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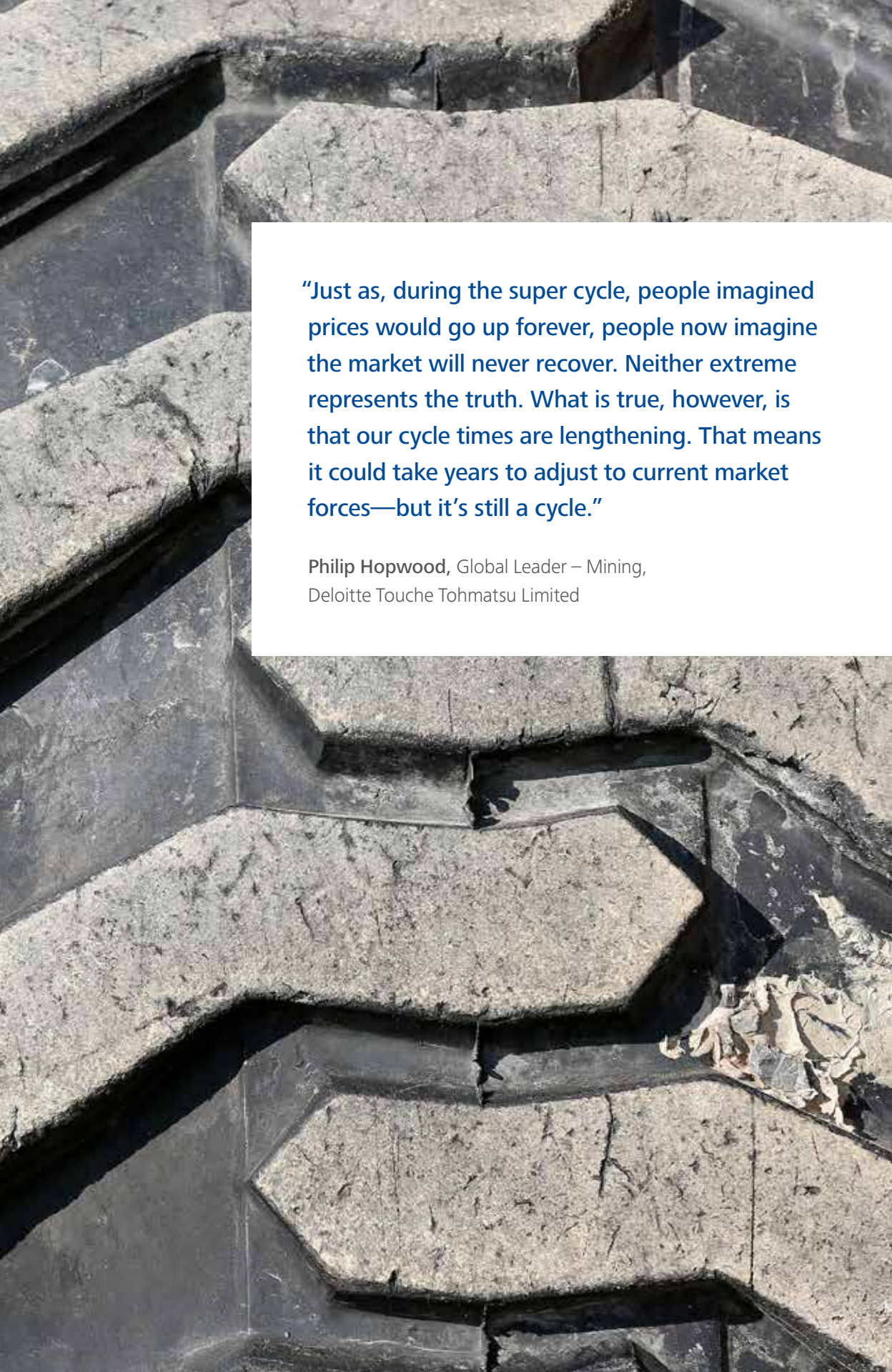
Tracking the trends 2016
The top 10 issues mining
companies will face in
the coming year





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A close-up photograph of a stone staircase, showing several steps made of large, rectangular, light-colored stone blocks. The steps are set against a dark, possibly metal, background. The lighting creates strong shadows, highlighting the texture of the stone. A white rectangular text box is centered over the middle of the image.

“Just as, during the super cycle, people imagined prices would go up forever, people now imagine the market will never recover. Neither extreme represents the truth. What is true, however, is that our cycle times are lengthening. That means it could take years to adjust to current market forces—but it’s still a cycle.”

Philip Hopwood, Global Leader – Mining,
Deloitte Touche Tohmatsu Limited



ARE WE THERE YET?

Anyone who has ever shared a car with children has likely heard the common refrain that exhorts drivers everywhere to go faster. Miners, impatiently waiting for this down cycle to end, have been searching for the proverbial gas pedal for years. Unfortunately, it looks like we still have a way to go.

As commodity prices continue to hit historically low levels, mining companies are struggling to recalibrate. It doesn't help that the industry faces a host of unresolved challenges—from tumbling demand and declining grades to mounting stakeholder expectations and a lack of financing. At the same time, miners must contend with a range of constantly-mutable issues, including the innovation imperative, shifting regulatory realities and the rising risks associated with both physical and cyber security.

ASKING THE HARD QUESTIONS

In this age of volatility, miners are asking increasingly tough questions: Have the world's demand factors for commodities irrevocably changed? Do we need new mining approaches? Is the traditional profit model shifting? Can we afford to take out more costs? Is our financing model broken? How can we reduce unsustainable debt levels?

Not all of these questions have answers, but they need to be asked. Only in this way will miners begin to rattle the cages of the status quo and identify the factors capable of driving future growth.

When this growth trajectory will be realized, however, is anyone's guess. China's perceived economic slowdown has cut a strip through the mining sector, spurring massive price drops for everything from iron ore, coal and aluminum through nickel, copper, zinc and lead. Investors and lenders have fled the sector and the promise of an injection of private equity or institutional capital remains elusive. As exploration dwindles, juniors continue to fight tooth-and-nail for survival. And despite these headwinds, governments still expect miners to help bolster their economies through tax dollars, royalty fees, shares of profit, infrastructure spends and community investments.



RIDING THE WAVES

Yet, despite the doom and gloom, most industry veterans agree that this is just another cycle. A painful cycle, to be sure, but one bound to end once the spectre of commodity shortfalls becomes reality and demand—from India, Southeast Asia and even Africa—once again outstrips supply. Until then, the industry will continue to flatten, contract and eliminate all waste. On the flip side, the companies that survive will emerge leaner, stronger and more innovative in how they operate. We're just not there yet.

To help position miners for the eventual rebound, our 2016 edition of *Tracking the trends* explores not only well-trodden themes, but also ancillary themes miners must take into account if they hope to navigate an increasingly uncertain future—including a look at China's painful transition, an overview of exponential technologies and a discussion of the ways in which a shifting global energy mix may alter the demand for specific commodities. Once again, we draw on the experience of Deloitte's global mining professionals to help identify the questions miners must ask—and suggest answers, where we have them. We look forward to your input and feedback.

"It's interesting times in the mining industry; more interesting than many of us expected. China's economic rebalancing is causing exceptional disruption. Commodity prices are taking much longer to recover than anticipated. To my mind, this makes innovation even more imperative. Rather than being optional, being bold may be the prerequisite to survival."

Glenn Ives, Americas Mining Leader,
Deloitte Canada



GOING LEAN

OPERATIONAL EXCELLENCE REMAINS FRONT AND CENTRE

Shaved. Cut. Pared down. Slashed. No matter how you say it, mining companies have spent several years ruthlessly reducing costs. On the plus side, this relentless focus is translating into enterprise-level productivity improvements, with virtually all of the major players targeting billions of dollars in embedded cost savings.

But that doesn't mean companies can afford to get complacent about cost control. Depressed commodity prices continue to threaten corporate profits, impel mine closures, put shareholder returns in peril and undermine capital budgets. This is forcing companies to consider how to both sustain their cost take-outs and drive ongoing productivity improvements.

FINDING NEW PRODUCTIVITY GAINS

Whilst there is no 'right' solution to this quandary, industry leaders are tackling this issue in a number of ways.

One strategy involves a continued investment in innovation. From automation and enhanced drilling systems to data analytics and mobile technologies, companies embracing innovation are improving mining intensity whilst reducing people, capital and energy intensity. In fact, in the energy space alone, some miners have realized energy savings of 10% to 40%¹ by investing in renewable energy installations, deploying innovative energy technologies and driving towards more automated mine processes to optimize energy consumption.

LEARNING FROM OTHER INDUSTRIES

Yet another method for improving productivity involves leveraging best practices from other industries. Since joining Rio Tinto from the automotive industry, Sam Walsh, the company's CEO, has been drawing parallels between mining and manufacturing. Years ago, he began advocating the adoption of lean practices into the mining sector. The approach, originally pioneered by Toyota Motor, has helped countless manufacturers boost productivity and reduce costs by eliminating all unnecessary processes from their operations.

Taking the concept a step further, one has to wonder whether the automotive sector—a highly-unionized environment, where safety is of paramount concern, and labor and overhead costs account for roughly 80% of operating budgets—has other lessons for miners.



The Ford Motor Company is a salient case in point.² In 2006, the company lost over US\$12 billion following a collapse in consumer demand. Between 2011 and 2014, however, Ford realized annual profits ranging from US\$6.2 billion to US\$8.3 billion. Whilst this turnaround has been attributed to many factors, a recent study suggests that the most pivotal steps included the company's willingness to:

- Reimagine the collective bargaining process by working with its union to develop a shared vision for success
- Offer generous voluntary separation packages, ranging from an early retirement program that covered healthcare costs to educational programs that paid college tuitions
- Take control of their end-to-end supply chains by bringing suppliers into their ecosystem to reduce costs
- Place greater emphasis on low frequency, high consequence safety issues rather than all safety incidents
- Encourage a culture of problem resolution rather than placing blame
- Embrace emerging technologies, such as robotics, self-driving vehicles, connecting vehicles to the cloud, and hybrid and electric vehicle development

In an equally significant move, Ford also put transformational responsibility squarely into the hands of its workers, rather than keeping it confined to expert engineers and managers. This marked a shift from the "... assumption that people need to be monitored and controlled on the job, to an assumption that people want to do a good job, and the focus should be on providing them with the tools and resources to do the best job they can."³

CONNECTING THE DOTS

Although there are as many differences between the automotive and mining sectors as there are similarities, forward-thinking miners can likely make unanticipated productivity gains by taking lessons from this example—including reforming industrial relations (see our sidebar), co-opting suppliers into the cost equation in an effort to extract every efficiency, and shifting from traditional command-and-control hierarchies into a world of matrix or networked structures where human ingenuity is not overly hampered by rigid processes.

"With the downturn in commodity markets, most organizations stopped discretionary spending and improved operational efficiencies. But that doesn't mean the extreme diligence can now end. It's important for companies to consider the full range of potential scenarios—from their options to grow should the market turn, to their response strategies if prices continue to plummet."

Eduardo Raffaini, Mining Leader,
Deloitte Brazil

REFORMING LABOR RELATIONS

To support the continued push for productivity, miners may have to tread into controversial waters: labor reform. With 40% to 50% of mine costs related to labor, it's a critical cost and productivity lever—and a potential mine field.

To enhance productivity, miners could ask the labor force to produce more ore per hour or drive towards more mechanized mining. Given the prevalence of grade declines, however, processing more rock may not yield additional production volumes and mechanization can negatively impact employment. This puts management and labor at cross-purposes, and could incite unions to strike.

Even greater tension is brewing in light of recent industry headcount cuts. Aside from leading to a loss of institutional knowledge, heightened safety risks and process inefficiencies—especially if measures are not taken to retain key talent—wholesale job reductions can trigger serious social backlash, potentially devolving to violence. This, in turn, could see miners losing their social license to operate as local communities react to a perceived breach of trust.

IS THERE ANOTHER WAY?

There's little doubt that a labor confrontation would produce more harm than good—which is why it's time to change the nature of the conversation. This starts by bringing all the stakeholders together to develop a shared vision of the future.

Labor must be prepared to articulate its expectations, not only in terms of wages, but in terms of standards of living, job rates and family welfare. Companies must be capable of clearly measuring and reporting on the full impact of their social spend—from wages paid and training provided, to schools built, labor mobility and community jobs created as a multiplier effect to their procurement spend. And governments will need to play a role as well, to ensure labor legislation reflects evolving community and corporate realities.

As miners cut jobs, they can help displaced employees access new training opportunities. At the same time, the remaining labor pool should be able to enhance productivity and consequently attract better wages. Whilst contract renegotiation can be a bitter pill to swallow, it can safeguard jobs that would otherwise be lost if mines are forced to shut down. It's incumbent on miners to open this dialogue with unions and governments in an attempt to devise more productive, win-win solutions.

STRATEGIES THAT BUCK THE TREND

With most quick wins already captured, mining companies are seeking operational improvements farther up the value chain. As noted, those solutions may include energy efficiency programs, the adoption of lean practices and investing in innovation—from automation and robotics to data analytics and materials processing—as a way to unlock further gains. Other ideas include:

DATA INTEGRATION

With miners now collecting masses of data—through sensors, equipment monitors and other devices—they need systems for turning that data into intelligence. This involves more than the adoption of analytic programs. It also requires companies to integrate their operational systems (i.e. SCADA, PLC, DPC⁴) with their enterprise resource planning (ERP) platforms. Ultimately, the aim is to enable better decision making by adopting a common platform capable of sharing information across the extended enterprise in near real time. Keep an eye, in this regard, on Rio Tinto's new data analytics excellence centre⁵ in Pune, India where the company will analyze the huge volumes of data captured by the sensors on its fixed and mobile equipment to better predict and prevent downtime events that could impact productivity or safety.

SUPPLY CHAIN OPTIMIZATION

In a bid to control costs, many miners have tightened their reviews of contractor service level agreements. But supply chain optimization goes beyond monitoring performance to encompass a more holistic approach. Companies that hope to emerge effectively from the downturn should take steps now to strengthen vendor relationships across the supply chain by, for instance, co-opting suppliers into their cost reduction initiatives, setting shared productivity targets and strategically consolidating suppliers around particular categories.

BACK OFFICE OUTSOURCING

Given the repetitive nature of many corporate support functions—such as finance, human resources, IT and procurement—companies can often realize cost benefits by outsourcing these activities. Restructuring the corporate model can improve productivity and process efficiency, free up time at the mine site and encourage collaboration amongst formerly-competing suppliers. By running shared service centres, companies can also begin to consolidate data and knowledge in a centralized fashion. This can help them identify cost reductions and performance improvements across the enterprise. Many outsourced service centres gain a holistic view of key performance metrics, such as total operational costs, employee satisfaction, time it takes to pay an invoice, frequency of a data security breach, etc. Organizations can then mine this data to make better business decisions.



OPERATING MODEL REVIEW

With the ongoing slump in commodity prices, companies may need to fundamentally rethink their operating models. This may see them question the areas of the business they choose to retain. Should mining companies, for instance, own power generation facilities or operate tailings and water treatment businesses? On the flip side, should they outsource their research and development (R&D) to service providers? At the heart of this analysis is a determination of what it means to be a mining company.

IMPROVED CAPITAL ALLOCATION

Capital allocation is typically fragmented across an organization, making it difficult for asset owners to link capital spends to expected financial and non-financial returns. To improve these decisions, companies can tie capital allocation to strategic priorities—by, for instance, emphasizing only high-quality, long-life assets; shifting decision-making around sustaining capex; or focusing more on higher-grade brownfield exploration.

WORKING CAPITAL EFFICIENCY

Whilst companies have long pulled the working capital lever to manage costs, predictive analytics can help strengthen this focus by enabling them to better match inventory/stockpiles with current demand—freeing up operational capital for more productive uses.

GREATER COLLABORATION

From a junior/mid-cap perspective, the current market headwinds provide an impetus for some innovative survival strategies. This includes pooling talent, sharing infrastructure and partnering on projects.

A FOCUS ON ACCOUNTABILITY

To sustain their cost take-outs, companies must solidify their commitment to performance improvement. This involves doing more than adopting appropriate metrics. It also involves making people accountable for delivering specific productivity results. By embedding operational excellence into corporate culture, companies can more effectively link their financial and operational drivers back to shareholder value.



INNOVATION: THE NEXT GENERATION

PREPARING FOR EXPONENTIAL CHANGE

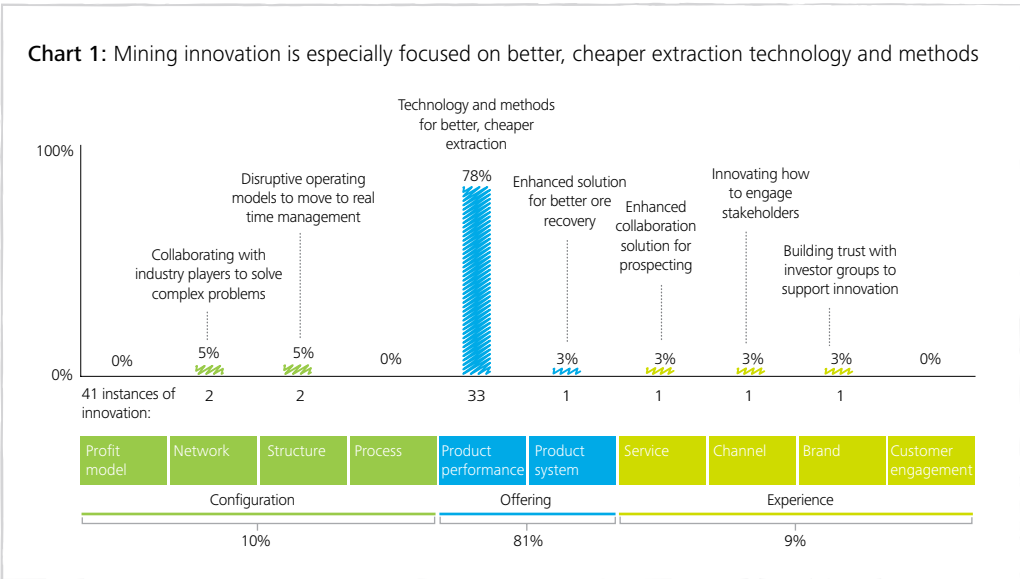
Once perhaps perceived as a fad, innovation is becoming a critical theme for miners. Solutions once considered unviable or inapplicable to the industry continue to be adapted to suit the needs of mining companies—including the move to replace diesel with lower carbon fuel sources and the growing reliance on sensors to monitor fixed and mobile assets.

Yet, despite this dizzying array of technologies, many miners remain at the early stage of the adoption curve—placing a majority of their innovation focus on technological optimization of old techniques in a bid to reduce costs or discover deposits more efficiently. To evolve, companies need to expand their innovation focus beyond technology to also consider new ways to configure and engage externally.

Recent innovations include AutoHaul, Rio Tinto’s autonomous rail system; the VAMOS (viable alternative mine operating system) project, which is exploring a new underwater robotic mining prototype; and EDS (enhanced drill systems), which rely on high-precision geolocation systems to provide equipment operators with continuous navigation and guidance, increasing the productivity of blast hole drills.

For more information about the 10 types of innovation, see the [Innovation State of Play: Mining Edition](#).

Chart 1: Mining innovation is especially focused on better, cheaper extraction technology and methods



Source: Deloitte Monitor Canada, Dublin, and Prospectors and Developers Association of Canada (PDAC), [Innovation state of play: Mining edition 2015](#)

GAME-CHANGING TECHNOLOGIES

Given the rapid pace of technological advancement, however, it's imperative to keep an eye on cross-sectorial innovations that may impact mining in the future. That's especially true when it comes to exponential technologies. Rather than moving on a linear curve that rises at a steady rate, exponential curves typically remain flat at the outset before dramatically accelerating. As a result, exponential technologies often disappoint in their early years before seemingly realizing an accelerated adoption.

With that in mind, here are a few technologies Deloitte thinks could potentially shift the trajectory not only for miners, but for global industry in general:

- **Networks**—As servers, personal computers, mobile devices and sensors of all kinds increasingly connect to the Internet—and each other—the development of truly unprecedented technologies is erupting. By 2020, Gartner forecasts that the global incremental gross domestic product (GDP) of the Internet of Things will grow to US\$1.9 trillion.⁶ With the cost of sensors dropping, it is becoming more feasible to collect data on a wide variety of mining equipment as well. This is empowering original equipment manufacturers (OEMs) to offer uptime guarantees designed to virtually eliminate all unplanned maintenance. This can only happen, however, if mines are equipped to share operational data with their suppliers. Given the unquestioned advantages of ensuring continuous equipment uptime, some companies are exploring the feasibility of adopting cloud-based integrated IT platforms to facilitate collaboration with suppliers.
- **Machine learning**—The move towards autonomous vehicles and automated technologies has already revolutionized mine operations. As the “intelligence” of these machines grows, they will be able to perform increasingly complex tasks, including hazardous processing activities—reducing labor costs and enhancing productivity as a result. As an end game, companies could ultimately operate fully autonomous mines, concentrating labor in centralized functional hubs rather than in remote regions.
- **Genomics**—In a meeting of sectors, medical gene research has spawned unanticipated genomic mining solutions, such as the use of bacteria capable of extracting minerals in situ and bio-remediation processes that use natural enzymes to clean sites contaminated by metal leaching and drainage. Whilst still relatively new, genomics solutions have already been used to bio-remediate polluted soils, improve mine drainage and mitigate threats to biological diversity through bio-monitoring.⁷
- **Wearables**—With devices like the Fitbit and the Apple Watch storming consumer markets, companies are wondering if wearable technology can deliver business benefits too. The answer is yes. By incorporating computer and advanced electronic technologies into clothing and accessories (i.e. hats, glasses, gloves, watches...), miners stand to realize a range of unprecedented advantages. For example, devices can track truck driver fatigue to cut down on accidents that endanger worker safety. By pinpointing the exact location of underground workers, wearables can allow mine operators to ventilate, heat or cool only occupied areas of the mine—saving significant electrical costs. Wearable devices can even signal if their wearers are in physical distress, enabling rapid response in the face of accidents or injuries. See <https://vimeo.com/122846215>.
- **Hybrid airships**—Whilst still under development, Lockheed Martin Corp is getting closer to commercializing giant hybrid airships that would enable mining companies to haul equipment to remote regions that lack accessible roads. Costs for the airships are expected to be comparable to truck transport over icy roads, and considerably cheaper than helicopter transport.⁸

ATTRACTING CHANGE AGENTS

As the mining industry evolves, leadership within the sector will need to change apace. Beyond attracting talent capable of addressing volatility, miners that aim to be world-class companies must also retain people who can institutionalize innovation.

This is easier said than done. In a [recent study](#),⁹ Deloitte Canada found that most companies are not prepared to leverage the opportunities presented by disruptive technologies. Those that are consistently working to foster an awareness of disruptive forces; build a resilient, innovative organizational culture; embrace new ways of making decisions; and invest in advanced technologies and the skills required to compete and evolve.

A [similar study](#)¹⁰ conducted in the mining space found that the most innovative companies exhibit four key capabilities:

- They employ a tailored approach built around clear work definitions designed to generate innovations
- They structure the organization to house innovative competencies connecting them to the broader enterprise and the world
- They nurture the people who innovate and invest in the skills, tools and training necessary to enable them
- They use metrics and incentives to guide performance and evaluate progress

Building these competencies will require miners to get more serious about their leadership programs—identifying the leadership profile required to drive corporate strategy in the next five to ten years, and assessing whether those leaders can be nurtured internally or should be recruited from outside the organization or the industry.

“The suggestion is not to pursue innovation for its own sake, but to look for ways that innovation can unleash the next wave of productivity and cost cutting. Right now, the mining industry is at a tipping point as it tries to identify strategies to make innovation deliver bottom line value.”

Andrew Swart, Global Mining Innovation Leader, Deloitte Canada

STRATEGIES THAT BUCK THE TREND

Although the timing may not yet be ripe to adopt certain exponential technologies, other innovations are already delivering advantages to savvy miners. These include:

GETTING SERIOUS ABOUT INNOVATION

To generate benefits from innovation and make step changes in how they do business, organizations must do more than simply talk about innovation. They must also determine their innovation focus, develop innovation strategies, tap into ecosystems and align their organizations systems and processes to drive innovation. Contrary to popular belief, innovation is more of a science than an art.

COLLABORATIVE ECOSYSTEMS

Innovation doesn't happen in isolation. Miners are demonstrating this understanding by establishing cross-industry think-tanks, venture funds and other collaborative ecosystems based on broad partnerships between miners, OEMs, technology experts, scientists and governments. Smaller mining companies are getting in on the act too, relying on crowdsourcing to encourage the development of innovative solutions. In fact, crowdsourcing—and similar cloud-based collaborative platforms—stands to change the way work is performed. National Aeronautics and Space Administration (NASA), for instance, enhanced asteroid tracking, deep-space networking and astronaut health by holding contests through TopCoder, a platform that brings together over 750,000 members to tackle complex data-coding challenges. Similarly, General Electric (GE) engaged Kaggle, the world's largest community of data scientists, to predict runway and gate arrival times for

domestic flights in the U.S. using multi-source flight and weather data. The team that won GE's prize produced a 40% accuracy improvement over industry standards, translating into annual savings of US\$6.2 million for a mid-sized airline.¹¹ Notably, Goldcorp used crowdsourcing years ago by challenging geologists to identify the optimal drilling location for one of their mines.¹² The question is: why haven't other miners followed suit?

DIGITAL WORKFORCE ENGAGEMENT

By using mobile and social technologies to stay connected with their workers, companies are bridging the gap between management and employees. The concept goes beyond traditional portals that allow employees to review internal memos or sign up for training. Instead—by using social media, wikis, widgets, blogs, tagging, rich media and mashups to deliver personalized messages in real time—companies are encouraging collaboration, enhancing productivity and unleashing creativity across the organization.

ENHANCED ASSET MANAGEMENT

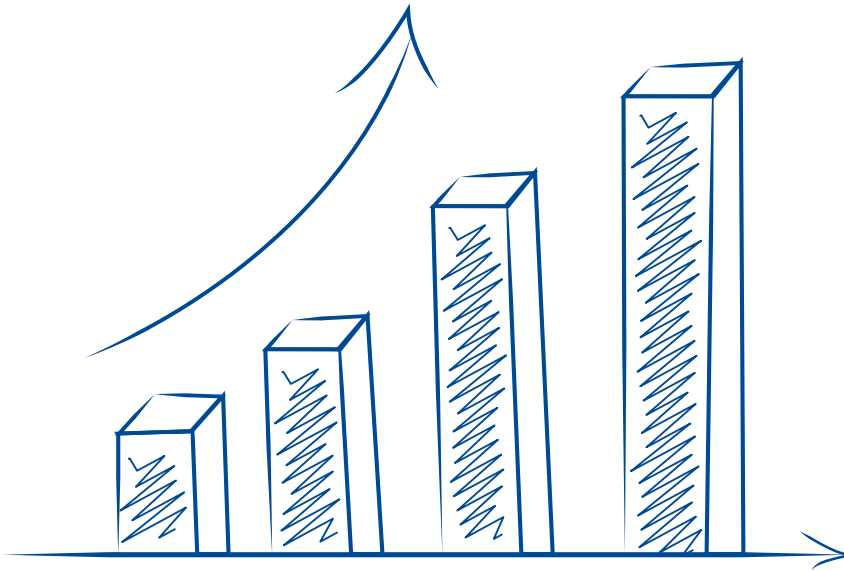
Before miners can achieve zero unplanned maintenance, they must first strengthen their asset management practices. Simply putting sensors onto all equipment is insufficient if the company lacks the ability to analyze the data output. With tools that give miners visibility into the health of the assets they are tracking, companies can amass and analyze baseline data points to predict things like regular failure points, asset wear-and-tear, required maintenance frequencies, shifting energy demands and optimal resource deployment, ultimately minimizing maintenance costs and improving asset efficiency.

ALIGNING WORK PROCESSES WITH ENERGY AVAILABILITY

Although today's lower cost of oil is reducing energy expenses for miners, it's not likely to last. That's why forward-thinking companies continue to make strides towards the adoption of renewable energy alternatives. Numerous companies already generate wind, solar, hydro and biomass power, supplemented by variable-speed backup generators capable of maximizing fuel efficiency—a solution that also works for companies running power off the grid. Companies farther along the maturity curve are also looking at changing their work processes to align with energy availability. Cronimet Chrome Mining SA (Pty) Ltd is piloting this type of system in South Africa with the commissioning of the world's largest solar PV-diesel hybrid power system.¹³ The company aims to use cheaper daytime electricity for activities such as processing, whilst continuing to run other less energy-intensive activities at night.

3D PRINTING AND MODULARIZATION

Originally confined to custom prototyping, 3D printing has rapidly become a production-ready technology. For miners, the implications are significant, enabling companies in remote locations to custom manufacture critical parts on demand—reducing both delays for unplanned maintenance and the need to hold costly inventories. As this technology matures, the entire equipment provision supply chain is set to shift, driving OEMs to favor modular designs. European Truck Factory,¹⁴ for instance, is bringing this concept to fruition with the design of modular components capable of being used by a full array of mining trucks. As more equipment becomes modular, miners can also begin relying on new forms of heavy lift transport (such as hybrid air vehicles) capable of moving modular equipment to remote sites. This will enable them to construct processing units in low-cost factories and transport them where they are needed—avoiding expensive on-site construction and potentially positioning them to access smaller ore deposits more economically than ever before.





CHINA'S PAINFUL TRANSITION

LOOKING FOR THE SILVER LINING

The decision this year to feature China as a standalone trend was not without internal debate. After all, any discussion of commodity supply and demand—which we explore in trend four—requires a spotlight on China.

Yet the demand factors do not tell the whole China story. Given the outsized effect China's economic situation exerts on world markets, it's also important to understand the global impact of the country's domestic market trends—particularly as the Chinese Government follows an increasingly interventionist path.

MARKET MAYHEM

Much of the story revolves around China's massive base of retail investors. In their search for returns, these investors have typically invested in domestic property—a trend that ultimately resulted in property market saturation. As construction began to slow and real estate prices fall, many investors diverted their funds to China's stock market. Anyone who reads the news now knows the result of that latest asset bubble. After rising by 150% in the 12 months to mid-June, by the end of the month the market had ceded its gains for the year.¹⁵

This may have remained a mostly domestic story except for President Xi Jinping's decision to prop up the stock market by pumping trillions of yuan into the financial system. Much of that money was channeled into large brokerage houses which pledged to buy billions of yuan worth of Chinese shares. Other measures included freezing initial public offerings (IPOs) and stopping trades on certain stocks.

Once beginning on this interventionist path, the Communist Party of China maintained this course when it decided to change the way it manages its currency's value in an effort to free

up its movements on world currency markets. This saw the yuan's value slide by over two cents in August 2015, heralding a sudden currency devaluation. In fact, after remaining virtually steady at roughly 6.20 yuan per U.S. dollar between March and August 2015, the exchange rate has been hovering between 6.35 and 6.41 since then.¹⁶

In a bid to support currency values, the Chinese Government has also sold billions of dollars of its U.S. treasury holdings, and is expected to continue selling them to the tune of US\$40 billion per month through the end of 2015.¹⁷ There's also China's worrying debt numbers, which have quadrupled since 2007.¹⁸

IMPLICATIONS FOR MINERS

Beyond interfering with the free movement of markets, the government's fiscal intervention may threaten its ability to fund new programs designed to spur future growth. In particular, the mining industry has been keeping a close eye on three primary initiatives: the Asia Infrastructure Investment Bank (AIIB), created to fund a range of commodity-intensive energy, transport and infrastructure projects across Asia with a capital pool starting at US\$100 billion¹⁹; the One Belt, One Road program, designed to spur trade between China and its neighboring countries along the Silk Road; and the megacity project, which has an unprecedented price tag of 42 trillion yuan²⁰ and is focused on linking Beijing, Tianjin and Hebei into one integrated megalopolis boasting a population of 130 million people.

Although hailed as potential bright spots amid a gloomy outlook, these projects may already be at risk, particularly if the Chinese Government continues to divert funds from these planned investments into the country's beleaguered stock market.

At the same time, these economic realities make it more costly for China to sustain its import levels—a situation already taking its toll on imports of key commodities. This, in turn, has prompted a devaluation of the currencies of resource-rich countries that rely on Chinese trade, including South Africa, Brazil, Indonesia and Russia.²¹ Australia's economy grew only 0.2% in the second quarter of 2015,²² whilst Canada's economy dipped into recession.

That said, China's trade regime is as much determined by financial management considerations as material demands. The country's sell-off of copper, for instance, indicates high Chinese inventories of precious and non-ferrous metals that can be sold when liquidity is needed. Without access to transparent official data, however, miners remain in the unfortunate position of making forecasts based on potentially flawed information.

THE SILVER LINING

On the plus side, concerns over long-term currency weakness may spur Chinese enterprises to buy overseas assets before the yuan is further devalued. This may lead to a short-term increase in outbound direct investments from Chinese State Owned Enterprises (SOEs) interested in both mining companies at the later stage of the production cycle and fixed asset investments (such as port facilities and railroads) likely to improve in value over time. As evidenced by the US\$298 million cash investment made by China's Zijin in a subsidiary of Canada's Barrick Gold Corp.,²³ and other similar deals, China still appears willing to make selective—but significant—bets in the mining sector.

In fact, currency weakness is already spurring a capital flight from China as high net worth individuals and large enterprises try to safeguard

the value of their assets. In addition to inflating residential property values abroad, this could also result in commodity price inflation. According to Goldman Sachs, net capital outflows in the second quarter of 2015 alone totaled US\$200 billion. For its part, JPMorgan estimated capital outflows for the past five quarters at US\$520 billion.²⁴

As China struggles to recalibrate amidst this deep structural downshift, silver linings may yet appear amidst the dark clouds. This is particularly true if Chinese investment in the mining sector picks up. Beyond investing in upstream assets, Chinese SOEs may also bring their engineering, construction and trading resources to the table—resulting in more direct, and more intimate, working relationships. In the meantime, miners will need to keep an eye on the macroeconomic issues driving China's demand profile so they can more intelligently plan for the future.

“If you believe that China is one of the most significant factors in the global mining market—whether it be capital, consumption, stockpiling, project construction or its announced infrastructure initiatives—then it's imperative to pay attention to the economic and political issues shaping the country's future.”

Jeremy South, Global Leader Mining M&A Advisory, Deloitte Canada



STRATEGIES THAT BUCK THE TREND

Although the margins of the ‘new normal’ have not been set in stone, miners can prepare for incipient shifts in a number of ways.

CONSIDER EXTREME SCENARIOS

As early as 2001, when China joined the World Trade Organization, pundits began anticipating strong, long-term growth in Chinese demand. Whilst the country has unquestionably enjoyed significant growth over the years, it would have been hard pressed to continue realizing double-digit growth over time. Companies seeking to navigate the new normal must now plan for scenarios in which China is unable to return to its previous levels of importing and consuming certain core commodities. Capital allocation, economic feasibility studies and even cost management programs will need to be re-contextualized in anticipation of more limited Chinese growth rates.

DEVELOP PLANS RELATIVE TO CHINA’S INVESTMENT INITIATIVES

Although investments in programs like AIB, One Belt, One Road and the building of China’s megalopolis are not fully realized, mining companies interested in capitalizing on these opportunities should determine now how they plan to position for success. Beyond building a business case, companies will need to foster local relationships and develop marketing and production strategies if they hope to play a role in these potentially massive infrastructure build-outs. They will also need to consider the potential risks associated with this involvement, including the financial liabilities and geopolitical complications that may arise from doing business in some of the countries along the Silk Road.

LEVERAGE CHINESE EXPERTISE

Natural resources firms are increasingly looking into how they can leverage Chinese expertise more systematically. This includes strategic sourcing arrangements for key operational inputs, leveraging Chinese design and construction expertise, turning to China for financing, or integrating commodity production more closely with downstream Chinese production. All of this requires new skills and capabilities that many miners today don’t have.

4

ADJUSTING TO THE NEW NORMAL

WHAT GOES DOWN MUST COME UP

What is now being called the “new normal” represents a structural change in China that likely translates into a sustained drop in commodity demand, driving a natural drop in prices.

In fact, China, the world’s largest consumer of industrial commodities, is on track to realize sub-7% annual growth over the near-term. The country’s purchasing managers index (PMI) fell to 48.7 in July 2015, signaling a market contraction, whilst the Economist Intelligence Unit (EIU) forecasts declining industrial production through 2019. As the country’s population ages, China’s labor force is also expected to contract.

PRODUCTION CONTINUES APACE

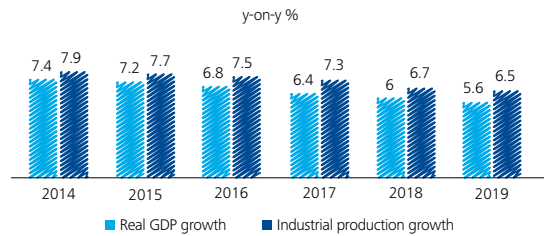
Yet despite these negative demand factors, commodity production does not seem to be falling as fast as economic factors would dictate. For instance, some producers have ramped up output at existing operations with the goal of reducing unit costs—a decision supported by weaker currencies and lower labor costs, which may be impelling the ongoing production of marginal assets despite current price signals. Others continue to produce to generate the cash-flow they need to pay off debt.

In other cases, majors are producing certain commodities, like iron ore, in a bid to consolidate market share. Other commodities with flat cost curves, like potash, may be subject to similar market plays, with Belarus’s state-owned producer, Belaruskali, reportedly running mines at almost full capacity and aggressively discounting prices to gain a foothold in the U.S. and China. This has introduced new supply side dynamics into the mining industry, as mid-cap producers in bulk commodities are increasingly edged out of the market.

Australia’s take or pay obligations are also contributing to over-production. Companies on the hook for massive infrastructure fees are finding that it may be cheaper to continue producing than to pay penalties for reduced port or rail usage.

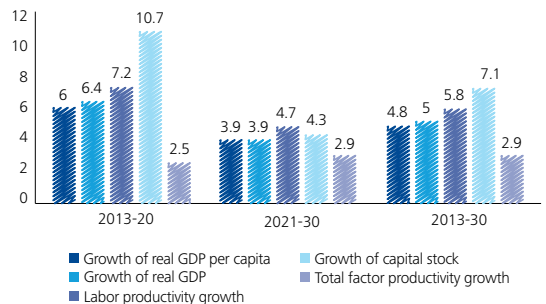
Yet another factor is the cost of rehabilitation. Rather than incurring the prohibitive costs associated with shutting down older mines, some companies are continuing to produce or putting mines into care and maintenance in the hope that a price recovery may make currently uneconomical reserves more viable.

Chart 2: China economic growth forecasts



Source: Economist Intelligence Unit forecast database, October 2015

Chart 3: China’s long-range growth and productivity forecasts



Source: Economist Intelligence Unit forecast database, October 2015

It doesn't help that the supply and demand numbers out of China remain opaque. In recent years alone, China has revealed excess reserves of aluminum, thermal coal, gold and copper—contributing to an oversupply that has often worked in its favor by keeping commodity prices depressed.

THE EXPLORATION DILEMMA

With excess supply flooding the market, concerns around future supply shortages seem premature. However, given the production timelines required by the mining sector, long-term thinking is a must. Exploration is the lifeblood of a business based on finite resources. Unfortunately, investment in exploration remains subdued. According to SNL Metals & Mining, global exploration spend declined 26% in 2014, with budgets falling to US\$11.4 billion compared to a peak of US\$22 billion in 2012.²⁵

The need to position for growth becomes even starker when you consider the difficulties associated with finding high-grade assets in stable regions. Companies that don't take the opportunity to stake early claims will find themselves competing for key reserves once markets turn, hampering their long-term prospects and profitability.

BUYING FUTURE TROUBLE

As the project pipeline dwindles, mining companies will be increasingly harried to meet future demand. A fragile outlook for the world economy aside, the big macro themes that underpin long-term mining forecasts are still holding up. Urbanization rates are rising, as is infrastructure development. In fact, between 2008 and 2017, infrastructure spending in emerging economies alone is expected to total US\$21.5 trillion.²⁶

At the same time, growth in India and countries across Southeast Asia could arguably offset slowing demand from China.

As an oil importer, India has seen an economic boost, further supported by a reform-minded government that has begun to open markets. In addition to making strides to reduce its budget deficit, the country introduced several pro-business measures and plans to revive stalled infrastructure projects and reinvigorate the manufacturing sector.

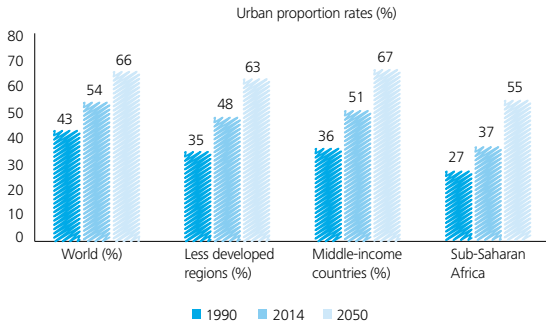
To realize these ambitions, India will need to address its chronic infrastructure bottlenecks, improve productivity, raise skills and reduce red tape. Also key is creating the right policy environment and incentives to attract foreign capital. Since taking office, Prime Minister Modi has spent much of his time overseas, in an effort to improve India's perception as a destination for foreign investment.

Assuming the necessary institutional, infrastructure and investment reforms take place, India's growth may well eclipse China's. The EIU is currently forecasting real GDP growth in India of roughly 6.4% over the next decade—almost double the expected annual growth rate of China over the same period.²⁷ By 2030, the country's population is expected to overtake China's,²⁸ spurring the need for massive infrastructure development that could well boost demand for—and prices of—the commodities needed to support economic growth.

Other countries in Southeast Asia are also marking fairly rapid growth. Over the next five years, GDP in the Philippines is expected to grow at 6%, whilst Cambodia, Myanmar and Vietnam post growth in excess of 7%.²⁹ Additionally, non-OECD growth forecasts through 2019 remain optimistic relative to OECD growth.

These factors are creating an odd paradox for miners, who will need to slow production over the short-term whilst maintaining the long-term pipeline.

Chart 4: Urbanization rates 1990-2050

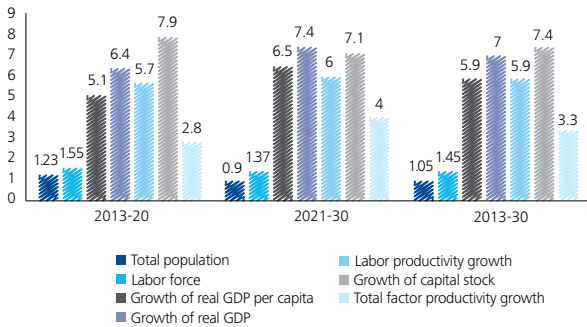


Source: From 2014 World Urbanization Prospects by Department of Economic and Social Affairs, ©2014 United Nations. Reprinted with the permission of the United Nations.

“Big cuts in growth capex and exploration budgets may have far-reaching consequences for miners. Whilst supply adjustments make sense given current industry fundamentals and price signals, is the mining sector taking this too far? If the industry does not find ways to ensure a pipeline of new deposits and think through the viability of traditional mining methods, it may find itself without a great deal of future growth optionality.”

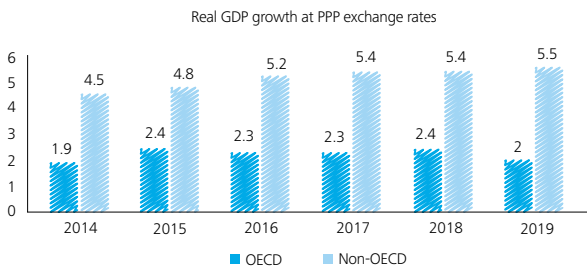
Christopher Lyon, Mining Leader,
Deloitte Chile

Chart 5: India’s long-term economic growth forecasts



Source: Economist Intelligence Unit forecast database, October 2015

Chart 6: OECD vs. non-OECD growth forecasts



Source: Economist Intelligence Unit forecast database, October 2015

THE COPPER CONUNDRUM

As the classic bellwether commodity, copper often serves as a proxy for larger economic trends. So the fall of copper prices to their lowest level since the global financial crisis likely points to a period of ongoing market turbulence.

What's surprising about this slump is that copper still seems to have strong long-term fundamentals. The commodity continues to face deep-rooted structural supply constraints. World production of copper grew by only 0.8% in 2014³⁰ due to a number of delayed copper project start-ups, unexpected production outages, falling ore grades, water and power shortages, higher stripping ratios and cuts in exploration budgets. These conditions prompted Chile to reduce its copper production forecasts for 2015 from 6 million tons down to 5.94 million tons.³¹

Similarly, whilst the global copper market was running at a surplus for the first half of 2015, analysts were predicting a return to a net deficit position even before Glencore cut production at its African mines. Following that announcement, Citigroup tripled its deficit forecast for 2016 to 284,000 tons.³²

Yet, despite these supply side dynamics, copper's rally remains sluggish. Sliding Chinese demand is at least partly to blame. As construction, auto production and infrastructure spending falls, China's copper demand growth may drop to 4.9% in 2015³³ fueled, at least in part, by the challenges faced by China's much-anticipated state electricity grid infrastructure development projects—ranging from project delays and financing issues to political constraints.

At the same time, London Metals Exchange (LME) inventories are rising, as are bonded warehouse stocks inside China. And some wonder what impact copper recycling is having on the markets. The uncertainty at the centre of the calculations, however, is China's unreported copper inventories—which could amount to hundreds of thousands of tons.³⁴

For Chile, the world's largest copper producer, the implications are dire. Miners that operate in the country already face amongst the world's highest wages, coupled with significant declines in productivity. Competition over natural resources, along with rising environmental activism, is resulting in social unrest and sparking violent—and sometimes fatal—protests. The viability of Codelco, the country's state-owned producer, is even at risk: if the company fails to expand its existing operations by 2023, its production could fall by half, putting it on the path to go under by 2030.³⁵ In response, the country's finance minister has already indicated that Chile may need to borrow money on international markets.

Despite these challenges, copper remains central to the world's largest developing economies—including China and India. Declining grades, stubborn cost levels, supply reductions and a lack of new capital to drive exploration and development all point to a price response in the near to medium-term, especially as planned global infrastructure projects come to fruition. If copper does test the US\$4.00 price level, producers will need to position appropriately for this recovery sooner rather than later.

STRATEGIES THAT BUCK THE TREND

As miners wait out commodity market gyrations, there are several strategies they can adopt to prepare for the 'new normal':

GET AGILE

With the lack of transparency around global supply and demand factors, companies need a higher degree of flexibility than ever. The aim is to hone the agility to scale production, labor and other inputs and outputs up or down in response to shifting economic trends. Predictive analytics can help organizations in this regard by identifying external events that may shift commodity market fundamentals.

GO MODULAR

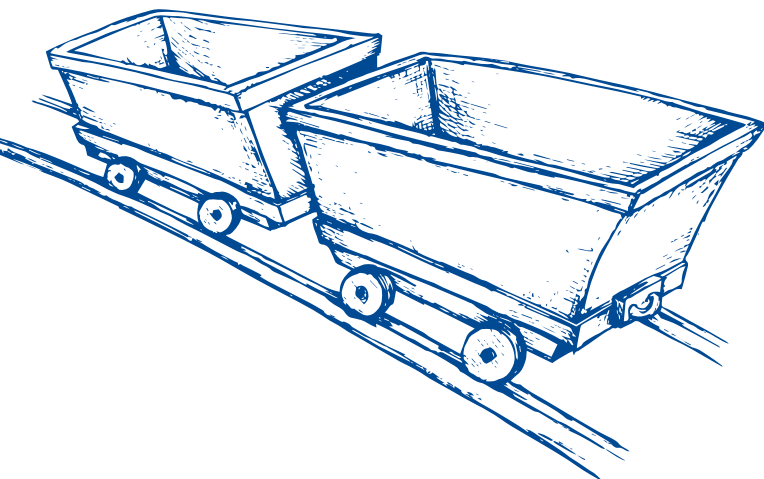
Rather than thinking in terms of large expansion projects, miners may be able to reduce the costs of exploration by using modular, highly automated designs to bring on new capacity in smaller increments. By buying flexibility, modular designs provide option value.

BLINK

The mining industry unquestionably understands that reducing production should help to shore up commodity prices. Individual miners, however, have been refusing to take the lead for fear of getting pushed out of the game entirely. In some ways, miners are playing a sector-wide game of chicken, with everyone hoping someone else will blink first. Whilst not universally applicable, it likely follows that companies will ease back on production in an attempt to bring balance back to the market rather than waiting to be pushed against the wall.

PARTNER

Although the appetite to explore has dwindled in recent years, miners may be missing a window of opportunity if they don't take action soon. By partnering with juniors that currently hold large unexplored or unutilized mining reserves, cash flow positive companies may be able to explore at lower costs than in the past, potentially resetting a portion of their cost base. Other partnership models include Rio Tinto's recent move to provide junior miners with access to its resource assessment technology in an effort to help them identify the best greenfield exploration projects. Although this initiative alone will not alter market dynamics, it does represent a step in the right direction.



5

THE SHIFTING GLOBAL ENERGY MIX PREPARING FOR INEVITABLE CHANGE

Given the mining industry’s extended cycle times, companies regularly look for insight relative to long-term commodity demand patterns. One area that may require more concerted focus relates to the shifting global energy mix.

In many ways, this discussion both begins and ends with the outlook for thermal coal. On the one hand, the extent to which societies appear to be embracing renewable generation is catching many people off guard. The environmental issues raised by burning coal are prompting countries across the world to explore a wide range of alternative energy generation options—from nuclear and gas to solar, hydro and wind power.

China’s consumption of thermal coal, for instance, fell 3% in 2014, despite a 3.8% increase in electricity output.³⁶ In its bid to reduce greenhouse gas emissions by up to 65% from 2005 levels, the country plans to increase its share of non-fossil fuels to 20% of its primary energy consumption by 2030.³⁷ These are significant indicators given China’s historical role as the world’s largest coal consumer (see chart 7).

Alternative power sources are expanding to bridge the gap. Beyond signing mega contracts with global LNG suppliers and developing

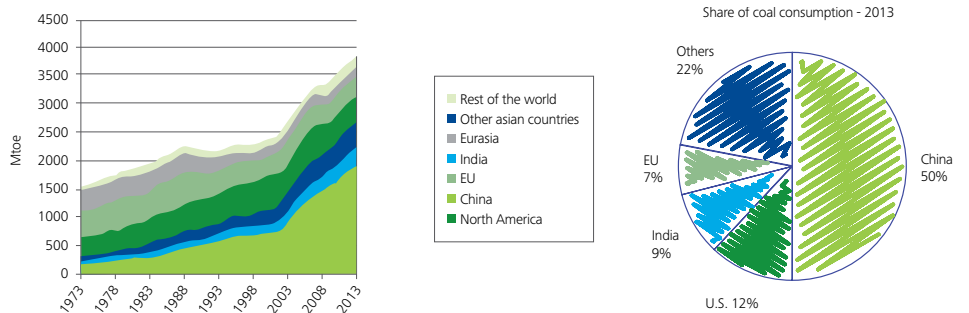
domestic gas supply, including shale, China is investing billions of yuan to fund clean energy production. Already, China plans to increase installed capacity of wind power from 96GW to 200GW, and of solar power from 28GW to roughly 100GW. It also plans to use natural gas for more than 10% of its primary energy consumption by 2020.³⁸ And China is not alone. In 2014, new installations of renewable power plants surpassed 100,000 megawatts of capacity.³⁹

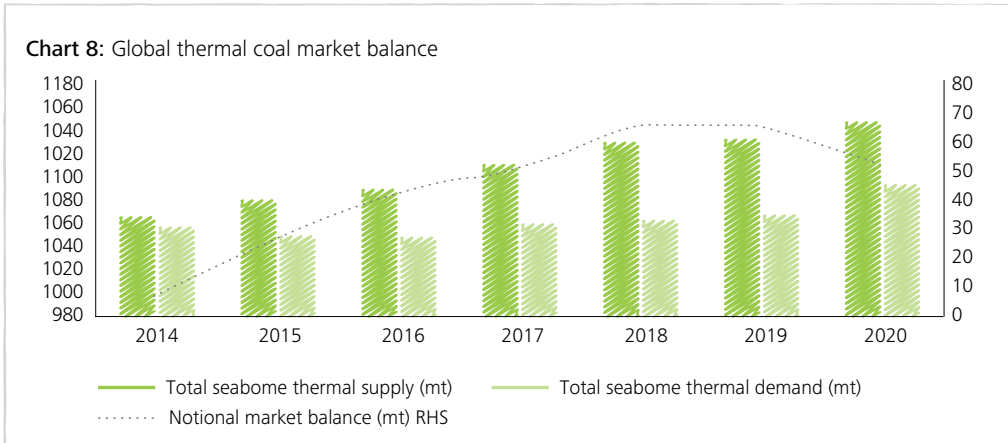
None of this is good news for coal producers. Whilst the fall in producer currencies and lower oil prices have given the industry some unexpected relief, these cost tailwinds are providing incentives to increase output at a time when producer discipline is essential if global thermal coal markets are to return to balance. Despite China’s decision to restrict imports, coal demand is not the real problem. The issue is excess supply.

According to Deutsche Bank’s supply/demand models, thermal coal is running a 30 million ton (mt) surplus, which is expected to rise to 68mt in 2018.⁴⁰

These factors have some people predicting an imminent demise for coal. Certainly, junior coal miners are taking the brunt of this impact, with a high percentage of the sector battling for survival.

Chart 7: Evolution of global coal consumption by major coal-consuming countries/regions (1973-2013)





Source: Deutsche Bank Markets Research, 2015 outlook and 4Q preview: Industrial Metals, Energy & Precious, 11 January 2015

DOWN, NOT OUT

On the other hand, most major energy forecasters agree that coal will remain a critical component of the global energy mix for years to come. According to the U.S. Energy Information Administration (EIA), fossil fuels will continue to supply nearly 80% of world energy use through 2040.⁴¹ Looking at electricity alone—which the International Energy Agency (IEA) says will remain the fastest-growing final form of energy worldwide—by 2040, 56% of power will still come from fossil fuels, with coal accounting for 31% of the mix.⁴²

Whilst coal is predicted to lose market share to natural gas and renewables, dropping to roughly 20% of the total global energy mix by 2040,⁴³ it is not yet on the way out. In fact, global demand for coal is expected to rise to nine billion tons by 2019, growing by an average of 2.1% per year.⁴⁴ Energy shortages in countries across Africa, Asia and South America—coupled with an anticipated 40% spike in global energy use by 2040⁴⁵—may also boost demand for fossil fuels.

There are questions, too, as to whether China can truly afford to stop burning coal at its intended rate. Pollution is a critical issue, but power shortages would cause considerably more social backlash. This may explain why the IEA forecast China’s thermal coal demand to grow to nearly half a billion tons by 2019.⁴⁶ Despite China’s efforts to moderate its coal consumption, it will still account for 60% of demand growth during the outlook period.⁴⁷

These demand factors also hinder efforts to curb the production of coal. Whilst countries in developed nations are adopting environmental agendas to reduce reliance on coal, coal production in countries with less stringent regulation may rise apace to meet global demand. This speaks to the imperative for the ongoing refinement of carbon capture and sequestration (CCS) technologies and other solutions that could reduce the environmental impact of coal-powered generation. Although many argue that the economics of clean coal technologies do not work, new coal-fired power plants currently being built promise to reduce carbon emissions by up to 20%.⁴⁸

CHANGE IS COMING

Yet, whilst the demise of coal may be premature, the move to alternative power sources is inevitable. Natural gas, which currently accounts for roughly 20% of the global energy mix,⁴⁹ is expected to account for 25% of global energy use by 2040, surpassing coal.⁵⁰

Similarly, nuclear power is enjoying a global resurgence, with installed capacity set to grow by 60% to 2040.⁵¹ Whilst nearly half of the world's current operating reactors will need to be retired by that date, over 60 new reactors are under construction in 15 countries.⁵²

Although some uranium producers are struggling to realize a profit at current prices, several low cost U.S. producers have signaled an intent to ramp up if uranium spot prices hit US\$50/lb. With demand for nuclear rising, Macquarie forecasts a gradual price increase to US\$53/lb through 2019, ultimately rising to US\$60/lb over the long-term.⁵³

“Although forecasts for global energy demand are not assured, one thing is certain: there will always be a need for electricity. That means mining companies should be asking which commodities will be required across the entire power generation value chain.”

Edith Alvarez, Mining Leader,
Deloitte Argentina

Additionally, the renewables genie cannot be put back into its bottle. Perhaps, like exponential technologies, renewables have not yet hit their full growth stride (much like the shale gas revolution in the U.S. seemingly took the world by storm). Although renewables currently account for only 3% of the global energy mix, that number is set to rise to 8% by 2035.⁵⁴ Notably, renewables' share of power generation is expected to grow from 21% in 2012 to 33% by 2040, overtaking gas as the second-largest source of generation in the next few years and surpassing coal as the top source after 2035.⁵⁵

As it does so, the need to address intermittency should lead to an increase in demand for commodities used in battery storage. Lithium and graphite, used in lithium-ion batteries, would be the initial beneficiaries. Yet, as researchers aim for battery improvements, other metals will benefit too. These include manganese, nickel and cobalt, which are already being added to lithium battery electrodes in an attempt to increase energy density; zinc, which is being used to create container-sized batteries for storage;⁵⁷ and aluminum, which is being tested in new aluminum-ion battery technology.⁵⁸

Although the market for these metals does not approach the size of the coal market, it is by no means insignificant. According to Citigroup, by 2030, the global battery storage market could be worth more than US\$400 billion.⁵⁸ Beyond providing storage for utilities, these batteries will also be increasingly in demand from a growing electric vehicle market, which reached 665,000 electric cars, 46,000 electric buses and 235 million electric two-wheelers in 2014.⁵⁹

As these forces continue to alter the make-up of the global energy mix, mining companies should likely consider whether—and how—they may want to shift their asset portfolios in response.

THE OTHER ENERGY CONVERSATION

In the mining sector, no conversation about energy is complete without considering the role of energy costs within a mining operation. When considered as a portfolio that incorporates diesel, heavy fuel oil, grid electricity, gas, LNG and other sources, energy can represent up to 30% of a mining company's total operating costs. Historically, miners have taken a very fragmented view of energy consumption, which has hampered their ability to reduce costs across the board. With today's low oil prices, however, and markets in excess supply, the timing is ripe to consider opportunities to get these costs under control.

A range of strategies exists to help miners achieve these goals, such as:

- Assessing the company's overall energy portfolio to identify ways to optimize both supply and demand factors before the inevitable rise in prices occurs
- Exploring new technology advances including small-scale LNG facilities that make this fuel source far more accessible, new engine technology that allows companies to substitute diesel for LNG on their haul trucks by running dual fuel systems and solar technology that creates new opportunities for remote locations
- Re-evaluating financial hedging strategies (particularly if currently on the wrong side of fuel price hedges) and looking for opportunities to deploy physical or technology hedges that may give the company greater fuel flexibility
- Using scenario planning to assess uncertainties in the global energy mix and the range of outcomes for energy prices

As the global energy mix shifts, and technology continues to advance, miners should be prepared to take advantage of emerging opportunities to control their energy costs.



STRATEGIES THAT BUCK THE TREND

As the global energy mix changes, miners will need to respond with short-, mid- and long-term strategies.

FOLLOW GLOBAL DEMAND

Over the short-term, coal producers may be able to maintain market share by focusing on countries where coal remains in demand. Over time, however, pure play coal producers are likely to suffer if they fail to consider diversification strategies.

DIVERSIFY

As the global energy market shifts, mining companies will need to keep pace by considering the full range of market angles. As new technology demands expand, this will open up opportunities for commodities in related industries, including lithium and/or other metals and minerals used in battery storage, solar panels and wind turbines.

RE-EVALUATE ENERGY STRATEGIES

As the energy mix shifts, companies will need to take steps to optimize what is currently a significant input cost into the business. This should include gaining an understanding of their baseline performance, developing a long-term energy strategy and optimizing a wide range of demand and supply side factors in an effort to change their performance.

THINK THROUGH CARBON PRICING

Whilst many miners voluntarily report their carbon emissions, governments around the world remain focused on meeting their long-term greenhouse gas reduction targets. This is leading to an inevitable focus on carbon pricing and carbon taxes. As miners develop their long-term energy strategies, they will need to determine how their processes must change if carbon pricing reporting becomes mandatory rather than a voluntary disclosure.





ENGAGEMENT PARTY

CHANGING THE NATURE OF STAKEHOLDER DIALOGUES

When it comes to stakeholder engagement, miners have traditionally found themselves between the proverbial rock and hard place. Reconciling the often competing needs of governments, local communities, non-governmental organizations (NGOs), employees and regulators—whilst still delivering return on shareholder investment—has become a balancing act of huge proportions.

Despite the recent ills in the mining sector, many governments have not softened their stances around resource nationalism. In most jurisdictions, mining companies continue to struggle to obtain environmental and other approvals, adhere to a range of beneficiation regulations and remit sometimes excessive taxes, royalties and fees. At the same time, the cost of bureaucracy is taking a toll on corporate profits. In a [recent report](#), Deloitte estimated that compliance with public sector rules in Australia alone translates into a AUD95 billion price tag for the economy.⁶⁰

Whilst governments are typically motivated by the need to maintain national revenues, their tactics are leading to detrimental results—not only to mining companies, but to economic health as well. Mongolia, for instance, saw its foreign investment plummet from US\$4.5 billion in 2012 to US\$400 million in 2014 largely due to a long-standing dispute between the country and Rio Tinto over the Oyo Tolgoi mine.⁶²

Pressure from other stakeholder groups is also mounting. Community expectations can no longer be met with lump sum cash payments, sports stadiums or water pumps. With each passing year, communities are seeking more meaningful outcomes—and are withholding consent when companies fail to accommodate their needs. This is also taking a financial toll. Researchers found that mining projects with capital expenditures of

between US\$3 to US\$5 billion can incur weekly losses of roughly US\$20 million due to delayed production caused by community opposition.⁶³

For their part, NGOs, special interest groups and activists have more tools in their arsenal than ever before. Increasingly, these organizations work to sway public opinion through online communications such as, social media and campaigns geared to go viral. As activist organizations become more vocal, and more organized, they are able to exert greater pressure on both governments and communities considering mining project approvals.

Disputes between miners and labor also remain rife in certain jurisdictions. Although by no means universal, some countries' citizens continue to perceive mining companies as foreign-owned conglomerates bent on colluding with government to exploit local labor and steal the country's resources. It doesn't help that mining company taxes do not translate into direct infrastructure investments, making it difficult for many stakeholders to understand the real contribution miners are making in their communities. Add in recent profitability challenges that have led to mine closures and staff layoffs, and you get a volatile situation—resulting in strikes, protests, riots and violence.

In Deloitte Australia's report, *Building the Lucky Country: Get out of your own way*, the total cost of red tape in Australia rises to AUD249 billion when you add in the time required for employees to comply with rules and regulations that the private sector imposes on itself. All told, self-imposed rules cost AUD21 billion a year to administer and generate a stunning AUD134 billion a year in compliance costs.⁶¹

A NEW CONVERSATION

Miners interested in reclaiming their license to operate are coming to realize that a new form of stakeholder engagement is needed—one that balances the demands of multiple groups. The concept of “return to shareholder, return to country, return to citizen” is relevant here. Rather than simply reporting the amount of money spent on taxes and community initiatives, companies should aim to track and report on the impact they are having on each stakeholder group—not only shareholders, but governments, communities and employees as well.

At a country level, for instance, miners can show how their activities and investments contribute to GDP, economic transformation and job creation. At the community level, they could report on outcomes such as number of university bursaries funded or the number of citizens connected to fresh water. From an employee perspective, they could track the percentage of employees living in houses with running water or who have been given access to training or apprenticeship programs.

Although this sounds vague, it is being applied by many companies to great effect. For example, in working with local First Nations communities, one Canadian mining company learned that the most effective community wellness metrics tied to outcomes such as the percentage of young people who speak their native language, having less crowded homes, the rate of people who seek pre-screening for cancer (which shows higher awareness of health and wellness) and the species that can still be found in their traditional hunting grounds.

Other creative metrics could include: the growth and profitability of local suppliers; the training opportunities made available to employees; improvements in literacy and secondary school completion rates; the percentage of children completing traditional or spiritual education programs; and even improvements in softer measures, such as work ethic or employee satisfaction.

If mining companies can start aligning their investments with the underlying and long-term needs of their disparate stakeholders, and further explore the concept of shared value—which demonstrates the interconnectedness of corporate competitiveness and community prosperity—they could earn not only the license to operate, but the license to grow.

“Miners are great at reporting how much they spend as an industry, but they don’t think about the impact they’re making on the broader system. If we can align our investments with the long-term needs and interests of our stakeholders, it would go a long way towards changing the nature of our dialogue.”

Andrew Lane, Mining Leader,
Deloitte Southern Africa

RECONCILING DIFFERENCES

One of the factors that often spurs tension between mining companies and local stakeholders revolves around competition for scarce resources. In many mining regions, there is insufficient power to meet the needs of both industry and local citizens. Similarly, land rights are coming into dispute, with local communities loath to relocate or give access to traditional hunting grounds.

The same is true of water. In some regions, governments have put mining projects on hold in light of concerns around the impact they were having on the quality and availability of local water resources. In other regions, governments are trying to limit water rights previously granted to mining companies. This issue only promises to escalate. According to a recent Moody's report, 70% of the mines of the 'big six' diversified miners are located in countries already under significant (56%) or moderate (14%) water stress.⁶⁴

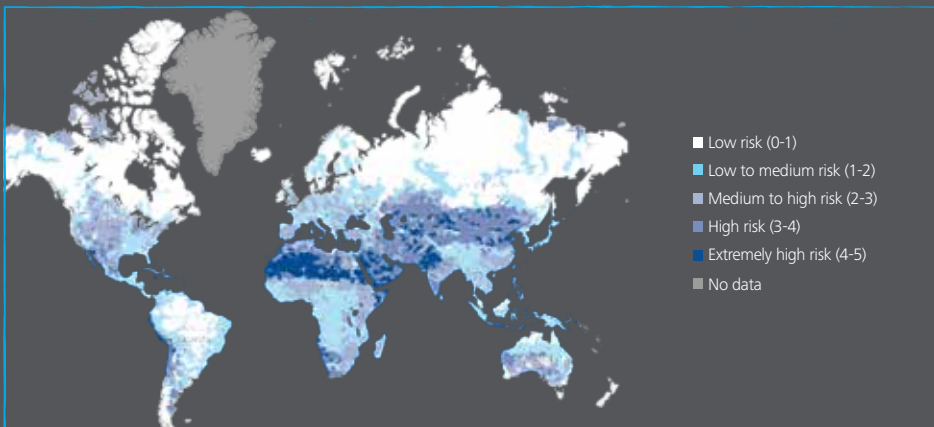
To address these issues, some mining companies have built their own power stations to meet their operational demands, with spillover generation made available to

local communities. In addition to traditional generation, companies are also exploring the feasibility of renewable generation, investing in solar and wind projects as a way to meet their energy needs. Similarly, despite the high price tag, several projects are already underway in Chile to build desalination plants.

Notably, these very investments can help miners refine their negotiations with local communities and governments around access to scarce resources. Once alternative power facilities are built, for instance, they can be relinquished to local communities at the end of the mine's life without the burden of significant maintenance and operational costs typically associated with conventional generation sources.

To identify these win-win solutions, companies must be willing to deploy technologies that minimize water and power usage. They must also think beyond the life of the mine. By creating these honest dialogues with communities early on, rather than simply engaging in stakeholder consultation, miners can position themselves to actually earn free and informed consent.

Chart 9: Water scarcity around the world



Source: World Resources Institute, Freshwater Sustainability Analyses: Interpretive Guidelines, November 2011



STRATEGIES THAT BUCK THE TREND

It takes time to build consensus. Here are some ways to get started now:

GET SERIOUS ABOUT SOCIAL

Although mining companies rely on some social media to engage with stakeholders, they are not on the forefront of emerging trends. This puts them at a disadvantage to organizations capable of mobilizing full-scale social media campaigns to back up their protests and concerns. It's time for miners to get more active in this space by using social media to engage directly and share targeted information with their various stakeholders.

LISTEN CAREFULLY

Beyond using social media platforms to communicate with stakeholders, miners should also leverage data analytics and 'social listening' tools to track what is being said about their organizations in real-time. By alerting companies to reputational risks, community concerns or patterns that may signal social unrest, social listening provides companies with an early warning system that allows them to respond proactively.

DEMONSTRATE COMMITMENT

Stakeholder management is rarely confined to negotiations with one or two discrete groups. More often, there are layers and sub-layers of decision makers, influencers, protagonists and antagonists that must be managed. To create win-win platforms that align miners with this complex web of stakeholders, companies must demonstrate a high level of commitment by engaging senior executives—right up to the CEO—to play key roles in stakeholder engagement and solution identification.

EXPAND THE DIALOGUE

Once miners come to understand individual stakeholder needs, it makes sense to hold dialogues across an entire mining cluster. By collaborating with employees, suppliers, government ministries, citizen groups, advocacy organizations, and even secondary and tertiary businesses, companies can expand the set of potential compromise outcomes that might meet the needs of typically divergent local groups and co-opt the entire universe of stakeholders into the solution-seeking process.

HELP INFORM NATIONAL MINE STRATEGIES

Governments eager to attract mining investment without alienating either corporate or community citizens would likely welcome input from industry stakeholders as they work to structure effective national mine strategies. Mining companies have a role to play in this regard as governments seek direction around policy.

WALK AWAY

Although few mining companies are willing or able to abandon viable projects, unreasonable pressures exerted by regulators or other stakeholders could tip an otherwise feasible project into the red. Mining companies capable of responsibly walking away from projects that no longer promise to deliver a solid business benefit would send a strong message to governments and local communities on what they potentially stand to lose by adopting an intransigent anti-mining stance.

7

THE CAPITAL CRISIS

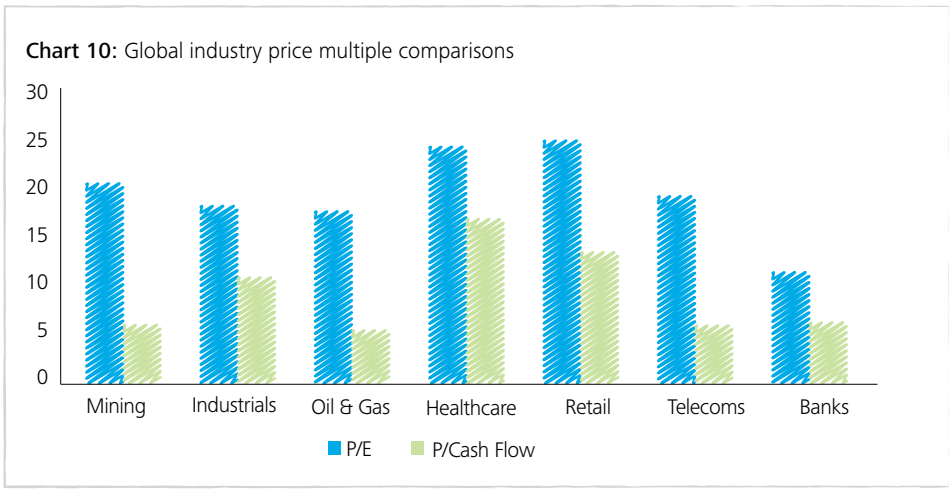
STARVED OF FINANCE, MINERS STRUGGLE TO SURVIVE

Weak earnings growth, caused in part by commodity price woes, continues to affect mining industry valuations. As of October 2015, the global mining sector was trading at a price/earnings multiple below the healthcare and retail sectors, although its performance relative to the telecom, banking and industrials sectors was much improved.

Despite this apparent recovery, companies across the industry are struggling. Roughly 10% of global gold mines⁶⁶ and a “significant portion” of met coal mines⁶⁷ are running at loss. Thermal coal is caught in a similar downward spiral, with 80% of U.S. production, 16% of Australian production and 19% of Indonesian production uneconomic

at current spot prices.⁶⁸ This is exacerbated by declining coal use in China and a large uptick in domestic capacity, notably in Western China. The vast majority of China’s iron ore producers are also operating in the red,⁶⁹ although low seaborne prices have helped the domestic steel market.

Industry debt burdens have spiraled out of control as well. As of the end of 2014, large metals and mining companies held over US\$690 billion of net debt, an amount equivalent to 64% of their combined market value.⁷⁰ This is spurring a range of measures to get debt under control, from Glencore’s move to pay off debt by selling US\$2.5 billion of new shares⁷¹ to Barrick Gold’s plans to reduce debt by US\$3 billion by cutting capital spending and selling assets.⁷²

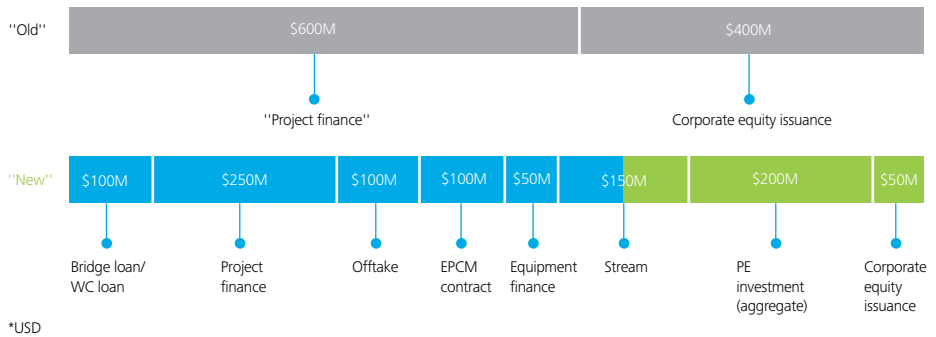


Source: Thomson Reuters, Datastream, October 2015

“As funding dries up, miners are being driven out of the industry. More worrisome is that no one seems to know how to solve the financing problem. What happens when large miners run out of cash reserves? What happens if the exploration model is irrevocably broken? How do we revive equity interest in the sector? If the industry is to thrive, we need answers to these questions.”

Chart 11: Traditional vs. new financing options*

Example: \$1B capex (company with \$75M market cap)



Source: Deloitte Canada

CAPITAL FLIGHT

Amidst this distress, capital continues to flee the sector. Many traditional lenders disappeared after the Lehman crisis, and the few groups that remain have been largely inactive. For their part, investors are diverting funds to industries that promise more stable, quicker returns. Even large-cap companies are feeling the pinch, leaving juniors deeper in the lurch. Many junior miners are fighting for survival, trying to feverishly adapt—like plants in the desert, waiting for the rains to arrive.

As a lifeline, companies have turned to a range of alternative financing vehicles, including offtake-related financings and royalty structures, such as streaming (see chart 11). Yet these solutions create concerns of their own. For instance, miners that enter streaming arrangements essentially sell their production forward at a discount to current commodity prices—and are on the hook for as many years as it takes them to deliver those production targets, often selling the upside that equity investors are counting on.

Unfortunately, given the lack of funding sources, miners can't afford to be too choosy. Institutional funds continue to bypass the sector, whilst the much-hyped private equity wave has yet to invest meaningful dollars. Companies are floundering in their efforts to attract risk-averse investors to the industry. Any capital returning to the sector is likely to be commodity-specific, which could potentially favor commodities such as copper, zinc, potash, gold and uranium. In other cases, however, existing players will be forced to consolidate and junior explorers may fade away—crippling the long-term prospects of the mining industry.

STRATEGIES THAT BUCK THE TREND

With lack of access to traditional sources of funding, many miners are exploring alternatives such as offtake deals, royalty and metal streaming arrangements, and equipment financing. Here are some other solutions to consider.

FIND UNLIKELY PARTNERS

Some miners are turning to Asian engineering, procurement and construction (EPC) firms to fund and build their mine projects. In exchange for winning a contract, these EPC groups will take equity stakes or bring along banking partners to provide debt funding. Other companies are turning to pension plans to fund infrastructure projects, such as solar or wind power stations. Financing is tied to the mine's guaranteed demand over a set period of years, with excess power being sold back to the grid once mining is complete.

COMMERCIALIZE DORMANT ASSETS

In an effort to earn alternative revenue streams, some miners are considering the viability of commercializing dormant assets, from property holdings to equipment. Ideas include sharing or subleasing office space; converting land to alternate uses; or renting out capital equipment.

COLLABORATE

Beyond sharing talent and infrastructure, juniors may be able to access financing by pooling together to reduce their individual administration costs. Although the concept is growing, companies could arguably create consolidated exploration funds that pool their best resources (people, tenements, techniques and processes) in a bid to attract equity capital by offering investors a well-governed, diversified exploration investment vehicle, rather than continuing to list individually.

REDUCE DEBT LEVELS

In an effort to restructure or reduce high debt loads, some miners are issuing notes to improve their financing terms, selling off parts of their portfolios and undergoing deep cost reduction efforts to free up capital that can be used to pay off debt and meet interest payments.

CONSIDER CROWDFUNDING

In 2014, global crowdfunding campaigns raised US\$16.2 billion.⁷³ Whilst mining is not likely to be a hot sector of crowdfunding, miners capable of telling a compelling story or coming up with an innovative offering could attract funds through these increasingly-popular platforms.

SEEK GOVERNMENT FUNDING

In various jurisdictions around the world, government and/or export credit agencies make funds available to companies that meet specific criteria—such as those that export a certain volume of goods internationally or those willing to purchase domestic mining equipment and supplies.





A TAXING TIME FOR MINERS

A GLOBAL TAX RESET CHALLENGES YESTERDAY'S TAX MANAGEMENT

With corporate social responsibility squarely in the spotlight, tax has become a favored media topic in recent years. Exposés of companies that have used tax shelters, highly technical interpretations, hybrid instruments and transfer pricing mechanisms to purportedly avoid paying their fair share of tax have resulted in both reputational and financial repercussions. Although miners, unlike many technology companies, embed their businesses in the countries in which they operate, they still find themselves subject to growing scrutiny—nor are they exempt from the rash of regulations and treaty changes that are now altering the global tax landscape.

The single biggest development mining companies will need to come to terms with are the OECD and G20 initiatives to address what is deemed to be inappropriate tax management. The 15 base erosion and profit shifting (BEPS) action items endeavor to ensure that participating countries adopt a coherent approach relative to specific tax-related issues. To do so, they reset a number of technical points and aim to increase transparency with the goal of creating a balanced international tax approach. In doing so, however, they promise to fundamentally change the tax implications associated with a range of activities, such as commodity trading, procurement structures, controlled foreign companies and interest deductions, to name just a few.

Although BEPS focuses on a number of specific issues, it is broadly accepted that it will have far-reaching consequences as tax scrutiny heightens on many fronts. Mining companies should expect a strong focus on tax compliance, substance and transfer pricing—and may face challenges related to their historical investment and trading structures, which have been developed over decades.

At the same time, country-by-country reporting—which will become mandatory for fiscal years ending December 31, 2016—will require companies to use a standard format to disclose more information to more tax authorities than in the past. The nature of this standardized reporting is uncharted in the context of mining and will likely present new challenges to companies that operate in multiple jurisdictions. It also raises concerns around what revenue authorities will do with the plethora of new information they collect.



As transparency becomes the new norm, and the scrutiny of tax authorities rises, companies will need to reassess their tax management increasingly in the context of good tax governance.

Although certain BEPS requirements—like country-by-country reporting—will only apply to multinational corporations with revenues in excess of 750 million euros, the majority of the changes will impact all companies. This leaves miners with less than one year to lay the groundwork for compliance. In fact, some countries have already injected BEPS-related principles into their tax provisions, whilst others have stepped up tax scrutiny and audits.

BUSINESS UNUSUAL IN THE CURRENT TAX WORLD

Notably, non-OECD countries are also tightening their tax laws, with new rules being enacted in various countries. Whilst certain changes are arguably being made in line with the anticipated BEPS changes, others attempt to alter what may be perceived as overly-beneficial dispensations towards mining. Countries embarking on tax changes include China, the Dominican Republic, El Salvador, Indonesia, Kenya, Malaysia, South Africa, Ghana, Taiwan and Thailand. Many countries—including Peru, Russia and Venezuela—are also attempting to crack down on perceived tax offenders, whilst introducing very technical changes to a variety of tax provisions. Tax authorities are also engaging in more aggressive audits across the board. And, of course, these changes are taking place amidst a tax climate that is often unfavorable to miners.

Whilst BEPS and related global legislation does not single out the extractive industry, it does play into the nationalist stance governments have exhibited to miners over the years. That may explain why these rules are triggering some concern that jurisdictions hungry for tax dollars may use corporate disclosures to reallocate profits to local companies—triggering higher local taxes and potentially resulting in double taxation. Concerns around information leakage are also rife, driving companies to consider their tax disclosures as public documents even if they are not currently intended as such. Given these trends, tax issues will likely move up mining company agendas, making their way into the C-suite.

“With global tax issues back in the press, mining companies are once again under scrutiny for their tax affairs. This will impel miners to base future investments on three main factors—a country’s geology, its political stability and its tax policy.”

James Ferguson, Global Mining Tax Leader, Deloitte UK



STRATEGIES THAT BUCK THE TREND

With long-standing tax rules in flux, mining companies will need to take steps to adhere to and understand the evolving tax environment:

UNDERSTAND THE IMPACT

Given the potential impact of new tax rules on earnings, companies should aim to understand the financial implications in advance. Assessment tools such as heat maps can flag the effect of the tax rules on a company's corporate structures, operations, financing activities, sales and supply chains, positioning them to proactively adapt to a changing tax environment. Early assessments have proven a key enabler for companies to approach these changes in a coordinated and structured manner.

ASSESS THE COMPANY'S STRUCTURE AND VALUE CHAIN

As multinational mining companies come under more intense scrutiny by various tax authorities, they may need to reconsider their operational and corporate structures related not only to sales and procurement, but also to how they use people and processes. Acting now will position first movers to better navigate the changing tax environment.

TAKE A FRESH LOOK AT THE COMPANY'S TAX MANAGEMENT

As the global focus on tax rises, companies may need to reconsider their current tax governance and tax management structures. For miners, this means adopting a tax management approach flexible enough to apply in both local and global environments. Whilst many of the changing tax rules apply predominantly to a company's financing structures and internal group transactions, this represents a good opportunity to review their entire tax management environment. With tax reform on the horizon, the time may be ripe for companies to revisit their entire tax structure to ensure it continues to reflect their strategic priorities and organizational risk tolerances.

ENGAGE

As the regulatory landscape becomes increasingly complex, mining companies of the future may need to proactively engage governments—and specifically finance and tax authorities—to navigate the changing environment. Companies that consistently engage these key stakeholders in a constructive manner can realize tangible advantages, particularly where tax rules related to stability or production agreements threaten to change.



THE M&A PARADOX TO BUY OR NOT TO BUY; THAT IS THE QUESTION

Although industry watchers have been predicting a pick-up in mining M&A for several years, M&A deal values and volumes continue to disappoint. Whilst there are many factors that support a resurgence in deal flows—including finance-starved juniors looking for a lifeline, cashed-up mid-caps scouring the market for value, private equity firms with money to spend and distressed assets available for the taking—risk aversion continues to prevail.

Although many juniors are merging with one another to preserve precious cash balances, the most active deal flow in recent years has still come from divestments and rescue-type deals, often with minimal cash changing hands. Diversified miners seeking to reduce their debt loads, simplify portfolios and generate additional cash to offset underperforming investments are selling and spinning off a range of non-core assets—whilst trying to retain marquee assets wherever possible.

THE BEAR TRAP

Be that as it may, both the hesitance to buy and the inclination to sell are still largely driven by shareholder pressure or the need to trim debt levels in today's low commodity price environment. Investor expectation for short-term returns is fueling many divestments, whilst the need to deliver on progressive dividend policies is diverting funds from potential acquisitions—at least for now. Paradoxically, this very commitment to demonstrate short-term growth may be harming the industry's long-term growth prospects.

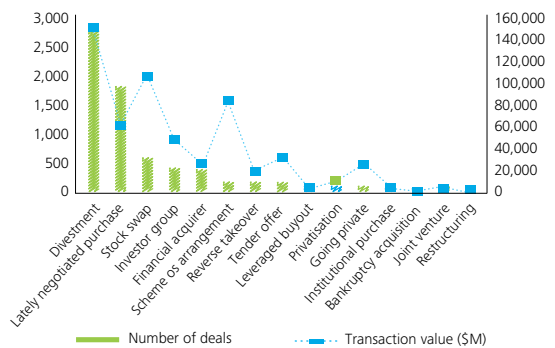
Given the cyclicity of the mining business and the current pressure on earnings, miners will increasingly struggle to fund their dividend programs from free cash flow alone. Caught in the need to deliver on the mantra of progressive shareholder returns, miners may be forced to turn to debt and/or raid the piggybank, potentially reallocating funds earmarked for capital projects or exploration to dividends. Those that do will suffer more than the risk of a credit ratings downgrade. They may also miss out on growth opportunities—preventing them from delivering long-term shareholder growth.

AGAINST THE GRAIN

The irony is that this is probably an ideal time for miners to be making acquisitions. With a plethora of distressed assets hitting the market, coupled with divestments from the majors, buyers that strike whilst the iron is hot could acquire uncontested assets. This may explain why some miners are looking at acquisitions that can help them drive local scale. In fact, a range of counter-cyclical opportunities are currently available to miners with cash flow and balance sheet capacity. Conversely, those trying to time the bottom of the market may find themselves giving up any gains from lower valuations to higher prices spurred by competitive bidding.

To complicate matters, acceding to investor sentiment now may hamper companies' ability to meet future shareholder expectations. That may explain why some majors are now turning to streaming deals and other tactics to reduce dividends and trim debt. After all, at some point, shareholders will begin to wonder how miners plan to fuel future growth. With assets earning sub-standard returns and investment in exploration and project development slowing, M&A may present a compelling answer for mining companies prepared to grow by acquisition.

Chart 12: Sell-side global mining deals since January 2012, by acquisition technique



Source: Thomson Reuters, Thomson One database, October 2015

STRATEGIES THAT BUCK THE TREND

By taking a strategic approach to M&A, mining companies may be able to seize unexpected opportunity. Consider these suggestions:

BUY COUNTER-CYCLICAL

Despite the imperative to focus on costs and productivity, mining companies must also lay the groundwork for future growth. Companies prepared to engage in counter-cyclical M&A today may reap long-term rewards. Consider Northern Star Resources, Australia's fastest-growing gold miner. Relying on a growth strategy that has seen it acquire non-core assets from the majors and, more recently, distressed assets from the juniors, the company's profits grew by over 300% for the year ended June 30, 2015—generating sufficient cash to pay out AUD26.5 million in dividends and AUD50 million in exploration.⁷⁴

DIVEST WISELY

Notwithstanding the prevailing trend towards divestment, asset sales may not be the optimal solution for all companies, especially in light of today's depressed valuations. Before putting assets on the block, miners should carefully consider the role individual mines can play in their portfolio. Beyond considering the cost issues, companies should also determine which mines may provide cash flow, alter their risk profile based on where they're located, provide long-term sustainability based on their reserve profile, offer a diversification advantage, balance political risk, provide a natural currency hedge and/or give the company the flexibility to ramp production up or down. By engaging in this type of enhanced review process, miners can avoid divesting assets that could potentially deliver long-term value or a competitive differentiator.

“The scarcity of funds and a fear of investing are driving many potential buyers to stay their hands. With asset values being tested, however, there are currently compelling reasons to buy. Whilst M&A will not be right for every company, counter-cyclical opportunities exist and companies that choose not to explore them may not be coming to the right conclusion.”

Debbie Thomas, African Services Leader, Deloitte UK

10

SAFE, SECURE AND HEALTHY

AN EXPANDED VIEW OF CORPORATE AND PERSONAL WELFARE

The safety imperative is never far from the minds of miners. The risks associated with mining remain real, with fatalities per 100,000 workers ranging from nine in Australia and 16 in the U.S. to 31 in Turkey.⁷⁵ China also remains an outlier. Whilst its safety record is improving, coal miners in the country face extremely hazardous working conditions.

In light of these realities, miners continue to refine their safety programs. In recent years, this has seen them turn to data analytics to pinpoint the industry risks, organizational behaviors and internal cultures most likely to result in severe safety events. As this technology becomes more intuitive and less costly, it is enabling companies to implement safety programs focused on zero fatalities (rather than zero harm).

MENTAL HEALTH CONCERNS

Yet, despite this progress, industry risks related to both safety and security continue to grow. In some ways, this is due to an expanding definition of safety. Today, leading companies realize that safety isn't only a function of process-driven policies. It also requires the promotion of a culture of safety. Embedded in that notion is the idea that employees must be both physically and mentally healthy for a safe and productive environment to flourish.

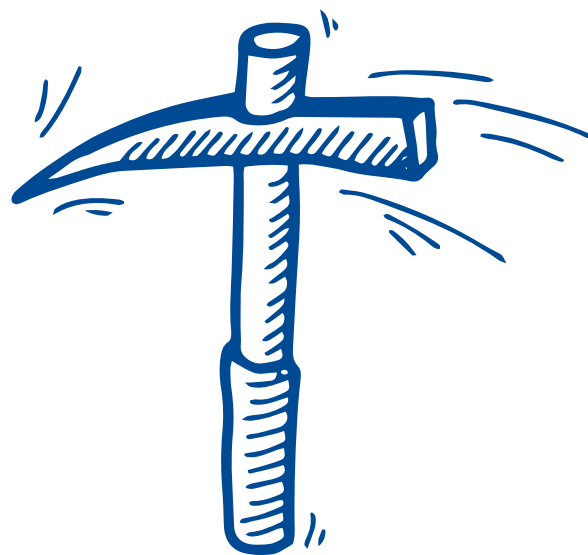
Unfortunately, industry mental health may be flagging. Ongoing challenges to corporate profitability have led to a spate of layoffs that are heightening employee despondency. Research also shows that common mining conditions—including difficult climates, remote sites and fly-in/fly-out (FIFO) arrangements—can lead to chronic stress. In Western Australia, a parliamentary inquiry launched after nine FIFO workers committed suicide in a 12 month period found that roughly 30% of the FIFO workforce

was experiencing mental health problems, compared to a national average of 20%.⁷⁶ Other jurisdictions are taking note. In Canada, Vale recently partnered with a local university and the United Steelworkers to conduct a three-year research project to both study and address the mental health of miners.⁷⁷

THE RISK OF PHYSICAL HARM

And this is not the only evolving safety risk. In recent years, global companies have faced mounting difficulty protecting both their staff and facilities in less stable regions from physical harm. In the first four months of 2015 alone, employees from at least three different mining companies were kidnapped and held for ransom.⁷⁸ Tragically, in Mexico's Guerrero state, three of the abducted workers were found dead.⁷⁹

Physical facilities are also not off limits, with mining sites and equipment in several high-risk countries subject to physical attack.





CYBER RISKS MOUNT

Similarly, cyber security is rising on the corporate agenda. As the Internet of Things evolves and network connectivity extends beyond the nuclear enterprise, miners find themselves facing unprecedented risks. Cyber criminals engaged in corporate espionage, attempted blackmail campaigns or malicious efforts to cause damage by hacking autonomous vehicles (for instance) are using increasingly sophisticated tactics to target both organizations and individuals.

Notably, the type of information at risk varies from financial performance data and technologies used to streamline processes, to areas where a company may be looking to mine or transactions it is considering entering. And the costs of a potential breach are considerable as well—ranging from damage to a company’s reputation and profits, to serious safety and security impacts.

As these risks expand, miners will come under greater pressure to tighten their processes and controls around safety and security in a bid to better protect all of their critical assets—from the well-being of their people to their physical facilities and data.

“Safety, security and mental health are all issues that go hand-in-hand with mining productivity. As our ability to analyze these factors becomes more operationalized, companies can begin making more serious strides to safeguard not only their intellectual property and physical assets, but also the health of their people.”

Nicki Ivory, Mining Leader West, Deloitte Australia

STRATEGIES THAT BUCK THE TREND

To enhance their safety records and security postures, miners must strengthen their ability to detect risks, prevent safety incidents and respond in the event of a crisis. This could include:

ENHANCING SAFETY ANALYTICS

As data analytics become more intuitive, companies are gaining greater ability to correlate the safety data they collect with other available data points (e.g., work rosters, production data, equipment maintenance schedules, weather conditions, vehicle telemetry). By correlating this data, companies can identify safety incident patterns and employees particularly at risk, and adopt processes and procedures to minimize the incidence of serious injury. Wearables can play a role here as well, enabling companies to reduce accidents by tracking both the location and physical health of their workers. See <https://vimeo.com/122846215>

STRENGTHENING MENTAL HEALTH POLICIES

Most mining companies already take steps to assess the mental health of their workers and provide counselling services to assist those in distress. With concerns around mental health rising, however, new strategies are coming to the fore, including enhanced training, revised work schedules and the fostering of a work culture focused on preventing the onset of mental health challenges, promoting recovery and reducing the stigma associated with reporting mental health issues. Analytics can likely strengthen these efforts as well by helping companies uncover the risk factors that contribute to mental health problems.

IMPROVING SECURITY PROTOCOLS

To protect their workers in hostile environments, some companies have begun to embed tracking devices and panic buttons into worker laptops, mobile phones and other equipment. They are also enhancing physical security—not only by erecting fences, mounting cameras and posting

guards on physical facilities, but also by replacing ID cards with facial recognition or other biometric technologies. Advanced monitoring systems can also help track access to facilities, pinpoint how insiders move through their environments and detect anomalous patterns.

EMPLOYING RISK MONITORS

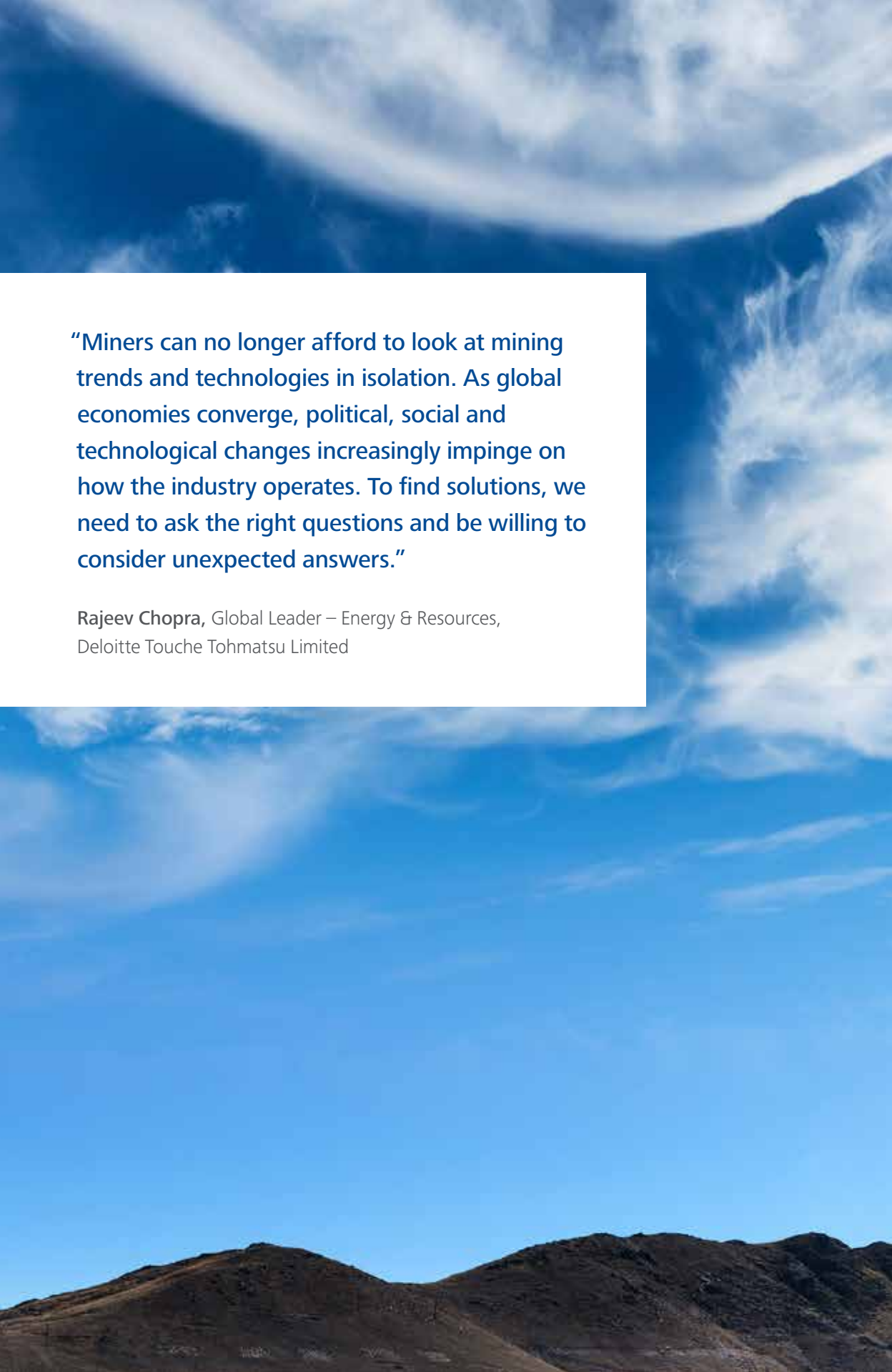
By monitoring ‘noise’ on the Internet from hacktivist groups, certain nation states and other threat agents, it is possible to identify indicators that may signal an imminent protest action, cyber attack or company being targeted for corporate espionage. Whilst this type of monitoring cannot protect organizations from every unknown threat, it can help pinpoint dangerous situations before they escalate, enabling companies to detect, prevent and respond to emerging risks.

CONDUCTING RISK ASSESSMENTS

In an effort to improve productivity and reduce costs, miners continue to build integrated supply chains and store a growing amount of information in the cloud. To mitigate the associated security risks, it’s imperative to track which external parties have access to the company’s data and what controls are in place to prevent the unauthorized dissemination of confidential data. Third-party contracts must include security requirements that are regularly enforced with audits. At the same time, vulnerability assessments should not be confined to suppliers. Insiders often present the greatest risk to corporate security, and should be monitored as well.

IMPROVING CRISIS MANAGEMENT

Minimizing damage and enhancing safety requires companies to adopt robust crisis management protocols—not only for cyber breaches, but also in the event of physical attacks. To effectively mobilize resources across the organization, companies must assess threat scenarios in advance and rehearse their responses through simulations.



“Miners can no longer afford to look at mining trends and technologies in isolation. As global economies converge, political, social and technological changes increasingly impinge on how the industry operates. To find solutions, we need to ask the right questions and be willing to consider unexpected answers.”

Rajeev Chopra, Global Leader – Energy & Resources,
Deloitte Touche Tohmatsu Limited

ASKING THE RIGHT QUESTIONS

MARRYING KNOWLEDGE WITH INTUITION

Anybody even peripherally involved with today's mining industry understands that the sector is facing potentially crippling challenges. Miners don't need to be told of the dangers endemic in free-falling commodity prices, China's volatile stock market, spiraling stakeholder demands and the virtual disappearance of funding. After all, they're living it.

What bears mentioning, however, are the hazards associated with hitting the panic button. Companies operating in fear risk becoming mired in the minutiae of cost control, budget management, capital allocation and investor relations. This leaves precious little time or resources for innovation, ingenuity and imagining solutions.

The mining industry has attracted its fair share of pioneering thinkers, contrarians and leaders willing to buck the trends. If the sector hopes to emerge from the current downturn and position for growth in what promises to be an altered future, it will need to marry the knowledge of its reigning experts with the intuition of its innovators.

This will take more than an understanding of the factors that have led to the current market madness. It will also require a willingness to draw lessons and ideas from seemingly unconnected businesses—from banks and nuclear reactors to airlines and race cars. Similarly, miners will need to draw upon the instincts of people capable of approaching the current challenges without any preconceptions. After all, if there were easy answers, we would already have found them. The time has come to take bold actions across the board—from labor negotiations, technology investments, portfolio diversification and stakeholder relations to fund raising, exploration activities, M&A and safety.

ENDNOTES

1. Canadian Clean Energy Conferences, September 2013. "Industry Report: Renewable Energy & Mining: Case Studies & Market Insight."
2. All case study data is taken from a report from the Economic Policy Institute entitled "The Decline and Resurgence of the U.S. Auto Industry," by Joel Cutcher-Gershenfeld, Dan Brooks and Martin Mulloy. May 6, 2015. Found at: <http://www.epi.org/publication/the-decline-and-resurgence-of-the-u-s-auto-industry/>
3. All case study data is taken from a report from the Economic Policy Institute entitled "The Decline and Resurgence of the U.S. Auto Industry," by Joel Cutcher-Gershenfeld, Dan Brooks and Martin Mulloy. May 6, 2015. Found at: <http://www.epi.org/publication/the-decline-and-resurgence-of-the-u-s-auto-industry/>
4. Acronyms as follows: SCADA (supervisory control and data acquisition); PLC (programmable logic controller); DPC (discrete process control)
5. Rio Tinto, March 3, 2015. "Rio Tinto launches big data Analytics Excellence Centre to drive productivity improvements." Accessed at http://www.riotinto.com/media/media-releases-237_14527.aspx on September 1, 2015.
6. Gartner Research, December 12, 2013. "Gartner Says the Internet of Things Installed Base Will Grow to 26 Billion Units By 2020." Accessible at <http://www.gartner.com/newsroom/id/2636073>.
7. Genome Canada, 2013. "Genomics for energy and mining." Accessed at http://www.genomecanada.ca/medias/PDF/EN/Energy_and_Mining_Factsheet_EN.pdf on September 2, 2015.
8. Reuters, November 21, 2014. "Lockheed sees buyer for hybrid cargo airships in 2015," by Andrea Shalal. Accessed at <http://www.hybridairvehicles.com/news-and-media/lockheed-sees-buyer-for-hybrid-cargo-airship-in-2015> on October 7, 2015. Canadian Clean Energy Conferences, September 2013. "Industry Report: Renewable Energy & Mining: Case Studies & Market Insight."
9. Deloitte Canada, 2015. "Age of disruption: Are Canadian firms prepared?" Accessible at <http://www2.deloitte.com/ca/en/pages/insights-and-issues/articles/future-of-productivity-2015.html>.
10. Deloitte Monitor, Canada, Dublin and Prospectors and Developers Association of Canada (PDAC), 2015. "Innovation state of play: Mining edition 2015." Accessible at <http://www2.deloitte.com/ca/en/pages/energy-and-resources/articles/deloitte-top-mining-innovation-trends.html>.
11. Deloitte Canada, 2015. "Age of disruption: Are Canadian firms prepared?" Accessible at <http://www2.deloitte.com/ca/en/pages/insights-and-issues/articles/future-of-productivity-2015.html>
12. Competitive Advantage via Quantitative Methods, February 22, 2012. "The Beginning of Crowdsourced Analytics." Accessed at <http://cavqm.blogspot.ca/2012/02/goldcorp-challenge-and-beginning-of.html> on October 7, 2015.
13. CRONIMET Mining. "Case Study: South Africa." Accessible at <http://www.cronimet-mining.com/en/energy/intelligent-energy-solutions/case-study-south-africa/>
14. See <http://www.etfrucks.eu/Innovations/Modular-design/>
15. The Guardian, August 24, 2015. "Why is China's stock market falling and how might it affect the global economy?" by Katie Allen. Accessed at <http://www.theguardian.com/business/2015/aug/24/china-stock-market-fall-effects-global-economy-shares-interest-rates-inflation> on September 9, 2015.
16. Exchange Rates UK. Accessed at <http://www.exchangerates.org.uk/USD-CNY-exchange-rate-history.html> on September 9, 2015.
17. Bloomberg News, August 27, 2015. "China Sells U.S. Treasuries to Support Yuan." Accessed at <http://www.bloomberg.com/news/articles/2015-08-27/china-said-to-sell-treasuries-as-dollars-needed-for-yuan-support> on September 8, 2015.
18. The Guardian, February 5, 2015. "Global debt has grown by US\$57 trillion in seven years following the financial crisis," by Ami Sedghi. Accessed at <http://www.theguardian.com/news/datablog/2015/feb/05/global-debt-has-grown-by-57-trillion-in-seven-years-following-the-financial-crisis> on September 8, 2015.
19. Financial Times, June 29, 2015. "AIB launch signals China's new ambition," by Gabriel Wildau and Charles Clover. Accessed at <http://www.ft.com/cms/s/0/5ea61666-1e24-11e5-aa5a-398b2169cf79.html#axzz3IAEvZMWw> on September 8, 2015.
20. China Briefing, May 20, 2015. "The New Free Trade Zones Explained, Part III: Tianjin," by Kimberly Wright. Accessed at <http://www.china-briefing.com/news/2015/05/20/new-free-trade-zones-explained-part-iii-tianjin.html> on September 8, 2015.
21. Financial Times, August 26, 2015. "China explainer: How global markets were sent into a tailspin," by Christopher Thompson and Kari-Ruth Pederson. Accessed at <http://www.ft.com/intl/cms/s/2/537192ac-4bec-11e5-9b5d-89a026fda5c9.html#axzz3IAEvZMWw> on September 9, 2015.
22. Financial Times, September 2, 2015. "Australian economy slows amid China ripples," by Jamie Smyth. Accessed at <http://www.ft.com/intl/cms/s/0/e23fd346-5131-11e5-9497-c74c95a1a7b1.html#axzz3IAEvZMWw> on September 9, 2015.
23. Mining.com, August 31, 2015. "China's Zijin hands US\$298 million to partner Barrick Gold," by Cecilia Jamasmie. Accessed at <http://www.mining.com/chinas-zijin-hands-298-million-to-partner-barrick-gold/> on October 7, 2015.
24. Financial Times, August 2, 2015. "Capital outflows reignite debate between China bulls and bears," by Gabriel Wildau. Accessed at <http://www.ft.com/intl/cms/s/0/5c615290-3737-11e5-b05b-b01deb57852.html#axzz3IAEvZMWw> on September 9, 2015.
25. Mining.com, March 2, 2015. "Poor market conditions put major chill on global exploration," by Cecilia Jamasmie. Accessed at <http://www.mining.com/poor-market-conditions-put-chill-on-global-exploration-31323/> on September 10, 2015.
26. Statista, 2015. "Infrastructure spending forecast of emerging markets from 2008 to 2017." Accessed at <http://www.statista.com/statistics/271779/infrastructure-spending-forecast-of-emerging-markets/> on September 10, 2015.
27. Next Big Future, June 24, 2015. "EIU GDP forecasts to 2050." Accessed at <http://nextbigfuture.com/2015/06/eiu-gdp-forecasts-to-2050.html> on September 10, 2015.
28. UN Department of Economic and Social Affairs, February 8, 2015. "China vs. India Population." Accessed at <http://statisticstimes.com/population/china-vs-india-population.php> on September 10, 2015.
29. The Diplomat, August 12, 2015. "Asia's Growth Far From Finished," by Anthony Fensom. Accessed at <http://thediplomat.com/2015/08/asia-growth-far-from-finished/> on September 10, 2015.
30. World Bureau of Metal Statistics, February 18, 2015. "January to December 2014 Metal Balances." Accessed at <http://www.world-bureau.com/readnews.asp?id=19> on September 10, 2015.
31. Mining.com, April 7, 2015. "World's largest copper producer Chile slashes 2015 output forecast," by Cecilia Jamasmie. Accessed at <http://www.mining.com/worlds-largest-copper-producer-chile-slashes-2015-output-forecast/> on September 10, 2015.

32. Bloomberg Business, September 8, 2015. "Copper Bulls Rewarded by Glencore as ANZ Sees Market Bottoming," by Eddie Van Der Walt and Martin Ritchie. Accessed at <http://www.bloomberg.com/news/articles/2015-09-09/metals-advance-in-shanghai-and-london-as-china-markets-stabilize> on September 10, 2015.
33. Commodity Online, December 16, 2014. "China Copper demand growth may slow to 4.9% in 2015: Deutsche Bank." Accessed at <http://www.commodityonline.com/fundamentals/china-copper-demand-growth-may-slow-to-49-in-2015-deutsche-bank/2680/> on September 10, 2015.
34. Mining.com, August 19, 2015. "The real reason the copper price is being crushed," by Erik Els. Accessed at <http://www.mining.com/the-real-reason-the-copper-price-is-being-crushed/> on September 10, 2015.
35. Financial Times, April 27, 2015. "Chile: Copper bottomed," by Henry Sanderson. Accessed at <http://www.ft.com/intl/cms/s/0/b9f15790-eaa0-11e4-96ec-00144feab7de.html#axzz3IAEvZMWW> on September 10, 2015.
36. Reuters, January 16, 2015. "China power consumption rises 3.8 pct in 2014." Accessed at <http://in.reuters.com/article/2015/01/16/china-power-consumption-idINL3N0UV11G20150116> on September 15, 2015.
37. The Guardian, June 30, 2015. "China makes carbon pledge ahead of Paris climate change summit," by Jennifer Duggan. Accessed at <http://www.theguardian.com/environment/2015/jun/30/china-carbon-emissions-2030-premier-li-keqiang-un-paris-climate-change-summit> on October 7, 2015.
38. The Guardian, June 30, 2015. "China makes carbon pledge ahead of Paris climate change summit," by Jennifer Duggan. Accessed at <http://www.theguardian.com/environment/2015/jun/30/china-carbon-emissions-2030-premier-li-keqiang-un-paris-climate-change-summit> on October 7, 2015.
39. The Guardian, April 20, 2015. "The world is finally producing renewable energy at an industrial scale," by Achim Steiner. Accessed at <http://www.theguardian.com/vital-signs/2015/apr/20/renewable-energy-global-trends-solar-power> on September 16, 2015.
40. Deutsche Bank, December 16, 2014. "Commodities Outlook 2015." Accessed at https://institutional.deutscheawm.com/content/media/Commodities_Outlook_2015_2014-12.pdf on September 15, 2015.
41. U.S. Energy Information Administration, July 25, 2013. "EIA projects world energy consumption will increase 56% by 2040." Accessed at <http://www.eia.gov/todayinenergy/detail.cfm?id=12251#> on September 16, 2015.
42. Power Magazine, January 1, 2015. "IEA: Renewables Will Overtake Coal's Share in World Power Mix by 2040," by Sonal Patel. Accessed at <http://www.powermag.com/iea-renewables-will-overtake-coals-share-in-world-power-mix-by-2040/> on September 16, 2015.
43. ExxonMobil, 2015. "The Outlook for Energy: A View to 2040." Accessed at http://cdn.exxonmobil.com/-/media/global/reports/outlook-for-energy/2015/2015-outlook-for-energy_print-resolution.pdf on September 16, 2015.
44. International Energy Agency, December 15, 2014. "Global coal demand to reach 9 billion tonnes per year by 2019." Accessed at <http://www.iaea.org/newsroomandevents/pressreleases/2014/december/global-coal-demand-to-reach-9-billion-tonnes-per-year-by-2019.html> on September 16, 2015.
45. Financial Post, May 20, 2015. "Shell's boss claims the world will face a massive energy crisis if fossil fuel production scaled back," by Andrew Critchlow. Accessed at http://business.financialpost.com/news/energy/shells-boss-claims-the-world-will-face-a-massive-energy-crisis-if-fossil-fuel-production-scaled-back?_lsa=ef9f-9688 on September 16, 2015.
46. Minerals Council of Australia, December 16, 2014. "World coal demand will exceed 9 billion tonnes by 2019," by Greg Evans. Accessed at http://www.minerals.org.au/news/world_coal_demand_will_exceed_9_billion_tonnes_by_2019 on September 16, 2015.
47. The Guardian, December 15, 2014. "Coal demand set to break 9bn tonne barrier this decade," by Arthur Neslen. Accessed at <http://www.theguardian.com/environment/2014/dec/15/coal-demand-set-to-break-9bn-tonne-barrier-this-decade> on September 16, 2015.
48. The Wall Street Journal, November 23, 2014. "Does 'Clean Coal' Technology Have a Future?" Accessed at <http://www.wsj.com/articles/does-clean-coal-technology-have-a-future-1416779351> on October 7, 2015.
49. The Economist Intelligence Unit. "World energy mix, 2015." Accessed at <http://www.eiu.com/industry/Energy> on September 16, 2015.
50. ExxonMobil, December 9, 2014. "ExxonMobil's Outlook for Energy Sees Global Increase in Future Demand." Accessed at <http://news.exxonmobil.com/press-release/exxonmobils-outlook-energy-sees-global-increase-future-demand> on September 16, 2015.
51. Power Magazine, January 1, 2015. "IEA: Renewables Will Overtake Coal's Share in World Power Mix by 2040," by Sonal Patel. Accessed at <http://www.powermag.com/iea-renewables-will-overtake-coals-share-in-world-power-mix-by-2040/> on September 16, 2015.
52. World Nuclear Association, May 2015. "Plans For New Reactors Worldwide." Accessed at http://www.world-nuclear.org/info/Current_and-Future-Generation/Plans-For-New-Reactors-Worldwide/ on September 16, 2015.
53. The Globe and Mail, February 11, 2015. "Big possibilities for this junior uranium miner," by David Milstead. Accessed at <http://www.theglobeandmail.com/globe-investor/investment-ideas/big-possibilities-for-uranium-stock-fission/article22924900/> on September 16, 2015.
54. Financial Post, May 20, 2015. "Shell's boss claims the world will face a massive energy crisis if fossil fuel production scaled back," by Andrew Critchlow. Accessed at http://business.financialpost.com/news/energy/shells-boss-claims-the-world-will-face-a-massive-energy-crisis-if-fossil-fuel-production-scaled-back?_lsa=ef9f-9688 on September 16, 2015.
55. International Energy Agency. "World Energy Outlook 2014 Factsheet." Accessed at http://www.worldenergyoutlook.org/media/weowsite/2014/141112_WEO_FactSheets.pdf on September 16, 2015.
56. The Economist, May 30, 2015. "Charge of the lithium brigade." Accessed at <http://www.economist.com/news/technology-quarterly/21651928-lithium-ion-battery-steadily-improving-new-research-aims-turbocharge> on September 16, 2015.
57. Chemistry World, April 7, 2015. "Super-fast charging aluminium batteries ready to take on lithium," by Tim Wogan. Accessed at <http://www.rsc.org/chemistryworld/2015/04/super-fast-charging-aluminium-batteries-aluminium-ready-take-lithium> on September 16, 2015.
58. Renew Economy, January 28, 2015. "Citi: Battery storage to hasten demise of fossil fuels," by Giles Parkinson. Accessed at <http://reneweconomy.com.au/2015/citi-battery-storage-to-hasten-demise-of-fossil-fuels> on September 16, 2015.

59. Clean Energy Ministerial, March 11, 2015. "EVI Releases the Global EV Outlook 2015." Accessed at <http://www.cleanenergyministerial.org/News/evi-releases-the-global-ev-outlook-2015-27091> on September 16, 2015.
60. Deloitte Australia, 2015. "Get out of your own way: Unleashing productivity." Accessible at <http://www2.deloitte.com/au/en/pages/building-lucky-country/articles/get-out-of-your-own-way.html>.
61. Deloitte Australia, 2015. "Get out of your own way: Unleashing productivity." Accessible at <http://www2.deloitte.com/au/en/pages/building-lucky-country/articles/get-out-of-your-own-way.html>.
62. Bloomberg Business, May 18, 2015. "Rio, Mongolia Agree to Restart Oyo Tolgoi Development," by Michael Kohn. Accessed at <http://www.bloomberg.com/news/articles/2015-05-18/rio-mongolia-agree-to-restart-oyo-tolgoi-development> on September 17, 2015.
63. Harvard Kennedy School, 2014. "Costs of Company-Community Conflict in the Extractive Sector," by Rachel Davis and Daniel Franks. Accessed at http://www.hks.harvard.edu/m-rcbg/CSRI/research/Costs%20of%20Conflict_Davis%20%20Franks.pdf on September 17, 2015.
64. Moody's Investors Service, February 13, 2013. "Water Scarcity to Raise Capex and Operating Costs, Heighten Operational Risks." Accessed at [http://op.bna.com/env.nsf/id/avio-94wss7/\\$File/Global%20Mining%20Industry%20-%20Water%20Scarcity%20to%20Raise%20Capex%20and%20Operating%20Costs%20Heighten%20Operational%20Risks.pdf](http://op.bna.com/env.nsf/id/avio-94wss7/$File/Global%20Mining%20Industry%20-%20Water%20Scarcity%20to%20Raise%20Capex%20and%20Operating%20Costs%20Heighten%20Operational%20Risks.pdf) on September 17, 2015.
65. Mining.com, July 23, 2015. "About 10% of global gold output being produced at a loss," by Cecilia Jamasmie. Accessed at <http://www.mining.com/about-10-percent-of-global-gold-output-being-produced-at-a-loss/> on September 21, 2015.
66. Mining Weekly, April 16, 2015. "Moody's lowers iron ore and met coal price forecasts, markets to remain under pressure to 2016," by Henry Lazenby. Accessed at <http://www.miningweekly.com/article/moodys-lowers-iron-ore-and-met-coal-price-forecasts-markets-to-remain-under-pressure-to-2016-2015-04-16> on September 21, 2015.
67. SNL Financial, July 21, 2015. "Morgan Stanley: Vast majority of US export coal uneconomic at current spot prices," by Rohan Somwanshi. Accessed at <https://www.snl.com/InteractiveX/Article.aspx?cdid=A-33289010-12341> on September 21, 2015.
68. Mining.com, September 17, 2015. "True giants of mining: World's top 10 iron ore mines," by Vladimir Basov. Accessed at <http://www.mining.com/true-giants-of-mining-worlds-top-10-iron-ore-mines/> on September 21, 2015.
69. Reuters, September 21, 2015. "Miners turn to alternative finance to cut debt as downturn grinds on," by Nicole Mordant. Accessed at <http://www.reuters.com/article/2015/09/21/mining-denver-financing-idUSL1N11H1L620150921> on September 21, 2015.
70. Bloomberg Business, September 16, 2015. "Glencore Sells Shares to Raise US\$2.5 Billion and Reduce Debt," by Jesse Riseborough. Accessed at <http://www.bloomberg.com/news/articles/2015-09-16/glencore-sells-2-5-billion-in-shares-to-reduce-debt-load> on October 14, 2015.
71. Kitco, September 22, 2015. "CEO: Barrick Making Progress On Debt Reduction; 'Fundamentally Different' Than a Year Ago." Accessed at <http://www.kitco.com/news/2015-09-22/CEO-Barrick-Making-Progress-On-Debt-Reduction-Fundamentally-Different-Than-A-Year-Ago.html> on October 14, 2015.
72. Crowdsourcing.org. "2015 Crowdfunding industry report." Accessed at <http://www.crowdsourcing.org/editorial/global-crowdfunding-market-to-reach-344b-in-2015-predicts-massolutions-2015cf-industry-report/45376> on September 21, 2015.
73. The Motley Fool, August 27, 2015. "Is Northern Star Resources Ltd a golden opportunity?" by Owen Raskiewicz. Accessed at <http://www.fool.com.au/2015/08/27/is-northern-star-reources-ltd-a-golden-opportunity/> on September 24, 2015.
74. Casey Research, November 17, 2014. "Mining Accidents: A Look Beyond the Headlines," by Lauryns Vegys. Accessed at <https://www.caseyresearch.com/articles/mining-accidents-a-look-beyond-the-headlines> on September 24, 2015.
75. Perth Now, June 19, 2015. "Mining bosses under pressure to change FIFO rosters to 'even-time'." Accessed at <http://www.perthnow.com.au/news/western-australia/mining-bosses-under-pressure-to-change-fifo-rosters-to-even-time/story-fnhocxo3-1227406387115> on September 28, 2015.
76. The Northern Miner, July 29, 2015. "Vale, partners to study mental health in mining." Accessed at <http://www.northernminer.com/news/vale-partners-to-study-mental-health-in-mining/1003696793/> on September 28, 2015.
77. The Northern Miner, May 27, 2015. "Kidnappings highlight miners' security risks." Accessed at <http://www.northernminer.com/news/kidnappings-highlight-security-risks-for-miners/1003642338/> on September 28, 2015.
78. Mining.com, March 16, 2015. "Kidnapped Goldcorp miners found dead in Mexico," by Cecilia Jamasmie. Accessed at <http://www.mining.com/kidnapped-goldcorp-miners-found-dead-in-mexico/> on September 28, 2015.

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