. Changing the constitution is symbolic but with profound economic and political consequences. There is a risk that social unrest erupts again if the population’s expectations are not met.

As the industry recovers, what are some of the most significant investments being made in 2021?

The installed capacity of mining in Chile is one of the largest in the world. An immense production capacity is coupled with tremendous challenges. The investments being made in 2021 are to maintain this capacity by expanding mines, some of which are heading underground. Most of the investment is targeted towards brownfield projects. Meanwhile, the greenfield projects under development are Quabirada Blanca and Salar Norte. The industry should be concerned about the lack of greenfield projects being undertaken.

Where do you see future growth potential for Plumining?

The challenges in the Chilean mining industry are entering a new stage as the industry matures. Today the industry is focused on sustaining operations in a complicated environment, characterised by political and economic uncertainty. Plumining’s role is to support clients through this uncertainty by providing guidance and consulting. Increasing use of copper is opening more opportunities around the world, so we will also focus on growing our business development service.

What was Chile’s experience with the pandemic, and how has it impacted the economy?

Preliminary forecasts show a GDP contraction in 2020 of 6 to 8%. The mining industry, however, has been resilient. The sector’s safety protocols were quickly adapted to minimize contagion risks. Production was generally stable or only marginally lower. Some investments were delayed due to logistical challenges resulting from the lockdowns, most of which are resuming in 2021.

How did the permitting process in Chile become more streamlined?

One initiative already implemented is the creation of an agency known as the Sustainable Project Management office (OPS), specifically to support and streamline the environmental permitting process of large projects. The ministry is also developing the National Mining Policy for 2050 in collaboration with the private sector, to be completed in June, to guide the mining industry’s development in the short, medium and long term as an engine for sustainable growth. Various administrative and legal initiatives that favor investment are being considered.

How are foreign investors in Chile protected from changes in the constitution?

Chile has been a healthy foreign direct investment (FDI) since the social upheaval of 2019 and the onset of the pandemic. While FDI flow globally has declined 42% according to UNCTAD, the indicators for Chile show a more moderate decline of 21%. This highlights the confidence that foreign investors still have when it comes to long-term investing in the country. Regarding possible constitutional changes, there is no indication that basic property rights will be affected. Chile’s historical stability and its legal system provide a framework that protects the property rights of foreign investors.

Legal definitions will be essential; the definition of concepts such as glaciers are imperative to determine if projects will be allowed to develop or if they will face restrictions.
Santiago Montt, Fernanda Santoro & Bernardo Aguiler a

SM: CEO
FS: Environmental Engineer
BA: Senior Mining Lawyer

Can you introduce Montt Group and its role in the Chilean mining industry?

SM: Montt Group is a 45-year-old firm, originally a law firm, but since the last 15 years we have transitioned to a consulting group, including professionals such as lawyers, engineers, economists and environmental specialists. We have progressively expanded to almost every Latin American country. Our most prominent offices are in Chile, Peru and Colombia. We are currently constituting mining divisions in Colombia and Ecuador. The group has extensive experience in mining litigation.

How is the environmental law in Chile pushing towards the construction of desalination plants?

SM: The adoption of environmental legislation in Chile is very slow in Chile. This is due to the long process of regulations once a decision is made. Today, carrying out an environmental study takes at least two years, and a declaration of environmental impact at least a year.

Desalination plants can be an excellent solution to the water scarcity that affects the northern and central parts of Chile. Montt Group is working on projects such as Curalco, which would be to have an engineering company in charge of the desalination plant and the construction of the pipeline and to share this infrastructure among a cluster of several mining companies, communities and other sectors.

FS: Desalination projects are a very viable solution for both mining and agricultural projects. However, these are large and expensive projects that require good coordination between different stakeholders.”

BA: Several of the leading mining companies in Chile are moving towards the desalination of ocean water, and this is encouraging the rest of the industry to follow suit. However, there are those that support radical views such as those of the Environmental Ministry and to promote these solutions, such as fostering joint initiatives to share desalination plant infrastructure.

Eduardo Valente

Leading Partner of Consulting
EY CHILE

What are some of EY’s most recent developments since we last spoke?

EY acquired a company in Chile specializing in digital data and artificial intelligence, allowing us to better analyze and use the data from our mining clients to increase productivity and lower costs. We have been working closely with major mining companies in Chile, helping them with their digital transformation programs, which has become a priority in the industry as a whole as it increases efficiency but also enhances safety by reducing operational risks. We see increasing use of digital data analytics, integrated remote operation centres and autonomous mining machinery such as trucks.

What other industry trends have you come across?

Another issue we are witness is regarding the risk associated with the license to operate (LTO). An LTO incorporates the management of relationships with governments, communities, associations and suppliers, to integrate production and reduce carbon emissions, as well as optimize water consumption and energy usage. EY is working with clients to not only ensure compliance with local regulations but also to design tailored strategies for sustainable operations. The key driver of LTOs is the more environmental aspect I foresee an industry that is carbon-negative and one that produces net zero emissions over the next decades. This ability to sell minerals in the future will likely depend on the extent of greenhouse gases used in the process, which will only push mining companies more towards ensuring sustainability.

Is the current political sphere impacting investment in the sector?

As a result of COVID-19, countries’ sovereign debt increased, putting pressure on governments to raise revenue which could drive tax and royalty increases. This poses a risk in Chile, as the mining sector could be responsible to pay for the pandemic debt and stimulus. 2021 is an eventful year for Chile, as it rewrites the constitution following the referendum last year, and holds elections in November. The country is no stranger to democracy, therefore I am confident it will be a smooth transition of power.

On April 11th this year, Chileans will vote for the first time in history for a Constitutional Convention, composed of 155 elected members that will have the responsibility to propose a new constitution for the country. This is the result of months of social distress that started in October 2019 and culminated with a plebiscite one year later. The overwhelming result of which was a decision to write a new constitution.

The Latin America region has been characterized by constitutional changes that often have come in the form of authoritarian governments and have contributed to institutional defects such as lack of rule of law and an overall detrimental scenario for investment. This has a particular impact for capex-intensive and long-term industries such as mining. Chile’s constitutional process, however, has moved forward within the legal framework set out in the current constitution and therefore maintaining the tradition of transparent electoral processes, well-functioning institutions and rule of law that have characterized the country over the last three decades. We see on the Chilean government’s path forward there are those that support radical views such as those of the Environmental Ministry and to promote these solutions, such as fostering joint initiatives to share desalination plant infrastructure.

CHILE MINING 2021

Global Business Reports

Expert Opinion Article by
FRANCISCO ACUÑA,
MINING CONSULTANT AND ENTREPRENEUR SENIOR CONSULTANT, CRU

Chile’s constitutional process and royalty reform discussion: Business as usual or a transformative landscape?

On April 11th this year, Chileans will vote for the first time in history for a Constitutional Convention, composed of 155 elected members that will have the responsibility to propose a new constitution for the country. This is the result of months of social distress that started in October 2019 and culminated with a plebiscite one year later. The overwhelming result of which was a decision to write a new constitution.

The view will likely have an impact on the political agenda. In late March 2020, a 3% ad valorem royalty legislative proposal was approved in the lower house and will move forward the legislative process. The short-term impact for a new royalty tax will mean that mining operations could lose their competitiveness in terms of economic viability. Valuations for mid-sized projects could be significantly reduced resulting in suspension or nullification of the investment decision. It is fair to assume that we might see changes in the upcoming year. Endogenous factors, such as the results of the constitutional process and presidential elections, are the key drivers that could shift the outcome one way or the other. Exogenous factors have also been shown to have a relevant impact (namely the copper price volatility). Finally, the response that the mining sector takes to either oppose or collaborate in this process, and how that is conveyed to the different stakeholders, will likely have an impact too.

This can be a turning point for the industry in Chile, but it could also be the consolidation as a tier one mining jurisdiction that demonstrates how institutional and rule of law can lead to structural social changes while maintaining the incentives of the mining sector for sustaining Chile’s development and growth.
Insights from the ground: Will the redrafting of the constitution impact mining investment in Chile?

“For the mining industry, I don’t expect Chile to move away from the robust and predictable set of rules we have and which have allowed mining investment to prosper and deliver growth in the sector over the last 40 years.”

- Iván Arriagada, CEO, Antofagasta Plc

“Any transformation will be smooth and non-disruptive to the mining sector. There is a great centuries-old mining culture in Chile. Change is a feature of Latin American politics, fortunately, in the case of Chile, change has been often progressive in nature.”

- Alastair McIntyre, CEO, Altiplano Metals

“I am confident in Chile’s ability to redraft the constitution without altering the investor sentiment that it has maintained for decades and that has allowed its rise as the top copper producer.”

- Tony Harwood, President & CEO, Montero Mining

“I believe that moving forward the way we do business is going to be different as it has to evolve with society and meet society’s expectations. Society will demand that business operations are in harmony with the environment and individuals’ livelihoods.”

- Tomás Fischer, General Manager, Edyce

“The process creates opportunities for mining companies to serve in the interests of the environment, local communities and the country in which they operate and to attempt to write the wrongs of the industry’s past mistakes.”

- Brian Miller, Managing Director, Astra Exploration

“We expect changes that will not significantly impact the mining industry, which is a pillar of the Chilean economy. Chile has parties across the political spectrum, however, they tend to meet in the center.”

- Philippe Hemmerdinger, President, Association of Industrial Mining Suppliers (Aprimin)

“In Chile, there are clear legal limits to what can be changed in the process of constitutional reform. There are several international treaties in force that guaranty the protection of investments.”

- Santiago Montt, CEO, Montt Group
“Among the key drivers that allowed the copper price to rebound have been the sizeable Chinese government’s stimulus to boost their economy post pandemic and China’s extremely high copper inventory build-up of refined copper in 2020, followed by other factors such as US stimulus.”

Alejandra Fernández, Mining Director, Fitch Ratings
Copper's anti-viral properties seem to have rubbed off on the Chilean mining industry, which managed to successfully navigate the pandemic disruptions that heavily impacted Peru, Mexico and Australia, resulting in a decrease in global copper supply by 1.2% in 2020, according to Cochilco, the Chilean copper commission.

“The mining sector showed great resilience and capacity to take care of the health and safety of workers, with contamination rates much lower than the average population,” highlighted Juan Carlos Jobet, Bi-Minister of Energy and Mining. “That was complemented with business continuity, as we closed 2020 with a copper output in line with 2019 figures. For comparison, copper production in Peru fell by 30% in 2020, so the industry’s performance in Chile was remarkable last year.”

Global supply disruptions decreased inventories, exacerbating the copper demand and supply gap, which has been in deficit since 2015, and improving the metal’s price outlook. According to Goldman Sachs, the copper price will climb to an average of US$9,175 per metric ton (US$4.16/lb) by 2022, fuelled by optimism over vaccinations worldwide and a strong economic revivals.

In the long-term, analysts foresee demand to dominate copper production in Chile. Major players and an upcoming mid-tier mining scene dominate copper production in Chile. According to Consejo Minero, the Chilean mining association for large scale operators, mining activity in Chile witnessed consistent growth in production until a decade ago, where it stabilized at 6 million mt/y, representing approximately 27% of the world’s copper supply. In 2019, production stood at 5.6 million mt, a decrease of 44,000 mt relative to 2018, primarily due to falling ore grades at the country’s biggest and oldest mines such as Escondida, the world’s largest copper mine and Codelco’s Chuquicamata and Andina.

2020 was an eventful year for producers in Chile, who were able to sustain production even as drastic measures were implemented. From January to May 2020, production increased by 3.5% from 2019. However, despite strong performances from El Teniente, Collahuasi and El Tesoro, overall production in 2020 stood at 5.73 million mt, signifying a 1% decrease from 2019 according to Cochilco, which is remarkable, considering that Peru and Mexico saw their copper production decrease by 14.5% and 4.5%, respectively. Jorge Cantalopps, director of studies at Cochilco, credits the country’s ability to sustain production to the rise in labour productivity, which increased by 24.9% year-on-year.

Cochilco’s report on copper production in Chile from 2020 – 2031 forecasts a 23.8% increase in output by 2031, reaching 7.095 million mt, after peaking in 2028 at 7.35 million mt, as a result of the development projects under construction today. This implies an average annual growth of 1.96%. Between 2020 and 2029, Chile is to witness investment in its mining sector amounting to US$74 billion, including 49 projects mainly copper-related. 68% of these projects are brownfield, 34% are in the execution stage, and 64% are in the feasibility stage.

It also highlights a significant change in the country’s production profile, shifting from hydrometallurgical copper production towards concentrates production, which will represent 54.9% of the total copper output by 2031. Optimism about a balanced copper market for Chile this year is reinforced as major Chilean projects such as Codelco’s El Teniente and Rajo Inca, BHP’s Spence and Teck Resources’ Quebrada Blanca II enter the commissioning phase, coupled with the development of Antofagasta Plc’s Los Pelambres and Capstone Mining’s Santos Domingo project.

Copper

ROBUST PRODUCTION AMID THE PANDEMIC AND RESUMING EXPLORATION

Copper Production per Mine in 2020

<table>
<thead>
<tr>
<th>Mine</th>
<th>Mt/y copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spence</td>
<td>1.0</td>
</tr>
<tr>
<td>Espejos</td>
<td>0.8</td>
</tr>
<tr>
<td>Quivirca Blanca</td>
<td>0.8</td>
</tr>
<tr>
<td>El Tesoro</td>
<td>0.8</td>
</tr>
<tr>
<td>Carro Colorado</td>
<td>0.7</td>
</tr>
<tr>
<td>Candelaria</td>
<td>0.7</td>
</tr>
<tr>
<td>El Arita</td>
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</tr>
<tr>
<td>Zaldivar</td>
<td>0.7</td>
</tr>
<tr>
<td>Anglo American Norte</td>
<td>0.6</td>
</tr>
<tr>
<td>Anglo American Sur</td>
<td>0.6</td>
</tr>
<tr>
<td>Los Pelambres</td>
<td>0.5</td>
</tr>
<tr>
<td>Collahuasi</td>
<td>0.5</td>
</tr>
<tr>
<td>Escondida</td>
<td>0.5</td>
</tr>
<tr>
<td>Codelco TOTAL (1)</td>
<td>0.5</td>
</tr>
<tr>
<td>Codelco - Chuquic.</td>
<td>0.5</td>
</tr>
<tr>
<td>Codelco - Tierra</td>
<td>0.5</td>
</tr>
<tr>
<td>Codelco - Andina</td>
<td>0.5</td>
</tr>
<tr>
<td>Codelco - Salvador</td>
<td>0.5</td>
</tr>
<tr>
<td>Codelco - Gaby</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: Cochilco, GBM
How did Antofagasta overcome the challenges posed by the health crisis? The safety and health of our workers and local communities has always been our first priority and never has this been more important than in the past year. We rapidly shifted our office-based workforce to working from home and introduced a range of new protocols to protect people. We have also been operating with approximately two-thirds of personnel at our key operations, with the rest either working from home or in quarantine. Throughout, we have been working in coordination with government authorities to ensure a consistent approach and also established a US$6 million fund to provide equipment, supplies and financial support to the communities near our operations.

Even though mine development and maintenance activities were initially restricted, operations have adjusted to the new working conditions and resumed. These measures enabled us to continue operating during the past year, allowing us to achieve our full year production guidance for 2020 and lower cash costs than in 2019.

What is the status of the Los Pelambres expansion? The construction of the Los Pelambres expansion project restarted in August alongside a detailed review of the project schedule and costs, including any COVID-19 restrictions. We now expect the project to complete in early H2 2022. Some mines in Chile are located in arid areas, where continental water availability is decreasing. Care for this precious resource is a crucial part of our approach and we are currently making the investments to use about 60% less water for water from 2025 onwards. At the moment, we use raw seawater at Centinela and Antucoya, and we are also building a desalination plant at Los Pelambres to release continental water for agricultural and other purposes in the Choapa valley. The usage of seawater is becoming increasingly common in Chile and no new mining projects of any size will be permitted to use continental water in the future.

How are you actively reducing your environmental footprint while integrating more automated mining techniques? We set a global goal of achieving carbon neutrality by 2040, including eight greenhouse gas emissions by 2030. Therefore, we put innovation at the centre of everything we do through our FutureSmart Mining approach, and we already have several concrete actions underway. This year, all our operations in Chile rely on 100% renewable electricity supply, including Collahuasi. We are also promoting electromobility in our operations and recently implemented a fleet of 17 electric buses to transport our workers. Anglo American also started the pilot of the first photovoltaic plant built on a pit deposit in the world, with a floating island on the Las Tortolas deposits. We are developing the world’s first green hydrogen mining truck. We look for ways to develop more modern and intelligent mining techniques to reduce our environmental footprint. The Los Bronces Integrated Remote Operation Center (IROC) is an Anglo American’s first remote control centre. It allows the Los Bronces mining process to move away from the robust and predictable set of rules we have and which have served the company well, to a more digitalised and dynamic operation. The IROC will allow Los Bronces to operate in real-time and in an integrated manner from Santiago and become the digital operation’s brain, where the integration of all digitalization and remote operation technology projects is materialized. It will incorporate artificial intelligence applications, augmented reality, remote operation technology, and other integrated technologies. With the implementation of the IROC, it will not be necessary to transfer workers to Los Bronces, which means reducing exposure to risk of working at high altitudes and harsh winters. Additionally, this centre will make it possible for a significant number of operators to work remotely, radically improving the workforce’s quality of life. Another similar initiative is our Digital Twin, which is a virtual simulator that allows us to visualize what is happening at Los Bronces mine in real-time. It uses a portable technology that provides workers with a control centre on their cell phone, tablet or computer. Also, since it reduces the need for the transfer of workers, it is beneficial to reduce the number of workers on-site amid the pandemic.

What is your view of copper fundamentals and the key drivers? Following 2020 and the impact of the pandemic, we now have a tight market and expectations are that there will be major stimulus to the global economy. We believe that copper demand growth will continue as the world seeks to find cleaner solutions for modern life. It also plays a key role in the manageable urban development and a post-pandemic world, given its antimicrobial qualities.

While we consume a lot of energy as a sector, we are convinced that copper mining is a key component in the move to a more sustainable world given its energy efficiency benefits, with multiple applications in battery technology, zero-emission transportation and renewable power generation technologies.

Analysts foresee a lag in mining investment in Chile as it rewrites a constitution. Do you see this impacting investment? I believe it is an opportunity for us to address the social issues in our country and positively affect people’s wellbeing. For example, we have several programs to reduce our environmental footprint. We are also promoting electromobility in our operations and recently implement a fleet of 17 electric buses to transport workers.

How are you working with the community? Our local communities have always been our partners in change, given its antimicrobial qualities. It also plays a key role in the sustainable world and cleaner solutions for modern life.

It has been implemented in 52 APRs in the different regions, benefiting more than 120,000 individuals through savings in energy, a reduction in the breakdown of matrices and greater availability of water for human consumption.

To strengthen local capacities, we support and promote the School of Social Leaders, which provides training to representatives of social organizations in leadership, administrative and management for competitive funds. Finally, to promote local economic development, we have created an “El Buen Fin” project. The most important and oldest is Emerge. Through this initiative, we have supported 3,200 businesses in neighboring communities, which have received essential knowledge, tools and advice that allowed them to improve the management and administration of their businesses and significantly increase their sales.

This year, all our operations in Chile will rely on 100% renewable electricity supply, including Collahuasi. We are also promoting electromobility in our operations and recently implemented a fleet of 17 electric buses to transport our workers.
Production rose in some mines in Chile over the course of 2020, while Anglo American reported a steep fall in production of 17.9% year-on-year in the first five months of 2020 as a result of water shortages at Los Bronces. Across its Los Broncos, El Soldado and Collahuasi joint venture, Anglo American produced 647,400 mt in 2020, which is a 1% increase compared to 2019.

On the other hand, Lundin Mining’s Candelaria saw production fall 14.9% to 126,702 mt amid conflicts with trade unions that forced it to suspend operations in October of 2020 until both parties reached an agreement by the end of November. However, Candelaria’s production is expected to rebound to 172,000 – 182,000 mt for 2021. Many major mining companies struggled to maintain smooth relationships with their workforce, and this issue was identified as the seventh risk facing mining companies globally in EY’s Global mining and metals top 10 business risks and opportunities report for this year. While companies moved rapidly to protect their workforce from the outbreak, labour unions criticized them for taking advantage of the crisis to reduce jobs.

To cope with the pandemic, Iván Arriagada, CEO of Antofagasta Plc, explained that the company shifted to working from home and operated with two-thirds of personnel on key sites. “Even though mine development and maintenance activities were initially restricted, operations have adjusted to the new working conditions and resumed. These measures enabled us to continue operating during the past year, allowing us to achieve our full year production guidance for 2020 and lower cash costs than in 2019,” he commented. The British multinational’s total production in Chile in 2020 stood at 733,900 mt. “We expect a solid performance in 2021, with copper production of 730-760,000 tonnes at a net cash cost of US$1.25/lb as ore grades increase at Centinela and operating efficiency at our mines remains high,” he added.

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construct a second US$2.7 billion concentrator in early 2022. Another major expansion project that was temporarily put on hold as a result of COVID-19 restrictions is Teck Resources’ Quebrada Blanca Phase II (QBI2), of which 40% was complete by February of 2021. This project will contribute 316,000 mt of copper for the first five years to Teck’s annual production of 276,000 mt, with an initial mine life of 28 years, using only 25% of the total reserves and with significant expansion potential. The company aims to become carbon-neutral by 2050. To enable this transition, 118 MW for QBI2 will be sourced from AES Gener’s renewable portfolio of wind, solar, and hydroelectric energy. In total, more than 50% of QBI2’s total operating power needs are expected to be from renewable sources.

Teck Resources also operates Quebrada Blanca, Carmen de Andacollo and Nueva Unión, a 50/50 joint venture with Newmont that is said to be one of the largest underdeveloped copper-gold-molybdenum projects in the Americas. It is awaiting the submission of the Environmental Impact Assessment (EIA) to begin the drilling campaign. Meanwhile, 350 km north of Santiago lies Carmen de Andacollo, an open-pit copper mine with a life of mine expected to continue until 2035 and annual production of approximately 60,000 mt. One of the most anticipated expansion projects is the Spence mine. BHP’s second-largest deposit in Chile after Escondida, for which production increased by 4% in 2020. BHP’s wholly-owned Pampa Norte operation, in the Atacama Desert of northern Chile, consists of the Spence and Caro Colorado mines, which collectively produced 243,000 mt in 2020, a 2% year-on-year decrease, primarily due to a 14% decline in stacked ore grade. These are targeting a production of 243,000-270,000 mt in 2021.

The US$2.5 billion Spence expansion project was delayed in April of 2020, as Covid-19 disrupted operations. However, construction was ramped up by Q4 of 2020 to ensure production by Q1 of 2021. According to the Australian giant, Escondida and Spence will rely on 100% renewable energy and eliminate water usage from aquifers by the mid-2020s and 2030, respectively. Freeport-McMoRan’s open-pit El Abra operation, the joint venture with CODELCO, is also working to increase the percentage of renewable energy. The operation was awarded a Silver Seal Energy Efficiency Award from the Chilean Ministry of Energy. The Phoenix-based company is evaluating a large-scale expansion at El Abra, as their focus in Chile is on brownfield expansions. “Pre-COVID-19, we were in the process of doing baseline studies for the significant sulfide resource, but were forced to stop that work,” commented Joshua Omlsted, president and chief operating officer—Americas of the company. “This year, we plan to restart those baseline studies and consolidate all our previous efforts on pre-feasibility studies to determine whether we want to take the project to the next step.” Meanwhile, Europe’s second-largest copper producer: KGHM Polska Miedź, reported record Q2 earnings from its joint venture with Japan’s Sumitomo Metal Mining Co, Sierra Gorda, an open-pit copper and molybdenum mine commissioned in 2014. The mine produced 709,000 mt of copper in 2020, recording a 1% annual increase in production. KGHM was granted environmental approval in 2018 for a US$2 billion expansion, which would extend the mine’s life by 21 years. The plans include an increase to the capacity of the facility’s mill from 190,000 mt to 230,000 mt per day, according to Chilean newspaper Estrategia.

Could you provide an overview of 2020’s production amid the pandemic, and indicate your guidance for 2021?

We had to modify our operating plans as a result of the impacts of COVID-19 on the global economy and the copper market. I’m extremely proud of how well the Freeport-McMoRan team responded to the challenges of the pandemic, specifically safeguarding our people, communities and assets as we executed and delivered on our revised operating plans.

As stated in our recent earnings call, copper sales for 2021 are projected to increase 20% over 2020, and our unit net cash cost of production is expected to decline. Consolidated sales volumes for the year 2021 are expected to approach 3.8 billion pounds of copper, 1.3 million ounces of gold and 85 million pounds of molybdenum.

What are the status and details of El Abra’s expansion? How will it expand your operational capacity?

El Abra, our mine in Chile, has been a part of our asset portfolio for many years and is similar to several other of our operations that are focused on leach production. During the last decade, our brownfield exploration has identified significant sulfide resource opportunity at El Abra. We’ve been exploring to determine if and when a transition from a leaching operation into a sulfide operation is economically feasible. As we look into the future, there are opportunities for growth at El Abra. Studies are currently underway but no decisions have been made at this point.

We’re taking the operation back to pre-COVID-19 levels over the next 12 months or so. Pre-COVID-19, we were in the process of doing baseline studies for the significant sulfide resource, but were forced to stop that work.

This year, we plan to restart those baseline studies and consolidate all our previous efforts on pre-feasibility studies to determine whether we want to take the project to the next step.

How are you addressing the water scarcity challenges of operating in Chile?

At El Abra, we source new water needs for our operations from groundwater and storm water. Globally, Freeport-McMoRan prioritizes maximizing our recycled/reused water across all our operations. El Abra is no exception, especially given it is in an arid region near the Atacama Desert. Our water use efficiency (water reused/recycled) at El Abra averages around 94% annually.

In addition to managing our own water risks, we also are dedicated to supporting our local communities in securing water. El Abra has been supplying drinking water to the indigenous community in Ascotán since 2009.

What is your view of copper fundamentals and its key drivers?

If you look at both supply and demand, the market seems to be tight. The global inventories are as low as they’ve been in at least a decade. From a fundamental perspective, the market continues to be strong, the challenges are around the uncertainties associated with a global recovery and China’s economic growth. Prices have risen significantly in recent months or so. Pre-COVID-19, we were working to turn around this opportunity at El Abra. We’ve been exploring to determine if and when a transition from a leaching operation into a sulfide operation is economically feasible. As we look into the future, there are opportunities for growth at El Abra. Studies are currently underway but no decisions have been made at this point.

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The rise of mid-tier mining

“...a current trend we have noted is the increase in mid-tier mining companies interested in Chile. Large-scale operators are expanding, but there are also several promising mid-sized projects for which we are developing studies,” highlighted Claudio Leach, president of Ausenco in South America, the leading Australian EPCM company operating globally. “We believe there is a strong potential for these projects to be developed in the future. Canadian and Australian junior companies are also increasingly active in Chile, especially in the gold space.”

Chile is known for its major mines, which produce 90% of its output. However, recently the country is witnessing the rapid growth of small to mid-tier mining producers such as Minera Tres Valles (MTV), Mantos Copper, Los Andes Copper, Altiplano Metals, Pucobre, and Capstone Mining.

Capstone Mining’s copper-iron-gold project, Santo Domingo, is Chile’s only fully permitted, greenfield project and is expected to start construction in 2021. “2021 is a pivotal year for Capstone Mining as we are putting together all the pieces to finance Santo Domingo, which is fully permitted,” commented Jerrold Annett, senior vice president of strategy and capital markets for Capstone. “We are expecting to begin construction by the end of 2021 and be in production by 2024. This will more than double the company’s entire production.” On the other hand, MTV ramped up production at its Don Gabriel mine following the completion of its expansion project in early 2020. The company is using block-caving to extract the ore. “This method has a very low unit cost compared to the other potential methods. The initial capital cost has been financed through our strategic partners,” commented CEO Luis Vega, who added: “We rely on a sophisticated monitoring system to control the caving. This is vital to achieving a uniform decrease in the columns of ore over the extraction points, so technology is key to the operation’s success.”

Meanwhile, Canada-based Los Andes Copper is working on the pre-feasibility study for its Vachachitas copper-molybdenum project, 150 km north of Santiago. Eduardo Covarrubias, director of Los Andes Copper, explained that the project has significant geological potential. “The current mineralization is open in most directions. We optimized the project on an operational scale at a starting rate of roughly 110,000 mt/d. With a large land package such as Vachachitas, there are so many alterations that one can spend the next 15 years drilling and finding more resources,” he said.

Another project with scope for expansion is Mantos Copper’s Mantoverde brownfield operation in the Atacama region, for which it secured US$846.6 million in February 2021 to fund the development of Mantoverde’s Sulphide Development Project (MDP). The project includes building a concentrator to process ore from the sulphide deposit and expanding the oxide operation, extending the life of Mantoverde to 2041 and increasing production to approximately 110,000 mt of copper annually and 33,000 oz of gold from 2023 to 2030.

Can you give an introduction to Capstone?

DP: Capstone Mining is a Vancouver-based base metals mining company focused on copper. We have two operating assets, the first-quartz low-cost Coquihalla operation in Mexico and the Pinto Valley mine in Arizona. We also have a large-scale transformational growth project in the Atacama Desert in Chile called Santo Domingo, a top quartile copper-iron-gold project that has a large cobalt deposit.

JA: 2021 is a pivotal year for Capstone Mining as we are putting together all the pieces to finance Santo Domingo, which is fully permitted. We are expecting to begin construction by the end of 2021 and be in production by 2024.

Can you elaborate on Santo Domingo’s timeline and the type of partner you are looking for to advance the project?

DP: Capstone Mining has recently repurchased the minority interest of the project and is again 100% owners. We were also able to bring down the capital cost estimate of the project by completing a US$210 million gold stream agreement with Wheaton Precious Metals. We have also reached an agreement with Puerto Ventanas to build and operate the port. The initial cost estimate of Santo Domingo was approximately US$1.5 billion, but where we stand today, we only need to finance about US$200 million. We would like to bring in a partner on a 30%-50% ownership level.

Can you give us an update on Los Andes’ most recent developments?

FP: We published a Preliminary Economic Assessment (PEA) in June 2019, and we have been working on a pre-feasibility study (PFS), including a drill programme, which we expect to commence by May 2021 following authorization from the government. Los Andes is also currently preparing to develop an environmental impact study.

How are you addressing the issue of power to the mine and to what extent are you relying on renewable energy sources?

EC: Currently, we are still sizing the power requirements of the project. We own hydropneumatic water rights in the Rocin River, allowing us to put together a small hydropower project. We are thinking about where power generation dynamics are going over the next 30 years and want to make sure that we include a significant portion of energy as renewable energy.

What is your vision for Los Andes Copper?

EC: We operate one of the most attractive new copper projects. When you compare Vachachitas with greenfield or extension projects, the fundamentals are very compelling in favor of Vachachitas. We are focused on ensuring that our project’s construction and operation is sound, reliable and favorable from an environmental and social perspective to continue advancing the project.

Can you tell us more about the expansion plans of Farellon and its timeline? Altiplano began expansion of the Hugo Decline at Farellon in early 2020 to access additional copper-gold mineralized material at depth within the iron oxide copper gold vein system. To date, we have accessed the 376 m level underground. We are expanding also to the southwest where we have observed good grades.

How will Altiplano’s new processing facility increase recovery and capacity?

Our new mill is designed to recover copper and gold and will reduce the current processing and trucking costs by 33% and 75%, respectively. We have also designed a magnetic iron recovery circuit which will allow us to capture high value iron concentrate and reduce tailings output by 45%. The facility will also include a de-watering system that will reduce freshwater consumption by 75% and produce dry tailings, ensuring our operations minimize our footprint.

What makes Chile an attractive mining investment destination?

Undoubtedly there is some concern regarding the change of the constitution, however, I am confident that any transformation will be smooth and non-disruptive to the mining sector, as citizens and politicians will recognize the importance of mining and the contribution it brings to the country. Change is a feature of Latin American politics, fortunately, in the case of Chile, change has been often progressive in nature.
Codelco: Going Underground

Chile faces a structural issue regarding productivity growth, as the country’s total factor productivity (TFP) has plateaued since the 1990s and decreased by 4.7% on average every year from 1993 to 2015 as a result of declining copper ore grades, according to the OECD. “Mines must invest in innovations to ensure higher copper ore grades are extracted and productivity is achieved to remain competitive,” confirmed Philippe Hemmerdinger, president of the Association of Industrial Mining Suppliers (Aprimin).

Chile is home to the world’s largest copper producer, Codelco, which accounts for 10% of the world’s known proven reserves and 11% of global annual production. Codelco also operates some of the oldest mines in the world, such as Chuquicamata, the company’s second-largest operation by size. The company’s total production amounted to 1.71 million mt in 2019 and increased by 1% in 2020. The company did however face challenges to maintain production amid the pandemic. Codelco has a plan to invest US$40 billion on its core assets to support its core business over the next decade. Chuquicamata’s life is to be extended with the introduction of a new section called Recursos Nortes, to contribute 20% of the ore fed daily to the mine’s processing facilities. The Diamante and Andesita mines, currently under construction, overall, the expansion will extend the productive life of the mine by 50 years, boosting production to more than 500,000 mt/y compared to 459,744 mt/y it produced in 2019.

Earlier in 2021, Codelco also approved a US$1.38 billion development project for Teniente, which has been operating since 1959 and today includes 3,000 km of underground tunnels. Its US$3.4 billion expansion, to be completed by 2023, will introduce a new section called Recursos Norte, to contribute 20% of the ore fed daily to the mine’s processing facilities. The expansion will extend the productive life of the mine by 50 years, boosting production to more than 500,000 mt/y compared to 459,744 mt/y it produced in 2019.

With great production capacity comes great challenges to maintain productivity amid the pandemic. Copper prices should only help the company’s positioning for the coming years. Codelco’s production rates amid the declining ore grades. The three levels deep underground expansion is to be implemented using conventional drill and blast drifting techniques. By 2026, it is expected to produce 320,000 mt/y of fine copper and 15,000 mt/y of molybdenum. Chuquicamata accounts for a quarter of Codelco’s total production, however 1,700 km to the south lies the company’s largest operation, El Teniente, the world’s largest underground mine. First mined in the early 1900s, El Teniente developed through the years and today includes 3,000 km of underground tunnels. Its US$3.4 billion expansion, to be completed by 2023, will introduce a new section called Recursos Norte, to contribute 20% of the ore fed daily to the mine’s processing facilities. The expansion will extend the productive life of the mine by 50 years, boosting production to more than 500,000 mt/y compared to 459,744 mt/y it produced in 2019.

Investors are wary of a copper supply shortage as demand for the metal is projected to grow by 1.7 million mt/y by 2027, according to the Copper Development Association. The worldwide increase in demand for cleaner energy, coupled with bets on economic recovery pushing metal prices to unprecedent highs, will drive increasing demand for copper. Resulting higher metal prices could cause a 15% to 20% increase in mineral exploration budgets, according to S&P Global. In 2020, Chile registered an exploration budget of US$458 million – the fourth highest in the world and equating to 5.5% of the global exploration budget for nonferrous metals, according to S&P and Coochi. However, this figure decreased by 30% in 2020 as the pandemic pushed companies to slash capex activities such as mine development, exploration and maintenance for a few months. Globally, in 2020, exploration budgets decreased 10% to US$ 8.7 billion compared to US$ 9.2 billion in 2019, with copper being the most affected with a drop of US$560 million, of which the drop for Chile was US$ 196 million.

According to Coochi, out of the 101 companies with exploration projects in Chile, 75 are junior companies, who are active, they represent a smaller portion of the market relative to other mining jurisdictions. Major companies remain the most relevant actors in Chile’s exploration segment, representing 85% of the total exploration budget in 2020. Nonetheless, majors tend to focus on updating their resource base and reserves of their current deposits through predominantly brownfield activities, which is worrying considering the need for greenfield projects given the industry’s recent decline in productivity due to falling ore grades.

“Shareholder and stakeholder pressure is a factor that prevents greenfield exploration and favours brownfield,” commented John Curry, director of prospect generator Excava. “It is false to assume that Chile has no greenfield opportunities and has matured in terms of exploration potential. Also, the past downturn in the commodity cycle has limited access to capital for exploration activities. Another datamap has been limited access to the prospective ground. We look forward to capturing opportunities with the boom in commodity markets,” he continued.

Junior exploration updates

A good portion of the copper prospects in Chile currently undergoing exploration are porphyry-type deposits, followed by iron-oxide-copper-gold (IOCG) deposits. Torq Resources acquired the promising Magarita IOCG project in March 2021, with an exploration target of approximately 20-25 mil. mt of copper at 0.2-0.5 Cu.

Pampa Metals controls a 100% interest in eight exploration projects in northern Chile. “Five of the eight projects’ geology is obscured by young sedimentary sequences, so geophysical exploration is our current priority combined with geological mapping, a program that has already been started at Arrieros,” stated Timothy Beale, director of Pampa Metals. “Pampa-Metals...
What was your strategic motivation behind the creation of Pampa Metals?

The idea to create Pampa Metals was seeded at the end of 2019 when Revelo Resources was looking at opportunities to progress its business and create a separately financed company. Revelo did, and which was able to invest in its own direct exploration. Eight of Revelo’s copper-focused projects were subsequently sold to a private company to create a new vehicle that now falls under the Pampa Metals Corporation name and that is listed on the Canadian Securities Exchange (CSE) with the ticker symbol of “PAMPA METALS CORP.”

Beale

Director

TIMOTHY BEALE

PAMPA METALS CORP.

To what extent has Chile’s stability been compromised following the protests in 2019 and the upcoming constitutional reform?

I do not believe the demonstrations altered the long-term stability. Chile has witnessed over the last decades. The government’s swift response to allow a referendum to rewrite the constitution, and the subsequent results of the referendum, are a testament to Chile’s maturity and stability as the country appears to be on a peaceful and positive democratic path that has not affected the ability of the country in general, and businesses, to continue and progress. The Chilean government is also to be praised for the manner with which it is handling the health crisis and the fact that mining production has largely been maintained.

Do you believe Chile’s declining copper grades are likely to pose a bigger challenge to mining in the future?

It’s inevitable that grade will decrease over time. It is a challenge but not insurmountable. We have great faith in all the projects in our portfolio and their geological prospectivity as they are located along the highly prospective and prime mineral belts in northern Chile. Five of the eight projects’ geology is obscured by young sedimentary sequences, so geophysical exploration is our current priority.

Which of the eight assets is Pampa Metals’ main focus at the moment?

We have great faith in all the projects in our portfolio and their geological prospectivity as they are located along the highly prospective and prime mineral belts in northern Chile. Five of the eight projects’ geology is obscured by young sedimentary sequences, so geophysical exploration is our current priority.

Where do you see the highest growth potential for Pampa Metals in Chile?

Chile is a mature market but in a positive way. Most of the mining activity occurs in the northern desert, where population density is low. Large portions of northern Chile are either underexplored or unexplored, so while it may be a mature mining market, it has not yet reached maturity in terms of its exploration potential. Pampa Metals’ efforts will be directed towards exploration by relying on improved geological models than those used 20 or 30 years ago, allowing us to revisit areas historically explored with fresh eyes and technology, as well as investigating totally new areas.

How do you market Chile as a mining jurisdiction to prospective investors?

We have always rated Chile very highly as a mining jurisdiction. Chile wears the crown of the top copper producer globally comfortably. It is also in the spotlight for its lithium resources and has long attracted attention for precious metals. Mining is the backbone of the Chilean economy and the country offers a sound legal, fiscal and financial framework for investors.
Can you give us an overview of Torq Resources and the company’s transition from Stratton Resources?

Torq Resources is an exploration company focused on establishing a top-tier mineral portfolio and the fourth company within our group of exploration juniors. Our management teams have raised US$550 million and monetized successes in two previous exploration companies, delivering high value to shareholders. Following a comprehensive review, focused primarily on the Americas, Torq saw high potential for exploration projects in Chile, a world-renowned mining country. Chile is attractive due to its stability economically and politically and sound mining code. The silver lining of the pandemic for us has been our ability to find and appoint a highly experienced local technical team to evaluate projects and build a strong portfolio led by Waldo Guadra, who has over 40 years of experience in the industry. Having this highly skilled team is critical as we look for opportunities in the primary mining regions of Chile.

Do you think we are witnessing the beginning of a new commodities supercycle?

We are witnessing the refractory effects of central banks around the world that are injecting stimulus into the world economies at an unprecedented level. This will trigger inflation and a boom in commodity prices. That, coupled with the lack of exploration and production short falls, will place significant upward pressure on the commodity complex. The majors will need to replace their resources as quickly as they can amidst downward trend that began in 2012. The pandemic ignited and exacerbated the upward cycle by triggering one of the most extensive expansionary monetary and fiscal plans in history.

How do investors perceive Torq Resources?

The market perceives our company as having a track record of success, so investors, rightly, have high expectations. Management are also major equity owners, so we are aligned with our shareholders’ interests. We are fortunate to have the exploration team that led the discovery at El Morro working with us. Mines are made not just stumbled upon, and it takes a high level of technical expertise to unlock significant discovery and develop a project that is economically appealing to investors and eventual major buyers. Torq is well positioned to meet this challenge as we combine our capital markets expertise with the team’s exceptional talent on the ground.

Where does Torq Resources see the highest growth potential in the near future?

Making a discovery is where we see the company’s greatest potential to bring value to our shareholder base. Torq Resources fills a void in the market for major companies, as we are equipped and confident in taking the calculated risk associated with exploration. We look forward to playing a significant part in the exploration succession plan in Chile as we seek out market-impacting copper and gold properties.

The industry, as a whole, therefore needs to invest more in exploration as it is the lifeblood of the mining industry. Our advantage is our ability to raise capital for that much needed exploration. By leveraging our global experience, we can fund and uncover projects that will help fill this void. Exploration activities undertaken in Chile today are predominantly focused on immediate production and converting existing resources or revisiting historical data. The decline in greenfield exploration is alarming and cause for concern. The risk-taking attitude towards exploration needs to be fostered and increased. This dormancy period in exploration affects regions like Chile because grounds are not readily open or are held by groups with low interest in exploration.

We are witnessing the reflationary efforts of central banks around the world who are injecting stimulus into the world economies at an unprecedented level. This will trigger inflation and a boom in commodity prices.

“We are seeing an upward cycle for commodity prices, which was expected to follow the downward trend that began in 2012. The pandemic ignited and exacerbated the upward cycle by triggering one of the most extensive expansionary monetary and fiscal plans in history.”

- Michael Kosowan, President and CEO, Torq Resources

“If you look at supply and demand, the market seems to be tight. Global inventories are as low as they have been in at least a decade. From a fundamental perspective, the market continues to be strong, the challenges are around the uncertainties associated with a global recovery and China.”

- Juan Carlos Guajardo, Founder and Executive Director, Plusmining

“Following 2020 and the impact of the pandemic, we now have a tight market and expectations are that there will be major stimulus to the global economy. We believe that copper demand growth will continue as the world seeks to find cleaner solutions for modern life.”

- Iván Arriagada, CEO, Antofagasta Plc

“A supercycle is defined as one resulting from a major structural shift in the market. There is uncertainty to the speed at which the transition will happen to EVs and renewable energy which will determine the nature of this structural shift and the extent to which this is a commodity supercycle.”

- John Currie, Director, Excavco
Chile’s prominent role as a copper producer often causes other metals to be overlooked. While gold production is typically associated with countries such as Mexico and Peru, Chile also has significant gold reserves. US$3 billion in investments have been recently announced in gold and silver projects for 2020-2029. Currently, there are also substantial development prospects for the lithium industry.

- Marco Riveros, Vice President, Cochilco

BEYOND COPPER: GOLD AND LITHIUM POTENTIAL

"Chile’s prominent role as a copper producer often causes other metals to be overlooked. While gold production is typically associated with countries such as Mexico and Peru, Chile also has significant gold reserves. US$3 billion in investments have been recently announced in gold and silver projects for 2020-2029. Currently, there are also substantial development prospects for the lithium industry."

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Image courtesy of Barrick
Gold mining in Latin America tends to be associated with Peru, Mexico, Brazil and Argentina. While the industry in Chile is relatively smaller, ranked 25th in the world according to the World Gold Council, it is one that holds great potential and has been recently attracting attention. The country’s renowned reputation as a mining jurisdiction coupled with the precious metal’s bullish price projections puts the Chilean gold mining industry in the spotlight. “2020 proved a record-breaking year for the gold price, spurred by low interest rates and government stimulus packages used to mitigate the impact of Covid-19,” explained Alastair McIntyre, CEO of Canada-based Alkatanos Metals, a junior resource company with interests in near-term production assets in Chile. “Massive amounts of USD stimulus put pressure on the dollar and with gold priced in US$, it has a natural tendency to rise. As economies need to reflate to get back to post COVID-19 employment and GDP levels, I see the outlook on gold remaining positive.”

According to Cochilco, Chile produced 1.33 million ounces of gold in 2019, representing a 4.7% year-on-year increase. Gold mining in the country dates back to the end of the sixteenth century, and was encouraged later on with the establishment of the royal mint in Santiago. Gold reserves in Chile can be found in sub-volcanic epithermal deposits and porphyry epithermal deposits, as a by-product of copper and molybdenum. The industry has significant potential and is expected to grow in size by 42% by 2023 according to local newspaper El Mercurio.

The northern part of Chile is home to exceptional gold vein deposits by the coast, which is where Gold Fields’ open-pit Salares Norte is located. Construction of the project began in February 2021. The US$860 million operation has an initial mine life of 11.5 years and should produce 450,000 ounces of gold annually for the first seven years. “Production is scheduled for early 2023, not considering any significant Covid-related delays, as announced before the outbreak,” confirmed Max Combes, country manager of Gold Fields in Chile. “By next winter, we will have 1,400 workers on-site, therefore, if we encounter further logistical delays, the expected production may change.”

Meanwhile, Yamana Gold, one of the biggest gold producers in Chile, operates the underground operations El Peñón and Minera Florida. El Peñón saw its production increase in 2020 to 162,000 ounces of gold, from 159,515 ounces in 2019. After drilling from Q4 2019 to Q1 2020, the Toronto-based company reported significant exploration results in March 2020, supporting further mine life extension at El Peñón. Minera Florida also witnessed a successful drilling campaign that led to discovery in 2020, providing flexibility to the operation, expanding the mineral resource base as well as life of mine. Another significant gold producer in Chile is Kinross, who announced in February 2020 to move forward with the La Coipa Restart Phase 7 project, which will require a US$225 million investment. In addition to generating 700 jobs, the asset is expected to produce 690,000 oz of gold from 2022 to 2024. Kinross is also proceeding with the feasibility study for the nearby Lobo Marte project in the Marroncua strip, after the pre-feasibility study estimated a total mine production life of approximately 4.5 million oz of gold. On the other hand, Chile’s environmental court ordered the definitive closure of Barrick’s Pascua-Lama in September 2020, over environmental concerns. Located in the Andes mountains on the border with Argentina, the project has been on hold since 2013 and was one of the largest Chilean gold projects, with probable reserves of 17.8 million ounces of gold. “Work is under way to re-evaluate Pascua-Lama’s potential through a comprehensive internal review of its technical, economic and social aspects and different approaches to permitting,” highlighted Marcelo Alvarez, executive director of Barrick in Chile and Argentina. “As our president and CEO Mark Bristow has pointed out, it appears that combining Lama with Veladero and looking at Pascua separately may make more sense. We are looking closely at this and all other options.”

Chile reached its peak of gold production 20 years ago, at 1.74 million ounces. By 2028, the entry of new projects into operation as mentioned above, namely Salares Norte, La Coipa and El Peñón, will add US$1.2 billion in investment into the sector and approximately 900,000 ounces to national production.\n
Exploration: a gold rush

Given the precious metal’s exceptional performance in 2020, global gold exploration budgets were higher than for other commodities. However, S&P Global Market Intelligence reports that the gold exploration budget in Latin America and Chile decreased by 14% and 35.8%, respectively, between 2019 and 2020. Nonetheless, the region

- Damien Koerber, COO and Executive Director, Equus Mining
- Tony Harwood, President and CEO, Montero Mining
still had the highest budget, totalling US$858 million in 2020 and accounts for the largest share of the global grass-roots stage budget.

Over the course of 2020, Cochilco identified 234 exploration projects being undertaken in Chile, of which 28% were gold-related. Gold-trumped copper, silver and zinc as the target mineral for last year, as it represented 48% of holes drilled in 2020.

The country is increasingly attracting junior miners who are finding access to finance easier than other commodities and focusing on brownfield exploration. According to S&P, fundraising by junior and intermediate companies for gold projects hit a record high from January to September of 2020, amounting to a total of US$4.05 billion.

“The exploration ground in the known gold regions of Chile are dominated by the majors and mid-tier mining companies,” explained Tony Harwood, president and director of Montero Mining, a new junior player in the Chilean gold mining industry. “In the south of Chile, there are some good underexplored opportunities although we would consider opportunities in the north, depending on availability.”

Montero Mining was focused on battery metals in Africa before acquiring the Isabela gold-silver project, for which the drilling program should be complete in 2021. Due to the lack of claims available in northern Chile, new junior companies tend to acquire assets in the south, which is more under the radar of major companies. For example, Australian junior company Equus Mining is to acquire the Cerro Bayo epithermal deposit from Mandalay Resources, where it plans to explore for brownfield and greenfield targets. “We have been exploring throughout the Cerro Bayo mine district for approximately 18 months and have already established an inferred mineral resource of approximately 302,000 ounces of gold equivalent at the Taitao Pit, of which two thirds is potentially open-pitivable,” commented Equus’ COO and executive director Damien Kowber. Meanwhile, Mirasol Resources, project generator and explorer, resumed exploration at the Inca Gold gold-silver project, on the Paleocene belt, after a brief suspension in 2020. The ongoing 1,500 m diamond drill program should be complete by Q2 2021. If exploration demonstrates significant potential for discovery, Newmont agreed to re-imburse Mirasol 70% of their costs and invest in additional exploration.

On the other hand, Astra Exploration is exploring for gold at Pampa Piacencia. Managing director Brian Miller highlighted that the property was first held by BDGold, who were exploring for copper. “It is located approximately 10 km north of Sierra Gorda and the mineralization consists of outcropping silica caps, quartz veins and sub cropping angular quartz fields that align with east-west to north-west lineaments. SQM has a 20% interest in the project and Arena Minerals will also be a major shareholder,” he added.

Max Combes
Country Manager Chile GOLD FIELDS

Can you elaborate on Gold Fields’ ability to stick to the construction schedule of Salares Norte amid the pandemic?

Since engineering, procurement and construction plans were finalized in advance and approved in February of 2020, it allowed the project timeline to be ahead of schedule. Therefore, when the outbreak started, we decided to accelerate some of our purchase orders and the construction plan execution. Construction platforms to begin working on temporary facilities started in April, and the earthwork in September. Meanwhile, the construction of this camp was divided into two stages: phase one which started on time, and phase two that was scheduled for October but was instead rescheduled. A decision was also made to add an additional building to increase the number of beds in the camp, to comply with Covid-19 social distancing restrictions.

Production is scheduled for early 2023, not considering any significant Covid-related delays. As announced before the outbreak, by next winter we will have 1,400 workers on-site, therefore, if we encounter further logistical delays, the expected production may change.

How does this project compare to other Gold Fields’ assets around the world?

This asset has very unique characteristics compared to other Gold Fields’ assets. All our gold plants are located in Australia, West Africa and South Africa, which host a very different climate and altitude compared to Chile and we are using different technology. The geology is also unique due to its gold and silver content. Cerro Corona in Peru is similar in terms of altitude but not in technology since it is a copper mine.

What technology are you relying on to ensure the mine’s efficiency through automation?

We have incorporated certain contemporary mining aspects into the design, such as adopting filtered dry stacked tailings in preference to the construction of a conventional tailings dam. By deviating the tailings prior to placement we will achieve a significant reduction in water consumption, reduction in tailings foot-print and improved physical stability of the tailings facility.

We are in the process of deploying a private LTE telecommunications network to support our digitization strategy and to enhance safety across the site. The LTE network will form the backbone of the mine and plant communications and will allow for the remote operation of certain equipment, e.g. production drill rigs and rock breakers. The design includes a modern integrated operations control room at Salares Norte which will oversee both mining and processing activities. The process plant is equipped with a high degree of automation implemented over the distributed control system and advanced process control will be implemented once the plant reaches steady production. Site operational data will also be relayed in real-time to a remote monitoring room in Santiago where a team of specialists will analyse the data with the aim to enhance operational performance. The project will implement a hybrid microgrid to provide electrical energy, with approximately 18% of the energy being supplied from solar power. This level of solar penetration is near the theoretical limit as the system will operate exclusively in island mode. The use of solar energy will decrease our carbon footprint and ensure project sustainability. We will continue to evaluate options to introduce more renewables and other green technologies into our energy matrix going forward.

Considering the bullish appetite for gold, will Gold Fields focus on exploration in the region?

Since the discovery of Salares Norte deposit in 2011, we have never ceased exploration activities in the district and have drilled several nearby exploration targets. As the Salares Norte project was consolidated in 2017, we started to allocate more resources to increase exploration activities in the district and began for different targeted plots. However, it is a long-term systematic process that could take a year, so it is too early to conclude that there will be another deposit. We are also considering opportunities beyond.

What are Gold Fields’ vision and strategy in South America in the upcoming years?

We are looking to consolidate our position around Salares Norte and create a pipeline of projects. We are also open to other opportunities that may be present in the Atacama or other regions. In Peru, Gold Fields also is looking to make use of new projects that give continuity or expand our presence in this country.

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Global Business Reports

Global Business Reports

Global Business Reports
Could you provide an overview of 2020 production in your Chilean mines amid the pandemic and indicate your guidance for 2021 for your projects?

In 2020, results for Zaldívar (jointly owned by Antofagasta and Barrick, being operated by Antofagasta) were 106 million lb of attributable production of our share at the cost of sales of 2.46 US$/lb and 2.25 US$/lb of all-in sustaining costs. For 2021 the outlook is 90 to 110 million lb of attributable production at the cost of sales of 2.30 – 2.50 US$/lb and 1.90 – 2.10 US$/lb of all-in sustaining costs. Following the completion of mining through a higher-grade zone for the last two years, we expect grades to decline in 2021. Major maintenance is scheduled for Q2 of 2021.

What is your strategy to reassess the potential of Pascua Lama?

Last year, we prioritized the resolution of several legacy issues. This included drawing a line under a legal process related to the Chilean side of the Pascua-Lama project that started in 2013. The Chilean Environmental Court found that no irreparable environmental damage had been caused, but that Pascua should transition to closure, a ruling that Barrick accepted. Pascua-Lama remains an important project and a unique gold deposit, and work is underway to re-evaluate its potential.

How are you allocating your US$8 billion exploration budget?

El Indio Belt has been a prolific generator of multiple world-class discoveries. The strategy is to build a critical mass of smaller deposits to create a mining complex capable of meeting Barrick’s criteria. Extensions of the belt are underexplored and likely to have a different style of mineralization requiring different search criteria, which is being investigated.

The Alturas – Del Carmen deposit spreads across the Chile and Argentine border and has a resource of over 8 million oz of gold and 4,917,000 oz of silver. It is also a high-grade deposit, and likely to have a different style of mineralization requiring Barrick’s criteria. Extensions of the belt are underexplored and likely to have a different style of mineralization requiring different search criteria, which is being investigated.

Andrés Guzmán

VP-Country Administrator Chile
YAMANA GOLD

Could you provide an overview of 2020 production at El Peñón and Minera Florida amid the pandemic and indicate your guidance for 2021?

Yamana’s operations in Chile were able to continue operating under COVID-19 protocols. El Peñón produced 216,749 gold equivalent ounces in 2020, comprised of 161,000 oz of gold and 4,917,000 oz of silver, while Minera Florida produced 90,000 oz of gold. For 2021, we are forecasting gold equivalent production of 215.0 – 229.0 oz at El Peñón, including gold production of 155,000 – 165,000 oz and silver production of 4,365,000 – 4,635,000 oz. Minera Florida is expected to produce 84,000 – 90,000 oz of gold.

What techniques are you relying on to minimize fresh water consumption and source power from renewable sources in your operations?

All of our wholly-owned operations, including El Peñón, are zero process water discharge facilities. Yamana also announced a savings plan in early 2021, which incorporates two high-level targets: a science-based 2°Celsius scenario compared to pre-industrial levels and an aspirational net-zero 2050 target. Our work in 2001 will identify the greenhouse gas (GHG) emissions baseline and establish the abatement pathway to achieve the 2°Celsius and net-zero 2050 targets.

Our operations made progress in optimizing power requirements in the production process. Several projects are underway, such as optimizations in the grinding system at El Peñón and optimization of the ventilation system of the underground mine. As for renewable energy, our focus is on entering contracts with producers who source their power from largely renewable sources.

What is your view on gold fundamentals and its key drivers?

Many of the factors that positively impacted gold in 2020 were in place before the onset of the global pandemic: geopolitical uncertainties, U.S. dollar weakness, elevated levels of government debt. These issues remain, and some, notably government debt, were exacerbated by the pandemic as governments around the world added double-digit trillions in stimulus spending to combat economic disruption wrought by the pandemic. Debt-to-GDP levels are at unprecedented levels, yet stimulus spending is likely to persist. The US$1.9 trillion stimulus package recently passed in the US is a good example of this. At the same time, as the pandemic subsides, pent-up demand for everything from cars and other luxury items to travel to simply enjoying an evening out again will drive an inflationary cycle in what is almost certain to remain a low-interest-rate environment. Interest rates are likely to remain low because, at current levels, worldwide debt cannot support higher rates; the interest payments on such large debt levels at increased rates would simply be too high. Hence, while we may see the price of gold fluctuate near term, as has occurred in early 2021, we believe the underlying fundamentals support a higher gold price longer term.

Demand for copper is also expected to surge in the coming decade as the green transition gains momentum. Yamana is well-positioned to benefit as it holds a majority stake 56.25% in one of the lowest capital intensity copper projects in the world: the MARA project. Located in Catamarca Province, Argentina, MARA has proven and probable copper mineral reserves of 11.8 billion pounds and proven and probable gold mineral reserves of 7.4 million oz on a 100% basis. We are continuing to advance the project with the Feasibility Study and Environmental and Social Impact Assessment expected to complete in 2022. While MARA is not located in Chile, it underscores the breadth of our portfolio in Latin America and represents a significant value that will ultimately benefit our stakeholders everywhere we operate.

Can you elaborate on Yamana’s growth strategy and investment plan in the Chile in the upcoming years?

Yamana has long been recognized as a successful explorer in mining with world-class properties that make it a leader in the Latin American mining sector. In 2020, we prioritized the resolution of several legacy issues and built on our strong relationships with governments at all levels in Chile as well as our community stakeholders undeniably underpinned by mutual trust and respect. We are continually working to grow our business, both organically through exploration campaigns and through acquisitions. If there is an opportunity to acquire a property in Chile, expand an existing operation, or advance an exploration property to development that makes sense for our business, we will not hesitate. We have operated successfully and responsibly in Chile for nearly 15 years, and we look forward to operating here for many more years to come.
Lithium

UNLEASHING CHILE'S POTENTIAL

Some 1500 km north of Santiago lies Atacama, the driest desert in the world and the home to 80% of Chile's lithium reserves. Chile mainly produces lithium carbonate, followed by lithium hydroxide and lithium chloride. Lithium carbonate holds the highest commercial transaction value and can be produced by either hard-rock mining extraction, the technique primarily used in Australia, or by extraction from brine, which is cheaper and more cost-effective.

There are two types of sales in South America. Andean and pre-Andean, the latter holds a higher concentration of lithium. Chile is home to multiple pre-Andean salars, namely Atacama, Punta Negra, Padremanes and Maricunga. However, the Atacama Salar is the only one hosting significant operations, led by Chile’s two lone producers, Santiaga-based Sociedad Quimica y Minera de Chile (SQM) and Albemarle.

Even though the lithium industry is small compared to copper, the lithium market dynamics are exciting in the near future as it is to witness rapid growth due to electric vehicles (EVs). Demand for the white metal did not grow as expected as a result of the global downturn caused by Covid-19. Demand for the metal is to witness rapid growth in the upcoming years. The industry could attract billions of dollars in investment that could facilitate Chile's rise as the top lithium producer in the world, especially given the copper giant’s history and stability in mining-related activities. “Lithium operators are therefore investing in brine extraction projects around the world to secure their lithium supply and take advantage of the upcoming lithium market dynamics. If the regulations surrounding it are addressed in a way that incentivizes private investors, the industry could attract billions of dollars in investment that could facilitate Chile’s rise as the top lithium producer in the world,” commented Steve Cochrane, president and CEO of Lithium Chile, the latter being the largest lithium exploration company in the world’s highest-grade lithium district, where over 50% of the world’s known lithium reserves are located.

Lithium chloride currently has 13 producers in 11 Salars and one Laguna complex, which totals 71,900 acres, commented Wilder Lenny-Pessagno, country manager for sales in the Americas for SQM, which totals 200,000 metric tons per year (mt/y). SQM is set to account for 73% and 74% of the increase in Chile’s lithium carbonate and lithium hydroxide production capacity, respectively by 2025, according to SQM. “The lithium market is poised to experience growth in the foreseeable future, and we expect it to oscillate around US$10,000 per tonne,” explained Marcelo Añando, executive director of TSX-listed White Gold, a junior mineral resource exploration company with interests in Chile. “The key drivers of this are the expansion of the global electric vehicles fleet, and the corresponding forecasted increase in lithium-ion battery production.” By 2033, Chilean lithium production will more than double, from 96,000 mt to 230,000 mt of lithium carbonate, according to companies. At the 11th Lithium Supply & Markets 2019 conference, then Minister of Mining Baldo Prokurica announced an investment pipeline for lithium projects valued at more than US$1.8 billion. The upcoming projects include Albemarle’s US$300 million expansion of La Negra plant phase 3, US$277 million Blanco project and SQM expansion initiatives.

Exploration: regulatory bottlenecks

The two main junior actors exploring for lithium in Chile are Vancouver-based Wealth Minerals and Calgary-based Lithium Chile, the latter being the largest lithium exploration company in the world’s highest-grade lithium district, where over 50% of the world’s known lithium reserves are located. “Lithium Chile currently has 13 properties in 11 Salars and one Laguna complex, which totals 71,900 acres,” commented Wilder Lenny-Pessagno, country manager for sales in the Americas for SQM, which totals 200,000 metric tons per year (mt/y). SQM is set to account for 73% and 74% of the increase in Chile’s lithium carbonate and lithium hydroxide production capacity, respectively by 2025, according to SQM. “The lithium market is poised to experience growth in the foreseeable future, and we expect it to oscillate around US$10,000 per tonne,” explained Marcelo Añando, executive director of TSX-listed White Gold, a junior mineral resource exploration company with interests in Chile. “The key drivers of this are the expansion of the global electric vehicles fleet, and the corresponding forecasted increase in lithium-ion battery production.” By 2033, Chilean lithium production will more than double, from 96,000 mt to 230,000 mt of lithium carbonate, according to companies. At the 11th Lithium Supply & Markets 2019 conference, then Minister of Mining Baldo Prokurica announced an investment pipeline for lithium projects valued at more than US$1.8 billion. The upcoming projects include Albemarle’s US$300 million expansion of La Negra plant phase 3, US$277 million Blanco project and SQM expansion initiatives.

Garaldo Illanes, chief financial officer of SQM, explained the company’s upcoming US$400 million investment plan to expand their production capacity of lithium carbonate, which currently stands at 70,000 mt/y to 120,000 mt/y by the end of 2021. “By 2023, we will expand our production in Chile to 180,000 mt/y. On the other hand, lithium hydroxide production will increase from 13,500 mt/y to 30,000 mt/y by 2023,” he added. SQM is set to account for 73% and 74% of the increase in Chile’s lithium carbonate and lithium hydroxide production capacity, respectively by 2025, according to SQM. Meanwhile, Albemarle started the La Negra expansion project, notwithstanding the 15% year-on-year decrease in its sales for 2020. The North-American company’s US$300 million expansion in two Chile are being carried out in waves, and will result in an increase in Albe marle’s lithium carbonate capacity by 42,700 mt/y at a low cost.

Environmental concerns: water

Lithium production through brine extraction requires a considerable amount of water, which South American countries have only recently started measuring. To extract lithium, mining companies must drill in the salt flats, then pump the mineral-rich brine to the surface. The liquid then evaporates in huge pools, raising the concentration of lithium from 1% to 6%.

Even though the process is relatively cheap and effective, it is problematic because it sparks conflict with indigenous communities, especially the farmers and the government, over the allocation of water in one of the driest regions on the planet, since the process can use up to approximately 500,000 gallons of water per tonne of lithium, according to the Institute for Energy Research (IER). There is also potential for air contamination and for the leakage of toxic chemicals from the evaporation pools into the water supply.

Lithium operators are therefore investing in new more sustainable technologies of lithium brine extraction and setting strict targets to minimize their environmental impact. Ilanes of SQM explained: “Our ambitious goal is to reduce our water consumption by 40% by 2030 and 65% by 2040. In the caliche ore operations, we will rely on the use of seawater. SQM will also reduce brine extraction by 50% by 2030 in the Salar de Atacama, which will be a challenge because it means to quadruple our lithium production.”

The lithium industry in Chile shares the same challenges as copper and gold—industry access to water, environmental issues and limiting the impact on local communities’ interests and trying to strike a balance between ensuring sustainable yet profitable operations. However, the industry’s unique challenge lies in the lack of clear operational rules. The guidelines of operating in Chile’s pre-Andean salars should be revised from an economic and environmental perspective to set the standards for future operating permits.

The Chilean government launched multiple initiatives, showing its awareness of the industry’s challenges and potential. For example, the Ministry of Mining and the Nuclear Energy Commission (CCHEN) are working on documents to present their case for lithium commercialization quotas. The Ministry is also working alongside the Inter-American Development Bank (IDB), preparing a study for sustainable lithium brine exploitation in the lithium triangle.
Our plan focuses on four initiatives. We plan to reduce our continental water consumption, as we operate in the driest place on earth, where water scarcity is pivotal to the region. Our goal is to reduce our consumption by 40% by 2039 and 65% by 2049. One of the most relevant initiatives we are working on to achieve this is developing a seawater pipeline.

Even though SQM is the lithium player with the lowest carbon footprint, the second initiative addresses carbon emissions, as our mining for carbon neutrality in our production of lithium, iodine and potassium chloride by 2039 and for all our products by 2049. Thirdly, SQM will reduce brine extraction by 50% by 2030 in the Salar de Atacama, which will be a challenge as we plan to quadruple our lithium production. Our production of lithium was 48,000 mt/y, which we expect to increase to 180,000 mt/y within the next two to three years. Only, the last initiative includes developing our relationship with surrounding communities by ensuring an ongoing dialogue with them.

What investments is SQM making to increase its production capacity of lithium carbonate and lithium hydroxide? We are investing approximately US$400 million to expand our production capacity of lithium carbonate in Chile, which currently stands at 70,000 mt/y, to 120,000 mt/y by the end of 2021. By 2023, we will expand production in Chile to 180,000 mt/y. On the other hand, lithium hydroxide production will increase from 13,500 mt/y to 30,000 mt/y by 2023.

Do you see challenges for Chile as a lithium mining destination amid the regulatory uncertainty surrounding the metal? Chile has a strong mining history. The regulatory framework has always been clear, and that is why so many companies have invested so much over the past several decades to develop the mining industry. On our end, we are making considerable investments in developing not just our lithium operations but also our iodine and nitrates operations in Chile. Rules are enforced, as they should be, to make sure mining activities have minimal impact on the environment and local communities. We have a great partnership with CORFO to operate the Salar de Atacama in the most sustainable and efficient manner, and we are working very hard to make this partnership stronger and more beneficial to CORFO, the local communities, the country and our shareholders.

What are some of the critical drivers of the lithium market globally? In the recent past, the main drivers for the demand growth were traditional applications, such as aluminum alloys, ceramics, lubricants and many others along with batteries for portable electronic devices and some for electric vehicles (EVs). These days, demand for EVs has grown tremendously as most auto-makers are switching to this new technology, resulting in more alternatives for end-users, with better performance and at a lower cost, all while taking care of the environment. We see demand growing at a high pace over the following years, resulting in a threefold increase in lithium demand before doubling again in the next five years.

Where does SQM see the highest growth potential? The obvious answer to this question is lithium, as the market is growing at a very high pace, based on solid fundamentals, and is expected to continue for many years in the future. But the potassium nitrate industry is expected to continue growing at a healthy 5% per year, and SQM is very well positioned to capture part of this growth. The iodine business, on the other hand, continues to be a very attractive business as we are the lowest-cost producer in an attractive market. Finally, the solar salts industry has a huge potential as the world transitions towards greener ways to produce and store energy.

Can you elaborate on Lithium Chile’s properties and flagship projects? Lithium Chile currently has 13 brine samples assaying up to 1820 mg/l lithium, which totals 71,900 acres. Salar de Coipasa is one of our flagship properties and is also located on the border. Lithium Chile is the second-largest Salar in the world, and the property straddles the Bolivian border. Lithium Chile controls approximately 70% on the Chilean side of this prospect, with the Bolivians holding the remainder. Both properties are under exploration, and this high growth is expected to continue for many years in the future. But the potassium nitrate industry is expected to continue growing at a healthy 5% per year, and SQM is very well positioned to capture part of this growth. The iodine business, on the other hand, continues to be a very attractive business as we are the lowest-cost producer in an attractive market. Finally, the solar salts industry has a huge potential as the world transitions towards greener ways to produce and store energy.

We are investing approximately US$400 million to expand our production capacity of lithium carbonate in Chile, which currently stands at 70,000 mt/y, to 120,000 mt/y by the end of 2021.
"I do not think we are experiencing the same mining boom we had 8-10 years ago. This said, we see more dynamism in lithium, rare earths and iron ore. It will take 5-7 years to ramp up these new projects, but there is an opportunity there because all these projects require a lot of infrastructure, from transmission lines to ports."

- Sandro Tavonatti, CEO, Sigdo Koppers Ingeniería y Construcción (SKIC)
between 0.5 and 0.7 cubic meters of freshwater per ton of ore. The shortage of fresh water in its arid areas, such as the north, where the majority of copper production takes place, has grave economic, social and environmental consequences. Water is a critical component in mining operations, used in hydrometallurgical processes, concentrators, smelters and re-finery, as well as other processes. According to a McKinsey report, the industry consumes enough water annually to provide for 75% of the Chilean popu-lation, and net freshwater consumption by copper mining is processed, with water held in tailings dams and its eventual evaporation and leakage one of the main reasons for this consump-tion, reported the Alta Ley Corporation. As a result of the ongoing water scarcity crisis and the indus-try’s high consumption, the Chilean Congress is discuss-ing amendments to the Water Code to limit freshwater withdraw-al. The mining industry is under pressure to decrease its freshwater usage and must seek other solutions such as de-salination, reuse and seawater flotation. “A primary concern is water scarcity. The country is at a turning point in matters of the environment, especially given the drafting of the national constitution. Projects have to be mindful of these risks and adapt their operations accordingly,” com-mented Iván Rayo, general manager of JRI Ingeniería, a Santi-ago-based engineering company working on Codileo’s Rajo Inca. “The government is drafting policies regarding water to consider giving water rights a temporary character, restricting some uses, which will affect mining operators if implemented.” Miners using continental water sources will be constantly threatened, as the recent case of Anglo’s Los Bronces has shown. According to the production report, Los Bronces production per output decreased by 28% in Q4 of 2019, due to a 44% decline in the plant’s processing capacity as a result of lack of water. It eventually came to an agreement with Codileo to use water from the tailings dams of the adjacent Andina mine. Chilean miners are already concerned with declining ore qual-ity. Now they must consider how to process a larger amount of ore while minimizing their water and energy usage, as the copper production matrix in Chile will change in the upcoming years and rely on the treatment of sulphide minerals which is an even more water-intensive process, according to Cochilco. However, another challenge is transporting water from the coast to high altitudes where most mines are found. | How has SRK evolved since we last spoke in 2017? SRK in Chile has grown and diversified since its establishment in Chile in 1994 from providing support on just geotechnical and environmental services for local mines, to include most mining disciplines today as SRK covers a project from exploration to mine closure. During the last years, we provided integrated services to the mining industry around the world. Our competitive advantage has in our ability to work in challenging conditions, whether extreme weather or remote locations. We leverage the skill and expertise of our engineers and consultants globally to ensure the best possible service for our clients. | Esteban Hormazabal | Global Manager SRK CONSULTING CHILE | INTERVIEW CHILE MINING 2021 Industry Explorations Global Business Reports | Chile Mining 2021 Industry Explorations Global Business Reports | Chile Mining 2021 Industry Explorations Global Business Reports | The journey to green mining: Water and energy | Energy Use in Processes Source: Alta Ley Corporation, Chile | Energy (PJ) 80 70 60 50 40 30 20 10 0 Mins Concentration Smelting Refining LX/SX/EIO Services | Mins | Electricity
Dave Lawson
President Mining and Minerals

WOOD

How does Wood’s growth strategy in Chile differ from Peru?
Our clientele in Chile is relatively mature with operations for decades, such as Codelco, Antofagasta Plc, BHP and Anglo American. Peru is still a developing market compared to Chile that we decided to best approach through mergers and acquisitions. Chile’s environment differs significantly from Peru, as mine sites are built in more remote locations with high altitudes.
We are working on the detail design for Codelco’s Chuquicamata at the moment under our underground mining division based in Santiago. We are seeing more potential for underground mining growth in Chile at the moment compared to Peru. Wood also works in Australia, North America and Africa. Our focus in Australia is predominantly lithium, as we are working with Albamare. On the other hand, in Africa we are working on copper, gold and platinum.

What trends are you witnessing for your services in the market this year?
We see an increase in mine development in Chile, as many clients are demanding feasibility studies and pre-feasibility studies. As Wood, we are developing the ‘Mine 2050’ concept for our clients. The mine of the future would rely on sophisticated technology using artificial intelligence, robotics and automation in mining processes to facilitate a fully automated plant and operation. Covid-19 has pushed the industry further towards the digitalization of processes overall. Mines are now looking to operate from control rooms in remote locations. However, some of our clients prefer task forces on the ground more than remote operations, mainly due to the risks surrounding complete remote operations, such as cybersecurity attacks.

Can you elaborate on Wood’s innovation in sustainable solutions for water and tailings management?
In Santiago, our Resilient Environments business is developing creative solutions for water and tailings management in the industry. Most mines in Chile use seawater to become more sustainable, and we are also seeing wind and solar power solutions playing major roles in the provision of electricity to the mining industry. Wood provides mining solutions that utilize applied intelligence to enhance operational and environmental sustainability.
Regarding tailings management, a solution often considered is the use of dry stack tailings as it significantly reduces the environmental footprint. However, the mine’s location and size may restrict it from using this method. Also, converting an existing tailings management solution to dry tailings would have financial implications that would require investigation to ensure feasibility. Some of the equipment needed for dry stack tailings has to increase in size to respond to current market trends. We are working with some equipment manufacturers to address this issue.

What potential do you see for the incorporation of green hydrogen energy solutions in the industry?
Green hydrogen is an area we expect to see immense growth in over the upcoming years. Wood’s track record in the technology, production and the use of hydrogen is decades-long, with a number of successful hydrogen projects delivered for clients around the world.

Where is Wood’s focus in the upcoming years to facilitate growth?
We successfully completed the Spence project for BHP, where our teams were hired as the integration contractors for the last four years. In the near future, we hope to leverage our expertise and offer the same service to our clients, which we think will be well received.

Are desalination plants the answer?
Chile opened its first desalination plant in 2003, in Antofagasta for human use. The leading mining operator in desalination in Chile is by far BHP with its Escondida Water Supply (EWS) project, the largest desalination plant in the Americas. By 2028, there will be a total of 27 desalination plants in Chile and, by 2031, 47% of the water used in mining will be extracted from the sea, according to Codelco. The Antofagasta region will have the highest number of desalination plants, supplying 66% of the copper industry’s water consumption, followed by regions of the Atacama, Tarapacá and Coquimbo. The 15 desalination plant projects include INCO’s complementary infrastructure project by Antofagasta Plc, being also executed by Bachtel. This expansion project obtained Chile’s first certified green loan for its construction, due to its focus on water efficiency.
Another upcoming desalination project, expected to be the second-largest in the country, is Codelco’s US$1 billion desalination project to supply 350 l/s to Radmiro Tomic, Chuquicamata and Ministro Hales mines, in addition to its facilities in Calama. The tender for the project was reactivated by the end of 2020 when Codelco decided to reformulate the project.

Other plants under development include Collahuasi’s desalination plant, which will have an initial capacity of 525 l/s and an extension that would have a capacity to treat 1,300 l/s, being executed by a leading water treatment EPCM solutions provider IDE Technologies. Desalination plants in northern Chile are built along the coast and water is transported using a complex pipeline system that requires non-corrosive piping. Jorge Donoso, the general manager of Techni Engineering and Construction who is working on the Collahuasi plant, explained that the company is witnessing an aroused interest in their pipeline services as a result of the industry’s move towards desalination solutions. “We also see a trend towards sharing infrastructure among mining companies. For example, in the northern district of Codelco, there are three mines operating in the same area, and all three customers have agreed to invest in the same infrastructure to distribute water to all the mines. We believe that this is an excellent long-term and sustainable solution in terms of environmental impact and cost,” he elaborated.

A by-product of desalination is brine, which is released back into the sea. According to José María Guzmán, country manager of CDM Smith in Chile, desalination is part of the solution, another part is water recycling: “The environmental impact of desalination has been an excellent trend for our firm in Chile, and our experience indicates that the impacts of desalination can be controlled and mitigated. For example, the correct discharge of salt using dissipers increases dilution rates and reduces the threat to marine biodiversity.” When it comes to minimizing water use in drilling, Tomás Buttazzoni, general manager of Technosteel highlighted:

“Every drilling rig uses a significant amount of water a day. The use of a mud plant addresses this issue as it ensures additives are not polluting the soil and allows for water recovery, decreasing water use by 30%.”

Water scarcity is an ever-growing challenge in Chile’s mining regions. Every drilling rig uses significant amount of water a day. The use of a mud plant addresses this issue as it ensures additives are not polluting the soil and allows for water recovery, decreasing water use by 30%.

Source: Aqueduct Water Risk Atlas; Cochilco; Water Atlas; MineSpans by McKinsey
In commemoration of the company’s 39th anniversary, what have been the most significant milestones for JRI?

JRI is a company that has never stopped growing and expanding its portfolio of service offerings. This year we are expanding our research center, which was created in 2008, by adding a new building and strengthening our focus on highly technical studies. JRI is home to more than 400 engineering professionals and we are investing during a period of economic downturn, which is testament to the company’s growth-led mindset and determination.

Since 2017, the Chilean market for engineering services has been highly competitive because mining activity in the country saw a slight decrease. With the pandemic, the market has tightened even further. We expect the renewal of mining operations in 2021 to increase demand for mining services.

What is JRI’s current portfolio of projects?

Since 2019, JRI has been a partner of Rajo Inca, one of Codelco’s landmark copper projects. JRI designed the conceptual and basic engineering of the mine and is currently involved in operational engineering as well. Due to its age, the mine has a very challenging geotechnical profile. Our work has allowed the mine to increase its capacity and ensure mining conditions are up to modern standards. JRI is in charge of all the project’s engineering needs, which has an investment value of $US1.38 billion.

How do you incorporate technological advancements and software in your operations?

In 2019, the company incorporated Building Information Modelling (BIM) in its operations. This system represents the digitalization of mining, where dimensions are calculated and mapped on a monitor. This technology was ground breaking for mining, an industry that until recently had not been able to apply such processes due to the complexity of its engineering. JRI decided to utilize BIM in all its projects to better integrate the engineering, construction and operation stages. This way, we offer clients a long-term tool for their operations. JRI is a company that has never stopped growing and expanding its portfolio of service offerings. This year we are expanding our research center, which was created in 2008, by adding a new building and strengthening our focus on highly technical studies. JRI is home to more than 400 engineering professionals and we are investing during a period of economic downturn, which is testament to the company’s growth-led mindset and determination.

Where do you see the highest growth potential for JRI?

Our plan is to develop detailed engineering solutions for structural projects like Rajo Inca. Participating throughout the different stages of the mine life is also a priority. We want to reinforce our focus on concentrate plants, underground engineering, tailings and pipelines. In terms of expansion abroad, we are waiting for the right time. Although we have the capacity to serve Peruvian engineering needs, the mining sector has fluctuated downward due to the pandemic. When investment in Peruvian mining activity resumes, we will be the first to expand our engineering services to the country.

How important is sustainable management of mining processes?

Chile is facing important environmental challenges due to climate change. A primary concern is water scarcity amid the ongoing drought. The country is at a turning point in matters of environment, especially given the drafting of the national constitution. Projects have to be mindful of these risks and adapt their operations accordingly. The government is drafting policies regarding water to consider giving water rights a temporary character, restricting some uses, which will affect mining operations if implemented.

How would you characterize the health of the Chilean mining industry?

The Chilean mining industry is facing challenges, many of which are due to the depth of mines. The depth of underground mines creates a risk of geotechnical failure. Climate change has increased precipitation in Chile’s mountainous regions which complicates the water management processes at mining sites; water drainage is also an issue for deep mines. Other challenges include electro mobility and ventilation. Finally, the mine’s transport systems are a central concern among many operators, especially when vertical extraction processes are necessary. Mines in Chile are getting deeper which is exacerbating the need for sophisticated engineering solutions.

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Did you have a dream job in mind when you were younger?

I had a fascination for design, and I decided to become an architect. However, during my studies, I realized that my true passion was for engineering. I switched my focus to civil engineering and ventured into the mining industry, where I found my true calling. I have always been fascinated by the complexity and scale of mining projects and the engineering challenges they present. Over the years, I have honed my skills in underground mining design and become a leader in the field.

What is the most rewarding thing about your job?

The most rewarding aspect of my job is seeing the impact of our projects on the mining industry. JRI’s work has contributed to the development and expansion of mining projects across Chile and Latin America. Witnessing the completion of projects that we have been involved in from the conceptual stage to the operational phase is incredibly fulfilling. It’s a testament to our commitment to excellence and our ability to deliver high-quality solutions. Additionally, seeing the positive outcomes of our projects, such as increased productivity and environmental sustainability, is incredibly rewarding.

What do you do to maintain a work-life balance?

Maintaining a work-life balance is crucial for sustainability and personal well-being. I make a conscious effort to set boundaries between work and personal life. I prioritize my family and personal time, ensuring that I take breaks and engage in activities that I enjoy. In addition, I practice mindfulness and relaxation techniques to manage stress and maintain mental health. I also make sure to maintain physical activity and a healthy diet to support my overall well-being.

What advice do you have for younger people interested in engineering?

For younger people interested in engineering, I advise them to pursue their passions and interests. It’s essential to develop a strong foundation in the technical aspects of engineering, but also to cultivate a creative mindset. Enhancing communication and analytical skills is crucial, as is the ability to lead and collaborate with others. Seeking out mentorship and networking opportunities can provide valuable guidance and connections. Finally, I encourage them to stay curious, adapt to change, and embrace challenges as opportunities for growth.
What have been Arcadis’ greatest milestones in Chile?

One of our key milestones is our integration with Geotechnica Consultants, as we combined the expertise of a global company with the legacy of a local company. Through further acquisitions we developed our process-focused capabilities, such as the concentration and hydrometallurgical beneficiation of minerals. Since Chile is a large producer of copper using both of these technologies, it was a great combination to add to our portfolio and we were able to deliver services to projects in different sectors, from profile engineering to EPCM projects.

Arcadis is differentiated in the water management field, but still decided to incorporate another company, Geotechnica, to complement our full range of capabilities to deliver various water management services for both continental and seawater.

Can you give us an overview of CDM Smith’s role in the mining sector?

JMG: We have been involved at BHP’s Spence mine in northern Chile as the client decided to outsource and engineering, procurements, and CDM Smith has had several roles through the project, and is now assuming an advisory role during operations. We offer engineering services that encompass water management, remediation, program management and geological services. The company can be involved throughout the entire mine life providing consulting engineering services that ensure operations run smoothly and that the operation’s legal requirements are met. Commitments are upheld. Collahuasi, Minera Escondida, Nueva Union and Cerro Colorado are other mines where CDM Smith has been involved.

RM: For CDM, it is important to participate in a mine’s entire life cycle. Our experience in project management, for example, allowed us to participate in the expansion of the desalination plant at BHP’s, Minera Escondida — a mega project which concluded in February 2020.

How does CDM Smith help companies mitigate drought-related risks?

JMG: CDM Smith monitors water availability and demand and building capacity for mining projects to identify water management schemes that are more resource independent. In Chile, due to the long distances between mines and water bodies, long-term planning that is conscious of environmental impact is crucial.

JMG: Is there a large potential for business related to mine closures. Environmental requirements emphasize water treatment facilities and management. CDM Smith can play a role in the execution of mine closures with the management and transportation of raw water for mining processes and tailings. The company’s project management expertise makes it an interesting option to clients, especially concerning reporting and data tracking.

Arcadis is involved in more than 70% of all significant tailings projects in Chile. Can you elaborate on tailings designs, and which is the most popular in Chile?

JMG: Tailings retention in Chile is strict, especially regarding water. Therefore, many of our designs are focused on leveraging the water in the tailings reservoirs to bring it back into the operation. We are continuously evaluating our processes to enhance efficiency and sustainability with new technologies.

What demand trends is the company currently witnessing for its services?

JMG: After the commodity price recovery, we saw that projects that were delayed due to dormant prices had resumed. We also saw an increase in demand for our services for projects moving to final execution. We are witnessing a trend of moving towards increasing sustainability and digital innovation, at the early stages of the value chain, due to the need for efficiency and social responsibility.

The Chilean government will soon pass a new Supreme Decree 248 to encourage the mining industry to move towards more sustainable and digital operations.

How would you say the permitting process has improved in Chile?

JMG: Over the years, institutional legislation in Chile has become stricter and the permitting process has been refined so that it is now an excellent process. Each country has certain particularities that need to be adhered to, thus, mining companies need an experienced team such as Arcadis, as we know what the authorities require and can mitigate risks. However, there are areas in the process that can be improved.

One of the challenges is that engineering and construction usually come after the EA study but should be done in parallel as the commitments taken at this stage impact profoundly on design and execution.

How has Ausenco grown in Chile in the last few years?

Claudio Lesch

President South America

AUSENCO

Ausenco is a global company founded in Brisbane, Australia 30 years ago. In 2008, we entered the South and North American markets through a series of acquisitions, including Pipeline Systems Incorporated (PSI) and Vector Engineering, that allowed us to better position ourselves in the Chilean market. Today, the South American market represents 45% of the company’s revenues, with Chile and Peru being the largest contributors.

In Chile, we provide consulting, design, and construction services from mine to port, including process plants, tailings, environment, permitting, asset management & optimization, pipelines and transportation & logistics. A safety achievement we are incredibly proud of is surpassing 6 million person-hours lost time injury free across our projects in Chile.

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We were recently awarded the EPC turnkey contract for Mantos Cobre’s Mantoverde Development project — a defining moment for us. We will deliver or a 30,000mt d copper concentrator plant and related infrastructure as well as significant carbon emission-reducing benefits. We are also working with BHP on the commissioning services of the Telfer Growth Option project, and we have been awarded a similar contract to provide commissioning services at Teck’s Quebrada Blanca project, where we are currently providing field engineering services.

What set Ausenco’s proposal apart from the competition for the Mantoverde project?

JMG: We were chosen because of our excellent track record in delivering similar projects as well as our capital-efficient and optimized design. We reduced the plant’s overall footprint by relocating the primary crusher, redesigning the stockpile reclaim tunnel and optimizing grinding and flotation. This reduced earthworks excavation and concrete requirements.

Can you elaborate on the challenges of developing mining projects unique to Chile?

JMG: Water scarcity is an ongoing challenge in Chile. The desalination and transport of seawater require large amounts of energy and increases operational costs for projects. Communion is also an energy-intensive process. The industry is becoming more concerned about the potential of renewable energy sources to address rising energy costs and sustain the industry’s growth.

Another challenge is bureaucracy. This affects how quickly projects are approved and permitted. The industry and government are aware of this issue, and efforts are being made to streamline the process.

How would you characterize the current trends in the Chilean mining industry?

JMG: Large-scale operators are expanding, but there are also several promising mid-sized projects for which we are designing solutions. In Chile, there is a strong potential for these projects to be developed in the future. Canadian and Latin American companies are also increasingly active in Chile, especially in the gold space.
Water reuse

Even though desalination plants present a long-term solution, it is also a very costly solution. The additional seawater desalination plants to large-scale projects adds at least US$1 billion to the project’s capex, or up to US$3 billion if it is as enormous as Escondida, in addition to high electricity costs to pump the water to high altitudes. Therefore, another way of limiting water usage is through recycling.

“Freeport-McMoRan prioritizes maximizing our recycled/reused water across all our operations. El Abra is no exception, especially given it is in an arid region near the Atacama Desert. Our water use efficiency (water reused/water incurred) at El Abra averages around 94% annually,” highlighted Joshua Olmsted, Freeport’s president and chief operating officer-Americas. Kinross, likewise, has noticed increased water re-use rates do not reach 85% at least, time and再次, our Escondida-based plants will be required by 2028. Antofagasta Plc is already making investments to use about 90% of water re-used/re-cycled in 2025 onwards, and Teck’s Q26 includes significant mechanisms for water reuse.

Tailings management

Only a small fraction of the large volumes extracted is the target mineral, which is obtained after processing, leaving behind tailings that consist of other chemical elements such as reagents and ground rock with water. The tailings represent between 85% to 95% of this material. Different initiatives are being taken to find value in tailings, such as Codelco, for example, through its subsidiary Codisclo Tech looking to identify traces of chemical elements such as germanium, gallium, tungsten, rare earth and others. Tailings are also crucial in the reduction of water consumption and reuse, since huge amounts of water are trapped in tailings, so mining companies are investing in large-scale filters to recover the water and remove the impurities. The impurities pose environmental problems to surrounding inhabitants, especially since there is always a risk of tailings dams collapsing due to the broken retaining walls that result in flooding of adjacent land, which has occurred in the past in Brazil, Mexico, Peru and Australia. As a result, mining companies are investing in sustainable and durable tailings management systems. For example, Los Andes Copper is using dry tailings in its Viacachitas project. “The project’s footprint will also be reduced as our tailings will be disposed of as a solid and will eliminate the need for a tailings dam,” confirmed director of the company, Eduardo Covarrubias. Even though a dry tailings option seems like the ideal solution, according to Dave Lawson, president of the mining and minerals at Wood, a dry stack tailings option is restricted by the mine’s location and size. “Converting an existing mine’s tailings management solution to dry tailings would have financial implications that would require investigation to ensure feasibility. Some of the equipment needed for dry stack tailings has to increase in size to respond to current market trends,” he added. Meanwhile, Mathiesen, an international group dedicated to the manufacture, marketing and distribution of specialty chemical products, sees great potential in supplying chemicals that optimize water recovery. “Given the unique chemical properties of mine tailings and the importance of its processing, the company plans to boost investment in water treatment,” commented Humberto Pasten, mining division manager of Mathiesen.

“We are searching for new chemical products that are more environmentally friendly and improve the recovery of copper and other secondary elements.” As Chile advances towards sustainable and green copper mining, it will elevate the tailings transformation sector as tailings management becomes a core focus. “Regulation in Chile is strict, especially regarding water, which is a primary concern when designing tailings dams,” highlighted Luis Soruco, general manager of Arcasid in Chile, one of the leading global design, engineering and management consulting firms. “There is a focus on making the tailings permanent and green, reducing its environmental impact.” As Chile advances towards sustainable and green copper mining, it will elevate the tailings transformation sector as tailings management becomes a core focus. “While the end result is a tailings dam, the process is important in terms of minimizing the environmental impact,” commented Armando Aranguren, head of sustainability at Collahuasi.

Energy

Over the next decade, the increased activity of concentration plants, the project to decrease in mineral grades and an increase in mineral hardness will result in a significant rise in energy consumption for Chile’s mines, which currently represents around 8% of the operating costs. “The desalination and the transport of seawater require large amounts of energy and increase the operational costs for projects,” highlighted Claudio Leoschi, president of Ausenco in South America, an Australian-based multinational EPC firm working with Mantos Copper, BHP and Teck Resources. “Communion is also an energy-intensive process. The mining industry is moving towards greater incorporation of renewable energy sources to address rising energy costs and sustainable issues.” Therefore, electricity demand for copper mining is forecasted to grow by 34% over the next decade, from 25 terawatt-hours (TWh) in 2020 to 33.4 TWh in 2031, according to Cochilco. To meet this demand, a generation capacity of 1,222 MW is needed. As a result, mining companies are shifting to cheaper and more sustainable alternatives. BHP is paying US$450 million to terminate its 2008 coal-fired energy contract with AES Corporation in Escondida and Spence. It will replace it with solar and wind power that will reduce its energy costs by 20%. Meanwhile, Collahuasi signed clean power supply contracts with several renewable energy providers, and we expect that more than 60% of the energy used in mining will come from renewable by 2023,” highlighted Minister Jobet.

An appetite for hydrogen

Under its renewable energy initiative, the Chilean government is also keen on elevating the so-called ‘fuel of the future’, green hydrogen. The Chilean government also announced a National Hydrogen Strategy and mining giants are looking at the potential of hydrogen as a way to address rising energy costs and sustainable issues. Green hydrogen is the process of sourcing hydrogen from renewable power sources such as solar or wind power. It will not only help reduce the energy costs by 20%. Meanwhile, Collahuasi signed clean power supply contracts with several renewable energy providers, and we expect that more than 60% of the energy used in mining will come from renewable by 2023,” highlighted Minister Jobet.

Hydrogen power generation is receiving more attention, but I believe that this will only become fruitful in five to ten years, as managing the fuel is still quite complex and very expensive. Over the last years and increasing interest among companies in using hydrogen as a source of fuel or batteries that accumulate energy to operate," confirmed Alejandro Miranda, general manager of Doosan Bobcat, the leading Korean construction equipment provider. “Doosan has been working on eliminating diesel engines from vehicles to incorporate solutions related to electricity. However, the pandemic has considerably limited the advancement in this area.” Overall, hydrogen fuel can play a role in decarbonizing the mining industry. According to the German-Chilean Chamber of Commerce, the fuel has a 70% chance of replacing fossil fuels within the industry. However, even though hydrogen power generation is receiving more attention, Varela highlighted: “This will only become fruitful in five to ten years, as managing the fuel is still quite complex and very expensive.”
Can you give an overview of Aggreko’s operations in Chile? We expanded into Chile in 2006, focusing mainly on mining. We began to develop all the transactional business units to support the miner in exploration, process mining, site construction, commissioning, production, maintenance, mine closure, as well as providing technical advice and expertise for mine expansion. Our first project was with Codelco during the construction of the Gaby copper mines. We then successfully designed, installed, and commissioned a 60 MW power plant for Escondida to provide a back-up power supply at the Coloso port.

Are hybrid solutions Aggreko’s specialty? Every isolated mine will have a hybrid solution in the near future. Larger mines in more accessible areas will have less of a need for hybrid systems and will probably still rely on transmission lines, but they are increasingly becoming more interested in generating their own power as it is more cost-effective. Aggreko has invested significantly in integration, allowing us to differentiate ourselves in the market. We have acquired Younicos, a battery and software company, to integrate technologies.

How would you describe the current power trends of the mining industry in Chile? The decentralization of the generation of power is a huge trend due to the reduction in costs. There is also significant investment in decarbonization. Digitalization is also a global trend and we are now able to operate different technologies on different grids, which was not possible in the past.

In Chile, even though there is a big need to reduce emissions, the amount of electric consumption is increasing. Generating power through renewable sources, mainly solar, has become a focus of the mining industry, which will create disturbances in the grid. Aggreko is working to have different points of generation to compensate for these disturbances, and batteries are also a great solution for this. Hydrogen power generation is also receiving more attention, but I believe that this will only become fruitful in five to ten years, as managing the fuel is still quite complex and very expensive.

How has the company grown over the last year? Our main projects over the last few years have involved feasibility studies for mining projects requiring alternative water sources and mineral ore transportation systems. We also provide the design and construction of these water transportation systems, frequently stretching all the way from the sea up into the mountains. We have also participated in the construction and maintenance of mineral processing assets for main mining companies. As an EPC company, we deliver complete solutions, encompassing all the stages in the project from the feasibility study to the delivery of water to the mine.

What projects are planned for this year? This year, Techint has been working with Quetrupila Blanca Phase 2 project to transport desalinated water and concentrate and is beginning work on a new contract with Anglo American at Los Bronces to maintain transportation systems for water, pulp, and concentrate.

How are you incorporating digitalization and automation solutions into your operations? For example, we are currently using drone technology for land, subsoil and progress surveys, allowing us to check our pipeline routes and give us a better understanding of the geological conditions affecting construction in a faster, more accurate and effective way. We have incorporated automation in welding activities and robot applications for several critical aspects of quality needed in pipelines construction.

There is significant evidence that the transformation to a greener economy will involve many changes in infrastructure, especially those related to power generation and transmission, but also transportation, including electric vehicles and supporting infrastructure. A greener and more connected world will require more electronic sensors and devices in smart cities and smart houses. The new society model will also increase the need for climate control devices in households, offices, public transportation, and public buildings. These new developments involve many raw materials, where copper, the old and well-known red metal, stands out, playing a vital role in a greener world.

According to the World Bank, climate change affects increased use of green technologies (including wind and solar generation and electric vehicles) could increase copper demand by 7.5 and 20 million tonnes by 2050, depending on the scenario for climate change. Other highly copper-intensive technologies are likely to increase this estimate, such as electric vehicle charging infrastructure, climate change mitigation devices, air conditioners, fans or heaters, intelligent technologies in households and public infrastructures in cities. Many challenges for the transition to a greener economy come from the supply perspective. Responsible sourcing of raw materials plays a prominent role. Despite the advancement in technologies, the integration and implementing a circular economy model, mining will still be a critical aspect of the supply chain in the foreseeable future. If we assume a conservative demand forecast of 15 million copper mt by 2050 (500 thousand mt of new supply each year), the pressure on the copper supply chain will be significant. For example, only two mines in the world produced more than 500 thousand mt of copper. It is not clear where supply will come from. When we think about the future, there are many images of how we envision a greener world, but there is a lack of understanding of how raw materials will be supplied for this purpose. As a contribution to this matter, Chile is already planning and developing what a greener world will mean for copper mining in terms of water, energy and the relationship with society.

Green copper mining will be efficient in reducing operational water footprints. The Chilean mining industry has already reduced freshwater use by 25% from 2010 to 2019. Cochilco forecasts that only 51% of water consumption will come from underground and surface sources by 2030. In addition, the water recycling rate in copper mining is around 80%, and most new projects will use new water sources, such as seawater and other water-efficient technologies. Green copper mining will be carbon-free. In Chile, due to the integration of electrical systems in the mining industry, the indirect greenhouse gas emissions were reduced by 20%, from 2017 to 2019. Furthermore, the copper mining companies have played a key role in the surprising change in the Chilean energy matrix, which is rapidly shifting to renewables. During the subsequent years, copper mining will be directly or indirectly involved in new renewable capacity in Chile. Renewable sources, mostly photovoltaic, will supply around 58% of the Chilean mining industry requirements by 2023. Additionally, the potential of green hydrogen technology could become an excellent opportunity for sustainable development, not only for Chile but also for the rest of the Latin American region.

Green mining involves much more than water and energy, and this is why there are other initiatives in Chile related to inclusion and increasing the participation of women in mining, increasing knowledge and contribution to indigenous people; and local development for surrounding communities and a strong respect for human rights. A new relationship with society requires a new deal with mining. Since 2019, Chile has been developing a long-term participatory strategy as part of the 2010 National Mining Policy. This is an opportunity to put mining in the perspective of a more sustainable future.

The way that we mine falls short of meeting the vision of a green economy, but it is also clear that sustainable mining is the way for the industry to remain as a global critical economic pillar. It is also a challenge for Chile, not only to maintain its production but also to have a competitive copper supply, but also to be a leader in responsible sourcing for a greener world.
How were you able to maintain supply chain continuity amid the pandemic? Our people’s health and safety has al-
ways been our top priority and since the pandemic started we have taken the nec-
essary precautions to reduce risks of ex-
posure and keep our staff and sites safe. Covid-19 impacted our business regard-
ing costs and schedule, as we now have to take extra sanitary measures. However, we never stopped production and are still
servicing the mining sector and the pulp and paper industry in the north and south of Chile respectively. Echeverría Izquierdo has approxi-
mately 8,000 employees in all of our countries of operation, and we are for-
tunate and proud to be still growing dur-
ing tough times.
Social unrest in the country caused the temporary closure of many offices and forced people to work from home.
There-
fore, when the pandemic hit, we were bet-
ter prepared to quickly adapt to a more virtual working environment and minimize disruption on our projects.
Can you highlight some of the projects Echeverría Izquierdo is working on in Chile?
Echeverría Izquierdo is currently working on the primary crusher at Teck’s Quebrada Blanca project, which is the main contractor for the new facility.
How does Echeverría Izquierdo incorporate new technologies into their operations to minimize operational costs?
The construction sector has been slow to incorporate new technologies. Echeverría Izquierdo has an innovation department with a strong focus on the digital trans-
formation of our activities to increase productivity and thus our competitiveness.
We are moving towards digitizing our warehouse and operations to shift into electronic,
and digital technologies as a priority to improve productivity and efficiency.
What is Echeverría Izquierdo strategy to consolidate and grow its market share?
Obtaining the QB2 and MAPA projects has been significant to the company’s growth. We are one of the leading players in the Chilean construction and industrial
rection space, and we aim to continue growing in both Chile and Peru building long term relations with our clients
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Can you provide some background information about SKIC?
The company was established in 1960. We currently operate in Chile, Peru, Brazil and Colombia as a regional EPC player, with an annual turnover around US$600 million and more than 15,000 employees. We have always focused on large scale industrial installation projects, mainly in the mining industry. In mining, we can generate many synergies with other companies from the Sigdo Koppers Group, such as Braexel, Godaduls, Puerto Andinas and Magotex. We are present across the whole value chain, from the mining infrastructure and production to the minerals’ shipping. We have expanded our scope from industrial installation to our current ability to handle EPC and BOP projects throughout the years. Beyond that, we have been present in large energy projects, with our involvement in more than 7,500 km of high voltage transmission lines in the region, as well as the related substations.

Can you give some details on your current work with mining clients?
Codelco is our main client today. We have supported them across most of their projects over the last couple of years. Recently we have started working with Teck on two important projects. We are building in the flotation area of Quibreda Blanca 2 and also the port. Teck is a new client for us, and I have no doubt that we will accomplish what we have done with our long-standing clients such as Antofagasta Plc. Gold Fields is also a new client for us in Chile. The Sala del Aire project is challenging at over 4,000 meters above sea level, so that is forcing us to take a fresh look at pre-assembly and modular construction processes, with the success of this project being based on our joint work with Fluor on these aspects.

What trends and opportunities do you see in the mining industry in Chile?
It is not like we are experiencing the same mining boom we had 10-15 years ago. This said, we see more dynamism in lithium, rare earths and iron ore. We plan to take 5-7 years to ramp up these new projects, but there is an opportunity there because all these projects require a lot of infrastructure, from transmission lines to ports. The energy industry is going to be very relevant over the next years. We are currently participating in Chile in the biggest transmission line project in decades (Rímac-Los Alguires, HVDC 1,500 km). Also, we will see more desalination projects that are energy-intensive, so this infrastructure will go hand in hand with renewable energy. We have already worked on the Escondida Water Supply (EWS) desalination plant for Escondida (2,500 l/s). We are currently bidding for a 2,400 l/s desalination plant in Peru and we are participating in various water and energy transmission tenders for Collahuasi. Finally, in terms of ports, we have just done the whole renovation of the ship loaders for Collahuasi.

How is the company evolving in terms of processes and new technologies?
A big transformation of SKIC over the last five years has been the migration to EPC projects. This way, we are much closer to the clients, being able to intervene in the early engineering phase, and this translates later into more productivity and a greater level of modularity and pre-assembly. We have invested very heavily in this process with excellent logistics management. There is a lot of space to continue improving productivity and safety. In this respect, Godaduls works with all the companies of the Group in new processes and new technologies. Our core business is structural steel erection and pre-assembly. We have the largest port facilities in the Americas of 3,000 tons of structural steel per month, complemented by our other services such as structural steel erection and modularization.

What are some of the main mining sites Edyce is working on?
Currently we are working on Teck Resources’ Quibreda Blanca phase 2 project as well as Antofagasta Plc’ Pimaco project at Minera Los Pelambres. Both projects have come into the construction phase over the last two years, and we continue to serve our clients who are trying to recover from delays caused by the pandemic. The economic outlook for the rest of 2021 and 2022 looks promising, and we are confident that the projects’ development pipelines of different mining companies will be executed as planned. Chile has had some difficult years recently, but we see signs of a recovery in the copper sector, and the government’s actions to reboot the economy. Some initiatives regarding productivity will now address the above-mentioned requirements. I am of the opinion that the laws that have been introduced will strengthen the industry and I believe that Edyce is in a very good position to meet these requirements. Chile’s path is in many ways similar to the path that other already developed countries followed. There are always voices of concern, especially when it comes to changes, but I believe the outcome depends on how we respond to the challenges. I am very optimistic for the way forward for Chile.
Can you give us an introduction to Promet and the company’s most recent developments?

Promet has a history of 30 years serving the mining industry with a workforce of over 4,000 workers at several projects in Chile and Peru. Last year, the Cintac Group acquired 60% of the company—the Cintac Group is a subsidiary of CAP, a large iron ore producer. This acquisition strengthened the company’s market share and its five-year strategy is to increase sales from US$200 million to US$500 million annually in camp-related services, industrial installation and structures for mining. We have built 2 million m² in Modular Construction, and our vision is to become the leading player in industrial construction—and also modular and pre-fabricated solutions—in Latin America.

Five years ago, we also established Promet Montajes, a company dedicated to industrial installation. Today, in Montos Blancos, we are working on the expansion of the concentrator for Montos Copper, valued at around US$70 million. In Montos Blancos, the expansion of the concentrator for Montos Copper is valued at approximately US$70 million. The project includes mills, flotation cells and all the necessary equipment. We also worked on several projects in Quibdó, Blanca. These are important projects for us that have allowed us to maintain good levels of activity during the pandemic. We have significant projects at Palambres, Centinela, Radomiro Tomic, and Collahuasi mines. Promet also works on gold mining projects, such as Salares Norte with Perfin Gold.

How is Promet incorporating more digital processes into its operations?

Digitalization is our main challenge ahead, so we are investing in higher levels of automation in our manufacturing plant. We are also using augmented reality to control the different projects as well as artificial intelligence and machine learning in order to optimize processes to achieve operational efficiency, breaking conventional paradigms. At the same time, we are now implementing BIM inside our company. In addition, we are aiming to control our water footprint, considering most of our facilities are in the desert. We aim to eliminate paper in all our processes, so everything is digital and installed in the cloud. In the future, companies will compete based on their extent of automation, digitalization and sustainability.

Do you have a final message to our international readership?

Our workforce is our main asset, and our priority as a company is to ensure their satisfaction and safety. Throughout our 30 years of operations, we have never had a fatality. Operations under Promet Montajes have never had an accident since its founding, and Promet Services offers excellent safety indicators. To achieve a solid safety performance, we have built a culture that prioritizes safety in our business. Over the next four to five years, we want to be the leading player in industrial construction, increasing our revenue to US$500 million annually, as well as expand operations to Colombia and Ecuador and consolidate our presence in Chile and Peru.
Can you introduce Züblin and its role in the mining industry?

Züblin is under the Austrian-based STRABAG Group, one of the largest European contractors. STRABAG fully acquired Züblin in 2016. We have been established in Chile for over 30 years and have vast experience in the Chilean mining industry, where mining represents approximately 90% of our business. We are a major player in the development and preparation of underground mines, providing services from construction to mining. Our experience covers civil works and mining infrastructure, as well as the integral exploitation of mines. Züblin actively participates in all significant underground mines across Chile. We offer the best technical and economically viable solutions to large-scaled mining ventures for clients such as Codelco. Our main attributes focus on the quality of our operations as well as the high safety standards that are an integral part of our working culture. For example, we have collaborated with Codelco on Chuquicamata and Andina.

What is Züblin’s offering to the underground mining industry in Chile?

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Given the challenging seismic conditions near El Teniente, we apply and rely on some of the latest tele-commanded technology on the market to execute the project. The use of equipment such as Boltec, for pre-drilling and mechanized fortification, is part of a pilot program where operators drive the scaler and an excavator from a cabin of operating. We see this in the case of Codelco, for example, where the company is choosing to adopt more remote equipment and trucks in their operations. Züblin was part of a pilot program where operators drive the scaler and an excavator from a cabin of operating. We see this in the case of Codelco, for example, where the company is choosing to adopt more remote equipment and trucks in their operations. Züblin was part of a pilot program where operators drive the scaler and an excavator from a cabin of operating.

How do you use your BIM.5D technology, and what are its applications in your mining projects?

BIM.5D (Building Information Modelling) is an important pillar in the execution of our corporate strategy and improves our project delivery from design to take over by our clients, in a continuous, real-time operation phases of a project. It is a model-based planning method that provides a visual representation of a project as it progresses. It highlights the materials and quantities required for the project and provides a timeline that demonstrates how changes in the design would impact the project. This level of digital planning technology is revolutionary in the construction industry, as it enhances cost efficiency design and scheduling. It also helps identify missing information and conflicts detected in the design, which helps avoid errors overall.

How is Züblin perceived by its clients?

Züblin is perceived as a reliable partner with a proven ability to execute projects in an efficient manner. We have a track record of being the leading technology partner in construction of the future. Our value as a partner is our commitment to quality, reliability and innovative spirit.
What is the role and history of Nexxo in the Chilean mining industry?

Nexxos history is more associated with the petrochemicals industry since 1980, and entered the mining and paper and pulp industries later in the early 2000s. Today, mining represents 45% of our sales, compared to just 15% a few years ago. We have a broad spectrum of services, including mechanical and industrial maintenance through long-term contracts and plant shut downs, as well as specialties related to maintenance. Among other specialties, we are recognized as leaders in the maintenance of reactors and catalysts in melting plants, as well as chemical and high-pressure water cleaning. We also provide a long list of other industrial services, including dredging and pre and operational tests. In mining we see an immense growth potential for our mechanical maintenance capabilities. In Chile we work with all the major mining companies such as CODELCO, AMSA, LUNDIN, GLencore and BH&P, and we currently have 10 long-term mechanical and industrial maintenance contracts in mining. Nexxos focus is on safety and maintains high standards. Since 2013, Nexxo operates as a subsidiary of Echeverria Izquierdo Montajes Industrail and supports our safety policies. We operate as an industry that has high safety standards, and we abide by them strictly. We are proud to have been awarded in 2018 and 2019 four stars in the Honor’s Roll by the Chilean Chamber of Construction. In 2020, we improved our safety results further.

In maintenance, Nexxo works through constant evaluation of the site and the conditions, which are different when compared to construction guidelines. We use tools and procedures to conclude and quantify risk and act upon it accordingly. We have identified our key tasks such as maintenance and their precursors and are working every day to minimize them. Our safety approach is preventative.

What trends have you witnessed for your services recently?

Clients in the mining industry tend to prefer managing their own assets and to prepare their own plans. The role of Nexxos fits in by providing support in carrying out the maintenance guidelines defined by the clients through long-term contracts, plant shut downs or spot services. This process differs from elsewhere since in other countries and industries, the whole process is outsourced. Another trend we witness is that in the last years, mining companies prioritized cost savings over long-term activities. Therefore, we focused our work on improving productivity, reducing the number of staff and minimizing risks. For example, robots are used to clean near or under conveyors. The use of robotics reduces costs considerably, which allows Nexxo to be more competitive. However, even if it did not save costs, we would still prefer the use of robots and specialized equipment for safety considerations.

Can you elaborate on your safety and quality assurance mechanisms?

Nexxos has the ISO 45001 certification, and our relationship with Echeverria Izquierdo Montajes Industrail guides and supports our safety policies. We operate as an industry that has high safety standards, and we abide by them strictly. We are proud to have been awarded in 2018 and 2019 four stars in the Honor’s Roll by the Chilean Chamber of Construction. In 2020, we improved our safety results further.

In maintenance, Nexxo works through constant evaluation of the site and the conditions, which are different when compared to construction guidelines. We use tools and procedures to conclude and quantify risk and act upon it accordingly. We have identified our key tasks such as maintenance and their precursors and are working every day to minimize them. Our safety approach is preventative. What trends have you witnessed for your services recently?

Can you explain the company’s history in Chile, its service portfolio for the mining industry and how it fits into the Thiess’s global strategy?

The company has been operating in Chile in 2015 with a contract awarded to undertake pre-strip operations for a client in the Antofagasta region. That established our base, and we’ve used that initial entry as the foundation for future growth in Chile. As the largest mining services provider in the world, Thiess brings deep experience, capabilities and strength to optimise mining operations in Chile. A key service offering and differentiator for us is strategic mine planning, both short and medium term, designed to meet specific client needs. Drill and blast design and execution are also considered part of our core business with scope to modify this for client needs. Traditional load and haul of waste material and ore, as well as maintenance of all core assets and auxiliary equipment on site are included in our offering.

In what way is Thiess introducing innovation in sustainable mining solutions?

We now have full autonomous driving rigs in Australia and are looking for the right opportunity to bring that technology to Chile. We are also going trialling a fully autonomous haul fleet project in Australia and look forward to bringing that to market in the future. Certainly, digitisation is our future. Through the convergence of operations and technologies, we can create smarter ways of working that drive efficiency through the mining value chain enabling quality client outcomes.

How is Thiess responding to the demand in underground mining in Chile’s mining industry?

While Thiess successfully operates underground projects in other parts of the world, our current focus in Chile is delivering our core services in an open cut environment. Can you elaborate on the importance of having a social license to operate in the industry?

At Thiess, we believe strong social performance starts with proactive, genuine and positive community engagement. This approach supports successful project outcomes by building understanding of culturally acceptable customs, managing community and stakeholder expectations, creating opportunities with local and regional business, promoting diversity and inclusion and, most importantly, paving the way for a meaningful, two-way communication between Thiess and project-affected communities.

Areas that we are particularly proud of in Chile is the establishment of our Allies program, which supports LGBTQA+ and female representation on our leadership team, and building the capacity of our people and industry through scholarships and pathway programs.

What are the company’s plans and strategy for growth in Chile for 2021 and beyond?

In 2021 and 2022, our team is focused on fulfilling current contracts, adding contracts that fit our portfolio, and continuing to bolster the business for growth. We see tremendous opportunities in the region for the services Thiess brings and see having a key role in providing sustainable solutions to customers.
One barrier to innovation in Chile is that mining companies refuse to incorporate unproven products and services into their operations as it risks their volume or continued operation. There are not many places to pilot technology on an industrial scale. Approximately one-third of Chilean mining suppliers do not allocate resources to innovation."

- Philippe Hemmerdinger, President, Aprimin

EQUIPMENT AND TECHNOLOGY
The Covid-19 pandemic means fewer people on-site, working to achieve the “The Covid-19 pandemic means fewer people on-site, working to achieve the...”

Hugo Salamanca
President
HIGHSERVICE CORP

In 2020, we introduced robotics in the change of mill lining, which is critical both from the point of view of production and the risk it entails for people.

How did you overcome the challenges posed by the pandemic?
2020 was a year of extraordinary efforts to sustain operations, with a solid focus on controlling and managing the pandemic. Despite these challenges, we are...
How has Finning maintained supply chain continuity amid the pandemic?

We were able to take all possible measures to ensure the safety of our employees over a thousand started working from home. We also applied special Covid-19 protocols to every job, adapted the workplace, and created multiple channels to help with the mental health of our personnel and their families.

Additionally, we created the Operational Continuity Committee to manage and secure all the required equipment and spare parts in our inventory and in our customers’ inventories to continue supplying them.

How does Finning’s distribution agreement with Rosenmin better position the company in the Chilean underground market?

We offer a comprehensive portfolio in the open-pit space, but there was a shortage of product line in relation to underground. Our representation of Rosenmin gives us a complementary position with the jumbo and other relevant lines. We also have to consider that Finning has the representation of Epiroc for Special Underground Auxiliary Equipment. Today, Finning has, under the umbrella of one company, the largest portfolio and the most comprehensive lines of equipment for underground mines. We are receiving positive feedback from our customers, showing that Rosenmin is a great addition to what we offer.

Can you give an overview of the technology the company offers in autonomous mining?

We developed a robust strategy that includes specialized organization that includes qualified managers, engineers and a complete organization platform in autonomous projects to support our customers’ value chain by offering interoperability solutions. We aim to develop an autonomous platform that allows control of drilling, loading, hauling and auxiliary equipment within the industry. The desalination plants are supporting the increasing investment in technology development within the industry. The mining industry is also the first to initiate operation management to computerize an entire mining operation, increases operational efficiency and labour flexibility. The Covid-19 pandemic encouraged digitization in the mining industry regarding supervision and maintenance. Maintenance on sites is now conducted through drone surveying which improves productivity, reduces risks, and is less expensive.

What products and services does Finning offer that emphasize sustainability?

By 2040, the mining industry is aiming for the elimination of gas emissions. Many mining companies are already switching to renewable energies. Many mining companies are already switching to renewable energies. Finning, in collaboration with Caterpillar, is heading also in a more sustainable direction. We also believe in building capacity for the future. That’s why we partner with communities to empower learning and training the future generation in science, technology, engineering, and math. We also committed to decrease the gender gap in the mining industry by providing free training and scholarships to women.

What are the barriers to mining innovation in Chile?

There are no significant barriers to innovation, and the mining industry has made tremendous innovations over the last year. Approximately 95% of our demand for renewable energy in Chile came from the mining industry. The desalination plants are supporting the increasing investment in technology development within the industry. The mining industry is also the first to initiate operation management to computerize an entire mining operation, increases operational efficiency and labour flexibility.

The Covid-19 pandemic encouraged digitization in the mining industry regarding supervision and maintenance. Maintenance on sites is now conducted through drone surveying which improves productivity, reduces risks, and is less expensive.

What are your main business lines in the Chilean market?

Sandvik is divided into three main groups: Sandvik Material Technology, Sandvik Rock Processing (included as of this year), and Sandvik Mining. We, under the Sandvik Mining division, are currently working in underground mining with Codelco at Chuquicamata and El Teniente. In November of last year, we were assigned an important project from Codelco’s El Teniente, leading automation for the underground loaders and underground trucks. Cimen is another mine we work closely with, and it is one where operations rely on automation to a large extent. Our strength in Chile lies in our efforts to standardizing, as our products can be used across various mining sites regardless of the mine size.

Has the pandemic accelerated the move towards mine automation in Chile?

There is no doubt that the pandemic accelerated the move towards automation and autonomous mining techniques in Chile. As Covid-19 impacts linger, miners are heading towards digitalization. Our customers today are able to work and operate their sites from miles away. Across South America, the target is to reduce the number of people on site, which is being done through machinery replacing multiple human tasks on the mine, especially underground due to safety concerns.

The challenge we face with automation is not developing the technology, but it is its implementation, which was amplified under the health crisis as travel restrictions were enforced. We are overcoming this challenge through the establishment of our Sandvik Digital Training Centre, allowing us to train our employees as well as our customers’ technicians.

Which market segment have you identified as key for Sandvik’s future growth?

In addition to automation, a key market segment for us is surface operations’ equipment. Chile and Peru produce between them approximately 40% of the global copper production, so Sandvik will continue to consolidate its presence in these markets and respond to their trends.

What changes has the company undergone since we last spoke in 2019?

CE: We have incorporated further technology into our offerings, including to increase automation and digitalization and, over last 2 years, we saw demand for our services increase as a result. Epiroc will be the first company in Chile to offer fully electric loaders, under our offering of the zero-emissions fleet, which will be at Codelco’s El Teniente. We also have several projects for underground production equipment (stimul, which will be operated via tele-remote). Overall, we are facilitating the growth and consolidation of our market share in Chile.

We are also working on our certification MCH262 to get gender diversity. Like many companies, we believe it’s very important to ensure an equal, diverse working environment. The certification and implementation process will take place during first semester 2021. RI: Recently, we have partnered with Los Bronces and Los Pelambres. Los Bronces is looking to start remote operations of their autonomous machinery from Santiago in March of 2021. Throughout 2020, we took on new challenges as we are now supplying Minera Los Pelambres with two autonomous rigs, operated from our office at the mine site, in addition to BHP’s Minera Escondida, where we are supplying six fully autonomous rigs. Anglo American partnered with Epiroc to develop and implement the new tele-remote drilling project at Los Bronces to allow more accurate and safer drilling. We are also supplying two fully autonomous rigs in mid-2021 to Candalaria’s open-pit expansion, Esqueria Sur. Later in 2021, Epiroc will introduce autonomous management of the electric rigs.

Where does Epiroc see the highest growth potential in the next two years?

CE: Automation and digitalization will continue to drive our growth. RI: Our surface mining offering will increase growth through continuous optimization of our customers’ value chain by offering interoperable solutions. We aim to develop an agnostic platform that allows control of drilling, loading, hauling and auxiliary equipment on-site.
Continuous investment in autonomous technology by OEMs

Unmanned drilling rigs and trucks are no longer an uncommon sight in Chile’s mining industry. Original Equipment Manufacturers (OEMs) such as Epiroc, Sandvik, Caterpillar, Komatsu, Volvo and Liebherr are revolutionizing the mining industry. These companies are looking to start remote operations of their autonomous machinery from Santiago in March of 2021,” commented Rodrigo Izquierdo, surface mining business line manager at Epiroc in Chile. Due to the pandemic and the resulting measures, automation solutions have gained traction and popularity. "The pandemic has changed circumstances radically and has given our clients an inevitable push towards the adoption of new solutions to counter challenges such as social distancing," stated Marcelo Schumacker, country division manager of ABB in Chile, pioneering technology solutions provider. The Covid-19 outbreak also pushed companies to be creative to ensure the same quality of after-sales service to reduce unplanned downtime. "Equipment diagnosis, for example, is a task that is done increasingly through remote means," highlighted Francisco Errázuriz, CEO of Sigdo Koppers subsidiary SCAK Maquinarias (SCAKM), distributor of world-renowned brands’ machinery in Chile. “Brands are developing products, with a focus on track-and-trace and telemetry in order to monitor equipment better and conduct maintenance proactively.”

Another important maintenance is being developed by geospatial solutions equipment provider Geocom by relying on augmented reality (AR). "This technology can be a game-changer in the industry. It will enable remote distance support and provide management with a real-time visual guide to operations. The use of AR in mining will disrupt and revolutionize the industry and is set to change the future of the mining safety,” stated the company’s general manager, Carlos Escudero.

Meanwhile, Epiroc is also investing in facilitating remote operations as it successfully piloted the autonomous operation of two Pit Viper 351 diesel drills at Los Pelambres, allowing the operators to work from an office environment in Santiago. The results show that operational drilling speed and well depth accuracy increased by 10% and 96%, respectively. "We successfully tested operating rigs from control centres in Santiago for Los Bronces and Los Pelambres. Los Bronces is looking to start remote operations of their autonomous machinery from Santiago in March of 2021," commented Rodrigo Izquierdo, surface mining business line manager at Epiroc in Chile. Due to the pandemic and the resulting measures, automation solutions have gained traction and popularity. "The pandemic has changed circumstances radically and has given our clients an inevitable push towards the adoption of new solutions to counter challenges such as social distancing," stated Marcelo Schumacker, country division manager of ABB in Chile, pioneering technology solutions provider. The Covid-19 outbreak also pushed companies to be creative to ensure the same quality of after-sales service to reduce unplanned downtime. "Equipment diagnosis, for example, is a task that is done increasingly through remote means," highlighted Francisco Errázuriz, CEO of Sigdo Koppers subsidiary SCAK Maquinarias (SCAKM), distributor of world-renowned brands’ machinery in Chile. “Brands are developing products, with a focus on track-and-trace and telemetry in order to monitor equipment better and conduct maintenance proactively.”

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How has demand changed for Komatsu amid the pandemic? In mining, we did not witness significant fluctuations in demand in Chile. There were several brownfield projects and fleet renovations that we took part in. Actually, our mining equipment sales for 2020 outperformed those of last year. In this sense, Komatsu was chosen as the most preferred supplier by its customers. During 2020, the implementation of Covid-19 related protocols posed several challenges as we managed to ensure operational continuity while protecting our workforce’s safety. In addition, a strong interest in automation has been a significant factor impacting demand over the past 18 to 24 months, leading to a very busy schedule of implementation of autonomous operations in the country for the next 2-3 years.

Can you elaborate on Komatsu’s latest technology in its autonomous fleets? Has the pandemic impacted autonomous equipment demand? The Komatsu Autonomous Haulage System (K-AHS) was first introduced in Chile, at Codalco’s Radomiro Tomic and then Gabriela Mistral mines, and since then, over 3 billion tons of material moved in operations around the world. We have witnessed strong interest from the market for additional autonomous fleets in Chile and Peru. Therefore, we set up an AHS base in Santiago consisting of specialists and engineers to support the fleet deployment and operations. Although. In the opinion of the pandemic has not been a significant factor in influencing demand trends for AHS, since drivers for the decision to adopt this technology respond to longer term safety and productivity gains, we believe the Covid crisis has put in evidence the need and viability for remote solutions, for example, monitoring and diagnostics used to support optimization decisions.

Given the company’s recent milestone at Sierra Gorda, what can you tell us about how Komatsu’s equipment enhances productivity? Our aim has always been the provision of reliable and dependable equipment. In addition to our reliability, we place a huge emphasis on increasing efficiency using data analytics. We collect and analyze data from the equipment and the surrounding environment to help our customers optimize their operations. We are proud to say that our customer Sierra Gorda managed to break a world record as they loaded 220,400 tons in just 24 hours, with one P&H4100XPC AC Komatsu shovel.

What measures is the company taking to reduce its carbon footprint? Komatsu is dedicating its efforts and resources to the reduction of greenhouse gases and the carbon footprint of its manufacturing operations, and also of our equipment fleets. Our goal is to reduce our emissions by 50% in all of our production bases globally by 2030, relative to 2010. Another target is to source 50% of all the electric power usage from renewable sources by 2030. Finally, by 2030 we also expect to reduce our emissions from our equipment by 50% compared to 2010. The haulage fleets are the biggest consumer of diesel and a significant source of emissions in the mining sector. Therefore, we are working on developing power agnostic vehicles for mining that can operate with a variety of power sources – such as hybrid engines, batteries, trolley systems and hydrogen fuel cells. The application will determine the best solution based on the environment the customer is operating in.

As commodity prices recover strongly, how does this resonate to your operations? The expectations for the future increase in demand for green technologies is driving the long-term bullish sentiment for copper prices. This has positive consequences on the Chilean mining industry and its suppliers, such as ourselves. Therefore, we are optimistic about the future and expect to see solid demand and customers’ interest in the implementation of the new technology we offer.

Where does Komatsu see the highest growth potential for 2021 – 2022? We are expecting an increase in our mining sales in 2021 relative to 2020. As the construction industry recovers, it will also contribute to our sales forecasts. Commodity prices recovery will benefit aftermarket sales volumes as customers increase their operational capacity and usage of equipment. In 2022, we foresee further slight recovery is demand compared to 2021, mainly driven by brownfield expansions and fleet renewals.
What has been Liebherr’s biggest milestone since its establishment in Chile in 2001? A turning point for us was our second contract with Codelco at the Radomiro Tomic mine, which led to our third at Collahuasi. In October last year, we started the ESTRS trial in Escondida for BHP to determine their future truck requirements, another great milestone. We also developed our ultra-class excavator concepts, firstly with Thiess entering the market in 2017. Last year we were very pleased to deliver the first R9800 800-tonne excavator for Liebherr in North and South America to BHP at the Spence mine.

How was Liebherr able to maintain supply chain continuity in the face of the pandemic? The management team’s focus was first to ensure the safety of our people. For spare parts supply, we have a very advanced planning department and, with this, we project our parts usage 18 months in advance. There were some delays in deliveries of spare parts, however, we have managed to use our allowed stock in Chile to compensate. We also adjusted our orders in 2020 to account for the increased lead times from our suppliers because of Covid. In 2021, we continue to use these adjustments to our processes to maintain parts supply.

Automation is playing a greater role in the Chilean mining industry. How does the technology Liebherr provides allow it to differentiate itself in the market? We are witnessing an increasing demand for automated processes in Chile, especially for autonomous trucks and smart equipment. Liebherr made the decision early to offer our truck automation packages via an open protocol philosophy, allowing our customers to use our truck with any management system available on the market. This gives the mines more flexibility as they are not bound to one OEM supplier. We also offer our LAND system (Liebherr Annual Delivery Assistant) allowing our customers to use their own trucks with any management system available on the market. This gives the mines more flexibility as they are not bound to one OEM supplier.

Can you provide us with the company’s most recent developments? Our most recent project is the R9800 800-tonne excavator for BHP at the Spence mine. We are very pleased to deliver the first R9800 800-tonne excavator for Liebherr in North and South America to BHP at the Spence mine.

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What can you tell us about your after-sales services and their significance to your Chilean operations? Our after-sales services are crucial in today’s mining environment. Equipment diagnosis, for example, is a task that is done increasingly through remote means. Brands are developing products with a focus on track-and-trace and telemetry in order to monitor equipment better and conduct maintenance proactively. Our office handles remote maintenance for the machinery we commercialize that incorporate these technologies.

What does SKC offer in the autonomous machinery space? Remote-controlled machinery is crucial in today’s mining environment. Equipment diagnosis, for example, is a task that is done increasingly through remote means. Brands are developing products with a focus on track-and-trace and telemetry in order to monitor equipment better and conduct maintenance proactively. Our office handles remote maintenance for the machinery we commercialize that incorporate these technologies.

Where does Liebherr see the highest growth potential in Chile? We will continue to consolidate our truck fleet. In terms of volume, we expect our trucks to continue to be a major part of our business. However, we forecast demand for growth in our excavators and dozers as well and we are very optimistic about this area of our business. Liebherr’s electric engine options for our excavators allow for a unique position in the market as it offers options that are more powerful than diesel-powered engines. We intend to follow the same pattern with our trucks as it offers more powerful, more environmentally friendly propulsion options. We already have trolley assist systems operating in other parts of the world, which significantly reduce the cost of mining equipment. We are currently developing a system for our excavators and our focus is projects already in production that require maintenance. We believe that SKC must generate new business, primarily by making use of digital capabilities. Despite the challenges that are in store for Chile and the world, we are optimistic because there are interesting opportunities. We must move aggressively to become a service-provider involved in helping clients navigate operations and taking care of their needs holistically.

Where do you see the highest growth potential, and what is your strategy to facilitate this growth? Chile’s investment plan for the next five years accounts for US$70 billion, of which 36% is dedicated to mining, 29% to public works and 14% to energy. The project pipeline is strong. Although there is exposure to mine construction, our business is predominantly focused on the production of mining equipment. Augmented reality is a process we are using to provide assistance and technical support to our clients. Fortunately for Chile, the country is geologically endowed and conditions are favourable for mining. For this reason, the country is projected to benefit from technological advancements. We must set the stage by promoting the cultural habits that will ensure a swift transition.

Could you provide us with the company’s most recent developments? Our most recent project is the R9800 800-tonne excavator for BHP at the Spence mine. We are very pleased to deliver the first R9800 800-tonne excavator for Liebherr in North and South America to BHP at the Spence mine.

What do you see as the biggest challenge currently facing the mining industry in Chile? One of the biggest challenges facing the mining industry in Chile is the increasing demand for autonomous technology. The pandemic has accelerated industry trends such as remote operations and electric mobility. Augmented reality is a process we are using to provide assistance and technical support to our clients. Fortunately for Chile, the country is geologically endowed and conditions are favourable for mining. For this reason, the country is projected to benefit from technological advancements. We must set the stage by promoting the cultural habits that will ensure a swift transition.

What is the main focus of the company’s investment plan in the next five years? Our supply network is composed of 11 nationwide branch offices offering product and after-sales support. We also have on-the-ground mechanics who work for SKC to provide preventive maintenance to machinery and advise clients accordingly. TPS and other LEAN processes are very important in allowing us to provide better support to our clients. We are focused on improving the uptime of our products by focusing on strengthening the company’s client-attention capabilities and prioritizing the incorporation of technology. It is very important for the company to help operators improve their productivity. SKC helps companies become more cost-efficient and improve safety. We use a set of key indicators to monitor progress in matters of safety and this environment.

What are your priorities in terms of expanding investments in autonomous machinery? Remote-controlled machinery is crucial in today’s mining environment. Equipment diagnosis, for example, is a task that is done increasingly through remote means. Brands are developing products with a focus on track-and-trace and telemetry in order to monitor equipment better and conduct maintenance proactively. Our office handles remote maintenance for the machinery we commercialize that incorporate these technologies.

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Underground Equipment

Autonomous solutions in drills, trucks and scanning technology for underground mines in Chile are of increasing relevance to the mine’s demands. For example, Sandvik is providing automated underground loaders, drills and trucks in Chile. DSI Underground, which was recently acquired by Sandvik, recently introduced to the underground mining equipment market an alternative to steel vents known as the Flexline and semi-rigid Hardline flexible vents, under its JV with ABC Canada. “Our vane axial fans are very aerodynamic and use less energy than models of older technology,” explained Carlos Leigh, the regional CEO of DSI Underground in LATAM. “The flexible ducts are made exclusively for mining with resistance to mining conditions, reducing energy consumption, and maintaining good ventilation for the miners, thus increasing work safety.”

Another promising innovation in underground mining is that being offered by Epiroc, which is offering battery-powered underground loaders, drills and trucks in Chile. DSI Underground, which was recently acquired by Sandvik, recently introduced to the underground mining equipment market an alternative to steel vents known as the Flexline and semi-rigid Hardline flexible vents, under its JV with ABC Canada. “Our vane axial fans are very aerodynamic and use less energy than models of older technology,” explained Carlos Leigh, the regional CEO of DSI Underground in LATAM. “The flexible ducts are made exclusively for mining with resistance to mining conditions, reducing energy consumption, and maintaining good ventilation for the miners, thus increasing work safety.”

Comminution and Material Handling

Concentration begins with comminution, involving crushing and wet grinding, which consumes around 50% of mine site energy and is the process representing the largest or second-largest capital and operating expenses. Considering the energy-intensive nature of comminution, the circuit design of the process can make or break an operation’s profit margins, which is decided upon primarily based on the ore’s characteristics, plant capacity and product size. A traditional option for circuit design is SAG milling, however, there are more than 20 variations or alternatives to it. The SAG circuit is considered due to its capacity to process high tonnages. However, it is one of the most inefficient circuits of comminution. If the ore characteristics allow for it, then the use of high pressure grinding rolls is more energy-efficient. Hoffmann Engineering is investing in innovations in HPGRs. “We are always looking at opportunities to carry out product improvement on the components we manufacture through redesigning, using better materials, heat treatment and machining processes to aim for longer lifetime and therefore lower operational costs,” commented Simão Antunes, general manager of Hoffmann in South America. On the other hand, Wärtsilä supplied Enduron HPGRs, which maximize crushing pressure using large lateral walls to ensure the materials do not exit the high-pressure area without undergoing crushing first. As a result, it decreases energy consumption by up to 40% compared to traditional grinding circuits.

Meanwhile, Metso Outotec is minimizing energy consumption and downtime in crushing processes by relying on performance centres to remotely monitor the crushers. “The size of the particles entering and leaving the crushers and mills can be controlled online,” elaborated Eduardo Nilo, general manager of Metso Outotec in Chile. “We developed sensors for analyzing particle size on trucks (VisioTrack) and on conveyor belts (VisioRock and Rock Sense), which are based on image analysis using computer or laser technologies.”

As for innovation in mills, ME Elecmetal is using sensors to reduce downtime by ensuring the right amount of tension on the bolts. The company launched several initiatives to introduce smart mill liners. “ME PolyFIT products are a part of a new generation of mill liners that combine different materials including rubber, castings, steel plates and ceramics among others, that fit each operation depending on the type of ore and operational conditions,” elaborated José Pablo Domínguez, general manager of ME Elecmetal in South America.

We see the market recovering at its own pace for 2021 as mines across LATAM reactivate their operations, slowly in some cases. In some tunnelling projects we expect some delays as a result of environmental approval processes.

- Carlos Leigh,
Regional Chief Executive Officer LATAM,
DSI Underground
What is the role of Weir Minerals in the Chilean mining industry?

Weir Minerals is the leading provider of equipment for any wet substances such as slurry or water. We supply equipment to transport these substances, as well as pumps, valves, compressors and turbines. The company consists of three divisions: the minerals division, oil and gas, and the ESOC division. A decision has been made to divest our oil and gas division, so we will focus solely on mining. We can supply the mines from the pit to the comminution and processing of the plant, providing our customers with a solution.

Can you elaborate on some of the technology you use to increase operational efficiency in your processes and equipment?

Our Syntrex platform relies on advanced IoT (Internet of Things) technology, using a cloud and smart sensors placed on the Weir product. It collects vital operational data that is transferred more visually to the customer through a digital interface. The service provided by the platform allows problems to be identified before they occur, reducing downtime and optimizing equipment performance throughout a circuit. Equipment wear and tear can be easily controlled, and trouble spots can be detected before they become major problems. As the mines are maximizing operational efficiency and profits, we support them as our service team is on call to ensure no time is lost. How did the pandemic impact your operations and the Chilean mining industry from your perspective?

We are fascinated by the resilience the Chilean mining industry has shown amid the pandemic, considering its impact on mines around the world. The industry globally adapted to the circumstances and recovered, especially as commodity prices rebounded. From Weir Minerals’ perspective, the pandemic confirmed the importance of our partnership in helping our customers to achieve their objectives more flexibly than in the past. Weir Minerals wants to increase its presence as a reliable partner in mining operations. As the mines focus on producing and providing continuous sustainable water management solutions, especially in Chile, where water is scarce. Our partnership with Andritz allows us to offer complete tailings solutions to the mining industry, as they supply dewatering technologies. Under the brand name IseloDry we offer customers a range of mechanical separation technologies, such as thickeners, filters presses, centrifuges and vacuum belt filters, reducing the size of the tailings dam to a tenth of what it used to be.

What are the main challenges facing the mining industry in Chile today?

The mines are located in remote areas, where talent acquisition is difficult, especially since today’s workforce, due to Covid, is unwilling to relocate to the site for long periods. Therefore, regarding labor, the industry is finding it challenging to retain talent. We are witnessing changes to the mining working culture with increasing digitalization. The mines are operating their mines from control rooms in Santiago, such as Codelco’s Hac Moj. Today, energy consumption is another challenge that is being overcome by the shift towards renewable energy sources. Finally, the social license to operate and incorporating communities into the operations continues to challenge the industry.

What goals would you like to achieve as Weir Minerals over the next three years?

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Fernando de la Lastra & Joerg von Loebenstein

**FL: General Manager and Co-Founder**

**JL: Engineering Manager and Co-Founder**

**TECNIPAK**

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**What is the role of Tecnipak in Chile’s mining industry?**

JL: Tecnipak serves the agricultural and mining industry, specifically mineral processing plants in mining. Mining represents approximately 50% of our sales. We identified a niche in the transfer chutes of conveyor systems in mineral transport. Initially, we started supplying parts, however, we are now leaders in the design, engineering and manufacture of complete equipment for transfer points and chutes. We also provide several components to better streamline and increase the efficiency of mineral transport, including a full line of belt cleaners and specialty wear plates. Tecnipak currently works with all major mining companies in Chile.

**Why did you incorporate the use of black ceramic and stainless steel into the belt scrapers?**

FL: We use different grades of stainless steel because the environment is corrosive due to the chemicals of the mining process that wear the coatings rapidly. High-grade stainless steel guarantees a long lifespan of our components - over at least five years. Stainless steel is typically more expensive than those of our competitors, who target more generic, for less expensive due to the chemicals of the mining environment.

**Can you elaborate on Tecnipak’s curved wear plates efficiency and capabilities?**

FL: The curved material is directed from one belt conveyor to another or to a crusher, mill or stacker, and this requires transfer chutes. These chutes have curved surfaces called deflectors, which are lined with wear plates. Deflectors have a curved shape because the transfer rate material does not go in a straight line, but the wear plates used to protect the surface of the deflector are usually flat due to convenience in manufacturing. Tecnipak has been a pioneer by succeeding in making curved wear plates that gradually redirect the ore so that it flows towards the next equipment in a convenient manner. With this shape, we have made the transition more fluid, which allows the transport of a larger amount of ore in less time, increasing productivity, reducing wear and generating less dust.

**How is Tecnipak looking to grow in the upcoming years?**

JL: Our strength is in catering to the large hard rock mining operations, where we have a domestic market share of 45-55%. We see room for growth in foreign markets with similar large-scale operations, such as Australia, Peru, Brazil and Canada.

FL: Despite seeing the potential for growth in other markets, we consider Chile a world leader in technology for copper production, and therefore, when our technology is successful in our country, this serves as a good reference when entering overseas markets.

**Do you have a final message to our readership?**

JL: Mining is a risky activity that can be negatively perceived due to its environmental impact. Tecnipak’s mission is to provide mining companies with reliable equipment that can help them reduce pollution and increase productivity and safety. We have a lot to offer in this sense, especially in large scale mineral processing operations, where 30% to 50% of unplanned downtime can be traced to malfunctioning transfer chutes.

**What are Bosch Rexroth’s most recent developments since 2019?**

This year we celebrate our sixth anniversary in Chile. We developed our engineering capability in mining and pulp and paper with Hägglunds installed bases in Iquique, Calama and Antofagasta. Our Rexroth connected hydraulics technology providing functionality and instant analysis and predictive maintenance. The second trend we witness is the emphasis on specialized field service contracts, demanding an increase of product knowledge and on-site technical support that secures process reliability. Lastly, we strengthened our service workshops in Antofagasta to include centralized just-in-time inventory and Condition Monitoring premium class repaired components, all of which will be reinforced soon with an specialized chemical team that will support our Hägglunds installed bases in Iquique, Calama and Antofagasta.

**What are some of the demand trends you are witnessing this year for your services?**

The mining industry in Chile and globally is headed towards machine modernization. Our Rexroth connected hydraulics leverage smart electronic sensors, supported by our IoT-Ready Online Diagnostics Network (ODIN) for hydraulic power units and Condition Monitoring premium products for Hägglunds drives. We are witnessing our South American operations’ fast growth annually, which speaks of our products’ quality, price and service level in such a competitive market. Competition in the market is healthy, driving innovation and efficiency to finally benefit customers.

**Do you have a final message to our international readership?**

We have seven factories around the world (currently building the 8th) and South America is a significant market for Bosch Rexroth, already representing 25% of the company’s turnover. We are witnessing our South American operations’ fast growth annually, which speaks of our products’ quality, price and service level in such a competitive market.
The use of data analytics

Data has been granted the title of ‘the new gold’ in recent years, as its processing and analysis can lead to considerable improvements in operations and efficiency as well as reducing costs. Data is relevant to every stage of mining, from exploration to production and mine closure. It is also pivotal in enhancing operational safety during blasting in underground and open-pit operations. “The mining industry today leverages vanguard technologies in its processes, such as automated or remote-controlled machinery and smart sensors for the collection and analysis of large amounts of data,” stated Roberto Saragoni, operations manager of Sistemas de Transporte de Materiales (STM), a bulk material handling equipment provider. “Real-time data from these sensors attached to material handling equipment helps to optimize performance by reducing maintenance stops.”

According to Eduardo Gorchs, CEO of Siemens in South America (without Argentina), “Peru is seen as a technological hub as one of the countries with fast 5G. As a reflection of this, we are currently being built in Chile. Digitalization and data management are growing exponentially, together with remote work due to the pandemic.”

- Dante Arrigoni, Director, Grupo Arrigoni

Chile is becoming a technological hub as one of the few Latin American countries with fast advancement towards 5G. As a reflection of this, five submarine cables are currently being built in Chile. Digitalization and data management are growing exponentially, together with remote work due to the pandemic.

What have been Enaex’s most recent developments?

Enaex has been working very hard on flight tests with our robotics. 2020 was a challenging year due to the pandemic, and mines were operating cautiously, so we could not undertake any testing in clients’ mines and some of our plans were deferred to 2021. However, in the case of Enaex Bright®, we managed to complete some testing in some mines to achieve the completion of some of its libraries/modules.

This year, we have developed developments in various underground and open pit mines. We are also pushing hard to research new blasting agents for the mining market. Enaex also expanded its presence to Australia and South Africa. We will continue with R&D activities in Chile and will then export these technologies.

Can you elaborate on the company’s strategic partnerships regarding robotics?

As a subsidiary of the Sigdo Koppers Group, Enaex has a mixture of partnerships. Through acquisitions and joint ventures, our strategy is to continue strengthening our international presence in the most important mining regions of the world. Our partners include SIR International, ASI Robots, Confo, AAMTC (Advance Mining Technology Center), GHH, Theone and SK Godelius. We are continuing to partner with start-ups (Drona, etc.), academic institutions (Pontificia Universidad Catolica de Chile, Santa Maria Technical University, etc.), and large companies to explore new areas which will complement our core business capabilities. With regards to start-ups, we are looking at companies that can assist us in the development of IoT/AI and augmented reality. From a research perspective, partnerships with academic intuitions have been extremely helpful.

What are Enaex’s innovations to enhance safety and productivity?

Safety and an exponential increase in productivity are vital for Enaex, and we have an ongoing development process focused on the delivery of new products and services that address specific problems and innovatively contribute to production process efficiency. We have developed the Safelock system, which locks the detonator in the booster, thus avoiding decoupling and making the priming operation more secure. We have also demonstrated the increased safety and productivity aspects of electronic detonation. Our electronic wireless system communicates with a digital blasting system located a few kilometres from the blasting zone and is controlled by a wireless communication protocol specifically developed and optimized to ensure safe, reliable, and synchronized operation of hundreds of detonating elements in open pit mines. In partnership with SRI, we have also launched Robominer®, which has technology designed to improve safety for miners while also expanding access to minerals in complex and harsh environments. Robominer® in open pit mines and our UG-its® for underground mines will both remove people from risky zones. Robominer® works with our Mine-iTruck®, a mobile explosive manufacturing truck in field operations but without people on site. Regarding underground applications, I have to mention our new initiation system solution for tunnelling development which will generate an increase in productivity.

How important is cybersecurity when moving towards more autonomous and digitized operations?

Cybersecurity is paramount. Enaex is in conversation with one of the leading communication network providers in the world to understand how we can assist mining companies. We are implementing a very robust plug and play system in mines that offers operational efficiencies but is also high security.

Where does Enaex see the highest potential for growth?

Our robotics solutions can significantly increase productivity, and we want to continue with R&D to keep innovating and provide better solutions to the market. There is also tremendous growth opportunity with regards to sustainability as we want to become a leader in offering sustainable products to the industry. We are focused on energy savings and the reduction of emissions, and we constantly work to improve all activities related to sustainability. The electromobility for our equipment is also an area of growth that currently has our attention.
Barriers and challenges to mining technology

There is no doubt that the industry is keen to promote and incorporate technologically advanced equipment and machinery into its open-pit and underground operations, however, it remains risk-averse regarding introducing or allowing piloting of new technologies at mine sites, which is key to developing any new technology. Therefore, new technologies must be introduced through cooperation with piloting centres, such as Ciptemin. “Ciptemin is financed publicly and focuses on providing the means to trial mining technologies, such as Ciptemin. “Ciptemin is financed publicly and focuses on providing the means to trial mining technologies, such as Ciptemin. “Ciptemin is financed publicly and focuses on providing the means to trial mining technologies, such as Ciptemin. “Ciptemin is financed publicly and focuses on providing the means to trial mining technologies, such as Ciptemin. “Ciptemin is financed publicly and focuses on providing the means to trial mining technologies, such as Ciptemin. "We offer remote training options for employees through a single attack. How did you maintain business continuity amid the pandemic? Our priority at the beginning were focused on maintaining our support service to our clients while keeping our staff safe, supporting a strategy of headcount reduction on mine sites as well. We implemented some radical changes and modifications to our day-to-day activities to continue operating since the mining industry and production were not halted. The market has undergone major changes in the last two years regarding the manner of communication with clients, which Covid-19 accelerated even further. Some of the modifications we introduced include remote inspection and the elimination of closed spaces offices. We developed a single open space office called “Co-Work” where our employees can work as a flexible cell and connect physically when they need to.

To what extent are you integrating technological platforms into your service offering? SGS communicates with clients using an online platform where they can easily access the testing process, results and timeline from any device. We also offer remote certification and assistance where the laboratory equipment can be connected from a distance to move data and analyze it. While all of these processes were available as part of our offering in the past, companies started paying more attention to these services in 2020. Mining companies were more cautious and conservative in the past regarding sharing data. SGS is looking for partners in AI in Chile and elsewhere to advance and develop further its digital offering.

Can you introduce to us SGS in Chile and its role in the mining industry? SGS is a world leader in the provision of TIC (Testing, Inspection, and Certification). Our services are primarily dedicated to the mining industry in Chile, representing 90% of our sales. We have a whole metallurgical department dedicated to assisting customers in improving their mineral processing. Meanwhile, our geological department provides certificates for exploration, and the engineering department supports brownfield projects. SGS covers the entire mining value chain from exploration until certification of final product in mining ports, passing through plant design, engineer- ing, processes control and optimization, modelling for production plans, and closure. In Chile we are currently increasing our capabilities in other areas like Big Data and AI, leveraging the global SGS knowledge from areas different than mining because we see significant room for adding value to our mining customers with this expertise due the complexity in copper ore bodies today.

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Can you elaborate on SGS’s mobile laboratories solution? Previously, we operated using a central laboratory where all the collected samples were analyzed. Today, we offer solutions such as a laboratory owned by the customer on-site, while we provide the expertise and analysis services. Another creative solution we implemented is SGS’s mobile laboratory, which moves flexibly to different sites, taking advantage of our expertise and experience in real-time at the remotest locations. Both solutions allow for the rapid processing of samples and data, especially when taking into account the rapid communication technologies under development, such as 5G.

Which of SGS’s services has been the most popular in the Chilean mining industry recently? SGS Eng. & Optimization area has been developing an Asset Integrity monitoring project in a remote manner, modeling the performance of critical assets supporting operational continuity and FTEs reduction. In addition, our metallurgical support has gained more traction recently, as we offer a comprehensive range of unit operations in support of flowsheet development and metallurgical process design such as flotation, comminution and beneficiation, gravity separation and others. We are also witnessing that the geological aspect of mining in Chile is becoming increasingly challenging for both open-pit and underground operations. Therefore, we see a growth potential for our services in this aspect.

Where does SGS see the highest growth potential in the upcoming years? We want to utilize our capabilities to facilitate our growth by satisfying the needs of our customers to the highest degree possible. It is effortless for companies to declare their operations as sustainable, but actually to act upon it that is what differentiates corporate cultures. SGS is determined to innovate in a sustainable manner and believes its sustainability promise to become the ideal partner in the mining industry.
What are ABB's lines of business, and what is the extent of digitalization in Chilean mines?

ABB has four main lines of business, all of which add value to the mining sector. First, we are involved in process automation, offering systems formed mainly by automation and electrification including services. Second, we have a motion business through which we supply drives and motors. Our third line of business is related to electrification, through which we offer low and medium voltage products. In this area, we made a large acquisition of GE Industrial Solutions. Finally, we are active in the robotics sector.

What is the role of GEOCOM in the Chilean mining industry?

GEOCOM is the leading provider of geospatial equipment and software used in measurements in mining in Chile for the last 35 years, representing and distributing world-class suppliers, such as Trimble from the USA, Agilis from Austria, Geoslam from the UK, Senz3D from Switzerland, DJI from China and others. Our goal has been the provision of the best and latest technology available on the market. In 1990, we introduced GPS technology in mining and by 2000, we installed GNSS reference stations on sites. A decade later, we started providing laser scanners, creating point clouds for precise measurements. We work with large-scale mining companies as well as junior, as our drones offering is relevant across the industry.

What is the role of ABB in the contribution of ABB to Gold Fields' Salares Norte project?

Gold Fields' Salares Norte mine is a pioneer in the incorporation of new technologies and innovative ideas. ABB is currently working on the electrification and automation of this project. We will provide a digital solution based on ABB Ability™ BDOA, including hardware and software, as well as six electric houses of approximately 700 square metres, with their electrical and automation, for the distribution of low voltage and medium voltage. In fact, we have worked with Claro and Nokia to carry out this project. As a key, showing our client how Salares Norte, located in the isolated region of Atacama, can be managed from a control centre in Santiago, thousands of kilometres away, but within reach of the satellite. Another test we carried out involved the use of 3D lenses to show how we can be constantly available for our clients, supporting them through new technologies from Siemens or from our ABB development units located abroad.

Can you elaborate on the contribution of ABB to Gold Fields' Salares Norte project?

In terms of process, Siemens is using the concept of digital twins. A digital twin is a virtual representation of a physical product or process, used to understand and predict the physical counterpart’s performance characteristics. They are used throughout the product lifecycle to simulate, predict and optimize the product and production system before it can be a project. In 2000, we introduced GNSS reference stations in mining in Chile for the first time. This technology is used in drills to navigate them safely. This is our HUSKY product. With ABB’s gearless mill drives installed worldwide are in Chile. The latest implementations that we have done were for BHP's Spence mine and Codelco's Chuquicamata project. Every time we introduce new solutions, they are applied in different areas, such as drilling, critical inspection, site operator training, and operator assistance. It will enable remote distance support and provide management with real-time visual guidance on the status of equipment. The use of AR in mining will disrupt and revolutionize the industry and is set to change the future of mine safety.

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Where do you wish to see GEOCOM in the market by its 40th anniversary? GEOCOM aims to become a global leader in the mining sector, offering systems formed mainly by automation and electrification including services. Second, we have a motion business through which we supply drives and motors. Our third line of business is related to electrification, through which we offer low and medium voltage products. In this area, we made a large acquisition of GE Industrial Solutions. Finally, we are active in the robotics sector.

What are ABB’s lines of business, and how do they relate to the mining sector?

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What has been the company’s main milestones in the last 12 months?

ABB has been involved in the automation and electrification process of Gold Fields’ Salares Norte mine. We have also been engaged in Codelco’s Chuquicamata’s project of ventilation on demand, where this solution will provide savings of 30-50% in energy consumption. I must mention that we are working hard to certify in Chilean Standard S3262 on Gender Equality and Constitution (SICGC), working, family and personal life.

Finally, ABB has been involved in the most prominent mining construction project in Chile, in Quebrada Blanca Phase 2 (QB2) by Teck with most of the automation and electrification equipment portfolio, including IQMIS, whole automation etc.

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What is Siemens’ strategy for growth for the next 35 years?

From a safety perspective, we strive to go towards a zero-harm sustained goal. We also have a carbon reduction strategy, and we strive to be carbon neutral by 2030, not only within the company but also with our customers and suppliers. Cybersecurity is becoming increasingly important as our digitalization efforts advance, and our goal is to have zero cyber incidents.
Can you elaborate on the innovative and sustainable sourcing solutions you provide regarding tailings management? HP: In Mathiesen our first objective has been to focus on optimizing the recovery of valuable elements (Cu, Mo, Ag, Au, etc.). We are promoting products that favor water recovery and improve the tailings management process, as these are essential topics, especially in Chile. We work with companies that are dedicated to tailings management for the extraction of copper, molybdenum, and water elements that have value through a sustainable exploitation reaction. JM: Beyond being a supplier of chemical reagents, our company is constantly looking to introduce operational improvements in the recovery processes of different minerals and to provide support to mining companies by analyzing mineral samples for mineral recovery.

Are mining companies increasingly outsourcing their on-site laboratories? JM: In mid-2020, our company invested in a laboratory in Peru, like the one we have in Chile, with highly qualified workers, which was constituted sharing practical and technological information. Mining companies can outsource certain activities to those laboratories to generate data and recommendations for decision-making.

What growth opportunities do you see in Chile in the next three years? JM: Mathiesen plans to continue investing in strategic points such as Antofagasta, the center of our regional expansion in Chile. Recently, we have also invested in a new production plant in the northern part of the country. We also plan to continue investing in technology, innovation, human capital, and logistics.

HP: Given the unique chemical properties of mine tailings and the importance of its processing, the company also plans to boost investment in water treatment and to search for new chemical products that are more environmentally friendly and improve the recovery of copper and other secondary elements. The lithium industry is a potential new line of business.

“Can you provide more information on your potential new line of business, especially the lithium industry?” HP: It is a natural extension of our sustainable sourcing solutions as it is a key element in the lithium extraction process. We see significant growth opportunities in this area due to the increasing demand for lithium in the electric vehicle and energy storage sectors.

“Are there any challenges you face in the lithium industry?” JM: One of the main challenges we face in the lithium industry is ensuring a sustainable and responsible sourcing of lithium. This involves maintaining a positive relationship with mining companies, governments, and other stakeholders to ensure the responsible extraction and processing of lithium.

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Concluding Thoughts

“It is effortless for companies to declare their operations as sustainable but actually to act upon it that is what differentiates corporate cultures. SGS is determined to innovate in a sustainable manner and live up to its sustainability promise to become the ideal partner in the mining industry.”

- Andrés Costa, Managing Director, SGS Chile

“One of our most significant milestones in 2020, is that we now supply all the major mining companies across the country. Under Polimet, we have increased our market share in the mid-tier mining sphere. Our competitive advantage is in the creation of robust engineering capacity, and our tech-focused manufacturing capacity.”

- Tomás Buttazzoni, General Manager, Technosteel

“As the copper price robustly recovered, we are witnessing several clients in a hurry to move rapidly to develop their projects to take advantage of the current market dynamics. Therefore, our efforts are geared towards developing projects in the shorter schedules our clients are requesting.”

- Roberto Saragoni, Operations Manager, Sistemas de Transporte de Materiales (STM)

“Sustainability is fundamental for Volvo Group. We are implementing a national strategy that brings together a series of initiatives that seek to positively impact the environment, society and the economy.”

- Jorge Masias, Managing Director, Volvo Chile

“The destruction or loss of data is our main concern. In this sense, cybersecurity is essential and we allocate many resources to its prevention. We adhere to our cloud providers safety requirements and we have in-store procedures that go beyond that to ensure even better coverage.”

- Ramón Opazo, CEO, Antirion
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Thank You

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