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Peru's Economic Engine

Political unrest hinders the mining industry

After 16 months in office and having survived two impeachment efforts in eight months, the former socialist Peruvian President, Pedro Castillo, was impeached and arrested on December 7th, 2022, after attempting to dissolve Congress.

During his speech before his arrest, the then-president stated that “a new Congress with constituent powers to draw up a new constitution” would be convened within no more than nine months. However, Congress, controlled by parties opposed to Castillo, called an emergency session, and passed Castillo's third impeachment and removal with 101 votes in favor, and only six votes against and 10 abstentions. As a result, Vice-President Dina Boluarte became the first female president in Peru's history. She also became the sixth president in the last six years, a clear sign of Peruvian politics' volatility.

Castillo's presidency could be considered as part of the Latin American shift toward leftist governments, a fact that has concerned the mining industry and investors. In fact, the governments of Mexico, Colombia, Argentina, and Bolivia issued a joint communiqué on December 12th, expressing their deep concerns over the events taking place in the Andean country.

Boluarte's rise to power was not welcomed by specific segments of Peruvian society, especially amongst rural areas outside Lima. Outraged by the events of the executive branch, protestors took to streets across the country demanding Castillo's release and Boluarte's departure, the closure of congress, new early elections, and a Constituent Assembly. However, these demands seem unlikely to be fulfilled as clashes continue.

Even though elections were initially scheduled for 2026, after weeks of nationwide protests, Boluarte urged Congress to move elections forward to April 2024. Lawmakers agreed, but Congress continues to be divided regarding moving the elections even earlier, to late 2023.

As political turmoil hinders mineral production and dampens investors' sentiment, Boluarte keeps pushing to move forward with the elections. Indeed, at the beginning of February, she proposed a new bill to bring elections to October 2023, but a congressional commission shelved it before it reached debate.

It remains to be seen how the political juncture will evolve in the upcoming months and what the direct impact of this will be on mining activities and investment.

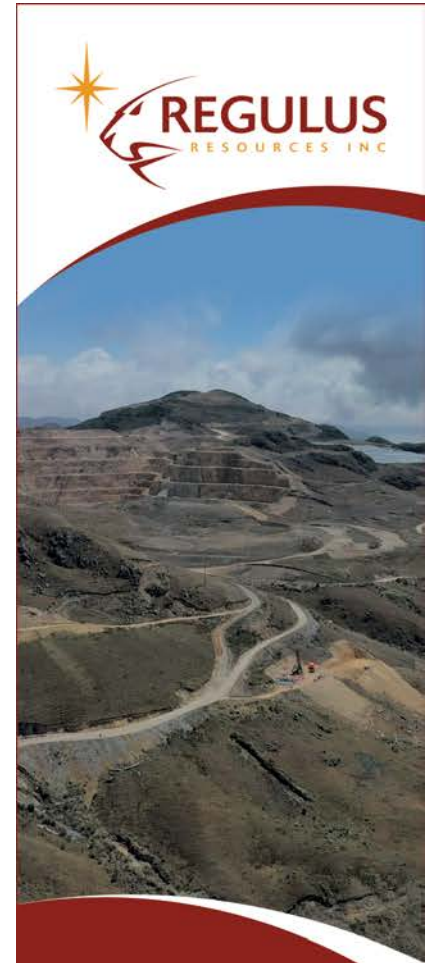
Social conflicts worsened by political events

Protest and social conflicts are nothing new to the Peruvian mining industry. Conflicts with local communities have been jeopardizing mining operations for a long time, but Castillo's detention triggered an uptick that halted the production from some mining units.

According to the Peruvian Office of the Ombudsman for the Prevention of Social Conflicts and Governance, by December 2022, there were 221 social conflicts and Loreto, Cusco, Apurímac, Áncash, and Puno are the regions with the most incidence. Of the 140 active socio-environmental conflicts registered during December, 67.1% (94 cases) were related to the mining activity.

Mines that share the Southern Mining Corridor (CMS, from Corredor Minero del Sur), such as Las Bambas (MMG), Constancia (Hudbay), and Antapaccay (Glencore), have been experiencing blockages affecting their mineral production over the last years. It was not until Anglo American's Quellaveco was set into production in September 2022 that monthly copper production overcame pre-pandemic levels, but the current situation is having detrimental effects on current production.

For instance, China-backed MMG's Las Bambas in Apurímac is one example of the deep-rooted problem. In 2022, Las Bambas was paralyzed for more than 50 days, and on January 30th, 2023, the



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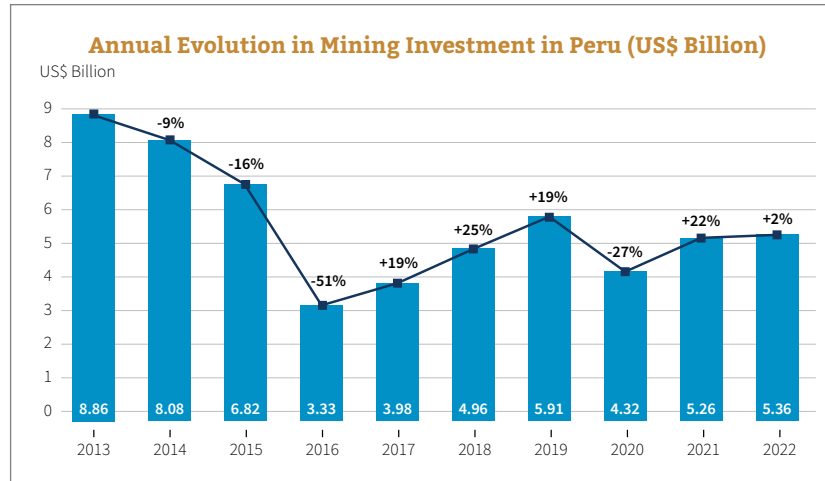
company issued a press release stating that the unit was on maintenance due to community unrest. The disruptions to inbound and outbound transportation and the shortage of key inputs have forced it to progressively slow down its operation, which accounts for around 2% of copper worldwide.

Glencore's Antapaccay, an operation that represented 6.2% of national copper production in 2022, is another example where political unrest is hindering mineral production. In January 2023, the company released a statement declaring that it had halted operations after an attack that set on fire a worker's house area. Before this attack, several protesters had vandalized Glencore's water plant and set the facility on fire and Antapaccay was already operating with only 38% of the labor force.

Minsur's San Rafael has been affected as well. The tin producer has been slowing down its operations and tin production since the beginning of 2023.

Even though Peruvian GDP rebounded after 2020, according to Scotiabank's economic research department, current turmoil might jeopardize GDP growth because of the impact of protest in the south of Peru, an area that accounts for 18% of the GDP. The economic department also forecasted that 1% of national copper production might be endangered.

As protests escalate, one can only wonder what is compounding the gap between the mining industry and local



Source: Ministry of Energy and Mines (MINEM)

communities. If we look at the annual evolution of tax revenues from the mining industry, we can appreciate that it has been on the rise since 2020. Besides, 2022 showed a tax revenue of S/15.8 billion (around US\$3.89 billion), a positive variation of 12.3% compared to 2021, marking the second consecutive year that revenue from mining has reached record levels.

It seems, however, that large segments of the society do not see any link between mining investment and Peru's well-being. Mining's contribution to Peru in terms of GDP and other macroeconomic figures are facts that not all social segments can grasp. In this context, Víctor Gobitz, president of the National Society of Mining, Petroleum, and Energy (SNMPE), stated: "One of Peru's main challenges is maintaining proper public resource manage-

ment so Peruvians can understand the direct link between mining investment and national welfare."

Despite social conflicts, the mining industry continues to work with local communities to bridge this gap for a better future where mining and society coexist harmoniously. Investors do not seem particularly deterred by the current turmoil and investment continues to flow into the Andean country. Recent Rio Tinto's investment of C\$20.5 million (US\$15 million) in Regulus Resources' AntaKori copper-gold project in Cajamarca is proof of this.

Investment Pipeline

Despite the challenging situation, there are multiple reasons to be bullish on Peru. The Ministry of Foreign Affairs and the multinational firm EY published a re-

"We took the leaders of Chumbivilcas to Canada to show them how mining companies and communities coexist. This allowed them to return to Peru with renewed foresight into mutually satisfactory relationships."

Javier del Río, VP South America and US, Hubyay Minerals



port in February 2022 estimating that only 0.28% of the country is being explored and only 1.07% of its territory is under exploitation. This provides plenty of space for mining companies to develop new projects. Moreover, due to the decarbonization goals set by the Paris Agreement, the world needs more minerals than ever, especially copper, to transition into an electrified world. Analysts state that the demand for copper will grow to 50 million tons per year (t/y) by 2035, leading to a potential supply gap of 9.9 million t/y. Peru, with its copper endowment, has a pivotal role to play.

According to the 2023 Portfolio of Mining Investment Projects, published in January 2023 by the Peruvian Ministry of Energy and Mines (MINEM), Peru has a pipeline of 47 projects with an overall investment value of US\$53.7 billion, showing an increase of 2% compared to the previous edition published in 2021.

The main developments in the portfolio are the addition of eight new projects; three were withdrawn (American Lithium's Falchani and Macusani and former Zincore Metals' AZOD project), and one was brought online: Quellaveco.

On the one hand, by 2023, it is expected that four projects will start construction, with a combined investment

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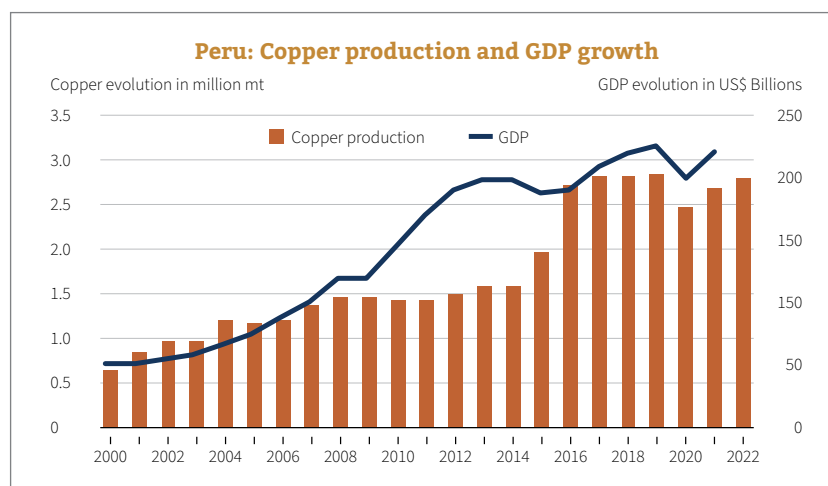
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of US\$2.95 billion: Nexa's Magistral, Bear Creek's Corani, Chungar's Romina, and Antamina's Reposición Antamina. The last two are being incorporated into the pipeline for the first time. On the other hand, by 2024, the construction of Newmont's US\$2.5 billion Yanacocha Sulfides project in Cajamarca is expected, and Teck's Zafranal project in Arequipa, which could amount to US\$2 billion as the company revises upwards the value of the project. It is noteworthy that Newmont's mega-project Yanacocha Sulfuros was expected to start construction in 2022, but was delayed due to rising costs and prolonged supply chain disruptions.

After the construction of Anglo American's Quellaveco project and its transition toward production, the entire Peruvian mining value chain relies on projects in the investment pipeline to begin construction and start ramping up operations. Provided the political climate stabilizes a bit, positive announcements should be made over the next couple of years. ■

"The Rio Tinto investment in Regulus was a considerable endorsement from one of the world's largest mining companies, not only for AntaKori and the long-term vision of our management group, but also as a vote of confidence in Peru."

John Black, CEO, Regulus Resources



Sources: Ministry of Energy and Mines (MINEM), World Bank, GBR

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Víctor Gobitz

President,
National Society of Mining,
Petroleum and Energy (SNMPE)



"The government could learn from the mining industry's decades-long planning horizon. This long-term public policy planning is needed to bridge the gap between society and the mining industry."

What have been the main initiatives of the SNMPE over the last year?

Firstly, as a union, we have been focusing on delivering the message that the mining industry's competitiveness depends on the taxation regime. Peru competes with other mining jurisdictions worldwide, and an appealing fiscal system is key to attracting investment into the country. Secondly, we have been focusing on communicating the positive effects of outsourcing and on the flexibility of the business to reduce its vulnerability to fluctuations in metal prices.

Finally, we have been addressing the configuration, distribution, and use of the Canon Minero. In Peru, 20 years ago, a regionalization system was established where 50% of the income tax is transferred into the jurisdiction where mines operate. However, it is necessary to make territorial planning efforts to translate these significant revenues into public policies that impact on communities' social and economic development in the mining areas.

How does mining contribute to Peru's development?

Mining activities occur in the high Andean territories, therefore, the mining industry invests in infrastructure and logistics chains, integrating remote areas into national and international markets. These logistic corridors generate opportunities and boost the economy of remote regions, and generate significant tax revenue, allowing the use of public funds to bridge social gaps.

Broadly speaking, Peru has robust macroeconomic indicators. However, Peru still has economic and social disparities, so it is essential that tax revenue translates into the development of less advanced territories. One of Peru's main challenges is maintaining proper public resource management so Peruvians can understand the direct link between mining investment and national welfare.

What kind of debate should be addressed today in the mining industry?

It would be ideal to maintain a mature open-dialogue process that includes both the society and the authorities to accord that the mining industry is one of Peru's economic pillars. This way, we could achieve a national mining policy that transcends any government.

Today, on the one hand, Peru has a public investment portfolio of around US\$100 billion in infrastructure. On the other hand, it has a mining investment portfolio of US\$60 billion.

Combined, they could create more significant synergies with more benefits for the population with lower human development indexes.

What do you think Peru's next big project could be?

Tía María is quite mature, and there should be an agreement for it to be brought online soon. In the north of Peru, in Cajamarca, there are significant projects like Michiquillay, Galeno, Conga o La Granja, with the capacity to produce more than a million tons of fine copper. In the South we find Trapiche, Quechuas, and Los Chancas.

Regarding the mining activity, not only greenfield projects need monitoring. Peru produces more than 2.5 million t/y copper, and to maximize its production, brownfield projects need continued investment to extend operation or to expand production. For example, Antamina, will extend its life with an investment of around US\$2 billion. Its environmental impact study is expected to be approved soon.

There is no doubt that greenfield projects broaden production supply, but the productive dimension that the country has acquired results in significant investment in existing brownfield units. Permitting for these projects is simpler; authorities should shorten them and streamline them without lowering the standards.

What factors do you think will drive copper demand?

Peru has a pipeline of around US\$60 billion in its investment portfolio, and copper projects account for 70% of the total investment. Two main factors will drive copper demand. In the short-term, China's gradual easing of its "zero Covid" policies; in the long-term, the world's decision to decrease fossil fuels consumption. Thus, Peru faces a favorable external scenario and has both the mining ecosystem and the mineral endowment to meet the international community's demand.

What are SNMPE's goals for 2023?

At SNMPE, we look to promote investments in the entire value chain of the mining industry. Mining not only invigorates the economy but also grants fiscal stability to Peru. The Government could learn much from the mining industry, which has a decades-long planning horizon due to the size of its projects. This long-term public policy planning is needed to bridge the gap between society and the mining industry. ■

Mining Production

Peru's copper output remains steady amid instability and market volatility

Few mining jurisdictions host the mineral endowment that Peru offers. The Andean country is the second-largest copper producer after Chile, and stands among the top four producers of silver, lead, zinc, tin, and molybdenum. Mining is also the engine of economic growth and prosperity in the country: mining accounts for nearly 60% of the country's total exports and almost 10% of the GDP.

In hindsight, 2022 was a volatile year for the copper market as the industry faced a series of challenges: supply shortage in Europe, political unrest in Peru and Chile —the world's two largest copper producers—, limited production in China, and high inflation rates within the US. In July 2022, copper prices dropped to US\$3.22/lb, the lowest since November 2020, as fear over a worldwide recession loomed.

The situation with precious metals was not much different. Silver remained below 2021's price levels. According to the London Bullion Market Association, silver prices averaged US\$21.73/oz in 2022, down from 2021's average price of US\$25.14/oz. On the other

"Although our copper production is bigger in Mexico than in Peru, we expect Cuajone's expansion and the commencement of the other projects in the pipeline will allow us to produce more in Peru."

Óscar González Rocha, Executive President, Southern Copper Corporation



hand, 2022 saw a record annual average gold price of US\$1,800 an ounce, closing the year with a marginal gain despite the headwinds from raising global interest rates and the strong US dollar.

Copper output

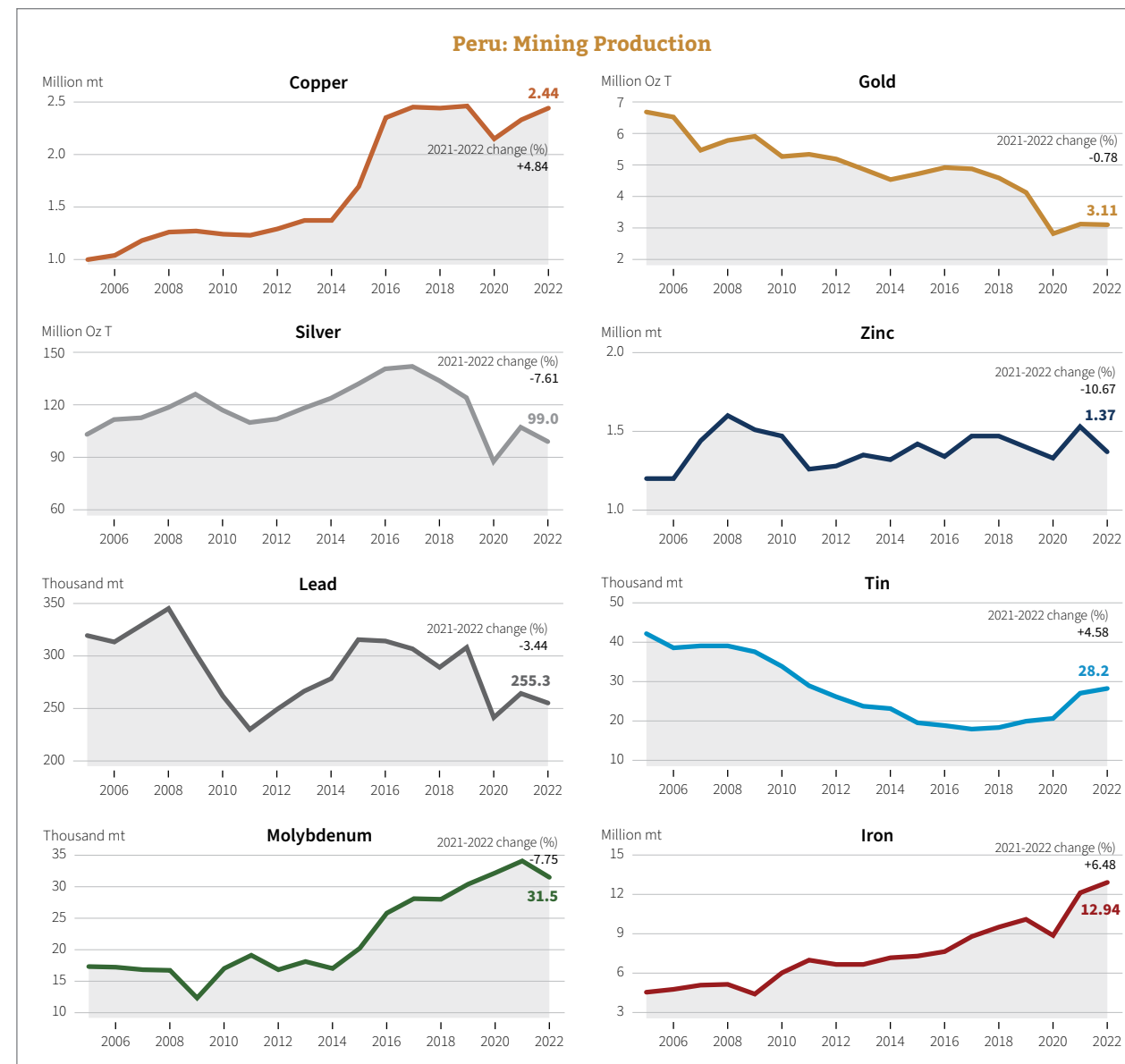
Copper presented a steady production in 2022 for a second year in a row, almost equaling pre-pandemic levels (2.44 million t/y in 2022 vs. 2.45 million t/y in 2019). In 2022, like in 2021, the top three copper producers in Peru continued to be Antamina, Cerro Verde, and Southern Copper.

According to MINEM's figures, Antamina produced around 468,000 mt/y, an increase of 1.6% compared to the 460,650 mt/y produced in 2021. Cerro Verde, operated by Freeport McMoRan, in Arequipa, presented a better performance in terms of year-on-year growth, yielding a production of 459,100 mt/y (+9.7%). Southern Copper came third with a production of around 342,000 mt/y, with a decrease of 14.2%, mainly due to the halt of operations at Cuajone and a temporary decline in ore grades.

Las Bambas, operated by MMG of China, remained the fourth largest copper producer with almost 255,000 mt/y, but like Southern Copper, also presented a decrease of 12.2% in its year-to-year production, also due to ongoing conflicts with local communities.

After major companies that have been producing for years, it is noteworthy to mention the first copper production from Anglo American's Quellaveco in Moquegua. The long-awaited mining unit started commercial production in September 2022, yielding 94,200 mt.

On the other hand, copper prices have been rising in the last months, trading near a seven-month bull run. Several factors contributed to this, one of them being the gradual easing of China's "zero Covid" policy. After a price decrease in the first half of 2022, China's lifting covid measures fueled optimism on the red metal,



Sources: Ministry of Energy and Mines (MINEM), GBR

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and it is expected that China's new policy will help the economy normalize and boost demand. Such prices have encouraged Peruvian copper producers to focus on organic growth by enhancing exploration activities and expanding operations around their existing producing mines.

Hudbay Minerals is an example of the organic growth taking place in Peru. By consolidating the production of its satellite deposit at Constancia, Pampacancha, Hudbay ramped up production to 86,000 t/d. Moreover, in 2022 Hudbay conducted an exploration campaign at its copper porphyry deposit, Llaguen, located 90 km from Trujillo in northern Peru. The initial mineral resource estimate includes 271 million metric tons of indicated resources at 0.42% of copper equivalent, and this year they will focus on preliminary technical studies to add to the PEA.

According to Javier del Río, Hudbay Minerals' VP South America and US, at Constancia, Hudbay was able to keep production up and reduce costs by innovating in equipment and using machine learning. However, he highlighted the essential support of a strong professional team: "These initiatives can only be profitable and favorable if we have a team of professionals who constantly think about how to optimize work and give us the stability to achieve our goals," del Río pointed out.

Amid social unrest, Javier del Río asserted the importance of the relationship with local communities. In 2022, 45% of Hudbay's labor force came from local communities and it also took the leaders of the Chumbivilcas community to Canada to show

"For us, having achieved The Copper Mark enhances our goal to be a benchmark company in the mining industry."



Adolfo Vera,
President and CEO,
Southern Peaks
Mining

them how mining and local communities coexist. Through its relationship with the community of Uchucarcoco, Hudbay obtained the agreements to advance the exploration permits for the Caballito and María Reyna deposits next to Constancia.

Also focusing on organic growth is Southern Peaks Mining (SPM). After expanding its operations capacity to 8,400 mt/d at Condestable, SPM concluded a feasibility study to pursue a second-stage expansion. It has also undertaken actions to modify its environmental impact assessment (EIA), which it hopes to achieve by March 2023. "Once approved, we expect to enter into a second stage to ramp up Condestable's production between 10,000 mt/d and 12,000 mt/d by 2024 or 2025," stated Adolfo Vera, president and CEO.

Another milestone achieved by the company is the transformation that it has undergone to meet the guidelines for being granted The Copper Mark. This certification for copper-producing companies demonstrates responsible production practices aligned with the United Nations Sustainable Development Goals. Condestable is the first medium-size and underground mine to achieve this certification. "For us, having achieved The Copper Mark enhances our goal to be a benchmark company in the mining industry," noted Vera.

Despite a declining production in 2022, Óscar González Rocha, executive president of Southern Copper Corporation, explained they are working at Cuajone to expand throughput to 108,000 mt/d instead of 90,000 mt/d: "We expect to bring Cuajone to a production level similar to Toquepala, where we process 120,000 mt/d."

Southern Copper also owns Tía María, one of Peru's largest projects in the pipeline, which has been in limbo for years, but Óscar González Rocha showed optimism, stating that he hopes to bring it online in 2023: "We recently met with the main Peruvian authorities to continue with the progress of the Tía María project in the Arequipa region. The project has all the engineering ready, and we expect it to come out this year once the political problems in the country are solved."

Precious Metals

2022 was a challenging year for precious metals in Peru. According to the latest MINEM figures, production of both gold and silver decreased, by 0.8% and 7.6%, respectively. Lower gold figures are mainly due to the sustainable decrease from Yanacocha, Retamas, and Hochschild's Ares. Minera Poderosa continues to be the largest gold producer, showing an increase of 1.6% in production and accounting for 9.7% of the overall gold output.

"Antamina will extend its life with an investment of around US\$2 billion. Its environmental impact study is expected to be approved soon, enabling it to continue production for eight more years in the same operational footprint."



Víctor Gobitz,
President, SNMPE;
President and CEO, Antamina

Buenaventura, a company that was for many years Peru's leading company in precious metals, continues moving forward with its precious metal and copper assets, and accounts for 4.3% of Peru's total gold production, having increased its output by 10.2% in 2022. In San Gabriel, it has been working non-stop to bring the project online since it was granted the construction permit in March 2022.

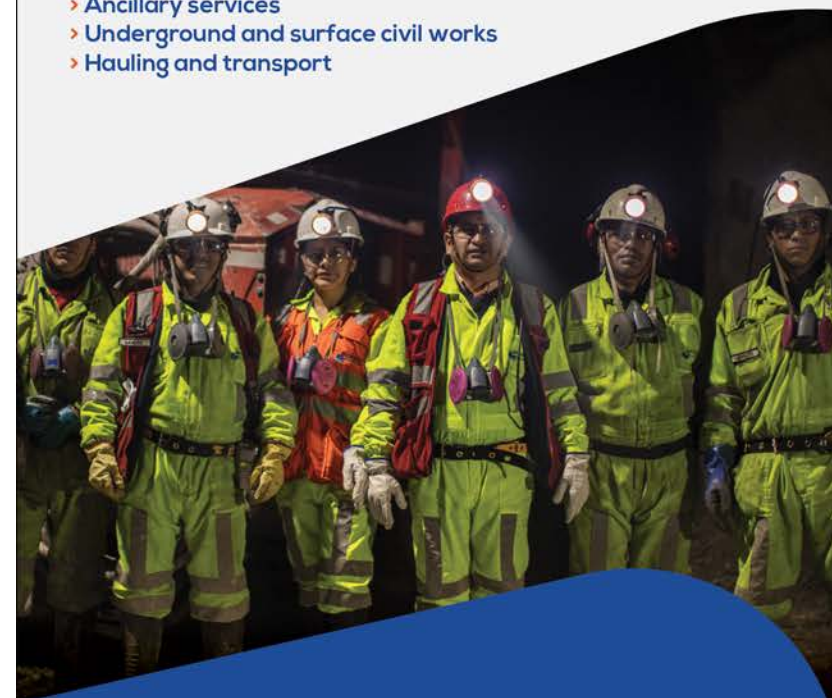
Meanwhile, at Uchucchacua, Buenaventura has been reviewing the mine design to optimize production and reduce costs: "We plan to restart operations at Uchucchacua by the end of 2023," commented Leandro García, CEO of Buenaventura.

Buenaventura also has Yumpag amongst its portfolio of projects, where it hopes to get the unit ready to start operations as soon as they are granted the permits. The company identified an estimated resource of nearly 200 million ounces (oz) of silver, signifying that it could be a large project. Finally, regarding El Brocal, the leading underground copper mine, they want to ramp up production to 9,000 t/d in 2023: "The medium-term plan is to convert El Brocal into a 100% copper mine, with a production ranging from 60,000 to 70,000 mt/y of fine copper," added García. ■

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A bullish outlook for Peru

"We must work together to recover the stability, confidence and predictability needed to continue attracting investments and new projects that promote Peru's development and welfare."

Leandro García, CEO, Buenaventura



"Peru is a jurisdiction where mines can get built. If we look at the world's largest mines that have been brought online recently, two of them are in Peru; Quellaveco and Mina Justa."

Jay Chmelauskas, President and CEO, Camino Corp.



"Copper is the one metal needed for all clean energy strategies. Peru is in the right spot regarding its copper endowment and also in its exploitation aspect, having the ability to significantly increase its production in the future."

David Kelley, President and CEO, Chakana Copper



"What we are currently experiencing in Peru has created many opportunities for acquisitions, deal negotiations and project re-negotiations."

Patrick Elliott, President and CEO, Forte Minerals



"We will continue operating in Peru, because countries with this kind of geological potential are where the next true world-class discoveries are most likely to be found."

Peter Dembicki, President and CEO, Tier One Silver



"With Peru's mining history and the economy's dependence on mining, we are confident that the current turmoil will flow through into the future and Peru will remain an attractive jurisdiction to explore."

David Fincham, President and CEO, Highlander Silver



"In Incimmet we are creating collaborative ecosystems with universities to develop innovation from which every stakeholder can benefit. We want to generate enthusiasm and optimism around mining."

Eduardo Cossio Chirinos, CEO, Incimmet



"With its mining potential, Peru allows us to experiment, develop and implement new technologies. We see no regulatory restrictions except those imposed by global standards. Peru offers favorable conditions for the research and development of tailings management technologies."

Gustavo Bravo, Mining Director for Latin America and the Caribbean, WSP



"In these times of change, there is always a particular market segment that sees opportunities to advance early-stage projects through the study process, as they believe in the long-term potential of Peru."

Paul Murphy, Manager - South America, Mining Plus



"Peru has many mining projects in the pipeline in different stages that demand various services and products according to the level of mechanization and automation required by their operations."

Franklin Pease, General Manager - Peru, Normet



"Even though uncertainty prevails in Peru, we have learned how to adapt to complex political and social situations."

James Valenzuela, CEO, Resemin



"Mining is an important source of income for Peru and therefore continues to be an active industry."

Enrique Sattler, CEO, Robocon



Junior Exploration

Explorers hopes are undiminished in the Andean Country

Investment in exploration in Peru has been fluctuating throughout the last decade. The country reached a peak of approximately US\$900 million in exploration investment in 2012, that declined to approximately US\$216 million in 2020, due to the exceptional pandemic impact. However, it has been progressively increasing from US\$327 million in 2021 to US\$586 million in 2022.

According to MINEM's 2022 Portfolio of Mining Exploration Projects, of the 63 projects located in 17 regions of Peru, with a global investment of US\$586 million, 49 are greenfield projects, and 14 are brownfields. Gold exploration projects represented 43.4% of the exploration budget, followed by copper, zinc, silver, and tin projects (36.1%, 11.2%, 8.3%, and 1%,

respectively). Even though gold takes the leading portion of the exploration budget, most investments are being made by large copper producers, particularly in brown-field operations, as they seek to take advantage of mineral prices. Copper represents around 72% of the total investment in mining projects.

Betting on Peru against the odds

Comparing figures from 2022 and 2021 of the exploration budget, we note a significant rise of 79.2% in investment; evidence that Peru continues to be an attractive mining jurisdiction, especially for mid-tier and major companies seeking to grow reserves and replace depleting pipelines.

In January 2023, Nuton, a Rio Tinto company, completed a private placement

financing with Vancouver-based Regulus Resources for a strategic investment of C\$20.5 million (around US\$15 million), giving Nuton control of over 16.1% of Regulus' common shares.

According to John Black, Regulus' CEO, large copper-gold companies have been monitoring their progress in their copper-gold AntaKori project in Cajamarca. Now that Rio Tinto has a stake in the company, they plan to test Nuton's primary sulfide leach technology to produce copper cathodes on site, using less water and eliminating tailings, logistics costs, and interaction with smelters. "From both an ESG and financial standpoint, it could be quite a game changer," pointed out Black.

Leveraging its team's experience and knowledge of the geology of the Andean

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Cordillera, Regulus' thesis is to consolidate its land package with the mine adjacent to AntaKori: Tantauatay, an oxide heap-leach gold mine operated by Coimloache (JV between Buenaventura, Southern Copper, and ESPRO) that is expected to run out of ore in about four years. AntaKori and Tantauatay – “TantaKori” – share a significant copper-gold sulfide deposit. “We are in a brownfield setting – it is much easier to develop a mine which is an expansion of an existing operation – and a combined ‘TantaKori’ project would provide long-term sustainable benefits for communities for generations,” concluded Black.

Camino Corporation is a junior that has been working in Peru for a number of years, and currently has three assets: Los Chapitos, an IOCG (iron oxide-copper-gold) deposit; María Cecilia, a copper-porphry project; and Plata Dorada, an early-stage copper-silver exploration project. At Los Chapitos, the company envisions an SX-EW heap-leach copper mine, and in January 2023, it entered into a letter of intent to partner with Nittetsu Mining Co. After completing due diligence, Nittetsu could earn a 35% interest in the project by making a payment of C\$10.1 million (US\$ 7.53 million) over three years. Regarding

María Cecilia, Camino received the permit to start operations in November 2022. It plans to drill the central portion to test for higher grades of copper and extend the strike of copper mineralization.

According to Jay Chmelauskas, president and CEO of Camino Corporation, the demand for copper is driven by electrification and by mines that have been in production for decades but are now depleting: “To maintain global supply and to meet rising demand, the copper industry requires more exploration discoveries and higher copper prices to incentivize production,” he added.

“Peru's socio-political context is delicate, but global trends point to a considerable increase in the demand for metals, so it is crucial to take advantage of Peru's potential for the medium and long term.”

Jorge Granda,
COO, AK Drilling



“The mining industry is becoming increasingly aware of the benefits of carbon footprint reduction. However, companies must start planning this transition now to achieve the proposed goals.”

Franco Pedraz,
Peru Country Manager, Worley



Juniors and electrification

Climate change is a global emergency that requires international cooperation and a strategic and coordinated framework at all levels. With the signing of the Paris Agreement in 2015, countries pledged to reduce carbon dioxide and greenhouse emissions, so that the world is expected to reduce emissions by 45% by 2030, and reach net zero by 2050.

To meet these goals, the world needs a rapid transition toward a low-carbon economy, but the main challenge remains in energy storage, especially in the energy and mobility sectors. The mining industry is destined to play a significant role in the decarbonization of the future as we need more minerals in order to stop relying on fossil fuels.

Several countries have taken action on this matter by securing their mineral supply chain for critical minerals, such as copper, lithium, nickel, etc., needed for energy storage, and particularly electric vehicles (EVs). For instance, in August 2022 the US passed the Inflation Reduction Act that enables businesses to receive tax credits for commercial EVs. Another example is Ontario, in Canada, which also published its first Critical Minerals Strategy in March 2022. Peru, the second largest copper producer behind Chile, has great potential to play a pivotal role in the trend toward an electrified future.

Copper is expected to be a cornerstone for all electricity-related technologies and a low-carbon future due to its efficiency, electrical and thermal conductivity, and several other characteristics that turn it into a critical component in energy applications. However, not enough copper is

being produced to meet future demand. According to S&P Global, copper demand is projected to double from the current 25 million metric tons per year (t/y) to about 50 million t/y by 2035, leading to a potential copper supply gap of around 9.9 million tons.

Right now, copper is as strategic as gold is precious, and everybody is bullish on the red metal. Copper demand presents opportunities for both precious metals producers on the hunt for copper deposits but also junior companies leveraging Peru's copper endowment.

At an earlier stage in the value chain, Forte Minerals Corp. is a company developing copper and gold projects in Peru that shows particular optimism and considers it is a favorable time to make new acquisitions. With its Pucarini, Esperanza, and Don Gregorio projects in the permitting process, and waiting for the green light to start drilling, Patrick Elliott, president and CEO of Forte, said that they are focusing on acquisitions on projects that are already drill-permitted to help fast-track the progress. “The Company strives for value creation by

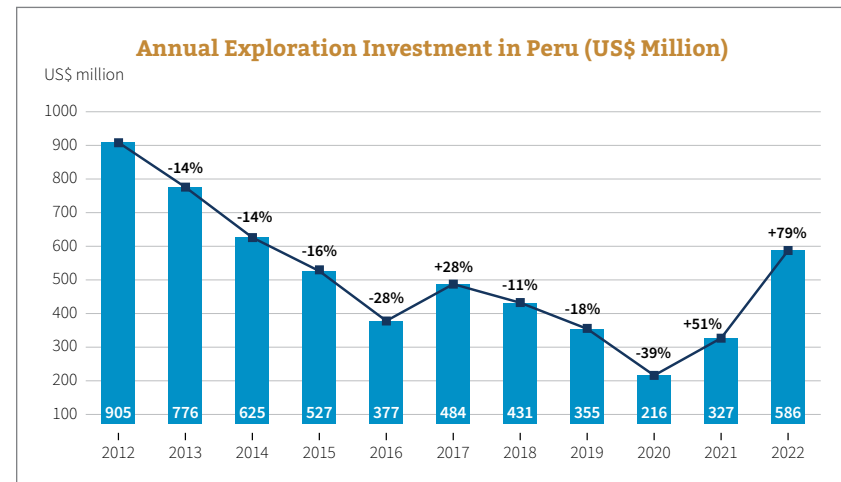
advancing projects from target identification through resource inventory development,” he added. By having GlobeTrotters Resource Group as a strategic project-generation partner, Forte Minerals has preferred access to its pipeline of early-stage projects.

Also leveraging the trend toward electrification is Tier One Silver. Silver shares practical uses with copper, remaining one of the best conductors of electricity. “As the world moves towards electrification, we will witness a rise in silver demand,” stated Peter Dembicki, president and CEO of Tier One Silver. Despite being a silver-play company, Tier One Silver has a base-metal story coming to light with high-grade copper samples and the presence of nickel at its Hurricane project.

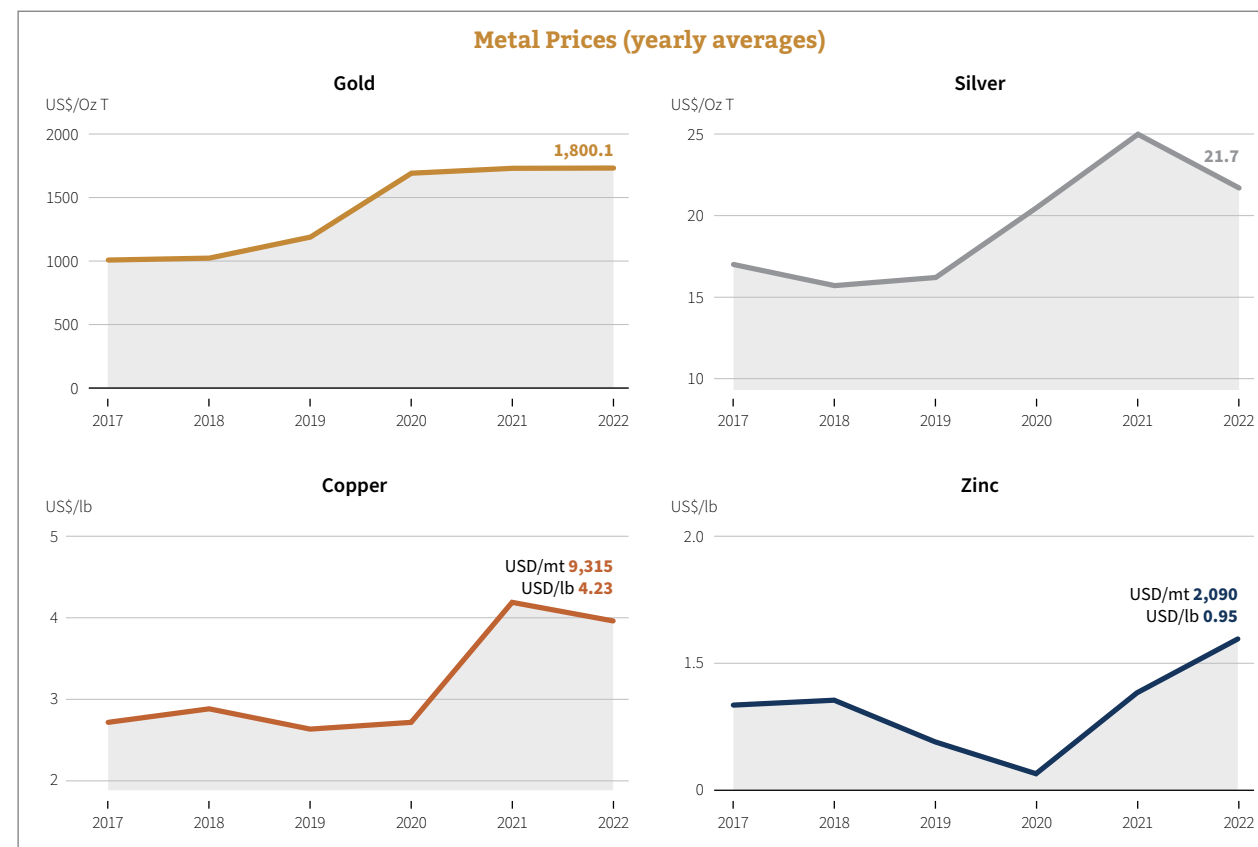
The company is leveraging its team's track record: it was founded by Ivan Bebek and Shawn Wallace, who founded Keegan Resources in West Africa and then Cayden Resources in Mexico, subsequently acquired by Agnico Eagle in 2014. Dembicki explained that its silver Curibaya asset remains its focus, where Tier One Silver has

been drilling in 2022 and recently granted the DIA that encompasses the Cambaya area where it found signs of copper-porphry mineralization.

Finally, Highlander Silver is a silver-focused company, currently exploring its Alta Victoria silver-polymetallic project. Highlander is encouraged by the results at the Santa Teresita target at Alta Victoria, where some intercepts are accompanied by alabandite (manganese sulfide): “We are very encouraged by the results at Santa Teresita and some intercepts, for example, the hole AV 22-14 with 7.9 meters of just over 230 g/t of silver equivalent. What we think is exciting is our interpretation of where we are in the system.” According to David Fincham, president and CEO of Highlander Silver, this mineral association is analogous to Buenaventura's high-grade Uchucchacua mine. The company also owns another property called Politunche. In 2022, Highlander purchased Solitario Zinc Corp.'s exploration work and integrated it into its database, helping to point out new areas where it is conducting geochemical samplings and detailed mapping. ■



Sources: Ministry of Energy and Mines (MINEM), GBR



Sources: Kitco, LME, GBR

Engineering, Consultancy and Contractors

Going deeper and cleaner

Environmental, Social and Governance (ESG) factors have become an inherent part of the mining industry. Compliance with these standards is not only necessary to maintain a more sustainable approach towards the environment and local communities, but it is also one of the key criteria for shareholders and investors to allocate resources. Therefore, poor performance on ESG compliance can result in less investment.

Worley is a company that offers sustainability-focused services in Peru. Franco Pedraz, Worley's country manager for Peru, asserted the company's commitment to providing decarbonizing solutions through its equipment manufacturing division: "At Worley, we have global expertise in electrified mining vehicles, power

"Brownfield projects allow us to deploy our greater capacity because, in addition to engineering, they require modifications to their environmental impact studies and permits, operational efficiency, and water optimization."

**Gonzalo Covarrubias,
General Manager - Peru, WSP**



generation, and green fuels. We have built and designed many hydrogen plants and water treatment plants." Pedraz believes that we might head toward the institutionalization of incentives like certifications for copper production through the use of green energy: "These could generate add-

ed value for investors and, consequently, an incentive for mining companies to invest in sustainable production measures," he added.

On the topic of sustainability, according to Gustavo Bravo, mining director for Latin America and the Caribbean at WSP,



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"The current political situation has had little impact on our activity since 90% of our services are due to sustainability projects with operating mines."

**Javier Mendoza,
General Manager,
Anddes**



ESG criteria are of paramount importance. WSP's recent acquisition of the Environment & Infrastructure business unit of Wood has strengthened their capabilities in tailings management, design, and the application of new technologies under ESG criteria. The company, that has been working at Quellaveco, offers co-disposal of waste rock with tailings, a technique that allows better usage of the geographical space. Continuing with the ESG factors, Gonzalo Covarrubias, general manager for WSP in Peru, added: "ESG criteria require a multidisciplinary perspective and a holistic view of the problems that in WSP we can address."

Reducing the tailings footprint

Among environmental concerns, we find tailings, a by-product of the metals and minerals recovery process, at the forefront. The management of tailings represents a long-term responsibility for mining companies, and due to its high environmental footprint, it can hinder the process of bringing new projects online.

Tailings management has not only improved in Peru but worldwide. The disasters of Mount Polley (Canada), Samarco and Brumadinho (Brazil) served as a reminder that the necessary standards were not widely in place in the industry. After Brumadinho, the International Council on Mining and Metals (ICMM), together with the United Nations Environment Programme (UNEP) and the Principles for Responsible Investment (PRI), established the Global Industry Standard on Tailings Management (GISTM) in 2020, mandatory for its members. Today, several operators in Peru are already adapting their facilities to the guidelines' recommendations or the ones from the Canadian Dam Association (CDA).

Javier Mendoza, general manager of Anddes, an environmental, engineering

and construction management consultancy, agrees that there has been progress regarding tailings in Peru. Still, national standards remain outdated: "National standards represent a problem for mining companies when reassessing their units for a possible sale", stated Mendoza. Anddes has worked on projects like Quellaveco and maintains an integrated contract with Las Bambas. Moreover, it developed a technology platform, AUDAS, which detects and reports earthquakes almost instantaneously, and it is being implemented at Minur, Raura, Marcobre y Antapaccay.

Arcadis is a consultancy and engineering company that also has experience working on tailings. According to Fredy Alejandro, country manager of the company, Arcadis led the engineering of around 90% of tailings dams in Chile and, in Europe, they have been working with renewable energy: "In South America, we have approached local investors to look at potential renewable energy projects applied to operations in the mining industry; for example, solar panels could be implemented in the tailings dam lagoons to prevent evaporation," pointed out Alejandro.

Related to its tailings practice, Arcadis has capabilities in water management, and is working with Southern Peru on the engineering for a treated wastewater pumping system from Ilo city to the tailings dam at Toquepala, 120 km apart.

Several companies in the mining industry have begun to include the figure of the Engineer of Record (EoR). The EoR is responsible for the design and construction phases of a project for tailings facilities. Reflecting on this incorporation into the

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Peruvian mining industry, Alberto Coya, Stantec's country manager for Peru and regional lead for Latin America, noted that the new guidelines of the ICMM and the heavy competition for qualified personnel have widened the talent gap in tailings engineers: "In some cases, companies demand full-time Engineers of Record, creating an additional challenge because the EoRs will not be available for other operations," added Coya.

SRK Consulting Peru's director, Antonio Samaniego, agreed with Coya about the lack of qualified engineers, stating that legislation has mixed the personal liability of the individual with the liability of the consulting firm: "Bearing the responsibility of a potential tailings failure is a burden for the engineers' career. This has reduced their willingness to take on these types of job positions," he explained.

Samaniego added that at SRK has been working with mine closure, a niche that has been very much in demand as well as tailings dams.

Going underground

A vast majority of Peru's mining production comes from open-pit operations, such as Antamina, Las Bambas, Cerro Verde, Toquepala, and now, Quellaveco. However, as open-pit operations become very deep, hauling costs make the mineral more expensive to extract, and this is creating opportunities for some of these massive operations to go underground, a transition already completed

"Mine closure was not regulated until the 1990s. Thus, many old mines did not consider certain aspects that today are binding like water management, one of the most significant vulnerabilities in mines that have been operating for years."

Antonio Samaniego, Director, SRK Consulting Peru



in other mines such as Chuquicamata in Chile. According to MINEM's figures in its investment 2023 portfolio, underground projects represent an overall investment of US\$ 5.7 billion, 10.7% of the entire portfolio amount. Buenaventura's San Gabriel is the only one that began construction in 2022. The underground development of Yanacocha, as the mine transitions from oxides to sulfides, represents one of the largest single investments in Peru's mining industry. Delayed to 2024, it presents a capex of US\$2.5 billion, and is set to provide substantial opportunities for underground contractors.

Such is the case of AESA, a Peruvian underground contractor part of the Breca Group, who won a tender for the integral development of the Yanacocha Sulfuros project, together with Redpath Mining of Canada. "The migration projects from open-pit to underground mines are large-scale operations that require experience, which the client often does not have. To serve this market segment, we thought

seeking a strategic partner was the best route," pointed out Gianflavio Carozzi, AESA's CEO.

In 2022, AESA reached an all-time high in sales with 35% growth compared to 2021. According to Carozzi, in recent years, mining companies have been trying to consolidate the contracting services in a single operator. Thus, they have been focusing on improving their capabilities to offer a better all-round service.

Meanwhile, companies like Pevoex, another Peruvian contractor, had to diversify activities, including additional services and other sectors. Rómulo Mucho, Pevoex's general manager, commented that they have been working on mine closure and environmental remediation services, explaining: "It is an important niche because it is an imminent requirement for all mines."

While open-pit operations represent the bulk of Peru's mineral production, there are very significant medium-size underground operations, such as Cerro

"Attracting high-skilled workers became challenging: there is a big gap between the available talent pool and the demand created by tailings management."

Alberto Coya, Country Manager Peru & Regional Lead Latam, Stantec



Lindo, Condestable and Marcapunta Norte, which is expecting to ramp up operations this year. A good portion of these smaller operations are in the hands of Peruvian players. Many executives believe that the growing importance of underground operations is unavoidable and that the underground mining landscape in Peru is set to change: "In a few years, the situation in Peru will begin to be similar to Chile: a mining industry with large underground mining projects operated by transnational companies," anticipated Alberto Coya, Stantec's country manager.

For Coya, underground operations provide several benefits in terms of ESG and permitting. These operations require smaller surface areas to develop new mines, and this could streamline the permitting processes.

Paul Murphy, manager of Mining Plus' South American Office, agreed: "Existing open-pit mines are coming to the end of their lives, but they still have good mineralization beneath them."

Mining Plus provides geological, mining and geotechnical engineering services throughout the entire project lifecycle. According to Murphy, companies come seeking for underground mass mining studies, methods that are not common in Peru, but it leverages the company's international expertise in the underground space. However, he highlighted that the Peruvian expertise in large pits attracts interest from all over the world. "The skillset in Pery is truly world-class and something the country should be very proud of."

One of the main challenges of this transition is the optimal timing to switch from an open-pit to an underground operation. Murphy stated that the right moment may not be when the mine reaches the end of its life and that the two mining methods may even work in parallel, adding that mining companies often do not consider this switch early enough: "The key is to know early, so better decisions can be made, and importantly, so the right data can be collected to make those better decisions," stated Murphy.

As said before, there is a considerable amount of small to medium-sized underground mines in Peru characterized by narrow-vein operations. In this sub-segment of the industry, several companies flourish, establishing leading positions in the development of equipment and services for this niche. Robocon provides a full range of services ranging from shotcrete production and contracting to slick lines, and has worked with different mining companies, such as Pan American Silver, Sierra Metals and Hochschild.

"The eLION portfolio has great potential due to the trend toward an electrified world, especially in underground mining. Electric motors provide ecological and economic advantages, as they lower ventilation and fuel costs."

Kai Rothgiesser, General Manager - Peru, Bosch Rexroth



According to Enrique Sattler, Robocon's CEO, the distance and depth of Robocon's customers has increased throughout the years, leading to the exploitation of narrower veins and the use of tunnels of just 2.40 meters. These factors led the company to continuously work on innovation, seeking to maintain efficiency and quality. Thus, it manufactured the Technoshot and Technomix range of mini-robots for shotcrete application and transportation with a width of 1.60 meters and a height of 2.20 meters. Moreover, the company has been working on the electrification of its equipment. Sattler commented that it plans to leverage Bosch Rexroth's eLION portfolio of products for electrification.

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"As the migration of large mines to underground operations approaches, we expect AESA Redpath Mining to be ideally positioned with proven capabilities and experience in Peru to work with mines such as Antamina or Mina Justa."

Gianflavio Carozzi,
CEO,
AESA



Robocon is one of the shotcrete contractors affiliated with EFNARC (European Federation for Specialist Construction Chemicals and Concrete Systems). Being a member of this federation allows it to certify its shotcrete operators and break into the European market where this certification is mandatory: "We have increased our interest in Spain, a country with great geological potential and where mining is reviving thanks to technological advances. We believe there could be a boom in underground mining there," added Sattler.

Like major OEMs, Bosch Rexroth, the German hydraulic specialist, has identified a niche in electrification with its eLION technology. This system is an alternative to combustion engines that can contribute to reducing energy costs. The modular portfolio for the off-highway sector includes inverters, gearboxes, software, and coordinated hydraulics. On the other hand, Bosch offers BODAS, a digital ecosystem of IoT solutions that enables customers to monitor and control the machine. Kai Rothgiesser, general manager of Bosch Rexroth Peru, revealed that the market is asking for open-platform solutions to integrate equipment from different service providers: "There is no single provider in the market that can simultaneously offer all services," he explained. ■

Equipment and Services

A robust ecosystem leveraging technology

Although markets are gradually recovering from the pandemic, uncertainty has been a constant in recent months, both globally and domestically. Like many other industries, the mining industry has been adopting new technologies, a process expedited by the pandemic, but also by the commitments that policymakers made under the Paris Agreements to decarbonize the environment, as well as concerns for workers' safety by reducing the need for people in risky areas.

The main technological trends shaping the Peruvian mining landscape include digitalization, automation, and the electrification of equipment. Thanks to a robust ecosystem in the Peruvian equipment and components segment, what seemed impossible a few years ago is becoming reality.

Greener and autonomous

From Australia to Chile, open-pit operations have been leveraging automation for several years. It is well-known that Quellaveco is the first 100% digital mine in Peru, and Epiroc has been playing its part in contributing to this eagerly awaited mine, providing Anglo American with six autonomous Pit Viper PV351 drill rigs and three pre-cutting SmartROC D65 drills. The Pit Vipers can automatically drill while supervised from a common control room, while the SmartROC series allow for visual remote operation.

Besides automation, Epiroc has been working on decarbonization. Ángel Tobar, Epiroc's general manager for the Andean region, stated that the company has a roadmap for the development of its bat-

"In 2023, we will launch a new division in Peru called DSD (Digital Solutions Division), which will coordinate our suite of products and in-house digital solutions, and from recent acquisitions such as Mobilaris or MineRP."

Ángel Tobar, General Manager Andean Region, Epiroc



tery-electric machinery portfolio: "Our goal is to have electric alternatives for all of our underground equipment by 2025, and by 2030 for the open-pit equipment."



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Tobar highlighted that combining digital with green solutions has a positive impact on production, working conditions and the environment, which is the objective of Epiroc's Smart and Green series; battery-powered machines equipped with Epiroc's Rig Control System (RCS), which makes them ready for automation and remote control.

Adopting electric equipment offers many advantages, especially in the underground segment, where the use of electric machinery can not only save on ventilation and cooling costs, but also improves the worker's health by not producing CO2.

Against all odds, where worldwide OEMs dominate the equipment segment, Peruvian underground equipment manufacturer Resemin has been developing green solutions for the narrow vein mining niche. Recently Resemin has been working on a Dual Bolter, which it expects to launch in mid-2023. This new model works both as a scaler and a roof bolter. "Unlike existing diesel-powered scalers, our Dual Bolter can be plugged into the electric grid to scale and start bolting without disconnecting," explained James Valenzuela, Resemin's founder and CEO.

Resemin has been selling its equipment worldwide for years and intends to build a plant outside of Peru: "Although we have not yet defined the location of our new plant, we believe it will be located in Eastern Europe or Mexico," stated James Valenzuela.

Another underground equipment manufacturer active in Peru is Finland-based Normet. Franklin Pease, general manager at Normet's Peruvian branch, commented that Normet has been

"Each processing plant and conveyor work with particular conditions; thus, we seek to be involved in the production process to identify the details that will optimize the solution and implement them in coordination with the client."



Eduardo Espinosa,
General Manager
Andean Region,
Martin Engineering

mechanizing underground equipment for many years, starting with shotcrete and now working on scalers, and as of late it has been working on the automation and electrification of the fleet. Recently, Normet launched the SmartScan that, using 3D laser scanning, eliminates the need for manual probing of the sprayed concrete thickness. Normet is also working on the SmartDrive, a modular battery electric vehicle architecture. "Our equipment has worked very well in Chile, so we will test how it adapts to the Peruvian mine configuration. Although the number of electric equipment in Peru is not high, the trend toward electrification is clear," said Pease.

On the technology front, a company that has been venturing into the underground space is Torsa. The Spanish firm, specializing in research, development and manufacturing of technological solutions for heavy industry, has initiated the development of its UGM device, an anticollision system for underground operations that is being tested in Chile. The system is similar to the one used in open-pit operations, but Torsa had to adapt the software and hardware for underground-specific conditions. "We expect it to be available from May 2023 so we can start underground testing it in Peru," said Alonso Quiñones, Torsa's country manager.

The company, that works in Marcobre's Mina Justa and Glencore's Antapaccay, also offers digital solutions, including Torsa Cloud, a business intelligence platform that provides its users with the information to identify and track the parameters related to their KPIs and optimize their activity

Ancillary technologies

Innovation in open-pit and underground equipment could not be possible without the external development of key components. Component companies are also hopping into some of the most relevant trends in digitalization and electrification and gathering crucial data from the equipment to optimize operations.

On the compressor technology side, Atlas Copco has developed several innovative solutions to improve and optimize air compressors. Atlas Copco offers the Elektronikon, a controller system installed in each compressor that uses the IoT, allowing remote monitoring and energy conservation. It also collects data from the sensors, processes it, and delivers it for an overview.

Julio Hernández, general manager of Compressor Technique - Atlas Copco Andean Region, asserted that this year Atlas Copco will launch AIRPlan in Peru, an all-inclusive contract for compressed

air delivery where the company maintains the ownership of the equipment, while the customers pay a flat rate and a variable rate according to the compressed air intake. "This all-inclusive contract has gained momentum in Colombia and Brazil, and we have noted a similar trend in Peru," said Hernández.

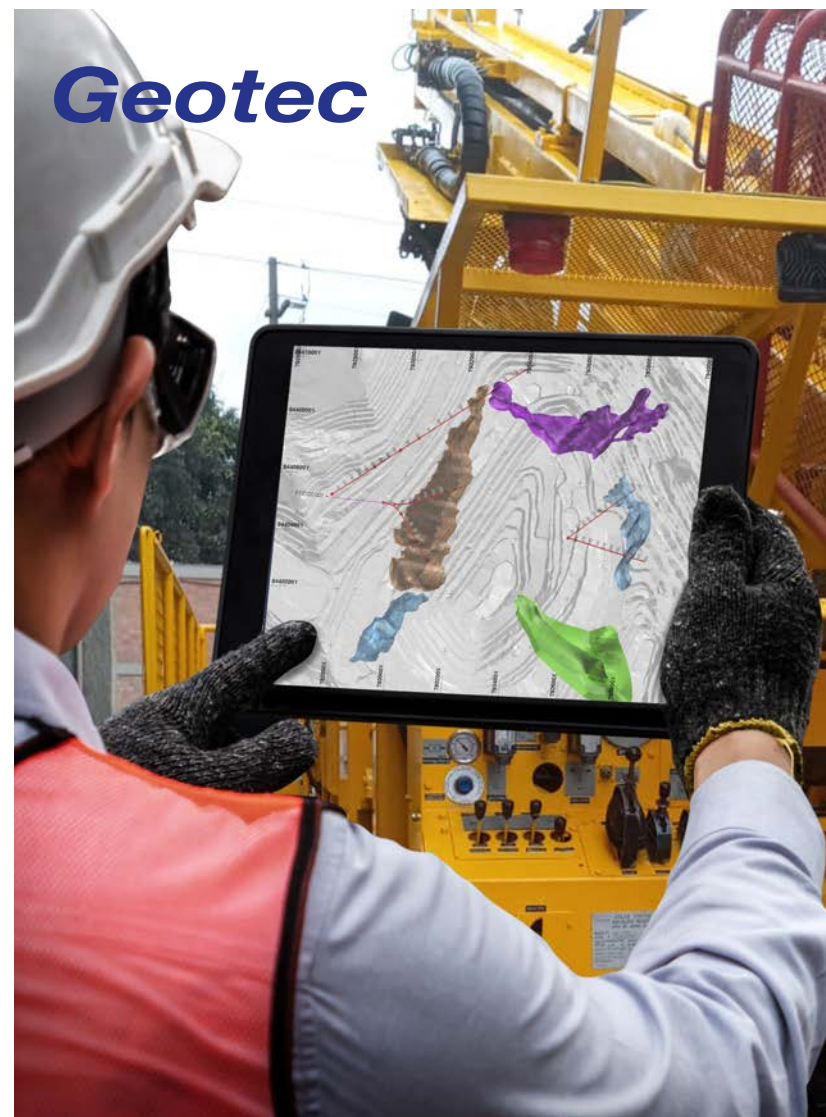
Martin Engineering is also leveraging autonomous and remote-control technology for its solutions. The company's primary focus is to promote solutions in the material handling space to decrease the need for maintenance and manned activities. As stated by Eduardo Espinosa, the company's general manager of the Andean Region, the next step will be to control the equipment remotely to reduce the human presence around conveyor belts. "By keeping staff away from risk areas, we can improve their safety," said Espinosa.

Drilling Services

Drilling companies are not lagging behind in terms of innovation and safety. Jorge Granda, COO of AK Drilling, highlighted the implementation of mechanical automation systems: rod handlers and preventive systems, such as guards that deactivate the equipment when it detects that the operator enters risky areas. However, there is general agreement between drilling companies that it is impossible to implement 100% automation: "Full automation in drilling is not possible because it requires the operator's expertise," stated Granda.

The fact that automation solutions cannot substitute specialized driller operators entails two additional implications for drilling service companies: they need to implement measures to guarantee their workers' safety during operations and design effective strategies to attract and retain talent.

Regarding safety measures, AK Drilling has well-established safety protocols that generate behavior patterns enhanced with continuous training. By transferring knowledge with continued training, they can implement risk-mitigation measures based on experience while encouraging good practices. In this context, Jorge Granda added: "it is crucial to have a skilled workforce to reduce the odds of accidents and, in AK Drilling, we have a well-structured safety department that can get feedback from our events, as well as industry events."



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On the other hand, MDH's general manager, Daniel Santa María Stein, stated that the lack of universities or institutes that provide technical expertise in drilling poses a challenge when it comes down to finding good drill operators, especially for remote or difficult-to-access projects. "Although at MDH we train our operators, it is a process that takes between three to four years, so demand exceeds the supply of drillers in the short-term."

Logistics

Cristian Rodríguez S., CEO of Stierlift, a heavy cargo transportation company, stated that even though the segment is exposed to a high turnover rate, the company has not experienced much, emphasizing: "Employee's care and safe working conditions set the company as an attractive option in the market."

According to an article from the Peruvian Institute of Mining Engineers (IIMP), 66% of mining fatalities in 2021 in Peru occurred on highways. This is a clear incentive to maximize security measures for transportation companies. In this regard, Rodríguez agreed that one of the biggest challenges for transportation companies in Peru is road conditions, for example, tunnels that make transportation difficult or winding roads in the highlands. In the high Andean territories, where most mining activities occur, mining companies tend to generate logistic corridors with opportunities to boost the economy of remote regions. However, Peru still needs more investment in infrastructure. According to Víctor Gobitz, president of the SNMPE, Peru has a public investment portfolio of around US\$100 billion in infrastructure. ■



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Peru Mining 2023

PDAC Pre-Release Edition

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If you wish to be interviewed for the report, please contact Lucrezia Falcidia (lfalcidia@gbreports.com)

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