E&MJ ENGINEERING AND MINING JOURNAL

GBR GLOBAL BUSINESS REPORTS

Mining in Ontario and Toronto's Global Reach

Challenges and opportunities in Canada's biggest mineral producer

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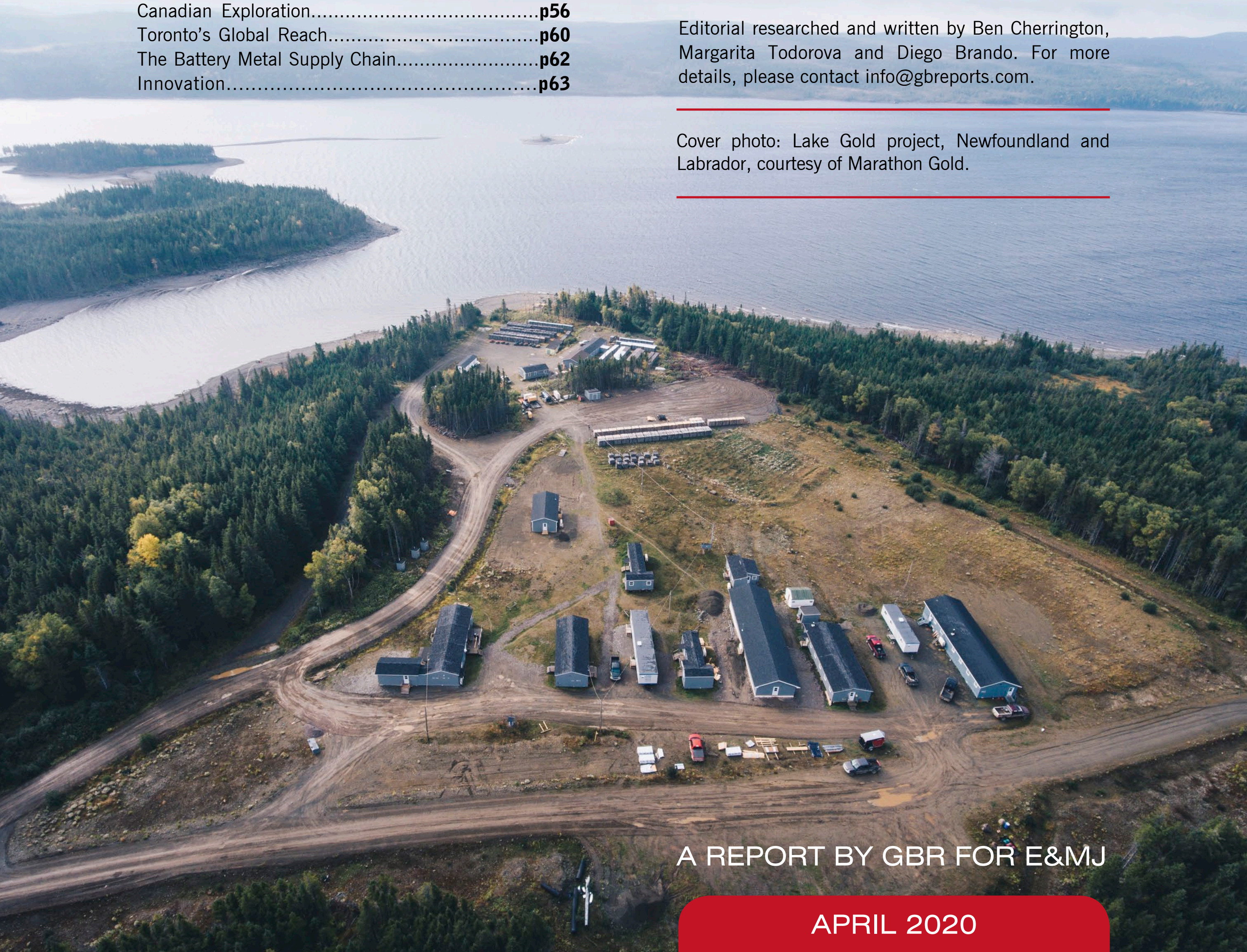
Cover photo: Lake Gold project, Newfoundland and Labrador, courtesy of Marathon Gold.



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Introduction

A global mining powerhouse facing competition

Ontario's position as one of the world's pre-eminent mining jurisdictions is demonstrated by a number of metrics. As Canada's leading producer of minerals, valued at C$10.1 billion in 2018, with the second largest number of mining companies headquartered in one city (Toronto is second to Vancouver) and as the traditional home of mining finance on Bay Street where the TSX is found, Ontario's influence reaches far beyond the borders of the province.

However, remaining competitive in a global market place cannot be maintained through reputation alone and, despite impressive production figures and a world-class mining ecosystem, there are signs that Ontario's traditional position of dominance has started to wane. The Fraser Institute's Mining Investment Attractiveness Index ranked Ontario number 16 in 2019, behind North American jurisdictions such as Utah (14), Saskatchewan (11), Idaho (8), and Alaska (4). Of course, none of these jurisdictions come close to matching Ontario's global influence, but even from a mining finance standpoint, the days of spending an afternoon on Bay Street to raise project finance are no longer.

High energy and labor costs and lengthy permitting processes are two of the main issues facing Ontario. Fortunately, the provincial government, led by Doug Ford's Progressive Conservative Party, elected on June 28, 2018, and a network of mining associations are cognizant of these challenges and have been proactive in attempting to establish a more favorable climate for mining investment.

In his interview with Global Business Reports, Greg Rickford, Minister of Energy, Northern Development, Mines and Indigenous Affairs from the Government of Ontario, emphasized a focus on key areas in order to position Ontario as the leading mining jurisdiction in Canada, including expediting regulatory processes for mine production, strengthening spaces for industry-wide dialogue and creating focused task groups to resolve a backlog of project-specific issues immediately. When asked what steps the Ontario government is taking to reduce red tape and streamline the mining process, Minister Rickford pointed to the four mining-related clauses in the "Better for People, Smarter for Business" project.

Greg Rickford, minister of energy, Northern development, mines, and Indigenous affairs, Government of Ontario.

Firstly, creating certainty for proponents submitting a closure plan by creating a 45-day timeline for the ministry to make a decision; secondly, to streamline processes and lessen confusion by amending the regulatory framework; thirdly, amending the mining rehabilitation code to ensure that it refers to the most recent version of dam safety; and lastly, improvements to the land mass administration system to make it easier for stakeholders to merge individual claims. "The timeline to open a mine is not at the speed of business or commodity markets, and we are working to correct this," acknowledged Minister Rickford.

Record M&A activity sweeps the industry

2019 ended much the way it started, with a wave of high-profile M&A deals in the gold and PGM space as Impala Platinum acquired North American Palladium for C$1 billion in October, Kirkland Lake Gold stunned the market with its acquisition of Detour Gold for C$4.3 billion in November and China's Zijin Mining Group bought Continental Gold for US$1.3 billion in December. By mid-December 2019, 348 deals worth more than US$30.5 billion had been agreed, according to Refinitiv Eikon data. This figure is up from US$10.8 billion in 2018 and even surpasses the previous high of US$25.7 billion from 2010.

One of the most noticeable differences between the boom-time M&A surge in 2010 and the 2019 activity has been the lack of premiums linked to the transactions, most notably Barrick's no-premium acquisition of Randgold, and the modest 18% premium paid by Newmont for Goldcorp. "The financial strategy we are seeing from companies is still very conservative," commented Daniel Ricica, partner of KPMG's energy and natural resources division, explaining that, despite the robust gold price, a seven-year downturn and previous misuse of capital are still fresh in the minds of investors: "The effects are still visible, and we see management and investors are still treading carefully."

At the Denver Gold Forum in September 2019, the month gold traded at a six-year high breaking the US$1,500/oz barrier, the main themes were the growing importance of ESG (Environmental, Social and Governance) to investors, and companies emphasizing their commitment to remain disciplined with capital allocation despite the rapid generation of free cash flow that flourishing precious metals prices were generating. This prudent approach from senior management is a legacy, you would like to think, of the numerous failed excesses of the previous upcycle. However, with gold approaching the US$1,700/oz threshold by the time the Prospectors and Developers Association of Canada (PDAC) took place in March 2020, will the buoyant mood foreshadow a more liberal outlay of capital in the coming months?

ESG moves to the forefront of strategy

Speaking at the Northern Miner's Progressive Mine Forum in Toronto, October 2019, Claudia Mueller, associate director of the Global Mining Management program at the Schulich School of Business, proclaimed that the next generation of mining leaders will arrive with a "tsunami" of ESG concerns.

Furthermore, the No. 1 consideration in EY's Top 10 business risks and opportunities in mining 2020 is license to operate (LTO), an issue that has evolved into something more than simply social license. "Looking at the list year-over-year, we have seen a big shift from the traditional corporate social responsibility approach towards adopting a holistic environmental, social and governance strategy," observed Theo Yameogo, co-leader of mining and metals Canada at EY.

On the environmental side, one of the key components of the increasing importance of ESG is water management. "I have seen the mining sector's views on water change a lot in a relatively short period of time," observed Kristin Pouw, principal consultant and water management specialist at SRK Consulting, noting that today there is a better appreciation of the resource, as both a liability and an asset. "Water management is becoming an important consideration for investors," she added, expanding: "Evidence of this increase in attention is that frameworks for disclosing information on water-related risks and financial and social penalties are being developed, and companies are developing and implementing internal standards for water management planning."

On the trend of regulatory changes requiring companies to understand, quantify and mitigate water impacts associated with mining, Pouw gave the example of a change to the federal Metal and Diamond Mining Effluent Regulations coming into effect in 2021, that will lower limits on some metals and impose a new limit on un-ionized ammonia for effluent discharges at all mines in Canada. "My advice to project developers is to look at, and plan, water management early on. This will give you the best chance of avoiding risks and successfully tackling issues," suggested Pouw, highlighting the benefits of looking at water management at an integration level – combining water, waste, and mining. "If you do not have the necessary internal capabilities, seek expert help to develop a water management strategy appropriate to the site's climate, geology, geography and regulatory framework. This will help you to avoid poor decisions that initially seemed appealing from an economic perspective and to ensure that your project goals remain deliverable," she advised.

Mining 2.0 downloading! ESG transitioning to action

By: **Dean McPherson,** Head, Business Development, Global Mining, Toronto Stock Exchange & TSX Venture Exchange

Two years ago the global mining sector started a slow climb out of a historically long downcycle. Plagued by historic volatility and uncertainty brought on by successive global crises, the sector's recovery has been inconsistent at best -- yet market optimism remains persistent.

Even through moments of uncertainty, the second half of 2019 saw a noted pickup in global mining financings, as well as mergers and acquisitions (M&A) activity. With a strong recovery in precious metals prices being added to the mix, we entered the new year with optimism all around.

Today, we're seeing strong underlying fundamentals (supply/demand imbalances) for base metals, as well as technological developments driving increased demand for battery metals in the medium-to-long-term.

Heading into PDAC 2020, we noted an increased sense of discipline on the part of mining investors. There is now a persistent bias in the sector, with investors seeking projects within relatively "safe" jurisdictions with minimal regulatory risks. Investors are looking for trusted management teams with a proven track record of growing stakeholder value. From exploration to production, the paradigm is shifting and stakeholder value has now supplanted shareholder value.

The previously mentioned pickup in M&A is driven in part by increased investor demand for efficiencies (often through economies of scales) to enhance shareholder return. This focus on shareholder return will no doubt continue in the near term, and perhaps extend down to more exploration companies. However, there is another component of this more disciplined investment approach.

Mining companies must now engage investors and stakeholders with detailed, informed and proactive environmental, social and governance (ESG) strategies. This is now also a key investment decision factor.

ESG transitioning to implementation and disclosure

To help mining companies listed on our Exchanges, we have developed an ESG portal. Issuers are able to access the site to help them navigate the complexities of ESG reporting, ratings and data collection. www.tsx.com/learning/esg

Two years ago we flagged the emergence and need for a "Mining 2.0" era; a new age of responsible and innovation-based mining. This concept has evolved and is now established under the umbrella of ESG and is in full implementation phase.

This year, we note from VRIC/Roundup to Africa Mining Indaba to PDAC, focus has been on innovation and positive change to restore the image of the sector in the eyes of investors and the public. Moving ESG from advocacy to disclosure and implementation is the key here.

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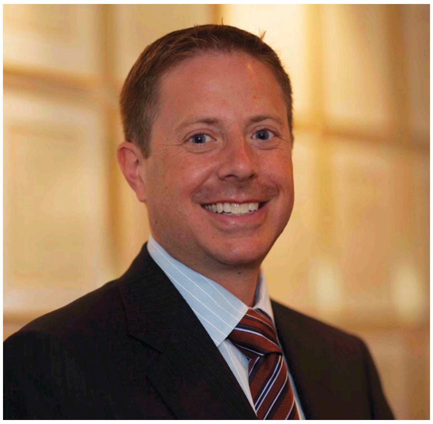
Toronto: the Home of Mining Finance

The challenge of attracting investment

Toronto remains the global investment engine of the mining industry through its stock exchanges, mining-focused financial services, consultants, legal advisors and banks that have a long history of financing projects from early stage exploration through to production. With almost twice the number of mining companies listed on the TSX and TSX.V (approximately 1,200) compared to its nearest competitor, the ASX, even companies that have never had or will likely never have operations in Canada choose to be headquartered in Toronto for its access to capital.


Michael White, president and CEO, IBK Capital.


Dean McPherson, Head, Business Development, Global Mining, Toronto Stock Exchange & TSX Venture Exchange

In October 2019, the TSX30 program was launched to highlight the top 30 performers on the main exchange over the last three years based on dividend adjusted share price appreciation. Considering the challenging market conditions in that time period, it is a welcome surprise that eight of the companies on the list are in the mining sector, five of which are headquartered in Toronto, with Kirkland Lake Gold being the fourth best performer overall with over 600% return. "The program showcases that investors can still receive great returns in the mining market," commented Dean McPherson, head of business development – global mining at the TMX Group, noting the significant role that management and jurisdiction play in encouraging investor appetite.

Although these success stories are encouraging, they do not paint the full picture. While the incredible performance of a small section of the industry is an encouraging sign moving forward and should elicit some investor confidence, a lack of new listings and the continued struggles of the junior community to attract finance have created a chasm between those who produce, and those who explore. A clear illustration of the challenging financial climate facing the industry came from Triple Flag Precious Metals Corp, which decided to pull the plug on its planned C$360 million IPO in December 2019, citing difficult market conditions and a lacklustre demand for new mining issues.

"In terms of new listings and financings, 2019 has been a bit volatile, not only for the mining sector but across the board," acknowledged McPherson, before noting that this is truly a global issue, as the number of new listings on TMX Group's equity exchanges in 2019 still outweighed those of its major competitors combined.

In such a context, companies need to cast their nets wide when sourcing capital, and a roadshow that includes the United States, Europe and Asia requires juniors to demonstrate more than just promising drill results. "My theory is that there has been a renaissance in mining, whereby a lot more is demanded from companies as the sector in general has matured. The companies, the environment and investors have all changed, demanding greater ROI," reflected McPherson.

Despite the struggles of the junior market, the outlook for metal demand is robust, and the fact remains that mines need to be discovered, financed and put into production – a process that does not happen overnight. A distressed market also presents opportunities, and the disparity between bullish precious metals prices and declining junior share prices is not sustainable. "There is now the opportunity for longer term investors to look at the undervalued juniors and take advantage of the current market," observed Ryan Matthiesen, managing director of investment banking at Haywood Securities, adding: "If you have the ability and patience to analyze and evaluate assets and teams, you will find great opportunities."

Raising finance in 2020: What are investors looking for?

With further M&A activity expected between the precious-metals mid-tiers and “cannabis 2.0” on the horizon as edibles, beverages and vaping products enter the Canadian market, the competition for investment dollars looks set to remain stiff in 2020. How, then, can the downtrodden junior community stand out from the crowd?

“What I like about an early bull market is that it separates the good from the bad,” stated Michael White, president and CEO of IBK Capital, the private investment firm that has helped to raise finance for the likes of Great Bear Resources (GBR) – the standout junior stock of 2019. “Management has to be very convincing in order to obtain capital. There must be a strong vision that is backed with historical data and reliable results, as well as a tested team that can be trusted to deliver results,” explained White, noting that investors will be put off if due diligence and planning are not prioritized in the rush to drill. “There is a lot of competition for funding. Being thorough with a strategy and prepared for execution is far more attractive than rushing to get results,” he added.

From the point of view of the investor, what should exploration companies focus on to impress the market, and are there indications that a stock may have reached its peak? “A comment that applies to any exploration discovery is that continuous exploration and expansion of a deposit are important for the company’s market valuation,” said White, pointing to the success of GBR’s strategy to continually step-out and add new mineralization at its Dixie project. “If a company’s sole focus turns to infill drilling, converting inferred resource to indicated or measured, this might be an indication that the stock has reached its limits,” he concluded.

Keith Spence, president and CEO of Global Mining Capital, echoed the sentiment that preparation is key, suggesting that junior companies often go public too hastily: “If a company remains private, puts its house in order, gets rid of some of the risks and then goes public, it will have a better product to offer the market.”

Noting a significant structural change in mining industry financing, Spence explained that a strong retail base had made Toronto into a global financial center for mining, but as the amount of institutional money grew, eventually the retail market disappeared: “Many investors have left the mining space after losing huge amounts of money due to major financial disasters and scandals during the last 20 years, such as the massive gold mining fraud by Bre-X Minerals.”

A reoccurring theme in Global Business Reports’ research and interviews was the growing importance of team and jurisdiction. Terry Harbort, president and CEO of Talisker Resources and VP exploration for Sable Resources, related how, over the last 10 years, there have been approximately 200,000 drill holes drilled in the global mining industry, yet only 38,000 of these drill holes actually made a significant intercept. “The discovery rate in the industry is 0.6%, so investors want to invest in the 0.6% of the industry that has actually found something,” said Harbort, noting that Sable Resources’ team has been responsible for discovering approximately 40 million oz globally.

Ryan Matthiesen commented that advanced projects in the right location with a clear path to production, backed by a good management team and strong investor base, will attract interest: “Capital is migrating to more secure jurisdictions and investors are willing to pay a premium for stability; a factor that is more important than it was a few years ago.”

Tellingly, for the first time ever, no Canadian jurisdictions were included in the top 10 of the Fraser Institute’s Investment Attractiveness Index in 2019. Improving the climate for investment will be key to maintaining a healthy project pipeline in the years to come.

Mining Production in Ontario

Majors streamline operations after mergers

In the wake of the two super mergers concluded in early 2019, there was uncertainty surrounding how the world's two largest gold miners, Newmont and Barrick Gold, would deal with their assets in Ontario. Would Newmont manage to sell its Red Lake mine? Would it begin operations at the new Borden mine in 2019? Would Barrick maintain its headquarters in Toronto despite its CEO being based abroad? Would Barrick's Hemlo mine survive the cut as the company decided to sell off non-core assets?

Crucially for the Ontario mining industry, the answer to all of the above was a resounding yes. The common theme in the restructuring decisions taken by both companies has been to focus on top-tier assets, trimming the fat to reduce costs and optimize operations.

Mark Bristow, Barrick's president and CEO, spoke on the reasoning behind the merger with Randgold: "Through the merger we obtained the possibility of having six or seven of the top 10 assets in the world. If you have an asset portfolio like this, you can create a standout business. If you want to be dominant in the gold mining industry, it is not about size, but about value and the quality of the assets," he stated.

Bristow commented that Barrick's success in 2019 was due to a focus on youth, praising his new management team for closing four big deals in 10 months: the Barrick-Randgold merger, the Nevada consolidation, the acquisition of Acacia Mining and the sale of KCGM. "One of the things we were focused on during the merger was to create a more agile, fit for purpose and modern corporate structure. You can have the best assets in the world, but without the right people they are useless," elaborated Bristow, who likened the previous incarnation of Barrick to a "patient in intensive care" when discussing a possible merger with John Thornton in 2015, emphasizing how the new generation of young talent brought in has re-energized the company.

This philosophy has been applied to Barrick's Hemlo operation in Thunder Bay. The project has undergone a modernization process to reduce an average employee age, which sat at 57 before the restructuring. "During our due diligence on Hemlo, we did not have a consensus on whether it was a good or bad operation, but it was clearly old fashioned," reflected Bristow, noting that a voluntary separation package offered to many of the mine workers had been accepted by all. "The next steps at the mine will be to phase out the open pit operation and move to an underground contract mining model, with the objective to upgrade Hemlo to a Barrick Tier 2 asset and extend its Life of Mine well into the future," he explained, concluding that Hemlo today is a more lean, agile, modern and profitable mine.

A major milestone for the Ontario mining industry was celebrated on October 1, 2019, as Newmont's new Borden "mine of the future" entered into commercial production. Located near Chapleau, under 200 km from Timmins, the Borden mine sits under the umbrella of Newmont's Porcupine Gold Mines operations, which also include the Hoyle Pond underground mine and the Hollinger open pit mine. The three operations combined should deliver approximately 300,000 gold oz/y, according to Marc Lauzier, Porcupine Gold Mines' general manager, who commented that Borden is expected to produce approximately 1,800 mt/d at about 6 grams of gold per metric ton (mt). "Borden's digital mining technologies, low carbon-energy vehicles and modern health and safety controls position it as one of the world's most technologically advanced mining operations," stated Lauzier, who expects Borden to be fully electric by 2021.

The Canadian and Ontario governments each provided Newmont with C$5 million for the electrification of the mine, which can be seen as a model of modern resource development from both environmental and cost standpoints: "Through the use of electric vehicles, we will be able to reduce 7,000 mt of greenhouse gas emissions and associated maintenance costs, as well as save the consumption of 2 million liters of diesel and 1 million liters of propane," explained Lauzier.

A golden age for Ontario mid-tiers

The darling of the Canadian mining industry over the last four years has been, without a doubt, Kirkland Lake Gold (KL Gold), with a remarkable rise that saw its stock increase from under C$3 in January 2016 to a high of almost C$65 in Q3 2019 as its market cap broke the C$12 billion threshold. KL Gold's serene progress was – at least temporarily – halted on November 25th, as the market reacted in shock to the company's all-share acquisition of Detour Gold Corp for C$4.9 billion, a 24% premium to its valuation at the time.

When questioned about initial market skepticism towards the Detour transaction, KL Gold president and CEO Tony Makuch spoke of the value he sees in adding a third high quality asset to the KL portfolio with a large reserve to support mining for over 20 years.


Mark Bristow, president and CEO, Barrick Gold Corp.


Anthony Makuch, president and CEO, Kirkland Lake Gold.


Duncan Middlemiss, president and CEO, Wesdome Gold Mines.

"We have already taken two "under-loved" assets at Macassa and Fosterville, and turned them into industry leading mines through investments in exploration, infrastructure, equipment and development," he stated, continuing: "Detour is in our back yard in northeastern Ontario, we know the geology here well, and bring a lot of synergies."

Another low-cost, high-grade gold producer from Ontario that enjoyed a tremendous 2019 was Wesdome Gold Mines, having enjoyed exploration and production success at its Eagle River mine in Ontario and at a second high potential asset, its Kiena mine in Québec. Before becoming Wesdome Gold Mines' president and CEO in 2016, Duncan Middlemiss was instrumental in the growth of St. Andrew Goldfields prior to its acquisition by Kirkland Lake Gold. Under his leadership, Wesdome's stock has risen from under C$2 in July 2016 to over C$10 dollars in December 2019, and shows no sign of slowing down. "Wesdome has a crystal clear strategy about building Canada's next mid-tier gold producer," stated Middlemiss, before going on explain how Wesdome's exploration and production success at Eagle River – producing at 21 g/mt in 2019 – has allowed the company to accelerate the investment program into the complex: "This includes enhancing the tailings capacity, improving the mill by adding a Falcon gravity concentrator and developing the proper drilling platforms within the mine."

Success at the Eagle River mine has also funded the C$27 million advanced exploration program at Wesdome's Kiena project in Québec, with a PEA expected to be released in April 2020. "The advantage Wesdome has is that this project is a fully built, fully permitted mine, and the resources that we have been able to explore and define better are incredibly high grade – almost 18 g/mt in the indicated and 15 g/mt in an inferred resource," said Middlemiss.

Canadian Exploration

A suffering junior market waits for the tide to turn

Major Drilling's specialized drilling teams use a CP50 core rig for deep core hole with directional drilling at a copper exploration project. Photo courtesy of Major Drilling.

Despite robust metals prices and gold breaking the US$1,600/oz threshold for the first time since 2013, funding has been harder than ever to come by for Canadian exploration companies. The cannabis hysteria and cryptocurrency boom have died down, but generalist investment has yet to return to the exploration sector, preferring to invest in low-cost producers showing free cash flow. "The funds are seeing generalist money coming into the large and mid-caps and, from their perspective, it is riskier to pick a micro-cap that could double when some of these intermediates have been doubling," explained Ryan Matthiesen, managing director of investment banking at Haywood Securities. "This has created a large valuation gap as bigger companies have been trading at much better multiples," he added.

The discrepancy between the producers and juniors is, however, not sustainable, as depleting reserves and declining ore grades incrementally increase the necessity for new discoveries to be funded, developed and brought into production.

In his interview with Global Business Reports, Barrick president and CEO Mark Bristow named Canada as a "standout jurisdiction for finding big mines," pointing to the opening up of big gold/copper porphyries in British Columbia and the potential of the older regions in Ontario and Québec to be reinvented through creative and penetrative exploration. "Archean rocks produce surprises, and I believe in Canada there are still great opportunities that lie within the ground," reflected Bristow.

Golden opportunities at Red Lake

Red Lake in Northwestern Ontario has been a hive of activity in 2019, as Newmont sold its Red Lake mine to Australian company Evolution Mining for US$375 million in November, Pure Gold Mining began construction at its Madsen Gold mine in September and a host of juniors ramped up exploration at the historic mining camp.

The best performing junior stock of Q4 2018 made further strides in 2019, as extensive exploration of Great Bear Resources' (GBR) Dixie project at Red Lake produced spectacular result after spectacular result, seeing the Vancouver-based junior's share price rise from C$2 in January to a high of C$9 in September.

"Approximately 12 months ago, we only had two zones discovered, but we have now increased this to seven discovered zones," stated Chris Taylor, GBR's president and CEO, who elaborated on how, through regional drilling and the use of government data, GBR discovered a new zone of shallow high-grade gold associated with silicification of host rocks related to a crustal-scale structure, called the LP fault. "The fault marks a contact between mafic and felsic/intermediate rocks and is spatially associated with an 80 m to 200 m wide quartz sericite zone associated with highly anomalous to high-grade gold mineralization," explained Taylor. "The Dixie project has transformed from another high-grade gold in quartz vein story, to being something entirely different now," he continued, likening the deposit to Hemlo as the mineralization is more disseminated in the rock, rather than in veins, with intercepts of high-grade gold mineralization going right to surface.

Palladium reaches all-time highs

When producing the previous version of this report in December 2018, palladium's remarkable performance was one of the key talking points, headlined by the now-acquired North American Palladium's Lac des Iles mine near Thunder Bay. While the outlook for 2019 was bullish, few would have predicted just how well the platinum group metals (PGM) would perform as rising demand from the hybrid automobile industry combined with a continued eight year deficit drove up the price by 83% for the year. On December 17, for the first time in history, palladium broke the US$2,000/oz threshold, becoming more valuable than gold has ever been (US$1,917/oz in 2011). By February 2020, palladium had reached a staggering US$2,600/oz.

Jamie Levy, president and CEO, Generation Mining.

How then did Toronto-based junior Generation Mining manage to acquire a 51% interest in the Marathon palladium project in Ontario from Sibanye Stillwater in 2019 for a total consideration of under US$6 million, considering that Stillwater had acquired the project in 2010 for US$118 million when palladium was worth less than US$1,000/oz? Jamie Levy, Generation Mining's president, CEO and director, expanded on how the project had been abandoned due to Stillwater's inability to raise money and its financial outlay with the US$450 million acquisition of Peregrine Metals. "There were management changes and Stillwater was sold to Sibanye. The merger was for US$2.2 billion, and the purchase was primarily motivated by Stillwater's assets in Montana," explained Levy, elaborating: "When we approached them, they had no interest in developing the property in Ontario. Sibanye's focus is in production rather than in developing the mines. For this reason, we managed to get the asset under very favorable conditions."

"The Generation Mining team negotiated an outstanding deal for their shareholders," affirmed Ryan Matthiesen, managing director for investment banking at Haywood Securities, the sole bookrunner on the financing.

Generation Mining can increase its interest in the Marathon palladium project to 80% by spending C$10 million and preparing a PEA within four years.

Generating an Ontario nickel play

In December 2019, Toronto-based project generator Noble Mineral Exploration announced the completion of the Crawford Nickel-Cobalt project property transfer to Canada Nickel for C$2 million in cash and 12 million shares of the new Ontario junior. "An important part of the transaction was the negotiation with the royalty holder to reduce the royalty from a 5% NSR to a 2% NSR," explained Vance White, Noble Mineral Exploration's president and CEO, noting that this reduction is going to make the project attractive to more participants, such as majors and mid-tiers.

Noble's Project 81 asset is a contiguous parcel of land covering all or parts of 14 townships adjacent to the Kidd Creek mine complex, which has been in production for 53 years and has produced


Jose Vizquerra, president, CEO and director, O3 Mining.


Terry Harbort, president, director and CEO, Talisker Resources.


Vance White, president and CEO, Noble Mineral Exploration.

160 million mt. Expanding on the potential of the land package, White commented that by taking out all of the early stage risks of airborne geophysics and data compilation, Noble has created drill-ready opportunities to be picked up by third parties. "The Canada Nickel deal is tangible proof of the potential of our land package, and we intend to continue developing projects into 2020 and beyond," stated White, adding: "We are looking at anywhere between a C$15 and C$20 million spend over the next 36 months with 8-10 partners."

Québec: a world-class mining jurisdiction

The first incarnation of Osisko Mining defined a new style of mineralization in Archean aged gold-only porphyries, ultimately discovering over 10 million oz of gold at Canadian Malartic. In recent years, no group has performed as much exploration in Canada as the second incarnation of the company, reaching a staggering 1 million meters of drilling in September 2019 in only four years.

Now, O3 Mining, the third iteration of the Osisko Mining Group, has been created with the intention of adding significant value to the Garrison and Marban assets in Ontario and Québec, according to Jose Vizquerra, O3's president, CEO and director. In July 2019, O3 Mining completed an RTO with Chantrell Ventures, transferring a portfolio of exploration projects including Marban and Garrison. Additionally, a portfolio of selected securities was transferred by Osisko, which ended with just over 53% of O3 Mining's outstanding shares.

Despite challenging conditions for juniors, O3 Mining has shown that the right projects with the right backing can make quick progress, as the company has raised over C$28 million to advance its exploration projects and acquired properties for a total value of roughly C$50 million to consolidate its portfolio in Québec. "These initiatives allow us to move closer to our goal of becoming a multi-million ounce, high-growth company, with over 61,000 ha of prospective ground," stated Vizquerra, adding: "O3 Mining's properties hold 3.6 million oz of measured and indicated resources at 1.26 g/mt of gold and 1.5 million oz of inferred resources at 2.14 g/mt of gold, positioning us as a Tier 1 company in the junior mining space."

Another well-funded, Québec-focused junior is Troilus Gold, which acquired the past-producing Troilus gold mine in Northern Québec in 2016 and worked privately on the asset before going public in January 2018. The Troilus mine was previously operated by Inmet Mining, which produced approximately 2 million oz of gold and 70,000 mt of copper in a US$300/oz gold environment when it first entered production and operated profitably for the next 14 years.

Having raised almost US$50 million in under two years and maintained a tight share structure, Troilus aims to start a PFS toward the end of 2020 with the goal of moving towards a production decision in 2021. "Troilus Gold has over US$400 million in inherited infrastructure and over 6 million oz in resources, having added more oz in the last two years than any gold company in the world," affirmed Reid.

A new greenstone belt and "the crown jewel of Canadian mining" in British Columbia

At Roundup 2020 in January, the Association for Mineral Exploration (AME) awarded its 2019 Celebration of Excellence H.H. "Spud" Huestis Award for significant contributions to enhancing the mineral resources of BC and/or Yukon to Peter Fischl of Westhaven Ventures. Fischl was recognized for his role in the discovery and ongoing definition of the South Zone high-grade epithermal gold-silver deposit at Westhaven's Shovelnose project in the newly emergent Spences Bridge Gold Belt (SBGB) in southern British Columbia.

Toronto-based junior Talisker Resources was able to gain control of 85% of this new gold belt in the largest single staking in B.C. history, staking nearly 190,000 hectares in a six hour period, according to president and CEO Terry Harbort. "During the 2019 field season, we conducted an aggressive exploration campaign with 22 geologists in the field collecting approximately 2,500 silt fraction first order stream sediment samples resulting in over 100 new anomalies and, to date, 10 defined drill targets," he said, adding that a planned budget of C$3.6 million has been allocated to continue the exploration at Spences Bridge in 2020, with Talisker's specialized greenfields team, in parallel to its program at the newly acquired Bralorne Gold Camp.


Alistair Ross, president and CEO, Rockcliff Metals Corp.

"The crown jewel of Canadian mining" was how Harbort described Talisker's Bralorne Gold asset in British Columbia, and the market seemed to agree, with the company's share price doubling in the wake of the November 2019 acquisition. The Bralorne Gold Camp is the source of the prolific Fraser River alluvial gold rush of the 1860's, producing 4.2 million oz of gold at 17.7 g/mt for over 50 years. Two of the mines in the camp, Pioneer and King, were closed in the mid 1960s, whereas the Bralorne mine continued until the early 1970s. "The gold price then was US$35/oz; that's about US$220/oz in today's dollars. I doubt there would be many mines today economic at US$220/oz gold," observed Harbort, adding: "With a highway right to it, a camp, a mine and tailings permit, and being connected to grid power with a hydro plant several kilometers away, we view Bralorne as a world class opportunity."

A path to near-term copper production in Manitoba

Gold miners made hay while the sun was shining in 2019, as expectations of U.S. Federal Reserve rate cuts and geopolitical tension mounted between the United States and China to create the perfect storm for the safe haven precious metal. Copper, on the other hand, suffered as trade tensions threatened demand outlook from China, which accounted for 49% of global refined copper consumption in 2018. When the US and China signed a "phase one" trade agreement on January 15th, copper reached a seven-month high of US$2.88/lb. However, a Chinese dynamic of a different kind conspired to send the red metal crashing to a low of US$2.50lb by the end of the month, a 13% drop in merely two weeks in reaction to the escalating coronavirus outbreak.

While China's overwhelming influence on the copper price is worrying, the current dip seems like an artificial low. Indeed, copper is "poised for liftoff" in 2020, according to Jefferies analyst Christopher LaFemina, who pointed to low copper inventories, high short positions, supply constraints and better demand creating conditions for the metal to rally, in a note to clients. This optimism is matched by the likes of Goldman Sachs, Morgan Stanley, Bank of America and Citi, which see copper rising with an improving global economy.

In May 2019, a three-way tie up between private equity investor Greenstone Resources, capital merchant bank Norvista and the Rockcliff exploration company run by Ken Lapierre came together with a clear strategy of moving into copper production, according to Alistair Ross, president and CEO of Rockcliff Metals Corp. "The initial work is to bring three of the company's resources, Tower, Talbot and Rail, to an indicated level of between 3% and 4% copper equivalent, with a target size of approximately 2.5 million mt each," revealed Ross, discussing the company's asset portfolio in the Flin Flon-Snow Lake district in Manitoba near on the Saskatchewan border.

Ross explained how Rockcliff is taking an innovative approach to change the way people see narrow veined, steeply dipping ore bodies, with the aim of mining a lot more on a daily basis than would traditionally be expected: "This is thanks to the adoption of a digital mine site design from the onset and from combining technologies that have not been used in unison before," he said, elaborating: "We conducted a peer-reviewed study of our conceptual method and gained agreement that it could be possible to produce at a mining rate of 2,000 mt/d. This is more than double the traditional rate and would turn the seven-year project into a three-year project."

With this timeframe, the project would rely on power generators instead of traditional hydro lines, be less intrusive to the environment and leave a minimized footprint.

Toronto's Global Reach

Mine the mines abroad, mine the markets in Toronto

"I always say asset quality overrides jurisdiction," professed Barrick chief Mark Bristow, a philosophy clearly shared by many mining companies headquartered in Toronto. From the biggest fish down to the micro-cap juniors, Canada is awash with companies headquartered in the home of mining, but with operations abroad.

Access to the capital markets and financial institutions, a wealth of mining expertise and a diverse international community all make Toronto an ideal hub for deal making and orchestrating financial support. As the home of the PDAC convention, which hosted attendees from 132 countries in 2019, what happens in Toronto invariably reverberates around the mining world.

On that note, Global Business Reports' annual guide to the Ontario mining industry would not be complete without an investigation into a variety of Toronto-based mining players plying their trade in countries with better coffee than Tim Hortons. Although jurisdictional stability has grown in importance in the eyes of investors in recent years, the tantalizing combination of underexplored and highly mineralized land with low operating costs continues to attract mining entrepreneurs.

Stephen G. Roman, president and CEO, Global Atomic Corp.

Diverse opportunities across Africa

London and Australia form natural hubs for Africa-focused mining companies, and China's growing influence in the region is apparent from its control of the cobalt supply chain in the DRC to its strategic infrastructure investments in East Africa. However, there are a number of success stories from the Toronto mining community active in Africa, with Teranga Gold being one of the standout performers in 2019.

"It has been a year of highlights for Teranga Gold," enthused Richard Young, president and CEO, who, in early December, announced plans to acquire the Massawa gold project from Barrick Gold. A non-core asset for Barrick, Massawa is ideally located right next door to Teranga's flagship Sabodala gold operation in Senegal and within 30 km of its plant. "As one of the highest-grade undeveloped open-pit gold reserves in Africa, the addition of Massawa is a game changing event for Teranga," Young stated, commenting that the acquisition is set to accelerate the repositioning of Teranga into a low-cost, mid-tier gold producer.

Additionally, Teranga's newest mine, Wahgnion, located in southeast Burkina Faso, achieved commercial production C$15 million below budget and two months ahead of schedule in August 2019. "We are really pleased with the work of our team and contractors throughout this project and in particular with the fact that it was completed with no lost time incidents over 5.3 million hours worked," added Young.

In the neighboring Republic of Niger, Global Atomic Corporation is advancing its large, high-grade, DASA uranium deposit with a resource of 250 million pounds and located in the middle of three existing plants. In contrast to the majority of junior companies, Global Atomic benefits from a positive cash flow from the significant dividend stream generated by its share in the Befesa Silvermet zinc concentrate production facility in Turkey, which was upgraded in 2019 and forecast to double throughput in 2020.

Stephen G. Roman, Global Atomic's president and CEO, would like to have the mining permit process complete by the end of 2020, so that the company can move ahead with construction of the DASA mine. Elaborating on the outlook for uranium, Roman said: "From an environmental standpoint, compare the amount of resources needed and footprint left by a large-scale solar or wind power installation to nuclear alternatives, such as a small modular reactor (SMR), and you will realize uranium's sustainable value to our future."

Trigon Metals is a Toronto-based junior focused on African copper, with projects in Namibia and Morocco. Elaborating on the company's decision to focus on a low-capex restart at its flagship past-producing Kombat mine asset in Namibia, Jed Richardson, president and CEO, underlined the importance of looking at what is properly financeable in today's market: "Country risk is what it is; the real risk is the next dollar," he reflected, continuing: "If I come to you and say I need US$100 million and I only raise US$50 million, then I am in trouble because a half built mine is worth nothing. Too often mines have been built on excel spreadsheets without taking practical realities and the myriad of risks associated with development into consideration. In a sense, the market is a little smarter now and companies need to work harder to prove their value."


Fred Stanford, president and CEO, Torex Gold Resources.

Gold production and innovation in Mexico

While populist rhetoric from the President of the United States continues to stoke the price of gold and depress the price of copper, further south, the election of a populist of a different leaning, Andrés Manuel López Obrador (also known as AMLO), sparked fears that Mexico's government could interfere with a myriad of mining projects, many of which belong to Canada-based companies. Fortunately, AMLO announced that he will not interfere with current mining concessions. On the other hand, good luck getting new ones: "We will maintain these concessions, and we are not going to cancel them, but now we are also not going to continue issuing new mining concessions, because a lot have been handed out," the Mexican president declared in a press conference in Zacatecas state in August 2019.

For those with concessions in hand, Mexico remains an excellent jurisdiction. One of the established Toronto-based mid-tiers active in Mexico is Torex Gold Resources (TXG), which saw its share price double from 2018 to 2019, a reflection of the transition of the company's El Limón Guajes mine to steady operation following the resolution to an illegal blockade in early-2018. "Since then, the mine has lived up to its potential, delivering record gold production in Q3 2019, following a record quarter in Q2 2019," clarified Fred Stafford, TXG's president and CEO. Operational performance combined with a resurgent gold price has allowed Torex to generate strong cash flow, which has been directed towards strengthening the company's balance sheet, de-risking its Media Luna project and advancing its proprietary Muckahi Mining System. The first blast of TXG's innovative Muckahi Mining System (pronounced "Muck-ah-high") took place in April 2019 and has been garnering attention from mine operators looking to reduce costs and optimize production. "If there is the potential of reducing costs by 30%, making an all-electric mine without any greenhouse gasses and producing less waste rock that must come to surface, you are going to attract interest from industry," remarked Stanford, who believes that once the integrated Muckahi system is demonstrated, it will become one of the cornerstones of TXG's growth strategy.

Mongolia ramps up mining development

Mongolia's mining minister, Dolgorsürengiin Sumyaabazar, reassured Rio Tinto in November by declaring that the company's US$7 billion expansion of the Oyu Tolgoi underground copper-gold mine, the second largest copper deposit in the world, will not be stopped. The minister's words eased fears that the government could try to renegotiate contractual agreements after the Mongolian parliament backed a petition to revise documents related to the asset's development. "The government understands that mining is a major contributor to the GDP and pays the vast majority of taxes in the country," observed Ali Haji, CEO of Mongolian lithium-focused exploration company Ion Energy. The company plans to go public in 2020, backed by a board of directors from the Steppe Gold management team.

In March 2020, Steppe Gold announced the commencement of ore processing at its 100%-owned ATO Gold Mine in Mongolia. Aneel Waraich, Steppe's executive vice president, explained how the company's projected sustaining costs going into 2020 are approximately US$650/oz including refining and royalties: "In Mongolia there is a skilled labor force at a cheaper cost than anywhere else in the world. This means that we were able to build our mine cheaper than anywhere else. We had equipment coming in from China, which meant that logistical lead times were quite quick and the costs were also relatively cheap."

Underlining Steppe Gold's focus on becoming a mid-tier Mongolian precious metals company, Waraich gave his outlook for 2020: "Steppe Gold will be in commercial production and at full run rate at the company's heap leach operation. We will also have completed strong exploration programs on our ATO, Mungu and UK projects."

Additionally, Erdene Resource Development Corp becoming the first company to be dual-listed in Mongolia and the TSX. "A landmark move for the country which demonstrates the government's interest in seeing its citizens – the ultimate beneficiaries of the natural resources of the country – share the risk and reward of mining projects via stock ownership," commented consultant Bayar Baatar.

The Battery Metal Supply Chain

North American collaboration in the effort to catch up with China

Although the United States and China announced a preliminary "phase one" trade agreement in December 2019, the future of their economic relationship remains uncertain. A defining feature of the Trump administration's economic policies has been its embrace of international trade protection and, while the United States holds the upper hand in most markets, China's dominance in the battery metals supply chain is indisputable. Electric vehicle (EV) sales grew to more than two million units globally in 2018: an increase of 63% on a year-on-year basis. Comparing the 2019 adoption rates for EVs, China leads comfortably with 6%, compared to 2.6% in Europe and North America, and 2.2% for the rest of the world. However, adoption rates are less of a cause for concern than the fact that China currently dictates the supply dynamics for the majority of metals used in the production of EVs and batteries.

Donald S. Bubar, president and CEO, Avalon Advanced Materials.

The fact that Tesla chose Shanghai as the location of its Gigafactory, built the plant in less than one year in 2019, and quickly raised an additional US$1.6 billion (through a consortium of state-backed Chinese lenders) in December for a plant expansion, is emblematic of the speed and assertiveness being shown by the Chinese in the battery race. The new plant is expected to double production capacity of Tesla's Model 3 sedan, will be the company's first manufacturing site outside the US, and China's first vehicle plant wholly owned by a foreign company.

On January 9, 2020, Prime Minister Trudeau and President Trump announced the Canada-US Joint Action Plan on Critical Minerals Collaboration had been finalized, aimed to advance the countries' mutual interest in securing supply chains. Canada is already a leading producer of nickel and cobalt and has another 70 advanced projects for both metals, according to a July 2019 presentation by Hilary Morgan, director of international affairs at Natural Resources Canada. Additionally, Canada is home to 16 advanced rare earths projects and 17 advanced and near-stage lithium projects.

"Governments are now recognizing the need to create critical minerals supply chains outside of China," reflected Don Bubar, president and CEO of Avalon Advanced Materials and one of the leading North American voices in the field of rare metals and critical minerals. "There is more urgency for other countries to develop their own critical minerals supply chains due to the risk of China restricting supply," he added, continuing: "We have all of these minerals in the ground in Canada and the time has come for us to take advantage of the opportunity by extracting these minerals and creating the value-added in Canada."

Mark Warner, lawyer at Pilot Law, suggested that Canada has the potential to be one of the countries to benefit from the current trade war by becoming a reliable alternative supplier for the United States, but such a context depends on the Canadian mining industry actually being able to get resources out of the ground. "The trade war has shown the need for a counter point to China. The demand and need is definitely there, but the question is if there is political will from North America, including Canada, to take advantage of this opportunity," said Warner, adding that Canada has seen a significant amount of mining investment coming from China, which could create challenges in the development of a North American supply chain.

Janice Zinck, director of green mining innovation at CanmetMINING, part of Natural Resources Canada, commented that China's dominance in the critical mineral space started 30 years ago and their long-term strategy allowed them to overtake competitors: "At that time, everybody was comfortable allowing China to supply products. Our resource strategies are not nearly as long term in the Western world as they are in China," she remarked.

"Canada is well-positioned to occupy a greater space in the value chain, but we need to be more strategic and invest in developing those resources," added Zinck, commenting that Canada is rich in mineral resources and has the necessary expertise, but needs to accelerate the pace at which it is advancing projects. "We have to look at supply-chains and value-chains in terms of what is driving the development. Instead of driving development from the resource, it should be driven from the magnet, battery or end product."

Innovation

The risk of standing still

Operational costs are rising, mines are getting deeper, ore grades are declining, exploration success is decreasing and environmental regulations are becoming stricter. All of these factors are underpinned by a seven-year downturn that has seen investment leave the mining sector. When looked at from a macro perspective, the climate is ripe for new innovations to dramatically reduce the cost of production, improve exploration success and reduce environmental impact. In such a context, innovation should be a necessity, rather than an option.

However, the mining industry's adoption rate for implementing new technologies lags behind other heavy industry such as the chemical, automotive and oil and gas sectors. "Having worked in other industries, when you approach a company with a new technology, if they realize it will optimize performance and cut costs, they are willing to be first-adopters. Mining companies, on the other hand, almost always ask "who else has this in their mines?" observed Nadine Miller, strategic advisor at the Awz HLS Fund and director of Wesdome Gold Mines.

"When I entered the industry in the 1970s, there were significant changes taking place," said Alex Henderson, president of Alex Henderson Consulting, who mentioned that a high degree of everything the industry does today was developed during this period. "I often ask clients to show me what is different in the new mine they are developing from previous mines that have been built. They usually answer that there is nothing different," he added.

There are reasons for this caution. Mining is an inherently risky business, from early stage exploration that raises vast sums of money to invest in ventures statistically unlikely to be developed, through to the complicated and dangerous process of extracting ore in a remote location at depth. By the time a mine is ready to go into production, tried and tested methods are often more attractive to operators looking to guarantee output for management and shareholders. Jeff More, president and CEO of MineSense Technologies, touched on the practical reality mines have to deal with: "By definition, mines have a lot more complexity than other industries. For example, when your industrial processes are inside of one building you have more flexibility to try new things in comparison to the mass scale in a mine," he reflected, noting however, that the rate of adoption for new technologies in mining is starting to accelerate.

Chrysalix Venture Capital, a global technology venture capital fund that specializes in transformational industrial innovation, was one of the companies to have funded MineSense Technologies. Charlie Haythornthwaite, senior partner at Chrysalix, suggested that the various pressures facing the mining industry are starting to force companies to change their approach: "Generally, there is renewed recognition that sustaining incremental innovation may no longer be enough and there is an ever greater need for step-change solutions."

This sentiment was echoed by Ryan McEachern, managing director of the Mining Suppliers Trade Association (MSTA) Canada, who acknowledged that the industry knows that it has to change: "After the last downturn, there has been a focus on what we must do in order to survive moving forward," he said, explaining that this encompasses two aspects: having a social license to operate, and integrating technology more efficiently. "I still see companies struggling on the second aspect. I think both the understanding of the need and the will are there at a corporate level but operationalizing those changes has been more challenging. The difficulty comes in integrating new technologies into an already established system," remarked McEachern.

For Douglas Morrison, president and CEO of the Centre for Excellence in Mining Innovation (CEMI), economic pressure will be the driving factor for the implementation of technology that significantly reduces the costs for metals needed to achieve electrification of the economy. "Climate change will soon begin to threaten coastal infrastructure on a scale which most economies will not be able to tolerate," stated Morrison, warning that if the demand for metals means the price of copper, nickel and lead increases, it will be harder to drive lower-cost carbon out of the economy and the trends in climate change will continue.

Morrison insists that we need to see greater volumes of base metal production, but at a lower price point, and this cost reduction must come not only from prospective mines which may not come into production within a decade, but from current mines as well. "If we change the cost of production significantly, we change the cut-off grade of ore, expand the volume of mineable ore and increase the life of mine," he explained, adding: "This requires us to implement whole-scale change in metal mining operations globally within the next decade. The innovation imperative for mining globally is to achieve a radical increase in the electrification of the economy; the consequences of failing are not trivial."

SMEs and start-ups: the lifeblood of innovation

Although there are mining companies at the forefront of innovation, such as Torex Gold Resources, Dundee Precious Metals and Newmont, the small and medium enterprises (SMEs) whose sole business is to create and develop mining technologies are often the real agents of change. Across Canada there are a number of world-leading mining-tech hubs, most notably in Sudbury, Val-d'Or, Toronto, Vancouver and Montreal.

The Sudbury and North Bay area in Northern Ontario is the home of the largest mining service sector hub in Canada. Although steeped in mining tradition, the modern day Sudbury Basin region is far from old-fashioned, with a high-tech ecosystem of companies producing ground-breaking technologies.

One such company is SafeSight Exploration, which celebrated its one-year anniversary of an underground drone program with Newmont in 2019. "This rugged utility drone integrates the latest LiDAR technology with an open platform flight controller and has the ability to go anywhere that a human should not go. The time for collecting data is also significantly reduced with the DB3 product being able to do a complete scan in approximately 15 mins," explained Mike Campigotto, president of SafeSight, who commented that his company is evolving to become more than just an underground drone specialist: "We are becoming a company that solves problems with innovative technologies rather than limiting ourselves to one type of technology. We can essentially become the technology extension of an innovation manager in a mine."

On the subject of new-technology implementation, Campigotto acknowledged that the majority of mining companies do not want to be first-adopters, but having a high-profile partnership can lead to further collaborations once the innovation has been proven, as has been the case with SafeSight which built upon its work with Newmont to collaborate with Redpath Mining, Wesdome Gold Mines and Barrick. "After just under three years in the field, SafeSight has already flown over 100 operational missions, so despite bringing innovation into a conservative industry, we have tangible proof that the best technologies can be adopted," he concluded.

Another Sudbury-based company to have had considerable success disseminating its technology is Maestro Digital Mine, which now supplies solutions to over 130 mines worldwide, according to Michael Gribbons, co-founder and vice president. Maestro launched its Zephyr AQS solution in May 2019, a low-cost air quality monitoring station for underground mines, after studying market data to find out what its users were buying and designing a product to fit a profile that matched 75% of these buyers. "The flaw of many technology companies is to hang on to a product and fail to innovate, and the innovation cycle is slow," observed Gribbons.

When asked which factor seemed to be top of the agenda of mining companies in 2019, Gribbons replied unequivocally that productivity has been the number one focus. "A 10% reduction in energy use does not have the same impact as a 10% increase in production," he said, underlining the importance of understanding the operating principles of a mine and how mine managers are being compensated. "The primary focus is on tonnage feeding the mill and second is health and safety. Energy is important but it is nowhere near those two parameters," he added, noting that Maestro's solutions can help dramatically in all three areas.

When it comes to step-change technology, the potential to reduce the cost of material movement from US$3.27 to US$0.16 per tonne is the type of impact that mining companies cannot afford to ignore, or perhaps, may find hard to believe, according to Jim Fisk, executive chairman of Rail-Veyor. Rail-Veyor's conveyor belt ore transportation technology has been implemented in mines across four continents, including Agnico Eagle's Goldex mine in Val-d'Or. Although the technology has gained traction through high-profile collaborations, Fisk commented that a resistance to change is still apparent when one does not have an engaged audience willing to consider a new process. "Many companies just look at the capital cost and forget about the operating cost, but in my experience mines shut down because of high operating costs, not because of high capex," he said.

While some innovations change or reinvent processes that have been in place for years, others enhance what is already in use. This is the case of Deep Cryogenics International, the Halifax-based start-up which addresses abrasive wear problems for mining tools and components. "Making items last longer is the eternal engineering challenge and this is what the Deep Cryogenics process does," stated Jack Cahn, founder and president, who explained how the deep cryogenics process takes the nitrogen in the air, separates and chills it to -196 C before warming it back up and imparting a permanent wear resistance to the metals. "The process uses no chemicals, leaves no waste, causes no harm, is not dangerous, is environmentally neutral, infinitely renewable and recyclable," he added.