Business risks facing mining and metals 2013-2014

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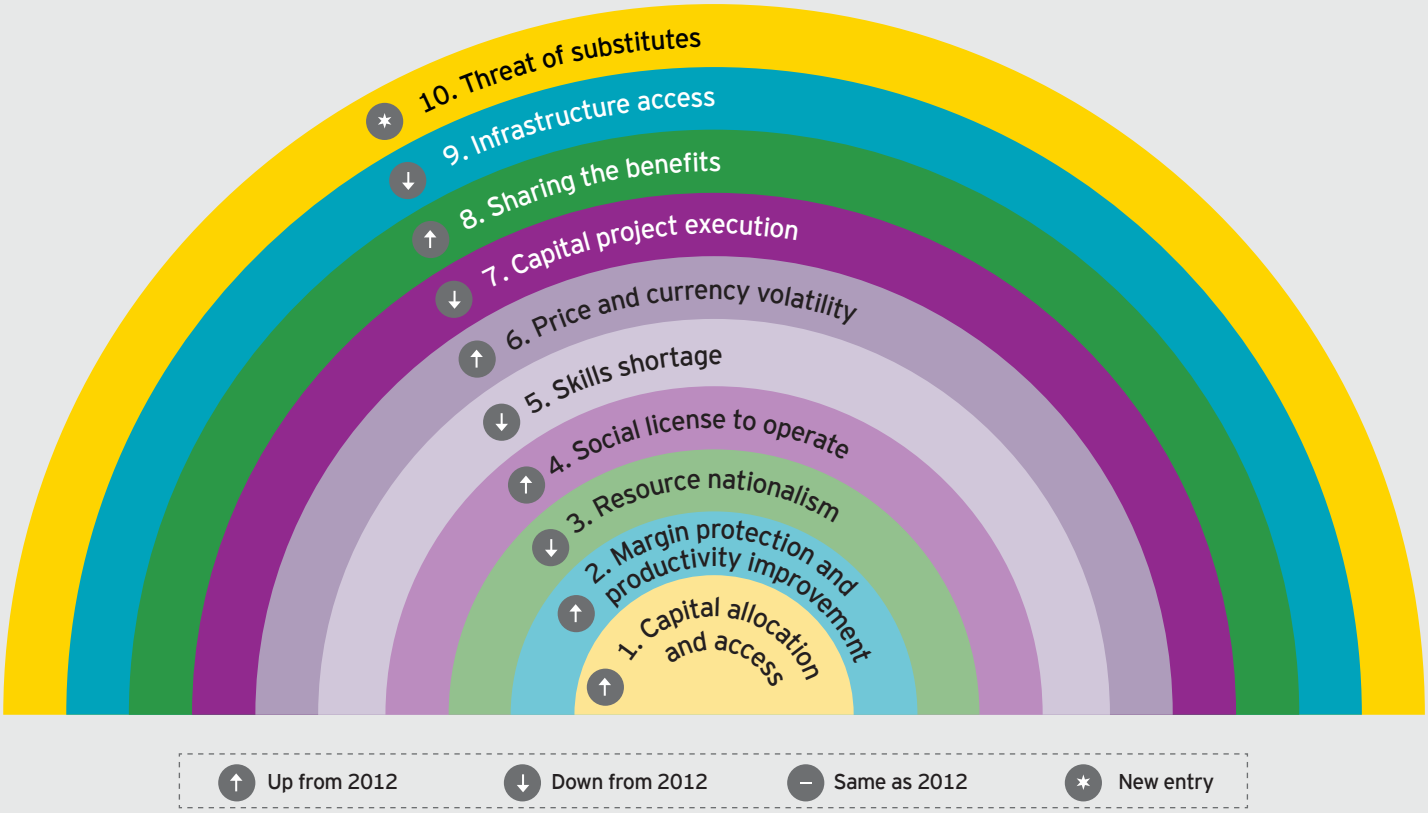
Contents

The Ernst & Young business risk radar for mining and metals



The risks closest to the center of the radar are those that pose the greatest challenges to the mining and metals sector in 2013 and into 2014.

Executive summary

The focus of risk has swung!

The twin capital dilemmas of capital allocation and access to capital have rocketed to the top of the business risk list for mining and metals companies globally, up from number eight in 2012. These capital dilemmas are strategic risks that threaten the long-term growth prospects of the larger miners at one end of the sector, and the short-term survival of cash-strapped juniors at the other end.

Risk 1a – Majors learning to balance shareholder demands with long-term growth strategies

For larger miners, the rapid decline in commodity prices in 2012, rampant cost inflation and falling returns have created a mismatch between miners' long-term investment horizons and the short-term return horizon of new yield-hungry shareholders in the sector.

Many years of high growth in earnings, cash flows and capital appreciation have attracted a different group of investors to mining. These investors have short-term investment horizons and are not as comfortable with the sector's cyclical nature and its longer-term and often counter cyclical development, investment and return horizon. This raises the question of how to balance the demands of short-term shareholders with those investing for longer-term returns. There is a profound risk that the decisions taken by mining and metals companies today could damage their growth prospects, destroying shareholder value over the longer term.

Risk 1b – Junior miners fight for survival

The dilemma for junior miners could not be more different. The dramatic and continuing sell-off in equity markets has starved the junior end of the market of capital at levels we have not seen in 10 years. Advanced juniors and mid-tier producers have been caught in the middle, exposed to a fragile balancing act between investors' thirst for yield and low tolerance of risk.

The cash and working capital position of the industry's smallest companies underlines the severity of the situation. Companies with a market value of less than US$2 million – about 20% of listed mining companies across the main junior exchanges – had on average less than US$1 million in cash and equivalents on their balance sheets at 31 December 2012.

Risk 2 – Margin protection and productivity improvement

A decade of higher prices has concealed the impact of rampant inflation, falling productivity and poor capital discipline in the sector. In 2012, the softening of commodity prices in an environment of escalating costs had a major impact on bottom lines, resulting in significant impairments and derating of company stock prices. A weak external environment and the lack of investor confidence have heralded an industry-wide directional change from growth for growth's sake towards long-term optimization of operating costs and capital allocation.

Top 10 risks

2013

01	Capital dilemmas – capital allocation and access (new in 2009)
02	Margin protection and productivity improvement (was cost inflation)
03	Resource nationalism
04	Social license to operate
05	Skills shortage
06	Price and currency volatility (new in 2010)
07	Capital project execution (new in 2011)
08	Sharing the benefits (new in 2012)
09	Infrastructure access
10	Threat of substitutes (new in 2013)

Remained in the top 10 over six years

Over six years

2008

01	Skills shortage
02	Industry consolidation (not a threat in 2013)
03	Infrastructure access
04	Maintaining a social license to operate
05	Climate change concerns (under the radar in 2013)
06	Rising costs (margin improvement)
07	Pipeline shrinkage (under the radar in 2013)
08	Resource nationalism
09	Access to secure energy (under the radar in 2013)
10	Increased regulation (under the radar in 2013)

"CEOs and boards today are protecting returns and managing the interests of varied and often competing stakeholders. This is in stark contrast to just 12 to 18 months ago when fast-tracking production and capacity constraints were top of the agenda."

Mike Elliott
Global Mining & Metals Leader, Ernst & Young

Some of the factors squeezing margins, such as scarcity premiums for inputs or high producer currencies, will ultimately self-correct as mineral prices fall. However, high costs will continue to take a toll on company margins until companies address the longer-term optimization of operating costs and capital allocation. While the market has been rewarding any cost decreases, those that improve long-term value by being embedded and sustainable will prove the most valuable.

Alongside this, productivity in the sector has been on the decline for nearly a decade, across manpower, equipment, processes and logistics. This has significantly impacted the sector's input to output ratio. Those who have tackled margin protection early are increasingly turning their focus towards optimizing productivity through their capital structure, and more judicious use of labor and equipment. These companies are also focused on using innovation as a means of enhancing productivity. The increased digitization of mines also means that firms can better monitor and analyze processes in order to understand why productivity is falling and to identify and employ better practices.

Risk 3 — Resource nationalism remains prolific

This risk is every bit as critical as it was last year; it is only that other risks have exceeded it in the urgency with which they need to be addressed, bumping it back to third place. In some respects, companies are becoming less sensitive to the shock of resource nationalism as it becomes increasingly prolific year-on-year (y-o-y). Rising taxes and royalties, mandated beneficiation, government ownership and the restriction of exports continue to spread across the globe. As resource nationalism has become more endemic, mining and metals companies have become better at managing this risk. There are some signs that the retreat in capital investment by the sector may see governments take a more considered and cautious approach, but the mining and metals sector must continue to engage with governments to foster a greater understanding of the value a project brings to the host government, country and community.

Our newcomer — Threat of substitutes

This horizon-watching risk is one to monitor closely as its most acute ramifications are being felt across North America. The US shale gas boom and the gas-for-coal substitution that has occurred was sudden and the impact unexpected, with global ramifications. It has highlighted the very credible and looming threat of substitution for single commodity companies or companies where one commodity dominates the product mix or profit share. The first indication that a threat exists can be seen when there are regulatory changes, commodity cost or supply issues, products with low profit margins, environmental concerns or technology advances. And once substitution starts occurring, it is potentially irreversible as it could cause a structural shift in consumer habits.

Substitution has the capacity to radically and rapidly change their market should the right conditions prevail. Other substitution examples include aluminium for steel; palladium for platinum; aluminium, plastics, fiber optics or steel and graphene for copper; and pig iron for pure nickel.

Other top risks

Social license to operate has crept up the list to fourth position as activists become more powerful and vocal through the use of social media around concerns over climate change, competition for water and the impact mining has on communities. Skills shortage slips to five as the deferral or cancellation of new projects brings temporary relief, but staffing the massive current development pipeline still remains a red hot issue. Price and currency volatility sees lower commodity prices testing the viability of marginal mines in the face of increasing costs. While the ramifications of poor capital project execution have largely been absorbed by the sector, a record amount of construction is still in progress. Sharing the benefits steps up a place as stakeholders increase their call for a bigger piece of the pie despite lower margins, and infrastructure access continues to test the miners as financing evaporates.

Some old faces in the crowd

Half of the risks that were present six years ago, remain as critical today. A sector participant's ability to mitigate these challenges can mean the difference between survival and profitability. New risk entrants over these years largely reflect the cyclical nature of the sector and the sector's ability to overcome these challenges.

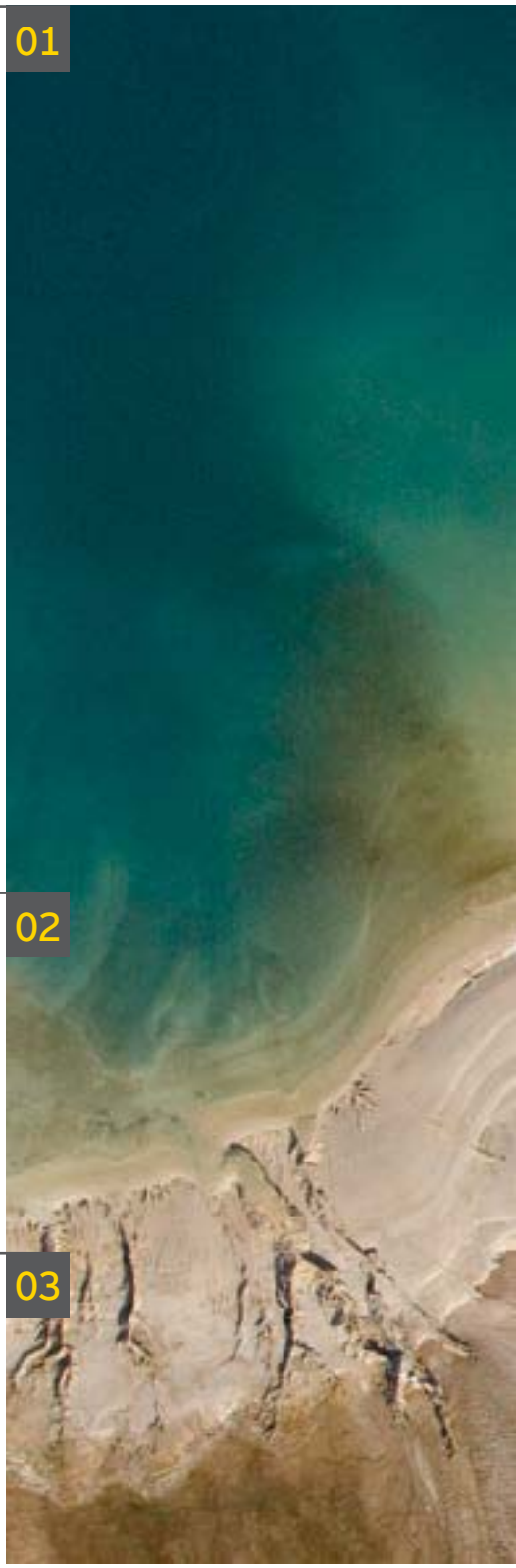
The top 10 business risks for mining and metals

01 Capital dilemmas – capital allocation and capital access

Volatility in the market has seen access to capital and its allocation catapulted to the number one risk ranking. For both majors and juniors they are being restricted from investing capital – the juniors through restricted access to capital and the majors through lack of permission to deploy it.

- **For the larger mining and metals companies, the dilemma is how best to allocate capital.**
  The industry has entered a new era of focusing on margin quality over price-driven volume growth. Its decision-makers have to balance divergent stakeholder demands with the ultimate goal of maximizing returns. There is a call by some investors for a structural shift in capital allocation strategies, with greater allocation of capital back to shareholders to offset falling short-term yields. Declarations by new and old CEOs alike promise greater capital discipline, a commitment to credit rating quality and an unfailing focus to maximize shareholder returns. This has created a mismatch between miners' long-term investment horizons and the short-term return horizon of dividend chasers. Balanced communication with long-term messages will help to reach and attract the long-term investors, and greater transparency will ensure the trust of all shareholders.
- **Juniors face the risk of not having access to sufficient working capital to stay solvent.**

The pullback of investors from riskier investments in the junior end of the market has created a capital desert for this segment of the market that has not been seen in a decade. The cash and working capital position of the industry's smallest companies is so severe that many are not in a cash position to wait for market conditions to improve, with a rationalization of the market expected. There is some hope in the form of private capital investors who are favoring the juniors with more advanced projects.



02 Margin protection and productivity improvement

Softening commodity prices in an environment of high costs are continuing to squeeze margins. Companies have responded with sector-wide redundancies, mine closures and divestments of non-core assets. There is a significant shift in the market from growth for growth's sake towards long-term optimization of operating costs and capital allocation.

There is also a renewed focus on improving productivity by removing inefficiencies across the organization that were allowed to creep in during the period of high commodity prices. Even a return to the productivity levels of labor and equipment that existed a decade ago would yield major benefits to margins.

03 Resource nationalism

While still high on the risk radar, resource nationalism is not the surprise it once was and mining and metals companies are more adept at managing it. It has even been touted that the current environment of squeezed margins and risk aversion might prompt some governments to promote initiatives to attract mining and metals investment.

Lagging realization as to the new reality leads governments to look to companies to fund the shortfall in revenues produced by a volatile economy. It is often at this point – just before an investment boom ends – that there is often an increase in government participation in the sector. This may be by direct equity, as well as increased taxes and royalties.

While the footprint of resource nationalism has continued to expand, it has also come in more variety – mandated beneficiation, government direct ownership, the threat of export taxes and most recently the use of EITI activities to revisit existing contracts.

Miners have had to become more politically savvy and are factoring specific country risk into investment models. The most successful are building strong relationships with government, effectively communicating the positive impacts of mining and increasing the transparency of government payments. Finding ways to otherwise direct their projects from the threat of resource nationalism has also been more productive.

04 Social license to operate

The need for a social license to operate (SLTO) is readily accepted by the mining and metals sector. Its consistent midpoint ranking points to its importance, as well as an understanding of what managing this risk entails. However, the pressure on SLTO remains with increased activism, digitally connected stakeholders and politicians who need to respond to general consensus. New sustainability challenges arise quickly and can also morph into other issues even quicker.

Stakeholders are becoming savvier, while anti-mining sentiment continues to proliferate against a backdrop of community and climate change concerns. Meanwhile, regulators are increasingly seeking to fill the gap between community expectations and existing laws with increased regulation. Achieving an SLTO is one challenge, maintaining it is another. The key to both is communicating the value through the concept of shared value.

The sector's understanding of the potential of shared value is encouragingly in its infancy, suggesting a real opportunity for addressing SLTO. Companies can find better ways to demonstrate shared value in a manner that draws attention to the benefits of their initiative.

05 Skills shortage

While the urgency of the availability of skilled talent has been slightly reduced by a number of mine closures and the cancellation of new projects, the long-term challenge remains. As supply increases (despite price reductions), the number of skilled workers also needs to increase.

The difficult market environment of 2012 saw the mining and metals sector experience layoffs at high-cost mines. As some companies discovered, job losses can affect social license to operate, create brand damage, increase indirect costs and result in higher turnover. However, while the environment saw the nature of the risk change, presenting the industry with a whole new set of challenges, longer-term demand for labor is still expected to trend steeply upwards. In fact, employment upheaval may actually accelerate the exit of workers from the sector.

There is no quick-fix solution; the shortage of skilled talent can be addressed by developing a more holistic framework by:

- Adopting creative and innovative approaches to access new pools of talent
- Leveraging technology
- Motivating, engaging and retaining existing skilled workers

In the short term, mining and metals companies should review their value proposition to attract and retain staff. The industry has a unique opportunity to recalibrate its salary levels given compensation levels are well above market average. This will allow it to be well prepared for the ongoing challenge of competing for skilled talent. Longer term, skill sets that better match the new market environment such as cost optimization, capital rationing and government stakeholder management will need to be met by an already thin-on-the-ground industry.

Price and currency volatility

06

Unprecedented price and currency volatility will continue to test mining and metals companies for the next few years as the sector approaches supply-demand equilibrium in many commodities.

Demand for most commodities – driven by China and other rapid-growth economies – has outstripped supply for the best part of the past decade, fueling higher prices and encouraging new supply. As supply and demand now approach equilibrium, longer lead times in changing production are leading to overcorrection and undercorrection in supply, causing increased price volatility.

The more progressive mining and metals companies are finding new ways to manage this volatility that will deliver benefits throughout the next two to three years when sharper and more frequent movements in prices are expected.

New solutions are required to cope with the bumpy ride ahead. Short-term commodity hedging is sure to be a feature of managing this risk but, for most, the opportunity to establish an effective hedge is past.

Companies must consider potential price and currency outcomes well beyond current forward curves and mine plans. Best practice in the current climate will include measuring uncertainties, probabilities and the impact of decisions on expected returns – inherently difficult to do. Companies can:

- Document the volatility of critical cash flow elements and improve mine planning to match volatility
- Better integrate mine and financial planning
- Consider how price and currency volatility change the corporate risk appetite
- Choose the right tools to react to price risk
- Increase the flexibility of costs to vary production levels

The next price upswing will give companies the opportunity to commence a hedging program that provides better protection from future downward price volatility.

Capital project execution

07

2012 saw numerous highly publicized mega projects being canceled, with others delivered late, over budget or not meeting specification. The underlying risk of mega projects has not changed; however, the new driver is the scarcity of capital rather than the scarcity of project inputs. While the mining investment boom is peaking, delivery of a record number of complex projects still challenges the sector – will there be more failures?

A key characteristic of how mining and metals companies have sought to address this is the increased involvement and accountability of executive management in portfolio management, project selection, size and scoping decisions. This is ensuring strategic risk management – critical in today's world. An accompanying focus on prudent project selection and planning is important, while other headline initiatives can include improved capex predictability, establishing a robust governance structure and contingency planning, to name a few.

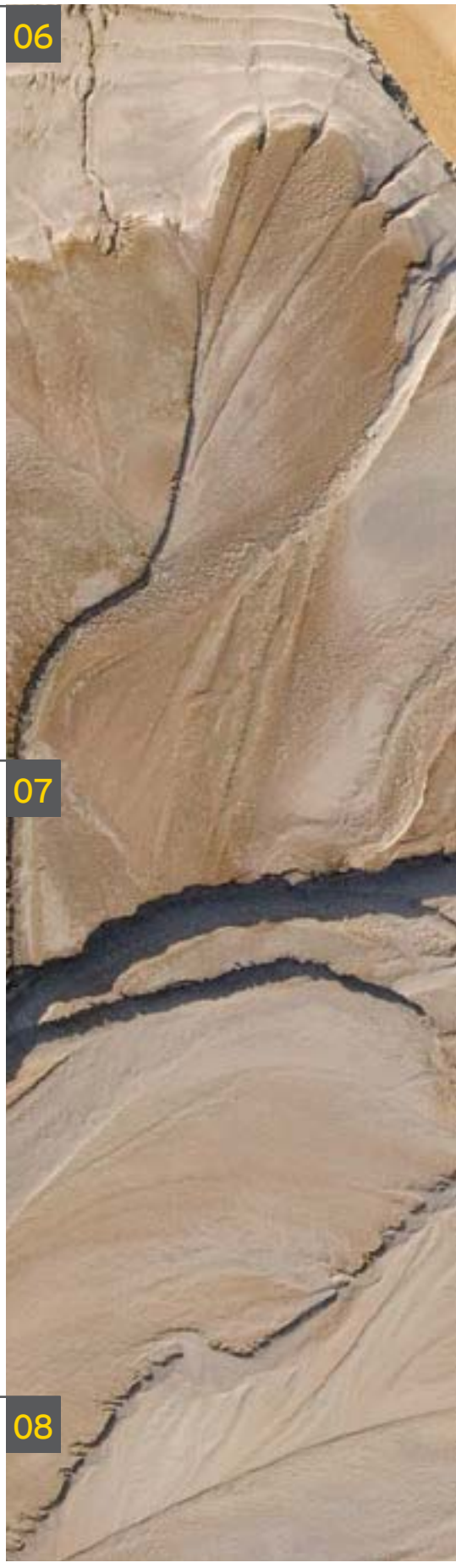
Capital investment management and project delivery principles are becoming popular terms within the sector's capital projects. Executives are right to demand more emphasis be placed on understanding the benefits and risk of these processes before a project has even been approved.

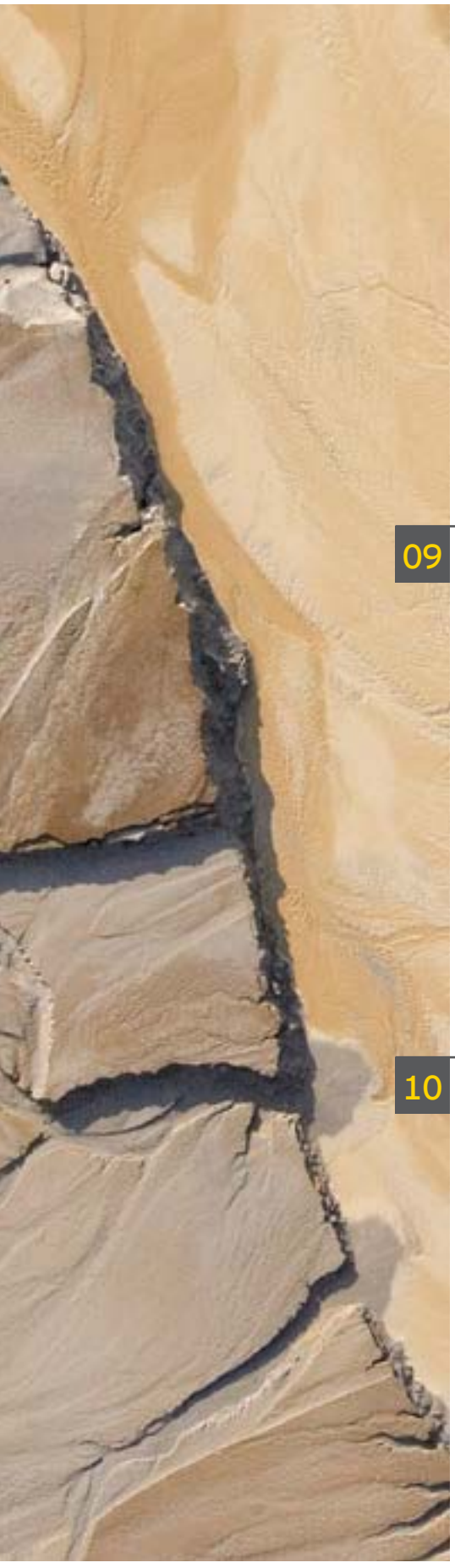
In an environment of volatile commodity prices, low profitability and mounting pressure from shareholders, future mega projects should be approved as programs with multiple projects. This will provide executives with more options for reassessment throughout the project life cycle, granting them much-needed flexibility in an otherwise inflexible environment.

Sharing the benefits

08

This risk is characterized by a push and pull: more vocal stakeholders with increased demands versus falling commodity prices and higher costs. Stakeholder expectations need to be reset to the new market conditions and lower base of distributable value; however, those expectations lag the new reality.





Shareholders feel they have seen little return in a period of large profits and large reinvestment in high-cost, organic growth and low-value M&A. Recent impairment charges have aggravated this attitude with criticism of management and board performance resulting in recent CEO turnover.

Despite the margin squeeze, 2012 and 2013 has seen a period of record industrial disputation and expansion of resource nationalism that sought to secure a large slice of a shrinking pie.

Organizations should take a long-term view of sharing the benefits and proactively manage stakeholder expectations. Initiatives include working with employees to improve productivity and provide a basis for real wage increases as a trade-off or obtaining acceleration in regulatory approvals as an offset to higher taxes.

One stakeholder group that is being well handled is suppliers. Companies have been proactive in responding to supplier demands and are renegotiating supply agreements. This entails the relationship focus to switch from short-term outcomes to exploit scarcity to a longer-term, more strategic one.

While stakeholder demands will naturally rebalance over time, those companies that communicate with their stakeholders to bring that rebalancing forward will create greater value. It is vital that the next reset does not sow the seeds of stakeholder discontent for the inevitable recovery in mineral prices.

09 Infrastructure access

With mining and metals companies turning to new deposits in frontier countries, the lack of infrastructure is a substantial hurdle. High costs and capital constraints are creating an infrastructure funding gap where neither governments nor miners are able to fund all of the mining infrastructure needs.

To fill this gap, mining and metals companies are having to reassess their needs and revise their strategies. Majors are being more selective in capital allocation, juniors are recognizing the need for collaboration, and everyone is considering selling stakes in infrastructure assets.

Newcomers include non-traditional financiers such as customers and equipment suppliers, typically from emerging countries and usually with government backing. Private equity is also showing an interest and institutional investors have emerged. Meanwhile, governments are increasingly playing the role of supporter rather than investor.

With companies changing the way they view the control of infrastructure, the infrastructure challenge looks set to change, and in so doing, a whole new set of sub-risks will undoubtedly materialize. Ultimately, a new model of risk transfer and retention will be necessary to unlock the necessary financing.

10 Threat of substitution

A newcomer to the top 10, substitution has the potential to be a game changer if your product is impacted. It has already dramatically transformed the US coal market and has the capacity to irreversibly change other commodity markets, should the right conditions prevail.

For single commodity organizations, or organizations where one commodity dominates the product mix/profit share, substitution is a very credible and looming threat, especially when the commodity's recent price has been high or there is a regulatory push that affects its prolific use. It is critical to respond to early indicators of a commodity threat – such as new or increasing environmental concerns, advances in technology, competing products with low profit margins and less dependence on quality and performance.

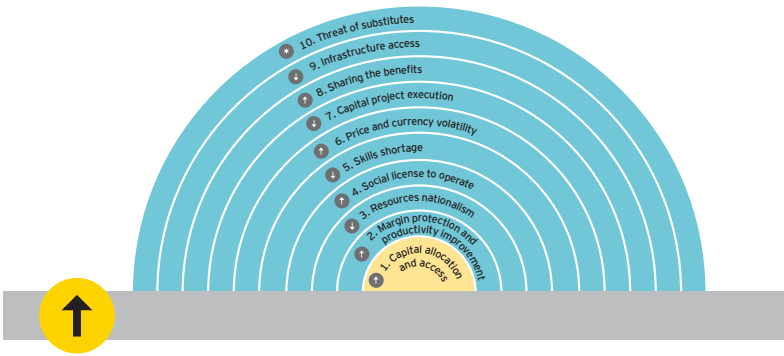
Mining and metals companies need to stay focused on government regulations, emergent technologies or price-driven behaviors and be active in preparing responses. Building risk management to deal with this risk into current strategies can help prepare the organization for these events. The risk of substitution also highlights the importance of monitoring interdependent sectors.

The top 10 business risks

01

The capital dilemmas

(8 in 2012)



Dilemma A – Capital allocation

The mantra over the past decade has been one of fastest, largest, smartest, underpinned by a then-unfaltering confidence in the strength and sustainability of Chinese demand and an investor preference for organizations with the strongest growth pipelines. With increasing Asian demand outstripping supply, growth was the goal of most in the mining and metals sector. It stood to reason that capital allocation was first dominated by M&A (buy) to increase exposure to growth as rapidly as possible. As much of this was funded by debt, the global financial crisis (GFC) lessened the attractiveness of this priority. The sharp recovery of mineral prices post-GFC signaled the preference in allocating capital to organic growth (build) projects.

While a rational decision for each individual enterprise, it had the collective effect of bidding up the cost of constructing many simultaneous projects and closed the supply deficit even quicker. But with the value created by organic growth now in question, we enter a new era of focus on margin growth over price-driven volume growth. The industry's decision-makers face a greater challenge than ever to balance the demands of their various stakeholders with the ultimate goal of maximizing returns.

The perfect storm

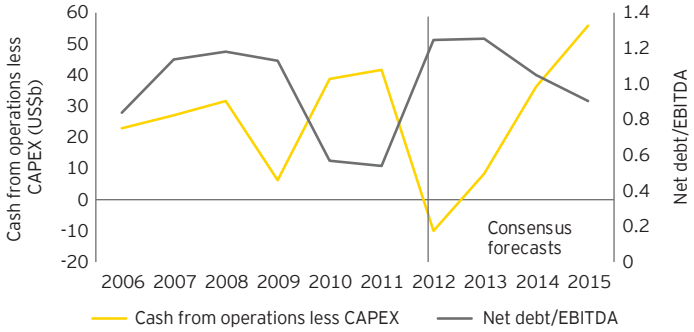
2012 and 2013 has represented a point of dislocation and disruption for the mining and metals industry. Weaker metal prices, labor unrest and rampant cost inflation have put pressure on earnings while peak levels of capital expenditure have simultaneously been ploughed into major growth projects. Margins have been squeezed, challenging expected rates of return on many of these projects. Lower prices have also limited the amount of operating and free cash flow available to companies. Balance sheets have been at risk of becoming inefficient, causing concern for credit ratings agencies and leading shareholders to question the scope for increased capital returns without a decisive change of strategy by management.

While the success of an acquisition can only be truly assessed in the fullness of time, it's difficult not to be concerned by the volume and scale of impairments announced in the 2012 reporting season. Around US$30 billion[2] of asset impairments were recorded in the December 2012 reporting season by the top six majors alone. The impairments represented the culmination of acquisitions, price collapses (commodities and equities), geopolitical challenges, and underestimated cost and capital requirements.

Changing of the guard

Beyond the multibillion-dollar write-downs, the penalties were severe and the message clear: investors demanded a changing of the guard. CEOs of some of the industry's largest companies, including BHP Billiton, Rio Tinto, Anglo American, Newmont Mining and Barrick Gold, have handed over the reins to a new wave of leaders with a reputation for focus on cost control and improving short-term cash flows. This was not just about perceived past mistakes but also in response to the need for a different style of leadership to satisfy the market's demand for discipline and focus on cash flow generation.

Gearing and free cash flow levels of mining peer group[1]



Source: Ernst & Young research, Capital IQ and company reports

1. Peer group comprises top 15 globally diversified mining companies by market value.
2. Ernst & Young research, company reports.

"The capital dilemma varies considerably for different sized players. For the small players, it is all about limited access to capital, while for the larger players, who can raise low-cost debt with relative ease, it's all about how they allocate it."

Lee Downham

Global Mining & Metals Transactions Leader, Ernst & Young

Humbled and disciplined

CEOs new and old have responded with a wholesale shift in rhetoric, declaring greater capital discipline, a commitment to credit rating quality and an unfailing focus on maximizing shareholder returns.

Rio Tinto's incoming CEO Sam Walsh, for example, has pledged focus, discipline and accountability, investment in the highest returning assets, and a well-received commitment to remove US$5 billion of operating costs over 2013 and 2014.[3] BHP Billiton's Andrew Mackenzie, who has assumed the role of CEO, is seen as the right person to lead BHP Billiton in a changing global environment.[4] He outlined his priorities for the company as follows: to increase cost efficiency, increase capital efficiency and grow volumes – in that order of importance.[5]

It is not that the large miners cannot finance new growth, rather, unless these projects are cash positive in the very short term, shareholders are expressing their disapproval.

A capital strike – but at what cost?

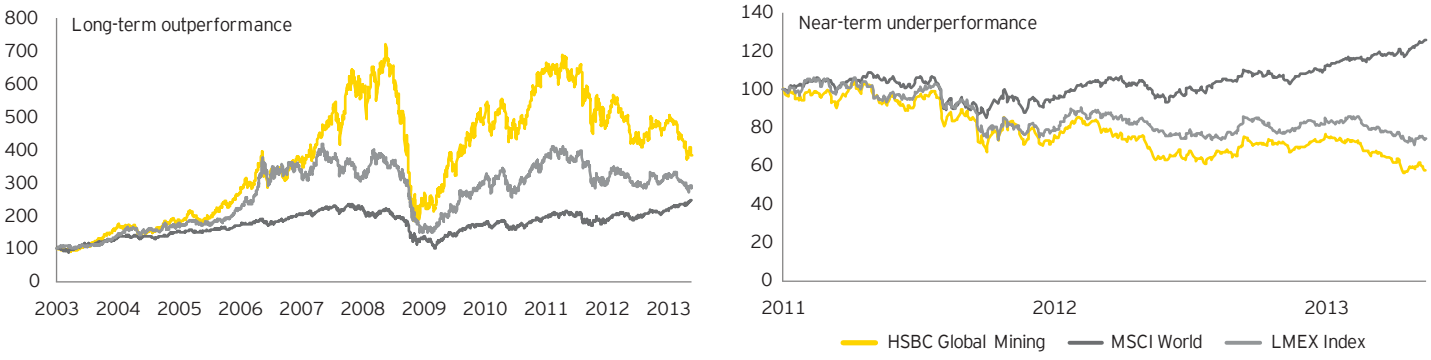
Widespread cutbacks in growth capex were also announced, which, along with other measures, should help to de-lever balance sheets and increase free cash flows in 2013 and 2014. However, actions such as those taken by Vale highlight the complexity and scale of the capital allocation challenge. Vale announced its intention to suspend its Rio Colorado potash project due to escalating capital costs that rendered the project no longer in line with Vale's commitment to discipline in capital allocation.[6] The Argentine Government's disappointment with the decision has been well documented. Companies must manage not only the demands of their equity shareholders but also of their multiple project stakeholders, from mine engineers and business unit heads to host governments and indigenous employees – all of whom have competing priorities and agendas.

In the words of Barrick Gold's CEO: "We can't be penny-wise and pound-foolish. Investments that protect our license to operate are critical to earning returns on investments and protecting our reputation."[7]

Divesting to reinvest

A pipeline of divestments is also building as companies seek to optimize their portfolios and recycle capital away from high-cost assets and into high-performing ones. Non-core, easier-to-extract assets have made the mark first, but increasingly we expect to see underperforming, high-cost or high-risk assets being marked for disposal as companies seek to remove costs and reallocate capital.

Total shareholder return – global miners vs. all sectors and base metals



Source: Thomson Datastream

3. Rio Tinto FY results presentation, 25 February 2013.

4. "Marius Kloppers to retire, Andrew Mackenzie to become CEO," BHP Billiton press release, 20 February 2013.

5. "BHP Billiton: strategic priorities underpin relative outperformance," Morgan Stanley, 1 March 2013.

6. "Update 3-Brazil's Vale halts $6 bln Argentine potash project," *Reuters*, 11 March 2013.

7. "In conversation with Barrick CEO Jamie Sokalsky," Beyond Borders, 29 January 2013 via http://barrickbeyondborders.com/2013/01/in-conversation-with-barrick-ceo-jamie-sokalsky/.

Short-term gains versus long-term growth

Maximizing shareholder returns has always been top of the agenda for boards, whether we look at capital allocation priorities in 2007 or 2013. The mining and metals industry has significantly outperformed other sectors over the long-term but has underperformed over the past two years. Therein lies the challenge: a seemingly irreconcilable mismatch between the long-term investment horizon of the industry and the short-term return horizon of shareholders.

Capital has been invested precisely to drive future earnings and ultimately deliver lower-cost, higher-margin projects – something that the market may not be fully recognizing, suggesting we could see a fairly rapid reversal of sentiment toward the sector.

Comments by Cynthia Carroll, outgoing Anglo American CEO, and by leading investment fund Blackrock,[8] epitomize the challenge that mining and metals companies face in 2013.

> "Some of the decisions (companies) are making are very good in terms of long term strategy but are you going to make money from it in the next three years, which is our investment horizon?"
>
> **Blackrock**

> "It's not an industry where you can react overnight to something that happened yesterday. The (industry) context has changed (and) may be the shareholder base must also change. It will need more time and patience."
>
> **Anglo American**

Structural change demanded

Many investors argue that divestment is not enough to drive a re-rating of the sector, with the ratio of cash allocated to dividends versus capex too low. They call for a structural shift in capital allocation strategies that would see an increase in dividend payments prioritized at the expense of investment in growth through high-risk M&A or low-returning capex. Underpinning this is a concern that the current assurances by management are price driven, with the implication that the industry will revert to old habits if prices recover.

While the market is requiring the greater allocation of capital to shareholders, it will be important that the performance measures applied to executives retain a strong long-term value creation element as this is the essence of mining – long-lived assets that create long-term value.

There is concern that the pendulum may swing too far, raising the possibility of another period of endemic underinvestment in new supply, as traditional capital providers and miners alike withdraw from long lead exploration funding. There is profound risk that the decisions taken by mining and metals companies today could have a detrimental impact on their growth prospects, destroying shareholder value over the long term.

This dilemma is evident in copper in 1Q 2013. After years of high prices, the inventory of copper projects has moved into production, with supply now catching up with demand. It is forecast that supply will exceed demand for the period 2014 to 2016. With a market in a short-term frame of mind and as spot pricing will remain soft, there will be little appetite for capital allocation to new copper production. There will, however, be a deficit in copper production from 2017. The projects required to close that deficit need to go into construction today.

Furthermore, competition is emerging from new and varied sources, including sovereign wealth funds and state-owned entities (SOEs). Such investors are often in a stronger position to make long-term, counter-cyclical investments, aided by state backing or influence, broader and cheaper access to capital, greater visibility of demand scenarios and relative lack of public scrutiny. The current environment provides unique opportunities (not least the assets that are being put up for sale) for those with the capital, appetite and ability to do deals, which may also include well-capitalized mid-tier miners.

SOEs have a low cost of capital but do not have access to the same pipeline of projects as the major diversifieds. If the capital strike is taken too far, the major diversifieds may find their competitive advantage eroded as the SOEs acquire and develop low-cost projects by counter-cyclical investing. Furthermore, the major diversifieds face the risk that when the time comes for them to return to the deal table, the cost of capital advantage currently enjoyed relative to sovereigns may have eroded.

With scrutiny over investment decisions at a peak and with capital management likely to be a key driver of share price performance in 2013, those who best manage the short-term needs of shareholders with long-term investment planning will be the winners.

8. "Outgoing Anglo American CEO says shareholders need to be patient," *Mining Journal*, 28 March 2013. "BlackRock cuts BHP stake on Olympic Dam, shale gas concerns," *Bloomberg*, 29 March 2012.

Steps companies can take to manage this risk – translating promises into action

Discipline and rigor needs to be exercised when making capital decisions, perhaps now more than ever for the industry. There also needs to be transparency over these processes and the underlying factors that have driven a capital decision. This will enable investors to understand what it means for the short- and long-term prospects of the company.

The market has also changed. Many years of relative high growth in earnings, cash flows and capital appreciation has attracted investors with short-term investment horizons who are not traditionally exposed to the sector. This is incongruent with a business that takes 10 years to develop a mine from discovery and then has an operating asset for 25 years or longer. This raises the question of how to balance the demands of short-term shareholders with those investing for longer-term returns. Balanced reporting that ensures the right long-term messages reach the longer-term investors and attract them to the share register is required, while not causing the more fickle cyclical investor to rush for the exits.

To this end, greater transparency in reporting is required so that management regains the trust of its shareholders. Stakeholder relations need to be carefully and proactively managed, requiring consistency of messaging and the demonstration of robust investment criteria being applied across all decision-making processes.

But, importantly, management must be mindful of not suffocating decisions through too much process. The experience of strong management teams should not go unheard, a combination of art and science is key in making capital decisions.

Companies that display best practice approaches to capital allocation, and ultimately deliver greatest returns, are those that demonstrate the behaviors outlined in the section below.

Demonstrate discipline and rigor

- Have a clear and agreed understanding of acceptable levels of risk against expected return
- Regularly and comprehensively assess risks, project economics and assumptions
- Have clear, objective governance – checks in place to manage internal lobbying
- Undertake thorough post-investment reviews – performance versus plan

Consider all the scenarios on a consistent basis

- Undertake forward-looking scenario testing
- Consider investments in context of wider portfolio or capital impact, not in isolation
- Ensure all capital is equally productive and, where it is not, consider selling infrastructure or contract mining
- Regularly review existing projects according to the same criteria as new investments
- Consider which assets provide enterprise value and which ones don't, leading to divestments decisions

Build in options

- Have flexibility to sequence, prioritize and change the destination of capital outlays
- Pursue alternative and innovative funding options to provide optionality

"In a volatile market, the window of opportunity to issue can be small, so you need to be ready to go when it opens up."

Paul Murphy
Asia-Pacific Mining & Metals Transactions Leader, Ernst & Young

Dilemma B — Access to capital

Access to capital has become a divided issue in 2012 and 2013. At one extreme, investment-grade producers have taken advantage of unprecedented demand in the bond markets to raise record proceeds with historically low coupons. At the other, the dramatic and continuing sell-off in the equity markets has critically impacted the availability of capital for the junior end of the market. Somewhere in the middle sit the advanced juniors and mid-tier producers, exposed to a fragile balancing act between investors' thirst for yield and tolerance of risk. The unhappy upshot of this situation is that access to capital has become critically restricted for those most in need.

Juniors in crisis

Ernst & Young's two sector indices, Mining Eye and Canadian Mining Eye, which track the performance of junior mining stocks on AIM and Toronto's main and Venture exchanges respectively, illustrate the extent of the sell-off over the past 18 months.

The price-driven, seemingly indiscriminate support that speculative juniors received from retail equity investors prior to the financial crisis is not on hand today. Investors instead are looking for low-risk, near-term, high-yield opportunities, which the early stage junior mining sector simply cannot offer. Furthermore, providers of risk capital have not yet adjusted to a new environment where a scarcity premium may no longer drive exponential growth in commodity prices. Instead, they are taking a step back, wait and see approach, opting to stay absent from the sector in the short-term rather than make long-term adjustments to their return expectations.

The damaging impact of this is amplified because junior mining companies cannot afford to take the same wait it out approach. The exploration sector faces escalating operational costs and challenges in 2013. Projects are increasingly located in frontier geographies, which can bring heightened geopolitical risk, infrastructure challenges and operating costs. Exploration and development is increasing in technical complexity, while projects are increasing in size to compensate for falling grades and to achieve economies of scale. Extended permitting requirements, regulatory uncertainty and lengthy arbitration processes are depressingly common, making for an unstable and therefore high-risk investment environment. These factors combine to push out the period from discovery to cash flow and thus the risk and return profiles of projects are changing.

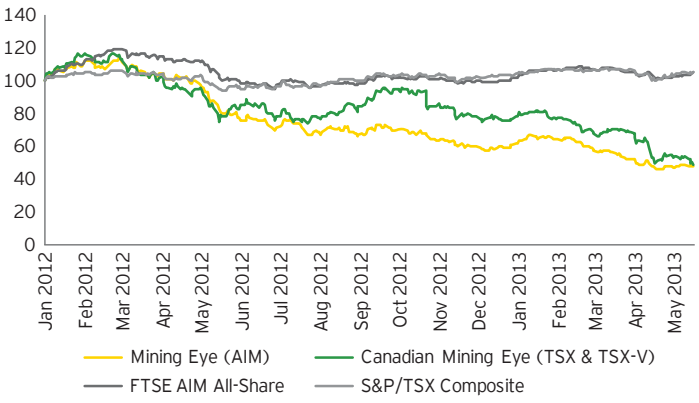
These risks do not go unheeded by investors. Without visibility or some surety over near-term cash flow to deliver returns, speculative juniors represent high risks and low or negative near-term yields — in other words, the opposite of the desired investment outcome.

The demise of risk capital

The absence of risk capital means that equity funding is both difficult and expensive to access. This has become evident in the ongoing decline in equity funding for exploration and development — perhaps most starkly illustrated by the near unprecedented absence of mining IPOs on either of Toronto's exchanges in Q1 2013. Many juniors are persisting with equity issues in the absence of affordable or accessible alternatives, as illustrated by the still relatively strong volume of follow-on issues in 2012. But the recurrent dilution of stock is only serving to perpetuate negative investor sentiment towards the sector.

Proceeds from equity placings by exploration companies listed on the Toronto, TSX-Venture, Australian and AIM stock exchanges fell by nearly 30% in 2012 compared with 2011, and by 47% in Q1 2013 compared with Q1 2012. Nearly 60% of Q1 2013 equity issues by exploration companies raised less than US$1 million. This is fundraising for survival.

Relative performance of mining stocks (2012–13)



Source: Ernst & Young, Thomson Datastream

Critical cash

The cash and working capital positions of the industry's smallest companies further underline the severity of the current situation. Companies with a market value of less than US$2 million (which account for around a fifth of listed companies across the main junior exchanges[1]) had, on average, less than US$1 million in cash and equivalents on their balance sheets at 31 December 2012. Over 40% of the mining companies listed on the TSX Venture Exchange had less than US$500,000 – barely sufficient for survival, let alone enough to fund drilling activities. This position is likely to have deteriorated further, given the absence of improved funding conditions over the opening months of 2013 to restore widespread working capital deficits.

There is some hope

There is a healthier picture for the more established juniors with advanced projects. It has transpired that non-traditional strategic investors, such as sovereign wealth funds and private capital providers, have proven better able to evaluate risk in this market, to the extent that they have the confidence to make long-term, counter-cyclical investments. Their view is that cash is available for good projects and proven management teams – a view evidenced by the increase in investments by this group in 2012.[2] However, the confluence of competition for capital between companies, and highly selective investing by capital providers, increases the risk that many quality projects may miss out on funding.

Advanced juniors are pursuing a range of alternative funding structures, each with varying degrees of risk, accessibility and cost attached. Such funding sources include convertible bonds, private capital, royalty and streaming agreements, standby equity, offtake/consumer finance, supplier finance and non-syndicated loans. Strategic secondary listings are still being pursued, albeit at a slower pace, to improve share liquidity and prospects for future fundraising through a widened shareholder profile. Conversely, secondary listings are also being canceled where poor trading volumes and regulatory costs/burdens are negating any benefit.

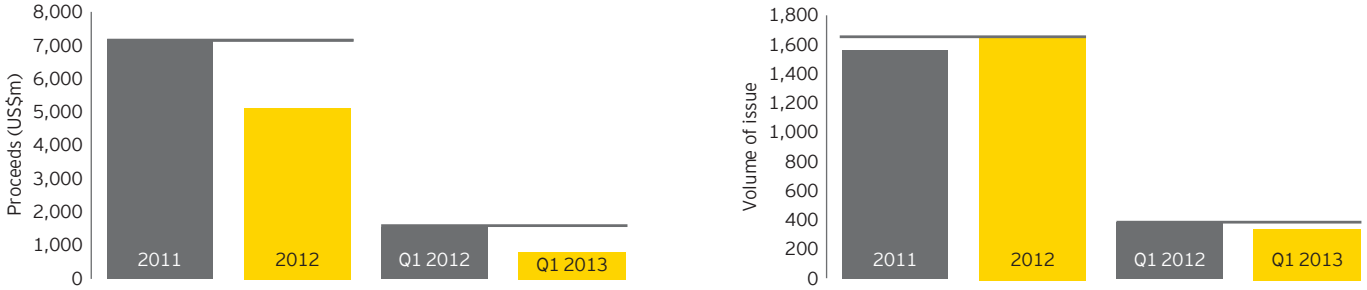
The arrival of opportunistic private capital into the market signals the prospect of somewhat higher asset and equity prices in the near term. This is also supported by the activities of institutions prepared to provide high-cost desperation (last resort) funding as they also believe that equity prices and availability should improve in the near term.

Survival of the fittest

With risk capital likely to stay absent pending any price-driven improvement in sentiment, speculative juniors are necessarily focused on survival financing rather than growth capital. Those with non-core assets are making disposals to release cash. Others are seeking partners in their peers to share risks and costs, or through mergers of equals to realize efficiency savings and pool finances, equipment and people. Others are exiting the sector altogether.

The likely outcome at the speculative end of the industry is a process of natural attrition – survival of the fittest – which will result in a rightsizing of the junior market to

Equity raisings by exploration companies – proceeds and volume (2011-Q1 2013)



Source: Ernst & Young research, ThomsonONE, Intierra

1. Based on reported cash balances of companies listed on the Toronto, TSX Venture, Australian and AIM exchanges. Source: Capital IQ.

2. "Mergers, acquisitions and capital raising in mining and metals," Ernst & Young, 2013.

mirror the refining of portfolios being undertaken by the majors in 2013. Depressed valuations will create buying opportunities, but for deals to be done, juniors with limited alternatives may need to adjust their value expectations.

The longer-term, industry-wide implications of restricted funding for greenfield exploration should not be ignored. But the fundamental and very real risk for junior companies in 2013 is about having sufficient working capital to stay afloat over the coming months.

Quality in quantity — record investment-grade debt

It is a very different picture in the world of the major producers. Such was the demand for investment grade debt in 2012 that companies issued new debt at yields near or below where their existing debt was trading. Mining and metals companies took advantage of this demand, raising US$73 billion of investment-grade debt for the repurchase of existing bonds, locking in lower coupons and extending maturities.

Equivalent proceeds raised in Q1 2013 have halved y-o-y (US$12.7 billion versus US$25.9 billion in Q1 2012), but global demand for investment grade debt (all sectors) remains strong. This fall in proceeds is largely a reflection of reduced need or desire among the mining majors to raise further debt, rather than any contraction in the availability of capital.

Access to capital is not at the top of the risk agenda for the majors in 2013, given revised capex programs, higher gearing levels and the more pressing focus on putting existing capital to better work.

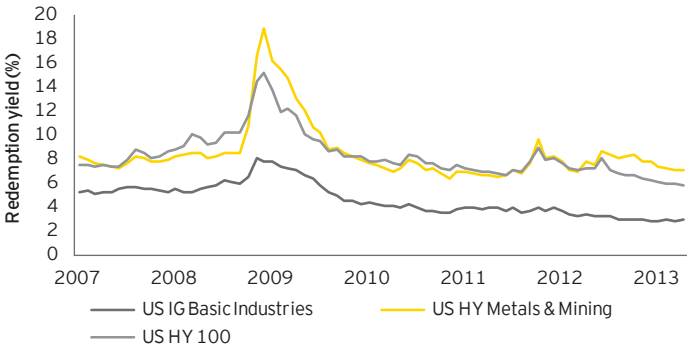
The mid-tiers — in demand but vulnerable

Investor thirst for yield remains unquenched. Global speculative issuance saw a 22% y-o-y increase to US$132 billion in Q1 2013,[3] a trend matched in the mining and metals sector with US$6.8 billion of bond issues accounting for 30% of all proceeds raised (compared with US$5.8 billion, accounting for 15% in Q1 2012). This offers some hope for mid-tier sub-investment-grade companies in an otherwise capital-constrained environment.

Yields on speculative-grade bonds (all sectors) have fallen to pre-financial crisis levels of around 7%, from 19% at the height of the crisis,[4] while spreads above benchmark (the premium paid to investors over safe government treasuries to compensate for the increased risk) have also tightened. This is a trend reflected in the mining and metals sector, which has enabled mid-tier companies to raise capital at a relatively low cost in historic terms. However, this situation may be fragile. Globally, concerns are being voiced that yields on speculative debt may no longer be sufficiently compensating investors for the increased risk attached to this asset class. A weakening of the economic outlook could quickly damage appetite for riskier assets, heightening the risk of increased cost of capital for companies.

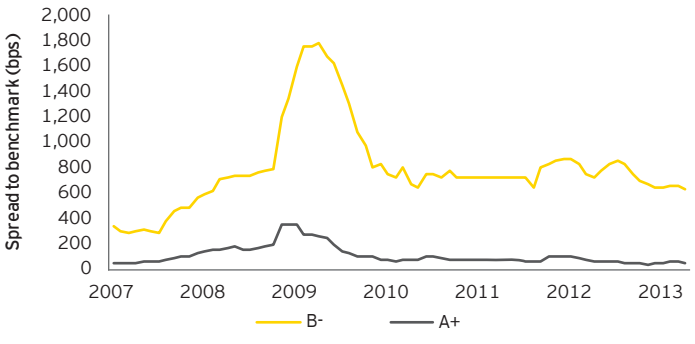
Given low-risk appetites and market volatility, as was the case in 2012, companies needing to raise capital at relatively lower cost through the bond markets must be prepared to act quickly. In 2012, windows of opportunity to issue bonds at favorable coupons were short-lived, and the only ones able to exploit these opportunities were issuers who had pre-prepared and marketed their documentation.

US corporate bond yields — investment grade and high yield (BofA ML)



Source: Thomson Datastream

Average spreads on corporate to treasury bonds — investment grade vs. speculative grade (Thomson Reuters)



Source: Thomson Datastream

3. "Debt Capital Markets Review, First Quarter 2013," *Thomson Reuters*, 2013.

4. Bank of America Merrill Lynch US High Yield Corporate Metals & Mining index.

Steps mining and metals companies can take to respond to this risk

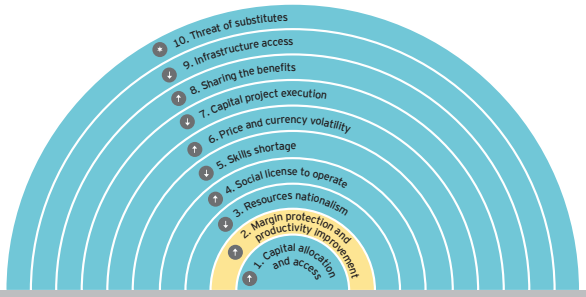
The challenge for junior companies is primarily one of knowledge, connections and competition:

- Knowing who the capital providers are, in a relatively opaque market
- Understanding the short- and long-term implications of different funding types and their real costs
- Competing for funds from a limited pool of increasingly selective investors
- Considering options for merger of equals

The 2013 market conditions require a greater level diligence over, and understanding of, available funding options and providers. Companies should:

- Seek advice in determining the right capital objectives and strategy, selecting the right products and providers, and transacting on the best terms
- Explore and assess all options – do they meet short and long-term strategic objectives? Are they in the best interests of all stakeholders, now and in the future? Is the trade-off between upfront capital and the long-term revenue or ownership impact acceptable? What doors do they open or close to further funding?
- Reconsider the upfront capital need – smaller requirements linked to realistic, achievable targets are more likely to attract funding
- Compare the true cost of funding alternatives
- If choosing to sell assets, consider selling early or face urgent seller documentation
- Use appropriate and innovative conduits to make connections with finance providers – traditional marketing platforms may no longer be appropriate

02



Margin protection and productivity improvement (4 in 2012)

High costs continue to take a toll on company margins, forcing a shift in industry mindsets from growth for growth's sake towards long-term optimization of operating costs and capital allocation. According to Rio Tinto CFO, Guy Elliott, the miner's cost base has risen by an average of US$2 billion a year since 2009.[1]

A number of major drivers have led to the deterioration of margins, in order of significance:

	Drivers	Examples
1	Falls in mineral prices as supply has closed the gap on demand	The LMEX index (basket of LME base metals' prices) has decreased 6% since 1 January 2012.[2]
2	Scarcity premiums in the costs of inputs	Australian mining wage rates have increased by 25% since 2008.[3]
3	Falling grades	Average nickel grades in 2000 were 6% and they are now <4%.
4	A gradual slide in the productivity of capital and labor	Australian labor productivity decreased 5.6% per annum and capital productivity decreased 4.1% per annum over the period 2000–01 to 2009–10.[4]
5	Poor capital project execution	Capital cost overruns are currently running at about 50% of all projects.[5]
6	Significant appreciation in producer' currencies	The Australian dollar, Canadian dollar and Chilean peso appreciated by 33%, 21% and 16%, respectively, between 2005 and 2012.[6]
7	Lack of cost containment discipline	Maximizing production was the priority, not limiting growth in the future cost base.

Value creation is not about absolute outcomes but more relative performance. Some of these drivers, such as lower scarcity premiums for inputs or the expected devaluation in producer currencies, will self-correct as mineral prices fall. However, there may be some lag as we have seen with currencies, and those companies that are most proactive in managing costs will perform relatively better than their peers.

Reacting to falling prices

The decade of higher prices has led to a generation of mine optimizers who have never had to react to price decreases and hence may not be experienced in having to reduce production from high-cost mines and brutally strip out operating costs.

Similarly, the marketing departments of the miners have not had to confront structural situations of supply demand balance for much of a decade. As one coal mining executive put it: "It can take more than 100 people weeks to reduce costs by 'a dollar a ton,' but one marketing person can give three times that amount away in five minutes during a customer contract negotiation."

Unwinding scarcity premiums

Most inputs have been in critical short supply over the past decade, be it skilled workers, tyres, sulfuric acid, port access or construction contractors, and the only way to secure supply has been to pay the scarcity premium that led to massive inflation in costs. Many companies are now looking to renegotiate their long-term supply contracts so that vendors, who have built strong margins, take some of the margin pain. Introducing greater flexibility into these arrangements should be a priority. BHP Billiton has launched a global campaign to renegotiate contracts with suppliers and contractors to adjust prices to reflect current market conditions.[7] The knock-on effect may benefit mid-tier miners that have less influence than major diversified players but work with a similar supplier base.

Cutting off uneconomic grade

Mining and metals producers are not known for their speed to react to new price signals, although the juniors in the sector are more nimble. A robust market allows miners to do what they do best: develop their annual mine plan, determine cutoff grades, produce according to that plan, and leave it to the marketers to sell whatever has been produced. However, volatile prices require greater flexibility in mine planning, and miners need to be able to reset their cutoff grades to remain economic. The speed and frequency of an organization's reaction to changing price signals can achieve greater option value for the enterprise.

1. "Drilling down and polishing up," *The Australian Financial Review*, 28 February 2013 via Factiva © 2013. Fairfax Media Management Pty Limited.
2. Thomson Datastream accessed 14 May 2013.
3. "Rio Tinto wage costs soar as productivity falls," *Australian Business News*, 19 April 2013.
4. "Productivity in the Australian Mining Sector," BREE, Canberra, March 2013 © Commonwealth of Australia 2013. Arif Syed, Quentin Grafton and Kaliappa Kalirajan 2013.
5. "Mine cost overruns high, constraining capacity – SocGen," *Metal Bulletin*, 2 May 2013.
6. "XE Currency Charts," www.xe.com, accessed on 8 May 2013.
7. "Frightful new realities of mining," *The Australian Financial Review*, 3 November 2012, via Factiva © 2012. Fairfax Media Management Pty Limited.

"High mineral prices concealed the impact of rampant cost inflation, falling productivity, currency appreciation and poor capital discipline. Current lower prices are revealing how much these have been dragging on margins for more than a decade. To remain competitive, these handicaps must be addressed."

Nathan Roost
Mining & Metals Advisory Partner,
Ernst & Young Australia

The cost of not addressing costs

In 2012 escalating costs had a major impact on bottom lines, resulting in significant write-downs of costly acquisitions and the derating of company stock prices. With prices losing scarcity premium, investors penalized industry players for chasing volume growth at any cost despite rewarding this in 2005 to 2008 and again in 2010 to 2011. Several companies have chosen to replace their senior management with industry veterans adept at cost control.

A weak external environment and the lack of investor confidence have heralded an industry-wide directional change ingraining long-term optimization of costs into the industry ethos. With this comes a new generation of leaders who are expected to champion being at the "bottom of costs per mined tonne and at the upper ranges of capital productivity," in the words of BHP Billiton CEO Andrew Mackenzie.[8] Companies that successfully refocus on productivity and cost will position themselves to take advantage of opportunities when – true to the industry's cyclical nature – new capital investment returns.

Languishing productivity plagues the industry

> "The mining industry is decades behind other parts of the economy on productivity, and the industry, not government, must raise its game. In the mining industry, we're some 20 to 30 years behind other more progressive sectors in terms of productivity and business practices."[9]
>
> **Mark Cutifani**
> **CEO, Anglo American**

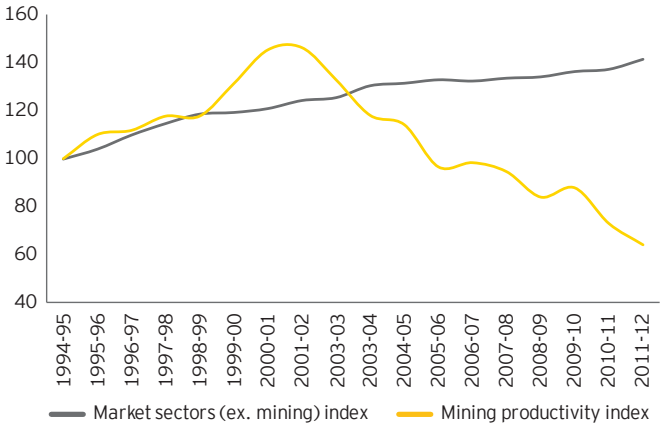
Studies by industry and government bodies highlight the adverse cost implications of supply chain inefficiencies and declining productivity, which crept into the industry over the past decade in the indiscriminate race for growth.

The decline in productivity across manpower, equipment, processes and logistics has significantly increased in the industry's input to output ratio. According to the Australian Bureau of Statistics (ABS), Australia's unadjusted multifactor productivity (MFP) in the resources sector declined 33% during 2000 to 2010.[10] During the boom, inflation and the growing skills shortages served to escalate labor costs, while labor productivity declined due to reduced working hours, inefficient management structures, industrial action and inadequate training/upskilling initiatives. Concerns of shortages led to greater insourcing to gain greater control of skills but often at the cost of productivity.

Labor productivity improvements in the sector are most likely to come from:

- A move back to outsourcing to optimize manpower utilization
- Removal of dual roles for growth and operations allowing focus on operational improvement
- Reduce skilled labor turnover and churn
- Unwinding the quadrupling in support (indirect) mine workers from the past 10 years

Mining labor productivity has declined by roughly 50% since 2001



Source: Australian Bureau of Statictics

Average annual growth in productivity (%) during 2000–07

	Labor	Capital	MFP
Australia	-4.02	-1.41	-1.99
US	0.66	-2.25	-1.68
Canada	-2.21	-0.28	-1.07

Source: Bradley and Sharpe, 2009. BREE, 2013.

8. "Drilling down and polishing up," *The Australian Financial Review*, 28 February 2013 via Factiva © 2013. Fairfax Media Management Pty Limited.

9. "Mining productivity decades behind other industries: Anglo boss," *www.miningaustralia.com.au*, accessed 10 January 2013.

10. The ABS classifies mining into: Coal Mining, Oil and Gas Mining; Metal Ore Mining (Iron, Bauxite, Copper, Gold, Mineral sand, Nickel, Silver-Lead-Zinc mining); and Other Mining (construction material mining).

- Increased use of productivity/wage trade-offs in labor negotiations
- Better use of operational data and benchmarking to target specific productivity challenges
- Greater empowerment of workers to challenge and redesign processes that limit productivity

During the same period, capital productivity has been adversely impacted by multiple factors, such as the long lead times between investment and production, overruns in project development, and the sluggish pace of innovation in mining technology to name but a few. In addition, there has been a reluctance to invest in an optimum mix of labor and capital as many companies favored the cheap but short-term alternative of labor-intensive production in response to demand uncertainties.

In a number of instances, capital was never right sized for a mine development (as rising prices always justified applying more and more capital to the challenge to increase production, rather than looking to optimize the capital already applied). For example, with falling copper grades, increased strip ratios and poorer average truck performance from 2006 to 2012, the result has been 134% more inputs have been required for each pound of copper produced. Just to return to 2006 truck performance would save 94% in extra inputs.[11] Companies are now revisiting their true capital needs and applying fresh thinking to increase both the availability and utilization of the existing assets.

Capital productivity improvements in the sector are most likely to come from:

- Reoptimizing capital for new price environment – e.g., more open cut operations from being "over-trucked" to "under-trucked"
- Higher cutoff grades requiring less waste handling via lower strip ratios and less tolerance for dilution
- Right sizing capital fleet for more mature mines
- Better use of operational data and benchmarking to target specific productivity challenges
- Improving the human/technology interaction and better training and development
- Continued de-bottlenecking
- Risk transfer to third-party owners of assets
- Rebalancing product chains to better utilize pit, rail and port infrastructure with integrated logistics
- Increased automation and innovative solutions across the sector
- Improved maintenance and asset management
- A renewed focus on continuous process improvement programs, such as a Lean Six Sigma

Refocus innovation – from supply growth to productivity enhancement

Over the past decade, innovation in the mining and metals sector has been focused on enabling companies to discover more, develop faster and produce more in a supply constrained environment. Innovation helped make previously uneconomic ore bodies viable and also enabled the substitution of capital for labor in response to a growing skills shortage.

With a contemporary need to increase productivity (or at least arrest its decline) the industry's focus on innovation must shift to achieving more output with fewer inputs, as well as doing what we currently do better.

To be successful innovators for productivity, mining and metals companies must:

- Collaborate with mining services suppliers, rather than rely on in-house labs
- Apply innovation to lower cost and increase speed to market
- Integrate innovators within operations
- Orient to a needs-based approach, rather than a capability looking for a need
- Tame big data to support innovators

Data the new fuel for productivity

The industry is slowly moving in the direction of digitization, with the implementation of data-enabled equipment, operating/safety/environmental sensors, Wi-Fi and wired networks, mine planning models and performance reporting. Increasingly, this data is supporting real-time tracking, surveillance, production cycle reporting, traffic management, communications, environmental monitoring, automation, machine telemetry, proximity detection and remote blasting.

The mining and metals industry does not generally apply advanced data mining and analytics to help answer the question why for falling productivity, and hence data collection is generally single purpose. As the industry enters an era of big data, advanced analytics holds the promise of identifying areas of potential productivity improvement way beyond time and motion studies and process mapping of old. For example, data can also be gathered to identify trucks with the highest productivity, best practices of which can then be extended across the fleet. Such data can also help facilitate decisions on equipment selection and the timing of equipment replacement/servicing.

11. Ernst & Young research, 2013.

The right skill set to maximize new technology

Operators were taught single or limited tasks for the rapidly installed technology they were entrusted with over the past decade. A renewed focus on productivity allows for the reassessment and retraining of capabilities needed to best utilize equipment and technology to ensure productivity improvement. According to Sandvik Director Andrew Philpott, "At the end of the day you can have the best technology in the world, but if the people do not buy into the technology, if the people do not know how to operate the technology and do not support the technology, then you're setting yourself up for failure."[11]

Required policy initiatives

The scale and complexity of new capital projects in the sector have been increasingly encumbered by inefficient regulatory approval processes, agency failure and stakeholders misalignment. Governments that obtain economic rents from the mining and metals sector have an ownership responsibility to foster innovation by directly investing in research or providing fiscal policy that supports R&D. Governments also provide the policy framework for industrial relations and need to foster an environment where wage and productivity trade-offs are possible. Government policy seeking to approve national productivity by way of microeconomic reform must address these public drivers of falling productivity.

Outlook

Obvious and reactive cost cutting announcements were rife in 2012 and 2013, including industry-wide layoffs, mine closures and non-core asset divestiture activities. Slowing expansion in the industry will mean some relief in terms of rising costs, although cost pressures are unlikely to abate in a hurry. Meanwhile, the present austerity in the mining and metals industry is said to be laying the groundwork for the next upturn, calling for balanced cost cuts and controlled growth. Margin protection, via better management of containable costs, and a renewed focus on operational productivity will be two critical factors for companies to return profits to levels experienced in the last five years.

Going forward, the industry is expected to adopt a strong operating focus as companies strive for increased asset and labor productivity. Until boards and executives start focusing on productivity metrics (and actively monitoring and communicating these), the remaining productivity potential will go untapped.

> "Our productivity agenda seeks to expand margins and increase returns in the absence of higher prices."[12]
>
> **Andrew Mackenzie**
> **CEO, BHP Billiton**

Long-term competitiveness and profitability can only be achieved by holistically and systematically managing productivity. The lowest possible cost per tonne of metal sold can be made a reality by optimizing the entire value chain from mine to market. This is by no means an easy task, given the variances that occur in upstream processes (exploration, planning, scheduling, drilling blasting, loading and hauling rock). The industry must innovate to find ways that make it possible to monitor and analyze upstream processes. How this information is understood and subsequently utilized could be the key to improving productivity.

Steps mining and metals companies can take to respond to this risk

- Focus on sustainable cost reduction programs
- Divest in non-core assets
- Review capital tied up in high levels of pre-stripping, advance development and stockpiles
- Consider the use of contract mining vs. sale or leaseback
- Review supplier contracts
- Outsource
- Create strategic joint ventures to optimize economies of scale
- Alter cut-off grades more frequently
- Reduce indirect workers
- Increase operational outsourcing to improve utilisation
- Improve labor turnover
- Obtain productivity trade-offs in wage negotiations
- Ensure greater multi-skilling
- Use operational data for benchmarking performance
- Re-optimize capital fleet
- Increase automation

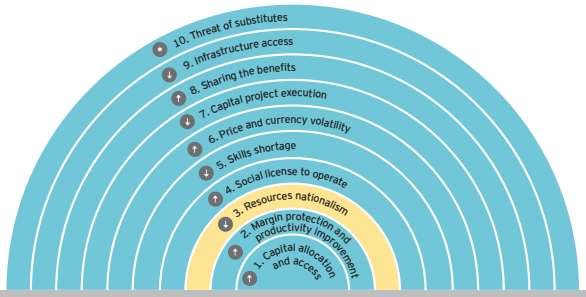
11. "The future of automation," Mining Australia, 11 December 2012.

12. "BHP Billiton presentation to the 2013 Bank of America Merril Lynch Global Metals, Mining & Steel Conference," BHP Billiton, 14 May 2013.

03

Resource nationalism

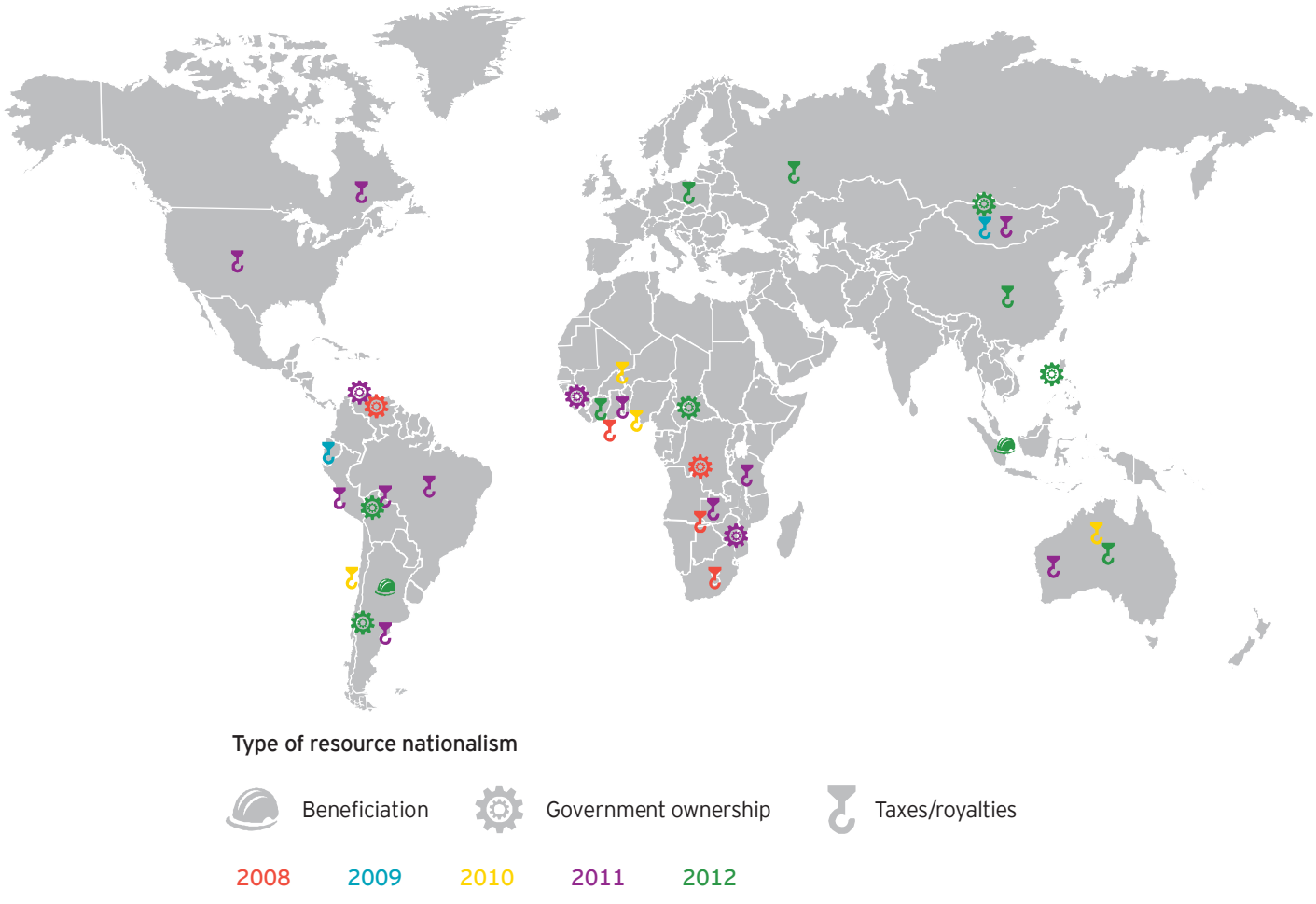
(1 in 2012)



As capital expenditure is reined in and mining and metals companies focus on managing their costs and increasing productivity, it is possible governments will retreat from rampant tax policy changes and promote initiatives to attract mining investment.

Over the past five years the four main forms of resource nationalism – mandated beneficiation, government ownership, restriction of exports, and increasing taxes or royalties – have spread across the world. A growing number of countries are either implementing or considering policies designed to maximize the return on natural resources to the country. These range from rather extreme policies in countries such as Venezuela and Zimbabwe, to a more considered approach by jurisdictions such as Australia, Canada (Quebec), Botswana, Ghana and Poland.

Resource nationalism spreads across the globe (2008–12)



Source: Ernst & Young research

"Resource nationalism remains prolific in resource-rich countries, and while it continues to be a major sector risk, it appears to have reached a tipping point where it no longer is the surprise it once was, and companies are getting better at managing this risk."

Andrew Miller
Global Mining & Metals Tax Leader, Ernst & Young

However, this continued spread of resource nationalism is out of kilter with mining and metals investment. While more governments expect more of the sector, there has been a significant retreat in capital investment as lower commodity prices are promoting a more cautious approach to large-scale projects. With greater demands from shareholders to preserve capital and limited financing, companies are delaying mining and metals projects or canceling them all together.

As a result, there are already early signs that there has been a retreat on some of the proposed legislative changes affecting mining and metals investment. For example, the Quebec Government has hinted at flexibility in its plan to raise the royalties that mining companies pay on minerals extracted in the Province and asserted that Quebec would remain competitive even if the mining rules changed.[1] In Guinea, the Government has changed its mining code by lowering some taxes in order to boost foreign investor interest, with profit taxes falling from 35% to 30% and the bauxite tax from 0.55% to 0.15% of the international market price for aluminium.[2]

That said, it is unlikely that resource nationalism will disappear as governments look to companies to fund the shortfall in revenues produced by the volatile economy. It is also often at this point – just before an investment boom ends – that there is an increase in government participation in the sector.

Over the past year, a number of governments have implemented or considered measures to increase their participation in mining and metals projects. Some recent examples include:

- **Mongolia** – Legislation was proposed to give the State a free stake in many mineral projects as well as the right to specify output targets regardless of market demand.[3] The Mongolian President believes the Government should increase its participation in Oyu Tolgoi – it presently has a 34% stake but is excluded from the running of the project – and would like a Government representative on the Managing Board. The Government is also pushing for increased participation by domestic businesses and greater transparency in supplier selection.[4]
- **Argentina** – The Government has increased its intervention in the sector as it has struggled to protect a shrinking trade surplus despite implementing import restrictions. Draft laws submitted by the local authorities in 2012 led to the suspension of investment by Pan American Silver in its Navidad project.[5]
- **Burkina Faso** – A new mining code will be put before the National Assembly in 2013 in the Government's bid to gain greater benefit from a rapidly expanding mining sector. The Government is proposing the right to acquire a stake in any mining company in return for payment at the market rate. This is in addition to the State's free 10% holding that the current legislation guarantees. The move would allow the Government a greater say in the investment decisions of operators in the sector.[6]
- **Bolivia** – Mining reforms introduced by the Bolivian Government included a requirement that companies switch from their current concessions and shared risk contracts to new ones that give the State a majority stake or, in the absence of that, broad oversight powers.[7]
- **Democratic Republic of Congo** – The Government plans to overhaul mining laws and give the State higher royalties and a bigger stake in projects.[8]

Governments of rapidly developing countries are consistent in their desire to achieve security of supply and to husband resources. They have generally sought to exercise this policy aim through state ownership of domestic resources and to aggressively acquire foreign resources via state-owned mining and metals companies. Even developed economies concerned with security of supply, such as Japan and Korea, have applied significant state participation in the acquisition of foreign production.

However, government ownership of assets can be a conflict of interest due to their role in the regulation of mining and metals. It can also be the least efficient means of securing the required return on a country's minerals. The national interest can best be served through efficient regulation and taxation to ensure mining activity benefits the country's economic development and protects the commercial sovereignty of the host nation.

State-owned mining and metal companies are exposed to the associated investment risk, which they may be poorly equipped to manage, thereby potentially reducing the country's return on its natural assets. Such mismanagement often occurs because governments tend to build a static model in a dynamic world.

1. "Quebec signals flexibility on controversial mining plan," Reuters via *Mining Weekly*, 15 March 2013.
2. "Guinea lowers mining taxes to boost foreign investor interest," *Global Insight*, 10 April 2013.
3. "Mongolia's mining laws threaten biggest coal project," *MineWeb,* 9 January 2013.
4. "President: "Time has come for Mongolia to take Oyu Tolgoi matters into its own hands," *Mining.com*, 4 February 2013.
5. "Mining investment in Argentina grows 72% despite risky business climate," *Mining.com*, 30 January 2013.
6. "Burkina Faso promises new mining in 2013," *Global Insight*, 4 January 2013.
7. "Bolivia says mining reform will not affect Sumitomo," *Reuters*, 24 August 2012.
8. "DRC mining laws won't be retroactive – Minister," *Reuters* via *Mining Weekly*, 1 November 2012.

Investments in mining and metals can take a long time to pay off, and if commodity prices decline, the timeline can extend even further. There seems little benefit in tying up government resources in mining and metals projects when there are private investors willing to do so.[9] This is especially relevant in the face of volatile commodity prices.

For mining and metals companies, increased government participation will necessitate strong stakeholder relationships, an active focus on corporate responsibility and a clear value propositions for all stakeholders, all of which needs to be effectively communicated.

Increasingly, countries are also seeking to gain greater value from their minerals, encouraging miners to export finished products as opposed to the raw materials. Guinea has passed legislation that gives the Government a free 15% stake in all mining projects that will ensure there is a greater amount of processing, refining and smelting done in Guinea.[10] Other countries, such as South Africa and Indonesia, are also in the process of implementing similar mandatory beneficiation policies.

Governments are also considering or imposing steep new export levies or a complete ban on unrefined ores to encourage mining companies to process minerals in country.

However, recent developments in Indonesia underline the difficulties of implementing a beneficiation strategy. The Indonesian Government is considering revising mining export regulations passed in 2012 as not all mining companies are ready to build smelters required to process ores by the 2014 deadline a complete ban on the export of unrefined minerals comes into effect. The Government has acknowledged that constructing a smelter takes time, money, technology and electricity supply and is seeking a solution that will make it economically viable for mining companies to build them.[11]

Other considerations of mandatory beneficiation policies for mining companies, aside from the increased investment in smelters and manufacturing facilities, include:

- The need for both low-cost power and infrastructure for beneficiation plants – both of which are often in short supply in these countries
- The need for skilled labor for value-added processing
- Loss of flexibility in global supply chain
- Concentration of investment risk
- Relatively higher taxes on value-add
- Less integration with customers supply chain

As resource nationalism has become more endemic, mining and metals companies have had to develop strategies to deal with rapid natural resource policy changes. They are doing this by taking the following steps:

- **Becoming politically savvy and factoring country risk into pricing models** – The rising participation of governments or state-owned corporations and increasing competitiveness they bring to the market will have to be managed by companies and priced into models. As a result, companies are factoring country risk into their project assessments and determining its affect on, amongst other things, capital allocation and valuation models.
- **Building strong relationships with government** – Organizations are investing time and money to build these relationships, with some having dedicated teams to negotiate with and educate the government on taxes and other resource nationalism initiatives.[12] In addition, mining and metals organizations and their investors will have to increasingly position themselves as partners in the economic and social development of the countries in which they are investing.[13]
- **Building brand and communicating effectively on the positive impacts of mining** – By managing an effective communication process highlighting the positive impact of mining through productive, profitable and sustainable development initiatives, mining and metals companies can show governments how their presence in the country can create positive economic (and social) contributions. In a time of asset impairments and project deferrals, miners also need to educate government on how improving mine productivity can increase benefits to local communities. For example, in Quebec and Australia, significant studies were commissioned by industry associations to educate the respective governments on the impact of their proposed tax policy changes.
- **Increasing the transparency of their payments to Government** – Revenue transparency and governance reform can help reduce the rent-seeking behavior of governments. By effectively communicating the long-term benefits of mining, governments will better understand the longer-term tax revenue benefits. These can include income taxes as well as taxes such as VAT on purchases of equipment and other property, ad

9. "The dangers of Quebec Resource Nationalism," *Montreal Gazette*, 5 June 2012.

10 "Guinea says new code encourages miners to do more than dig," *Reuters News*, 10 April 2013.

11 "Indonesia softens stance on unprocessed mineral export ban," *Global Insight*, 11 April 2013.

12. "Global Mining & Metals Tax Survey: From Backroom to Boardroom," Ernst & Young, April 2013.

13. "Resource nationalism new form of mercantilism," MiningIndaba.com, 7 February 2013.

valorem taxes and payroll taxes. There is often a significant multiplier effect associated with both the development and long-term operation of mines with direct and indirect jobs created via infrastructure development and suppliers, and associated income and payroll tax revenue from those jobs. It is therefore important that governments and miners act in partnership to optimize the long-term positive economic impact of a mine.

- **Implementing arm's-length valuation of risks and functions through sophisticated transfer pricing** – Higher tax take in producer nations provides incentives for other non-producer nations to provide incentives to capture some of that value. Companies are centralizing processes in favorable tax jurisdictions. However, there is a move to ensure that the tax base is not eroded. Governments around the world are taking a hard look at potential tax base erosion and profit shifting, as described in a recent OECD discussion paper.[14] For example, in several Latin American countries new transfer pricing laws have been introduced to prevent tax revenue leakage through intercompany transactions. Mining companies will need to ensure that global supply chains are carefully planned and fully documented to demonstrate the level of income earned in producer nations.

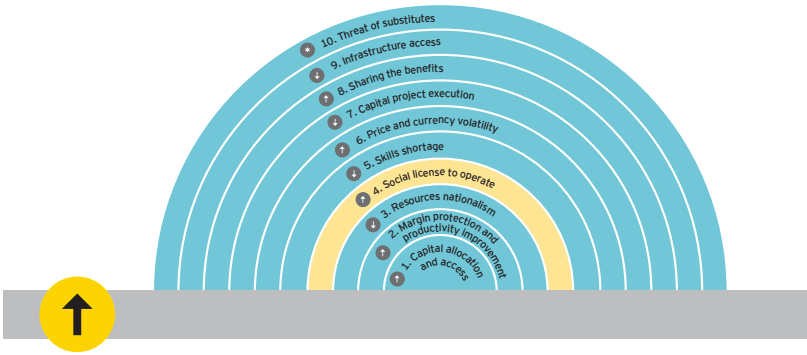
Steps mining and metals companies can take to respond to this risk

- Invest in transparent relationships with host governments to foster a greater understanding of the project value to the host
- Align with the host government's long-term economic and political incentives, and become an invaluable part of the infrastructure in the host country
- Focus on generating direct and sustainable benefits for the host community through proactive and well-organized social and community development programs
- Work with multilateral agencies and other stakeholders to show the adverse economic and social effects of resource nationalism and the beneficial sustainable development effects of a stable, certain mutually beneficial mining policy
- Partner with state-owned enterprises that have strong government-to-government relationships

14. "OECD releases report on base erosion and profit shifting," Ernst & Young, http://www.ey.com/GL/en/Services/Tax/International-Tax/Alert--OECD-releases-report-on-base-erosion-and-profit-shifting, accessed 10 May 2013.

04

Social license to operate (6 in 2012)



In a volatile operating environment, managing the needs and expectations of communities, governments, employees and other stakeholders who provide mining and metals companies with their social license to operate (SLTO) can be a delicate balancing act of agendas and issues. In times of increased activism, digitally connected stakeholders and politicians who need to respond to general consensus, the pressure is on!

Increasingly savvy stakeholders

The community and governments are developing a more sophisticated understanding of mining and metals activity and its potential impact, raising specific concerns and increasing their scrutiny. For example, air emissions are of particular concern for communities that now have access to real data and often undertake their own monitoring using low-cost digitally connected equipment.

Social media is also empowering stakeholder both en masse and within smaller community groups. Instead of liaising with the designated community leader (such as the mayor, chief or elder) in the Web 2.0 era, many more impacted parties need to be included in the consultation and education process.

Communities have a greater awareness of their rights and are prepared to defend them using social media and other channels. These factors increase the urgency for companies to respond to community concerns and complaints. However, while an attitude of open and early engagement with stakeholders is vital, communication needs to be more strategic. Communities should be consulted from the outset, even from pre-exploration, to identify and ideally eliminate potential issues. Cloud Peak Energy recently sought to achieve this when it signed option and exploration agreements with the Crow Tribe of Indians for the Northern Powder River Basin. The benefit of the agreement is clearly articulated by the company's CEO, Colin Marshall: "We are embarking on what we see as a long-term partnership with the Crow Tribe that will hopefully provide revenue and jobs and economic development on the Reservation."[1]

Anti-mining agenda in communities

There is a risk that active issue-based community groups can be manipulated by politicians and other groups with wider political agendas that magnify the challenge of community consent. There is strong evidence of some anti-mining non-government organizations (NGOs) tapping into community concerns over issues such as water access or loss of artisanal mining rights to prevent larger-scale mine development from occurring.

On the other hand, in today's current financial environment, some companies with existing operations are choosing to run at a loss for a period of time in order to preserve their SLTO and prevent reputational damage. given the impact of potential high-cost mine closures or suspensions on local communities.

There is a significant upwelling of anti-mining sentiment in several regions, including Latin America and Africa. SLTO issues in Latin America intensified in 2012, with mining and metals operations increasingly perceived as having a negative impact on human rights, communities and the natural environment.

The Peruvian Ombudsman recently reported that by January 2013, the country had 158 active and 62 latent social conflicts – a large number by anyone's measure and quite alarming for companies. The majority of the cases are related to the extractive industries and 66.8% were socio-environmental.[2] This includes the US$4.8 billion Conga project in Peru, which was deferred in 2012 due to ongoing opposition from local residents concerned about potential water pollution.[3]

The Bank of America estimates that investment in Peru's mining industry decreased by 6% y-o-y in 1Q12 due to increasing anti-mining protests in the country.[4] There is potential contagion of this activity from Peru across to Colombia and Argentina.

1. "Cloud Peak Energy and the Crow Tribe of Indians Sign Option and Exploration Agreements," Cloud Peak website, http://cloudpeakenergy.com/investor-relations/press-releases/, accessed 24 January 2013.

2. "Peru: Peruvian Government refines assessment of social conflicts," *Global Insight*, 21 March 2013.

3. "Conga delay undermines Peru perception," *Miningweekly*, http://www.miningweekly.com/article/conga-delay-undermines-peru-perception-2012-10-27, accessed 27 October 2012.

4. "Anti-mining protests hurting sector investments – Bank of America," Business News Americas, 13 June 2012.

"As the expectations of mining and metals stakeholders continue to rise, companies have to do even more to maintain a social license to operate. It is not a task that has a beginning and an end, rather it is an ongoing relationship that needs constant attentions."

Mathew Nelson

Asia-Pacific Climate Change and Sustainability Services Leader, Ernst & Young

Areas of significant community conflict — ranked by frequency of event

1	Water access
2	Competing land use
3	Artisanal mining rights
4	Water quality
5	Community relocation
6	Loss of natural environment
7	Use of fly-in-fly-out workforce

Source: Ernst & Young research

Unfortunately, bad media and reputational damage suffered by one company can, in turn, result in collateral damage for the whole industry. Companies need to be wary of the potential of bad press and the impact it can have in making decisions. In 2012, Australian coal miners were battling heavy regional flooding in Queensland and around a quarter of the coal mines released excess water in breach of environmental guidelines. They were issued with hefty fines but the timing was unfortunate — due to an existing dispute with agricultural interests seeking to gain greater control over water — resulting in heightened publicity.[5]

The flow-on effect of the developing world's concerns

While the mining and metals sector has benefited from the economic awakening of densely populated countries such as China, the associated environmental impacts are to its detriment. No better example exists than the grassroots call to end the dangerous record levels of air pollution in China experienced in early 2013. The Chinese Government's response has been to announce a 4 billion tonne annual cap on the burning of coal to curb its circa 20% contribution to Chinese air pollution. This cap will impact producers of low-energy, high-sulfur and high-ash coal, resulting in Chinese mine closures and significant pricing discounts. It may also prove a boon for producers of high-quality thermal coal, with higher demand resulting in a pricing premium.

Increased regulatory and judicial activism

The growing community concern about the impact of mining and metals operations is leading to increased legislation to protect communities, as regulators seek to fill a gap between expectations and existing regulations. In Australia, the Regional Australia Institute is proposing that mining companies engage with communities to gain their consent before receiving government approval for projects.[6]

In South Africa, there have also been changes to compliance requirements and reporting standards, which include new disclosure and reporting requirements relating to conflict minerals, publish-what-you-pay, and mandatory non-financial disclosure for listed companies. Also, the European Commission is adopting a directive to enhance the transparency of certain large companies on social and environmental matters.

As if increased legislation and protracted government approval processes are not enough, there are increasing instances of judiciaries suspending projects even after government and regulatory approvals have been obtained. Recent examples include Barrick's Pascua-Lama project in Chile and Rio Tinto's Warkworth/Mount Thorley project in Australia.[7] This highlights how stakeholders are turning to the courts to apply a less technical interpretation of compliance with environmental standards. The rise of dedicated environmental tribunals provides more opportunity for this style of action.

In India, the courts have become more active in restricting miners from accessing new resources and, in the states of Goa and Karnataka, are banning iron ore exports. Land access for coal, bauxite and iron ore miners has become more problematic as competing land use for cultural, environmental, residential or agricultural purposes has, to date, found sympathy in the judiciary. Given the expected growth in the Indian economy in years to come, these decisions will have implications beyond the borders of India.

Changing expectations providing new threats

Global climate change concerns and increasing regulation mean that fossil fuel reserves may not be able to be exploited, resulting in stranded assets and high exposure for investors. A joint report by Australia's Climate Institute and Carbon

5. "Rio fined $2200 over mine water release," *The Australian Financial Review*, 7 March 2013.

6. "Think local on new mines, institute says," *The Australian Financial Review*, 10 April 2013.

7. "UPDATE 3 — Chile fines Barrick's Pascua Lama, halts gold project," *Reuters*, http://www.reuters.com/article/2013/05/24/barrick-chile-pascualama-idUSL2N0E51AV20130524, accessed 24 May 2013. "Rio reviewing Australia coal mine after court bars expansion," *mineweb*, 15 April 2013, http://www.mineweb.co.za/mineweb/content/en/mineweb-fast-news?oid=186177&sn=Detail, accessed 24 May 2013.

Tracker[8] reports that Australian coal reserves represent 15%–25% of the global carbon budget to 2050, required to limit global warming to 2ºC. This exposes Australian producers to reduced demand as traditional coal importers respond to international climate change commitments and pressure from civil society and look to alternative fuels.

It is the same story for coal producers globally. In 2012, the International Energy Agency acknowledged that, in the absence of carbon capture and storage technology, more than two-thirds of coal, oil and gas reserves cannot be commercialized before 2050 if we are to commit to the same targets.[9] Investors may begin to reconsider the valuations of coal producers that are based on expected reserves and optimistic assumptions around commercialization but don't take into account global climate change policy and the implications of a low-carbon future. Companies need to consider how they communicate their strategy to investors and other stakeholders, incorporate adequate risk and scenario modeling and identify opportunities in a low-carbon future. Increasingly, anti-mining protest groups are using carbon emissions as a social, legal and regulatory obstacle to the development of new coal mines.

In July 2012, the World Health Organization declared diesel engine exhaust as a known (Group 1) carcinogen to humans. Since diesel exhaust now joins smoking, asbestos and radiation as an identified carcinogen, the implications for a safe working place are far reaching. The mining industry is highly dependent on diesel mobile equipment and power generation. The risk is greatest for underground operations where the operation of diesel equipment in confined spaces, adequate ventilation and proper separation of humans from exhaust will be critical. This may significantly increase the operating costs of underground mining.

Community support for a project is partly dependent on its economic participation and local employment is an important element of that. This has prompted governments in new mining frontiers, such as Mongolia and Mozambique, to legislate to limit the number and roles of foreign managers and mine workers. In established mining nations such as Chile, Australia and Canada, labor unions have acted to restrict foreign workers as a means of preserving scarcity premiums in incomes.

Mounting community opposition to the impact of fly-in-fly-out (FIFO) workforces on local and regional communities has placed this issue on the political agenda. In Australia, the 2013 House of Representatives report on FIFO described it as a cancer in society and recommended policy changes that would make FIFO (and therefore the cost of mining) more costly, including changing the tax treatment of FIFO.

Communicating the value

SLTO covers a myriad of relationships and remains a great challenge for companies, many of which are still not proactively responding to this risk. Where mining and metals companies can create value within communities and for broader stakeholders, they can also create further value for their companies and shareholders. Measuring and reporting on this shared value can be a valuable tool for a company in maintaining a SLTO, as well as becoming more strategic and resilient in how it does business.

One way of doing this is through the concept of shared value — focusing on the connections between societal and economic progress — which has the power to unleash the next wave of global growth. Companies such as Xstrata and Newmont have embarked on important shared value initiatives.

How to create shared value:

- Look at ways of creating shared value. Examples include increasing the capability and capacity of local businesses to provide goods and services to mining and manufacturing operations in the areas they operate. This can increase efficiency and reduce costs in the supply chain, reduce environmental impacts, and contribute to a more sustainable and resilient local community that shares in the value of the operations.
- Measure the value that is created for stakeholders and the company and demonstrate returns from both a social and financial standpoint.
- Communicate this value to stakeholders so that the benefits are visible and obvious.
- Be open about how decisions are made.

The major mining and metals organizations are trying to implement systems to share and measure the benefit of their operations, demonstrating that they not only make communities and governments wealthier but also healthier. This relies on working with communities to create shared value.

8. "Unburnable Carbon: Australia's carbon bubble," The Climate Institute and Carbon Tracker, April 2013.
9. "World Energy Outlook 2013," International Energy Agency.

"The mining and metals business community's understanding of the potential of shared value is still in its infancy. Companies need to find better ways to demonstrate shared value in their projects to all stakeholders in a manner that draws attention to the benefits of their initiative. Every organization should look at decisions through the lens of shared value. This will lead to new approaches that generate greater innovation and growth for companies, as well as greater benefits for society."

Meg Fricke

Senior Manager, Climate Change and Sustainability Services, Ernst & Young Australia

In Western Australia, Cameco Corporation, Newcrest Mining and Reward Minerals have reserved A$5 million in contracts for the local indigenous group, the Martu, for services including labor hire, construction and maintenance. The initiative, Martu Mining Services, is aimed at attracting money into indigenous businesses[10] while also increasing the capacity of local suppliers that can create supply chain efficiencies. An additional benefit of employing indigenous peoples is a more reliable source of skilled labor, reducing the social and environmental impact of FIFO workers and the associated costs, and the value it creates for local communities. By creating a shared value proposition, mining and metals companies can remove much of the challenge around their SLTO within a community, while increasing shareholder and corporate value.

Frameworks and methodologies are being developed to assist with measuring the value of specific initiatives, such as the Social Return on Investment framework (SROI), which is based on social generally accepted accounting principles (SGAAP). These accounting principles are designed to help manage and understand the social, economic and environmental outcomes created by an organization and its activity.[11]

Steps mining and metals companies can take to respond to this risk

- Engage early and openly with local communities to understand and address concerns around mining operations and implement strategies to reduce impacts
- Identify how operations can be adjusted to create more value for communities and consequently increase the value returned to the company. Consider opportunities provided by local supplier and employee capability, as well as indigenous communities
- Measure and report on the value created and use this data to continually monitor, improve and capitalize on opportunities
- Incorporate SLTO risks into the enterprise risk management framework with clear and proactive risk mitigation strategies
- Embed these mitigation strategies in all critical business processes to ensure an integrated approach
- Integrate sustainability key performance indicators with productivity outcomes, as well as in remuneration structures
- Use sustainability outcomes to attract and retain workers who value the company's sustainability philosophy
- Improve speed to act on potential license issues
- Foster trusting and supportive relationships with all stakeholders to reduce security risks in troubled locations
- Integrate sustainability objectives into long-term planning

10. "Traditional owners get stake in services," *Australian Financial Review*, 2 February 2012.

11. "The SROI Network Intl," The SROI Network Limited, http://www.thesroinetwork.org/, accessed 10 May 2013.

05

Skills shortage

(2 in 2012)

The availability of skilled talent remains one of the key long-term challenges for the mining and metals sector. While the slowdown in new investment in the sector might see some short-term relief for construction and development jobs, longer-term demand for labor is expected to continue to trend steeply upwards.

The increase in supply over the past decade requires many more skilled workers just to maintain the higher levels of production. A number of those projects are not yet in production and still need to be staffed. In the five years to 2011, the Australian mining workforce increased by 65%. It did so by bleeding other sectors of skills and transporting them to remote locations, with an 85% increase in long-distance workers over the same period.[1] This, however, may be short-lived because as other sectors recover, a number of these long-distance workers will be attracted back to the industries they came from.

According to BHP Billiton, Australia's resources sector needs an additional 170,000 workers by 2016 to 2017.[2] This challenge is compounded by reports by the Mining Industry Human Resources Council's 2010 National Employer Survey that in Canada 40% of the mining workforce will be eligible for retirement by 2014, taking with them an average of 21 years of mining sector experience. Together, this will increase the need for skilled workers to 60,000 to 90,000 by 2017.[3] Many other countries face the same challenge, including Chile and Brazil. The ability to address the skills shortage will only worsen labor productivity as undertrained, under-manned and under-experienced project teams can cope but don't excel in performance.

This looming global skills shortage crisis remains a constraint on the long-term growth in the sector. From 2008, mining and metals companies have recognized the need for longer-term solutions to this seemingly endemic problem. They began to cooperate with both the government and each other in the significant ramp-up of university and vocational training. A number of mining and metals companies also decided to increase innovation to progress the automation of labor-intensive processes. In addressing the skills shortage challenge, companies must continue to adopt creative and innovative approaches to access new pools of talent; leverage technology; and motivate, engage and retain existing skilled workers.

1. "Analysis of the long distance commuter workforce across Australia," Minerals Council of Australia, March 2013.

2. "Australian mining giant BHP Billiton estimates that the industry will need a further...," Federal Government Broadcast Alerts, 3 October 2011, via Factiva © 2011 Media Monitors Australia Pty Ltd.

3. "Answering the HR Challenge: Why Industry Collaboration is Essential," *mining.com,* 1 May 2010, http://www.mining.com/answering-the-hr-challenge-why-industry-collaboration-is-essential/, accessed on 10 May 2013.

4. "Access to capital is one of the most significant challenges facing the Canadian mining industry," *miningweekly.com*, http://www.miningweekly.com/article/weathering-the-storm-2013-01-28, accessed 30 April 2013.

"There has been a short-term easing in the skills shortage crisis because of project deferrals and cancellations, but it remains a medium to long-term challenge especially in geology and engineering."

Louise Rolland
Executive Director, Advisory,
Ernst & Young Australia

Job cuts

Company name	Region	Jobs impacted
Rio Tinto[5]	Rossing uranium mine in Namibia	276
ThyssenKrupp[6]	Across Europe	2,000
BHP Billiton[7]	Olympic Dam, Australia	~100
Xstrata[8]	Collinsville coal mine, Australia	~100
BHP Billiton and Rio Tinto JV[9]	Arizona, US	400
Peabody[10]	Willow Lake Mine, US	400
Tata Steel[11]	UK	900
Arch Coal[12]	Virginia and West Virginia	750
Total		Approx 4,900

The nature of the risk shifted in 2012

During 2012, several companies were forced to trim their staff numbers due to cost cuts prompted by the difficult market environment. The impacts were more sectorial and regional with the coal sector, aluminum, steel and uranium sectors all impacted by suspension of projects or closure of high-costs mines.

The implications of these redundancies for the industry are:

- **Exodus of talent from the sector:** laid-off staff are likely to seek employment in other sectors offering more opportunities.
- **Cost**: Direct costs include sunk costs related to training and severance pay; indirect costs include training costs for new hires or higher compensation to reattract and induct talent when the market outlook improves.

In cost reduction mode, the industry has done little to preserve this talent and redeploy it to areas of greater need. Intermediaries, such as talent brokers, have been left to try and facilitate this redeployment.

The impact of layoffs

1. Social license to operate

In a cyclical industry, job security can become an issue. Thus, widespread layoffs have the ability to impact the long-term availability of new hires. They may also impact government's endorsement of the industry's social license to operate, damaging relations and the ability to negotiate future contracts with government. For example, Amplats, a South African-based Anglo American subsidiary, announced 14,000 job cuts and has been heavily criticized by the South African Government,[13] potentially setting the scene for higher levels of government intervention.

2. Brand damage

A mismanaged layoff can impact a company's brand, not only as an employer, but also as a socially responsible corporate citizen. This can have long-term ramifications for the organization and jeopardize the sustainability of operations. Investing in the effective management of layoffs ensures the process inflicts minimal damage to the organization's long-term brand reputation.

Companies can prevent the negative impact of cyclical downturn through effective forecasting and planning processes. Although companies can often do little to avoid layoffs, actively managing mid- to long-term staffing requirements requires a strong ability to forecast and plan properly. One solution is planning across shorter time horizons as this allows clear communication, timely course correction and management of risk in an uncertain market.

5. "Rössing announces major organisational restructure," Rio Tinto website, http://www.rossing.com/bullet/bulletpress94.pdf, accessed 1 March 2013.

6. "Handelsblatt: ThyssenKrupp may sell units, to cut jobs," *Handelsblatt*, 11 February 2013, Factiva.

7. "WA workers fear for jobs as BHP sacks Olympic Dam staff," *The West Australian*, 7 February 2013, Factiva.

8. "Anger over job cuts Thiess, Xstrata announce 100-plus workers are to go," *Townsville Bulletin*, 16 January 2013, Factiva.

9. "BHP and Rio slash 400 jobs in Arizona," *The Australian*, 4 December 2012.

10. "Willow Lake Mine in Southern Illinois to be Closed," Peabody company website, http://www.peabodyenergy.com/content/120/Press-Releases, accessed 27 November 2012.

11. "Tata Steel restructures to improve competitiveness of UK operations through market cycles," Tata Steel company website, http://www.tatasteeleurope.com/en/news/news/2012_tata_steel_restructures, accessed 23 November 2012.

12. "Arch Coal Responds to Thermal Coal Market Weakness by Idling Several Operations and Reducing Production in Appalachia," Arch Coal company website, http://news.archcoal.com/phoenix.zhtml?c=107109&p=irol-newsArticle&ID=1707619&highlight, 21 June 2012, via Factiva.

13. "Anglo American faces wrath of South African government over Amplats cuts," *The Guardian*, 15 January 2013.

3. Loss of investment

Skills shortages not only increase the direct cost of labor but also the indirect costs, including training and development productivity, recruitment, and management. Conservative estimates assess the indirect costs at nearly double direct costs. Mining and metals companies have been prepared to make this investment as they have a longer-term view of each project. Savings realized through cost cutting may be short term as they are at risk of being eroded by increased costs, both direct and indirect, when the sector returns to growth.

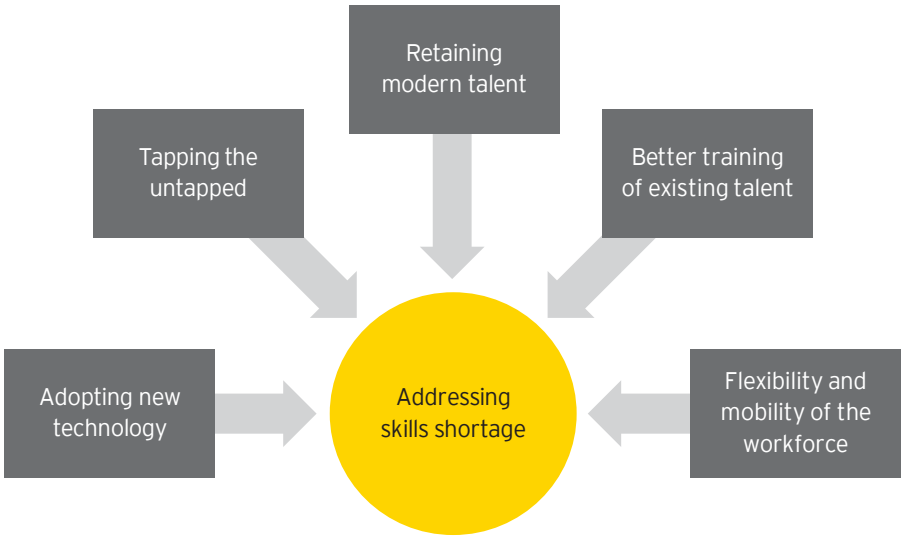
4. Increased turnover

The industry is facing increased employee turnover, which has impacted overall productivity. The Kinetic Group Heartbeat Report 2012 confirmed that almost 25% of the total workforce in Queensland's mining and metal sector is replaced each year. This costs the local industry around A$140 million per annum.[14] According to Australian Mines and Metals Association, the resources industry has the highest employee turnover in Australia.[15]

Mitigating the long-term risk

Skilled workforce availability remains a major long-term industry challenge. While there is no quick-fix solution, it can be addressed by developing a more holistic framework. Solutions include technology adoption, effective management of the modern workforce and tapping into different sources of labor. These options are cost effective and enhance the organization's social license to operate by supporting the local economy.

As the mining and metals business environment changes, so does the need for different skill sets within the sector.



Management ranks require skills such as cost optimization, productivity improvement, capital rationing and allocation, government relations, stakeholder engagement, and strategic thinking to meet these challenges. This will confront the makeup of the board, the C-suite and middle management. It will revisit the relevant experience for the sector and accelerate the gender balance on a needs basis.

1. Embracing new technology

Companies have to reassess longer-term demand for specific skills in light of expected automation. Several players are working to adopt automation technologies that could be applicable at a broader level across the industry. Rio Tinto's Mine of the Future program is expected to bring automation to the company's mine sites.[16] BHP Billiton is also implementing a program, Next Generation Mining, which includes integrated remote operating centers, autonomous haulage, autonomous drilling, and new ways of evaluating and modeling ore bodies.[17] Automation does not need to be limited to entry-level jobs and could provide solutions to challenges such as skills shortages, deeper ore bodies, increased safety regulations and a carbon-constrained future.

Promoting automation may attract new talent to the industry and change the sector's job profile by opening up highly technical roles necessary to design, implement and maintain these new systems. Increasing automation may also allow people to move out of risky operations and instead manage their jobs from a remote location.

14. "Mining workforce turnover 'costs $140m'," *Financial Review*, 17 May 2012.

15. "AMMA research paper: Labour turnover," AMMA, February 2013, http://www.amma.org.au/assets/Policy/Papers/20130227AMMA%20Research%20Paper%20-%20Labour%20Turnover.pdf, accessed 1 May 2013.

16. "Mine of the Future," Rio Tinto website, http://www.riotinto.com/ourapproach/17203_mine_of_the_future.asp, accessed 1 April 2013.

17. "BHP Billiton Could Slash Work Force with Automated Mining," *DesignBuildSource.com.au*, 15 March 2013.

2. Existing talent, new opportunities

Companies need to come up with innovative ways to develop new career paths. The traditional model, wherein a worker joins the sector after completing an undergraduate program and stays in the job and/or organization for years, is a historical one.

People are more likely to change jobs and even sectors fairly frequently. Mining and metals companies can facilitate these changes by opening up different experiences for their staff and thereby maintain their talent pool. BHP Billiton Mitsubishi Alliance (BMA) is doing just this, providing new and existing employees with broad-based training applicable across all its operations. It has awarded a US$21 million contract to the Australian Institute of Management (AIM) to offer around 140 training courses focused on business communication, customer services, sales and marketing, finance, human resources and project management.[18]

3. Tapping into new skill sources

Women and local workers remain a source of new and underutilized talent. Tapping into this labor pool provides the following benefits:

- **Access to a latent talent pool:** Tata Steel set up a skills development center at the Kalinganagar Industrial Complex, Orissa to leverage the locally available talent pool. The center provides technical skills training to enable employability in the six million metric ton steel plant.[19] Likewise, the large diversifieds are currently recruiting local workers to fill their vacant positions instead of leveraging their enterprise migration agreement.[20]
- **Corporate social responsibility credibility:** while employing the indigenous population does not give the companies access to as large a talent pool, it enables organizations to be socially responsible. BHP Billiton Iron Ore is recruiting indigenous candidates for haul truck operator roles at its Yandi, Mining Area C and Eastern Ridge mine sites in the Pilbara, Australia, and Rio Tinto is the largest indigenous employer in Australia.[21]

4. Increasing mobility of potential workers

Rapid growth in the sector has seen an increase in projects in remote locations, with high employment in the sector allowing workers to be more selective as to where they work. On one front, fly-in-fly-out (FIFO) appears a functional solution, and flexibility in flight destinations and schedules can allow workers to combine big-city lifestyles with high-value remote working. This may increase the cost per passenger movement as it may require more flights to more distant destinations in smaller planes. In addition, little is known about the impact of various employment arrangements, including FIFO, on productivity and well-being. The other challenges of FIFO arrangements include:

- There is a long-term mental health impact on the employees on FIFO rosters from extended periods of separation from families and reduced social and community interaction.
- There is an economic impact on housing as an increase in demand for housing pushes up prices and affects affordability. It can also impact local businesses and the local economy if mining companies purchase goods and services from suppliers outside the local mining based communities.
- The local social structure is impacted as the FIFO workers drastically change the local demographics. It also increases the pressure on essential services, such as health services and policing.

Government incentives can be provided to remote workers via tax allowances or rebates. Such incentives are designed to both encourage greater mobility and attract workers to reside in remote areas.

Risks attached to solutions

Organizations need to be mindful of the risks associated with the solutions they adopt to address the skills shortage. For example, some companies have started sourcing skilled labor from developing countries such as China and India and in Southeast Asia, and have been heavily criticized by national worker's unions and governments. HD Mining in Canada engaged coal miners from China to work in their underground mine.[22] While this addresses the skills requirement of the company, large-scale migration in a short period of time can create settlement issues and impact the local population. The local labor unions have challenged the decision of HD Mining in federal court that it employed Chinese workers on temporary visas impacting the job availability for local Canadian workforce.[23]

18. "Lucrative mine training contract drives record profit for institute," *The Courier-Mail*, 16 July 2012, Factiva.

19. "Odisha CM inaugurates Prerana, a skill development centre set up by Tata Steel at Kalinganagar," *Orissa Diary*, 5 January 2013, Factiva.

20. "BHP, Rio hiring local for now," *The Australian*, 29 May 2012, Factiva.

21. "Paid skills training for Indigenous candidates," *Central Midlands Advocate*, 22 June 2012, Factiva.

22. "HD Mining Invests US$15m in Tumbler Ridge for Worker Housing," HD Mining company website, http://www.hdminingintl.com/hd-invests-15m-in-tumbler-ridge, accessed 24 November 2013.

23. Murray River Project Temporary Foreign Workers Returning to China," HD Mining company website, http://www.hdminingintl.com/january-28-2013-murray-river-project-temporary-foreign-workers-returning-to-china, accessed 28 January 2013.

Outlook

In the short-term mining and metals companies may need to look at their value proposition to attract and retain staff — namely compensation and non-financial benefits. The current economic downturn eases the skills shortage pressure and also provides the industry with the opportunity to recalibrate its salary levels as compensation levels are well above the market average.

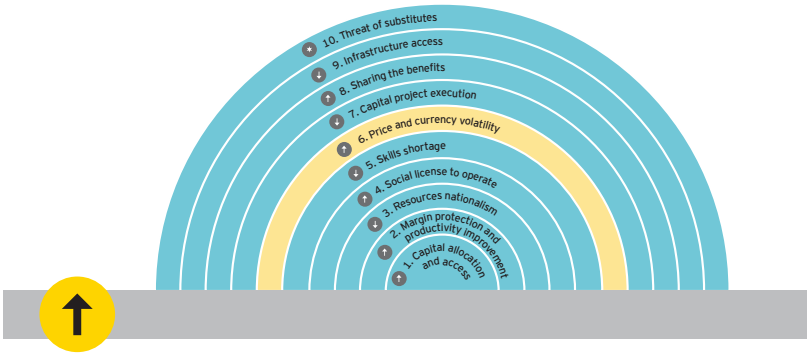
However, the sector must not lose focus and underinvest in its efforts to tackle long-term challenges posed by the issue. Skills shortage is expected to remain one of the biggest risks facing the mining and metals industry. Such an acute shortage of skills can be somewhat mitigated if the sector is able to adapt to automation of various activities, tap into newer sources of talent, and effectively manage the migration and mobility of its workforce.

Steps companies can take to respond to this risk

- Source talent from aligned sectors and a broader demographic
- Account for demographic and diversity factors when making investment decisions
- Initiate programs that encourage semi-skilled and retired workers to upskill or re-enter the workforce
- Target initiatives to retain critical skills held by older workers
- Create employment offers that better balance remuneration and career development opportunities
- Implement early labor scheduling and sourcing within mine planning
- Develop sustainable skills development programs to fill these gaps
- Develop strategic alliances with institutions and communities
- Target initiatives to understand and optimize productivity
- Substitute capital for labor through innovation

06

Price and currency volatility (7 in 2012)

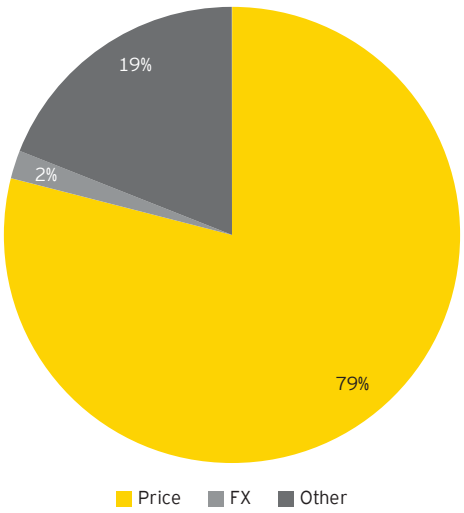


Across the mining and metals sector, there is renewed emphasis on performance, meeting targets and responding to shareholder needs, with the sentiment being one of long-term positive outlook. Producers are focusing on protecting margins and containing soaring operating costs rather than boosting output. Cost cutting and profit pressure are pushed in large part by market risks, including commodity price volatility, interest and exchange rates, and equity risk.[1]

In the December 2012 reported results of the large diversified mining companies, mineral price movements of US$20.2 billion comprised 79% of the fall in period-on-period earnings. Producer currency movements generally provide a natural hedge against these movements, as they often depreciate with falling prices. However, large-scale quantitative easing in the US, Europe and Japan has prevented this depreciation from occurring in most producer nations. As such, the currency impact on earnings was also adverse but only by 2%. This loss of a natural hedge has made it even more critical for mining and metals companies to quickly respond to volatility.

Lower commodity prices and the higher cost of mining mean producers have sought to curb costs to maintain margins. In the case of gold, producers have, where practical, targeted higher-grade ore instead of lower-grade material, which became more economic to mine as gold prices soared above US$1,800 an ounce. Producers have deliberately lowered their gold ore grades as the gold price has risen, but if gold prices remain low, the process can be reversed. The result will be less low-grade ore processed, with gold grades increasing and cash costs being reduced. An unexpected but positive side effect of this scenario is that gold mines with the flexibility to increase their head grade may actually produce more gold when prices are lower.[2]

Impact of price and currency fluctuations in diversified miners earnings
December 2012 – Fall in earnings



Source: Ernst & Young research, company reports

Is hedging a sanctuary from volatility?

The drastic fall in gold prices during April 2013 increased pressure to hedge new production forwards. In *The lost art of hedging*,[3] Ernst & Young found that a hedge program is most valuable when cash flow is at its worst – when prices are low – as long as it was entered into when prices were higher. Companies should be cautious about the herd mentality to hedge with falling prices and close out hedge books during times of rising prices. Ideally, the time to hedge is when metal prices are near their peak. A good indicator is to determine when prices are trading above their historic trend average – where hedging is more likely to produce gains rather than losses. The recent drop in the gold price demonstrated how the speed of price changes challenges in-house risk management systems to respond in a timely fashion.

While the majors may have the financial strength to absorb the downward price risk, mid-tiers and juniors entering production might not. This means smaller producers may have to bow to pressure from potential lenders to enter new hedge contracts.[4] With rising costs being a sector-wide problem, we expect to see more companies using short-term hedging to lock in costs, and potentially profits, through short-term commodity price hedging.

1. "Business Pulse – Exploring dual perspectives on the top 10 risks and opportunities in 2013 and beyond: global report," Ernst & Young, 2013.

2. "Australian gold miners give hedging the cold shoulder," *Reuters*, 24 April 2013.

3. "The lost art of hedging," Ernst & Young, April 2011.

4. "Let's hedge gold again like we did last whenever," *Mineweb*, 24 January 2013.

Volatility and risk

The mining super-cycle has amplified the price signals for increasing supply. But it has also created the conditions for increased volatility as producers chasing massive returns may collectively overshoot supply, causing prices to crash and thereby reducing future supply via the industry capital strike. This will be accentuated as many high-cost, low-grade mines, whose lives were extended by the past decade's higher prices, will close over the next couple of years in the face of low prices. Until the supply-demand equilibrium is restored, we expect to see price volatility as the new normal.

Mining and metals companies must consider the potential price and currency outcomes well beyond both current forward curves and current mine plans. Given what we have experienced in recent years, many potential scenarios could exist. Examining those as static scenarios provides little insight as to the likelihood of each. The modern mine manager must consider these scenarios in a dynamic environment that considers the probabilities of each in a deterministic fashion. Best practice in the current climate has managers measuring uncertainties, probabilities and the impact decisions may have on expected returns of their mines.

This requires the quantification of risk, which is inherently difficult to do. It is important that risks are identified, including the appropriate interactions between risks. Many mining and metals companies do this but stop there. They don't go on to assign probabilities to these risks. Much of the price and currency uncertainty can be seen empirically with how the market is pricing uncertainty. Modern computing power and models enable not just the one scenario to be prepared, but multiple scenarios using numerical methods, such as Monte Carlo simulation. The risk or the uncertainty profile helps focus management's attention on what can be done to maximize the outcomes. It also focuses attention on how much the mining and metals companies may be willing to pay, by way of cost of action, to drive preferred outcomes.

In a period of falling prices it is important to remember that there are other options to avoid the risk or suffering the fate. The challenge for managers is to identify these options and evaluate them in the face of potential price and currency uncertainties.

Using the right tools to tame volatility

The humble discounted cash flow (DCF) model is as ubiquitous to mining as hard hats and high-visibility shirts. It is the right model to apply when projects have high net present values and low cash flow volatility and when management has little flexibility in the face of changing prices and currency rates. However, in periods of high metal prices or exchange rate volatility, the temptation of many is to increase the discount rate for this perceived risk. Alternatively, the risk of volatile prices can be somewhat offset by management taking advantage of price spikes and limiting the exposure to price slumps. Such choices could include:

- Undertaking no new action
- Suspending mining and process stockpiles
- Reducing shifts and hence production
- Deferring new development
- Moving to highest-grade reserves
- Abandoning production and selling either the project or hybrids thereof

Such flexibility can alter a project's risk and value profile, and static DCF analysis does not account for how these actions affect project value and risks.

Best practice responses to price and currency volatility include using probable measures of uncertainty and flexibility analysis. This approach will not only value a project in an environment of uncertainty, but also provide mining and metals companies with a guide for the possible courses of action to optimize their returns.

Unfamiliarity with these tools and the supporting theoretical basis by decision-makers is the biggest obstacle to their widespread usage. Organizations that do use them have a distinct advantage, as long as they are able to effectively communicate their quantified choices in simple, non-technical language. For those managers who find numeric modeling and simulation frustrating, alternate price decks and multi-scenario planning tend to be effective.

"As supply begins to catch demand, we expect a period of even greater volatility in mineral prices and producer currencies. The knee-jerk reaction is to start hedging again. However, for most, the opportunity to establish an effective hedge is past – new solutions are necessary to deal with volatility. Managing revenue and cost volatility in the short term will be a focus for the miners."

Jay Patel

Mining & Metals Transactions Partner, Ernst & Young, Canada

Being nimble with cutoff grades and mine sequencing

During times of low volatility in pricing, cutoff grades are often established during the feasibility study and then never changed. As the variables for determining the most economic grade to be mined and milled become more volatile, the frequency with which they need to be revised increases.

Between 2009 and 2012, sustained price increases encouraged mine operators to maximize production, sometimes at the expense of recoveries in the beneficiation plants. However, a new price and valuation environment is allowing miners to reoptimize the grades for both the mine and the mill. Changing the residence time of ore in the beneficiation plant may change the recovery and rate of production to suit a new price environment. Having preplanned scenarios for mine and mill grade cutoff optimization in a variety of price scenarios is essential to a flexible response in a volatile price environment.

Like cutoff grades, the extraction sequence can influence the optimization of cash flows from a mine during a period of price volatility. Over the past decade, significant innovation in the techniques for long-term mine production scheduling has occurred. These techniques employ modern computing power to provide highest-value mine sequencing to changes in variables, such as price. Some of the features include evaluations of all possible bench combinations, attempts to find the best 3-D path through the deposit and nesting of interim pits culminating in the ultimate pit. The ability to quickly assess new price data and amend mine sequencing is imperative to reacting to price and currency volatility.

Increasing the flexibility of costs

Mine costs are often viewed as fixed with the only solution being to maximize production to lower the average unit cost. Managers who hold this perspective are typically most fatalistic in the face of price and currency volatility. However, it can be better practice for managers to build greater flexibility into their cost structure to provide a greater range of responses to price and currency volatility. These options allow managers to more easily vary the level of production without a major cost penalty. Some common examples include:

- Creating flexibility in maintenance to flex the timing of preventative maintenance
- Introducing mining contractors to provide labor flexibility
- Using equipment hire to support peak production
- Outsourcing energy supply to power by the hour model
- Varying stockpile management
- Undertaking campaign rehabilitation using contractors

Many of these options will challenge mining and metals companies to move from their traditional position of self-sufficiency. However, the requirement for flexibility often trumps the desire for total control and highlights the importance of partnering relationships with key suppliers of these services.

Challenging notions of scale

When production is no longer being maximized and accelerated, some of the old style mine optimization concepts come back to the fore. Questions that should be posed include:

- Is the dilution created by large-scale mining equipment tolerable in a lower price environment?
- Does a smaller-scale truck and shovel fleet reoptimize capital for the reduced scale of production and does it provide the added benefit of decreased dilution?
- During lower prices, is the mine better off under-trucked rather than over-trucked even though this costs shovel utilization?

These may all result in lower production, potentially higher recovery and lower cost. The real advantage is planning in advance to enable fast action before the majority follow suit.

Outlook

During 2013 and 2014, mining and metals companies will be preoccupied with reacting to the downside risk of price and currency volatility. The more progressive organizations will be implementing a number of the initiatives outlined herein, which will benefit the mine in all parts of the price cycle. Some will be enticed, or forced, to enter into significant hedging, which will create its own problems during the next volatile upswing. The removal of loose monetary policy and quantitative easing may well enable a subsequent wave of volatility, when producer currencies reset themselves.

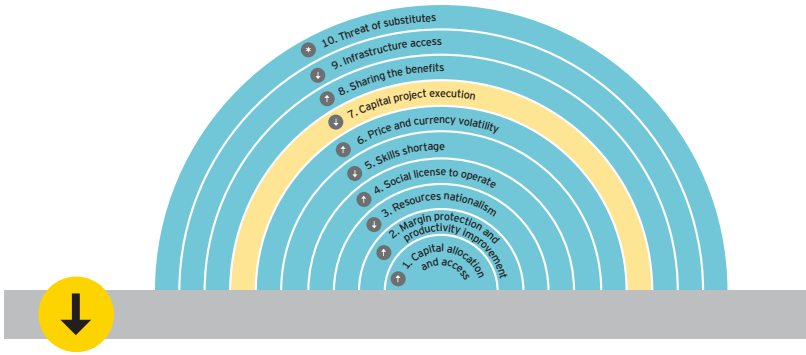
The next price upswing will provide an opportunity for mining and metals companies to commence a hedging program that can better protect them from future downward price volatility. In the meantime, management of short-term price risk will require miners to consider purchasing put options to protect themselves against perceived downside risk.

Steps mining and metals companies can take to respond to this risk

- Develop a documented understanding of the volatility of critical cash flow elements
- Improve the integration of mine and financial planning
- Improve the speed of mine planning to match volatility
- Develop a communication plan that quickly communicates changes to mine planning both internally and externally
- Give life to the identified risks in the business — to future risk management plans linked with expected returns
- Consider how price and currency volatility may change the corporate risk appetite
- Choose the right tools to identify and assess options to react to price risk
- Consider increasing the flexibility of costs to more easily vary the level of production, even if it increases overall cost
- Prepare for a future hedging program when prices once again increase, while managing short-term price risk

07

Capital project execution risk (5 in 2012)



In 2012, there were fewer capital project announcements against a backdrop of volatile commodity prices, low profitability and mounting pressure from shareholders demanding short-term cash returns be maximized. Leaders of the major mining and metals companies have responded with a capital strike, with the number of new capital projects announced in 2012 declining by 21%,[1] while the value of new projects declined by 57%.[2]

The effect of this decline will be felt in the market in the next three to seven years when the newly announced changes to the capital projects enter construction phase. As a consequence, the pressure on project construction capabilities, such as skilled manpower and equipment, should ease as demand and supply align.

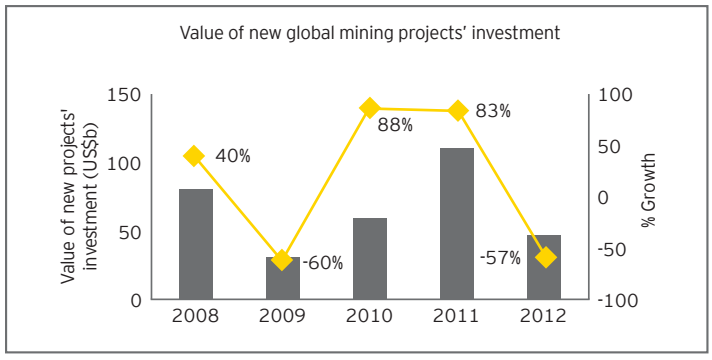
Drivers of capital project execution risk

The contributing factors to capital project execution risks are largely unchanged and include:

- Tighter constraints on capital
- Challenges in project economic forecasting
- Global program delivery inconsistency
- Global human capital constraints
- Poor cost and schedule control
- Contractor delivery reliance and yet under-performance
- Poor program and project contracting strategy
- Lack of access to strategic infrastructure
- Poor handover and production ramp-up
- Financial and commercial mismanagement
- Legal and regulatory compliance
- Health, safety, environment (HSE) and stakeholder management
- Broader usage of Engineering, Procurement and Construction Management (EPCM) and tendency away from in-house program management

The drivers of a changed risk profile

Over the past 12 months, the profile of capital project execution risk has increased significantly. It is now being recognized as a risk that needs to be addressed and one that requires proactive management. This shift has been driven by the market's focus on short-term return on investment plus recognition of the project impacts if budgets and timelines are out of sync with stakeholder demands. Poor management of capital project risk can not only compromise the schedule and cost budgets, but also have a profoundly negative impact on a company's profitability, growth prospects, social license to operate and overall financial health.



Source: Ernst & Young analysis and E&MJ's Annual Survey of Global Mining Investment

1. Note: Value and volume of new projects in 2012 may increase as announcements made by the end of 2012 are registered in Raw Materials Database by 2013.

2. Ernst & Young analysis and "E&MJ's Annual Survey of Global Mining Investment," E&MJ Engineering & Mining Journal, http://www.e-mj.com/index.php/features/2541-e-mj-s-annual-survey-of-global-mining-investment, accessed on 4 March 2013.

1. Executive leadership feels the brunt of decisions years ago

There has been a high turnover in the leadership of mining majors as executives have departed from their roles over the past year. Such changes of the guard have been due to severe cost escalations in capital projects and/or impairment write-downs on unprofitable investments, against a backdrop of economic uncertainty and unstable demand growth. While external factors played a large role, it begs the question: were they poor project decisions to begin with and are the project gating processes sufficiently robust to monitor projects through their life cycle?

2. Large mining and metal projects delayed for rationalizing and replanning

There has been a wave of decisions by mining and metals companies to delay large projects in order to rationalize or scale back these projects. For example:

- BHP Billiton decided to hold and redesign its uranium Olympic Dam expansion project, the Pothash Jansen expansion project and the Iron Ore Outer Harbour Project.[3]
- Peabody placed the expansion of its Metropolitan metallurgical coal mine and Wambo open-pit thermal coal mine on hold.[4]

Despite the reassessment of projects, we expect to see some approvals of mega mining and metals projects, albeit with a sense of heightened vigilance and prudence over scale, technology and capital outlay vis-à-vis healthy returns to shareholders.

3. Availability and cost of finance becomes dearer

Unlike previous years, the resources sector is grappling with limited availability and higher cost of finance. This further accentuates the need for careful planning of total capex, proactive portfolio management, considered project selection and efficient project execution. Several of the minor mining companies are struggling to obtain funding at the same favorable level of previous years.

4. Cost overruns and delays continue

The resource sector continues to witness high-profile critical program failures and frequent capex revisions. For instance, Barrick Gold's Pascua-Lama Gold project's cost estimate increased US$0.5 billion in less than five months to US$8.5 billion during 2012.[5] Anglo American revised its estimates for completing its Minas Rio project in 2H 2012 at a cost of US$8.8 billion.[6] Both projects are behind schedule and way over budget. These cost revisions point towards an urgent need for improved capex predictability and increased scrutiny of project execution.

There is also a heightened awareness that cash flow alone is not an adequate measure of a project's success, since the implementation of the project plan — on schedule — is also vital. The success of a project is a function of both cash flow and schedule and, taken together, these underpin an accurate estimate. Late in the development of these massive projects, mining and metals companies are even more vulnerable to resource nationalism. Investors continue to highlight the need to start the commercial production as planned to prevent erosion of prospective earnings.

3. "Outer Harbour project 'not best option right now' – BHP," *Mining Weekly*, 24 August 2012, http://www.miningweekly.com/article/outer-harbour-project-not-best-option-right-now-bhp-2012-08-24, accessed on 3 April 2013.

4. "Peabody Energy slashes growth strategy," *The Australian*, 8 September 2012, http://www.theaustralian.com.au/business/mining-energy/peabody-energy-slashes-growth-strategy/story-e6frg9e6-1226467682581, accessed 4 April 2013.

5. "Costs rise again for Barrick's Andes mine," *The Globe and Mail*, 01 November 2012, http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/costs-rise-again-for-barricks-andes-mine/article4809243/, accessed on 3 April 2013.

6. "Anglo American confirms Minas-Rio capex and records $4 billion impairment," Press Release Anglo American website, 29 January 2013, http://www.angloamerican.com/media/releases/2013pr/2013-01-29, accessed on 3 April 2013.

"There has been a growing trend in the cancellation of highly publicized mega projects over the last year, with others being delivered late, over budget or delayed. The underlying risk profile of mega projects has not changed, instead there has been a shift from scarce resources to scarce capital."

Claus Jensen
Advisory Partner,
Ernst & Young Australia

How mining and metal companies are responding to challenges associated with capital project execution

Mitigating risk is about predicting the future, and a risk management process is only as good as the people producing it. While there is an increased focus on prudent project selection and planning, there are a host of other measures available to companies to actively address the risks associated with capital project execution.

1. Increase the focus on managing strategic risks by senior management

There has been a marked increase in the involvement and accountability of executive management in portfolio management, project selection, size and scoping decisions. Mining and metals companies are making a concerted effort to staff senior management with people who have strong capital project management experience and credentials. For instance, BHP Billiton's newly appointed CEO, Andrew Mackenzie, has a strong background in the resources sector, having worked with oil and gas and mining conglomerates, which is expected to benefit the diversified mining company.

As a consequence, building a streamlined reporting structure is key for a project team in keeping executive management and their team appropriately and adequately informed about capital project execution. A robust, project-independent gating review process is also essential to enable senior management to proactively stop or mothball projects when they become uneconomic or misaligned to the company's strategy. This would help senior management to pre-empt strategic risk issues, actively address them and maintain control over the project portfolio.

2. Improve capex predictability

Companies can improve capex predictability by incorporating project assurance reviews, commissioning independent reviews and obtaining additional assurance to evaluate the projects in their portfolio. Mining and metals companies are increasingly using additional qualitative and quantitative assessment methods to measure risks and improve project estimates throughout the life of the project, and not just at the business case stage.

Overall, greater emphasis is being placed on ensuring rigor in the underlying business case data. This substantially helps improve management's level of decision-making confidence and lessens any deviation from plan during implementation.

3. Become an intelligent owner

Given the high percentage of project failures – a recent study reveals that about 65% of mega projects fail[7] – mining and metals companies must decide what their core competencies are – project delivery and/or ongoing production. Many of the large mining companies have oscillated on this point for some years now.

They now have to become an intelligent owner in the project space and decide how they balance in-house capacity and capability with external assistance through EPCMs. The focus needs to shift from short-term, tactical management of contractor relationships – where management is simply squeezing the contract terms for every dollar being spent on the project to date – to long-term strategic relationships where upskilling of both the owner and contractor results in efficiencies being created and shared fairly.

Owners are reviewing the value of their in-house project management capability and capacity. There is an increased focus on building exact and measurable performance targets and reporting mechanisms to incorporate competitive tensions and raise the bar on project delivery.

4. Establish a robust governance structure

Mining and metals companies recognize that not all major capital project activities can be outsourced. The owner needs to retain responsibility and accountability of core programs to ensure delivery is consistent with its objectives. Success depends on a sound governance structure with clearly defined roles created by the project management team, strong oversight by senior management and independent assurance by an external advisor. A robust project governance system can ensure transparency and proper accountability, which again can support effective decision-making at an executive level.

5. Encourage a culture of reporting both successes and failures

Transparency in communication can be achieved via cultural change. Emphasis must be placed on improving the culture within mining and metals companies so that not only successes are welcome, but failures are also openly discussed and accepted. This will allow them to be corrected and learned from. Many of the mega capital projects that are now being canceled and reconfigured may have been adjusted earlier by executive teams had the relevant risks been escalated sooner, with greater emphasis placed on the downsize probabilities.[8]

7. "Edward Merrow Reveals Why Megaprojects Fail in 'Project Manager,'" IPA Independent Project Analysis, January 2012, http://ipaglobal.com/News-Room/Announcements/Edward-Merrow-Reveals-Why-Megaprojects-Fail-in--Pr, accessed on 9 May 2013.

8. This finding is also supported by research and findings that was conducted by Said Business School, Oxford University Professor, Bent Flyvberg.

6. Contingency planning – what is your plan B?

Continual reviews should be encouraged at periodic intervals throughout the project life cycle to assess progress against plan and formally approve moving forward to the next project phase. These gate reviews help address any deviation from approved plan and prompt remedial measures. They also allow the executive team to review contingency planning including setting aside resources and funds. Taking the time to step back and regular review progress is key to countering unforeseen and evolving risks.

7. Asset portfolio review and management

Given the continued volatile market conditions, mining and metals companies are increasing considering divesting non-core assets – including projects under construction phase – the objective being to slim down the company's asset portfolio and invest in profitable core business activities that have assured long-term returns. Mining and metals companies are therefore continuing to develop their portfolio, program and project management processes to ensure the free flow of information to enable effective decision-making at all three levels.

8. Understand the capital project organization network and its performance could help unlock significant latent value

Mega capital projects are complex – the stakes are high, and the reliance on diverse participants to manage the risk and meet the value objectives presents an interesting challenge. Ernst & Young research has identified that a closer look at your network will reveal the way work is really done both inside and outside an enterprise. It is important to consider how an organization connects, how it communicates, how it solves problems and how it makes decisions.

Understanding the nature of these interactions will provide valuable insights into enterprise flow (information, work, relationships and costs) and hence performance. Network analysis reveals that formal enterprise flows are reasonably predictable. However, informal enterprise flows are also at play, and unless management understands the net value impact of these formal and informal flows, there is a missed opportunity.

9. Standardize design and construction

Too often organizations develop unique solutions to standard problems. The key to gaining productivity and reducing risk is to standardize, replicate and leverage existing engineering designs and practices. Management needs to have a stronger control environment to force engineers to comply with a company's design standards and off-the-shelf solutions that they have already designed, tested and implemented in another project.

Outlook

Recent research undertaken by Ernst & Young indicates that while there have not been great improvements in capital project execution within the mining and metals sector, it has not deteriorated. In order to make step-change improvements and prevent project failures, there needs to be more innovation in how projects are undertaken. They also need to be managed within a more holistic investment portfolio.

Capital investment management and project delivery principles – such as portfolio/program optimization, front-end loading, value engineering and modular construction approach – are now becoming widely used terms within capital projects in the mining and metals sector. It is therefore imperative that executives demand more emphasis be placed on understanding the benefits and risk of these processes before a project has even been approved.

While the time of project failures is certainly not behind us, many large and spectacular ones have already occurred with detrimental consequences for some CEOs of major mining and metals companies. In an environment of volatile commodity prices, low profitability and mounting pressure from shareholders, it stands to reason that future mega projects be approved as programs with multiple projects to provide executives with more options for reassessment throughout the project life cycle.

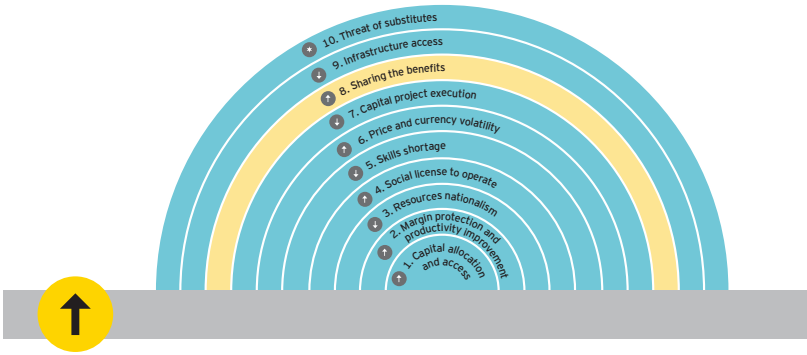
Steps mining companies are taking to respond to this risk

- Rigorous portfolio management and greater scrutiny around project selection, prioritization and management is vital
- Operationalize knowledge management through incorporating learning, technological advancements and benchmarks into all procedures and databases
- Implement an effective risk management process where there is a clear line of sight between project, portfolio and strategic risk management such that objectives are supported by appropriate tactics that address all potential project threats
- Ensure project and supply chain performance is monitored and managed by aligning owner and contractor teams alike through pragmatic contracting strategies and incentive programs
- Implement advanced assurance frameworks that provide independent review and oversight over project performance

08

Sharing the benefits

(9 in 2012)



The past year has seen a dip in the value created by many mining and metals companies in the face of lower commodity prices, higher costs, increased risk and capital project overruns. While the benefits for stakeholders of mining and metals projects have shrunk, there is a lag in the readjustment of their expectations and most are still demanding a greater share.

In 2012, the demands of and the value created by mining were both increasing and producers were struggling to balance the two. In 2013 and 2014, there is even greater urgency to respond to stakeholder demands given the lower base of distributable value. Furthermore, most companies are still adjusting to sharing the benefits in a reactive manner.

The lag occurs as the signals of change in the return to the stakeholder do not occur simultaneously with the price signals received by the mining and metals companies. For example, lower coal prices do not cause coal workers or their unions to moderate wage demands until a number of high-costs mines begin to close and the number of unemployed mine workers increases. Miners increase this lag by delaying the suspension of cash negative mines.

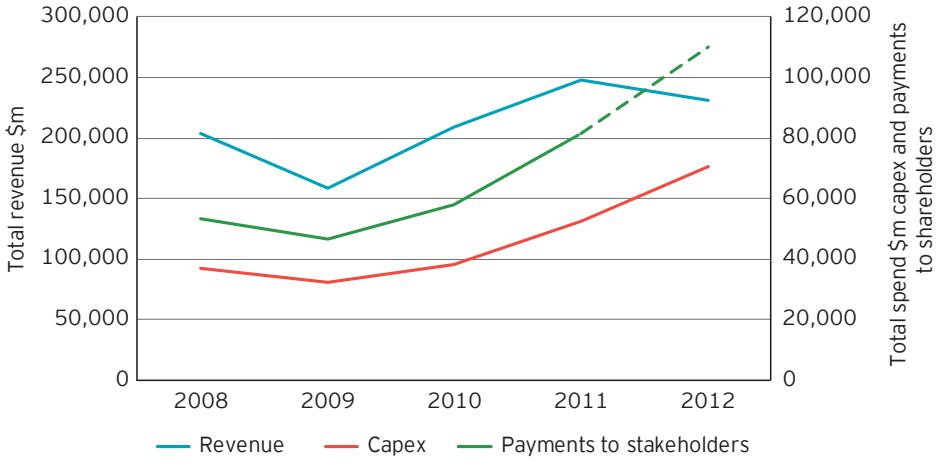
The following table sets out the time it takes from when a signal occurs to when a reduction in demand is seen.

Stakeholders	Signals	Timing after a fall in prices
Government	▸ Drop in investment in the sector ▸ Relative poor performance in attracting investment ▸ Mine closures	12–24 months
Employees	▸ Mine closures ▸ Rise of unemployment	18–36 months
Communities	▸ Lower economic activity from the mine ▸ Reduced capital spend ▸ Mine closures	24–36 months
Shareholders	▸ Lower profits ▸ Reduced cash flow ▸ Mine closures	6–12 months
Suppliers	▸ Less purchasing volumes ▸ More competition in tendering ▸ Contract renegotiations	0–12 months

Source: Ernst & Young

To combat this, organizations need to take a longer-term view of this risk and proactively manage stakeholder expectations, both of which will make them more sustainable in the long run. Continued investment in countries that look to actively reduce investment risk is a way of doing this, delivering longer-term benefit to governments and sustainable growth for communities in which the operations are situated. Other initiatives include working with employees to improve productivity and provide a basis for real wage increases.

Investment and pricing boom peaked



Source: Capital IQ, company reports, Ernst & Young analysis

Understanding and managing stakeholders

Stakeholder demands and needs differ depending on the group and their associated emotions, drivers and demands. These groups typically include governments, communities, shareholders, employees and suppliers. Understanding their differences, and managing these accordingly, will secure the best outcome for all.

1. Governments

Government demands have broadened as they seek to secure greater domestic participation in the wealth of the super-cycle. Originally governments primarily sought to increase royalties and taxes but their requirements have expanded to include increased participation through in-country beneficiation and direct or other domestic participation in projects. Examples are South Africa's yet-to-be implemented beneficiation strategy, the recent export tax on unprocessed ore in Indonesia and increased government participation in Mongolia. These are covered in more detail in the resource nationalism risk section of this report. Governments are notorious for creating policy by referring to yesterday rather than anticipating tomorrow. Unfortunately, resources policy is targeting a risk/reward profile that the mining and metals sector has not enjoyed for a number of years.

2. Communities

Many communities perceive that while they are most impacted by intrusive mining and metals activity, other stakeholders in a mining and metals project prosper more. Because of this, communities feel they are entitled to receive a greater share of the benefits often resulting in greater militancy amongst communities, e.g., in Peru and Chile. Communities need to clearly see a full range of benefits from mining, from financial gain to improved infrastructure, increased employment opportunities and expanded business opportunities. Many of these benefits will ensue as a result of a new mine; however, companies need to be more adept at communicating the benefits to the communities at the time of consultation.

In Australia, community frustration has bubbled up over the coal seam methane industry. Miners do not require surface rights to extract coal seam methane, and because farmers are unable to unlock into the economic value beneath their land, they are turning to other mechanisms such as water quality concerns to stop exploration, development and production. This is resulting in negative behavior, which can block the economic benefit for all. Queensland Gas has broken the deadlock by taking a proactive approach to this problem and recognizing its moral obligation to serve the interests of the community. It has amicably negotiated a large number of agreements with landholders without going to court, which has historically been the course of action.[1]

1. "CSG sector signs deal a day with farmers," *The Australian*, 4 April 2013 via Factiva.

"We are now seeing increased demand from most stakeholders for a larger slice of a shrinking pie."

Mike Elliott
Global Mining & Metals Leader, Ernst & Young

3. Shareholders

Shareholders have also become increasingly vocal in their demands. They feel they have seen little return in a period of large profits and reinvestment in high-cost, organic growth and low-value M&A. Recent impairment changes have only aggravated this attitude. As a result, shareholders have become more critical of the performance of management and boards, with the effect on senior management evidenced by recent CEO turnover.

A key focus of this demand is the greater return of profits to shareholders going forward as a benefit for the risk taken in investing. The pent-up demand for greater cash returns to shareholders is creating an environment where long-term value creation is being sacrificed for short-term cash distributions. Not only are time horizons reduced, but risk appetites have become far more conservative. Neither is healthy for the sustainability of the sector.

This has the potential to limit longer-term growth for both a company and the sector as investment in mining and metals projects is a decades-long commitment. Companies need to turn this around through clearer communication with shareholders about the importance of a long-term growth strategy and attract investors who share this longer-term vision. They need to combine this with more rigorous decision-making processes for potential investments to provide shareholders with confidence in its future value.

4. Employees

Labor strikes have been increasing in both frequency and duration, even though prices are down. Organized labor in mines has the potential to make industrial relations a political issue. This was seen at its extreme in August 2012 at the Marikana platinum mine in South Africa when 34 striking Lonmin mineworkers were shot dead and 78 were wounded after police opened fire.[2] This highlighted the need for direct communication channels with workers. While workers may aspire to higher real wages, the dialogue needs to be about achieving productivity improvements to justify such increases. Prior to the super-cycle, this was a regular feature of the labor bargaining process.

5. Suppliers

Mining and metals companies have already started working with suppliers. This is one of the few stakeholder groups being handled well. The sector's response to supplier demands has been more proactive and has included renegotiating supply agreements. With the renegotiated contracts, suppliers have been able to see the longer-term benefit of decreasing margins to retain a relationship. This has allowed the relationship focus to switch from short-term outcomes to exploit scarcity to longer-term strategies.

Outlook

While stakeholder demands will naturally rebalance over time, as shown in the table, those mining and metals companies that can best communicate with their stakeholders to bring that rebalancing forward will create greater value. It is vital that the next reset does not sow the seeds of stakeholder discontent for the next recovery in mineral prices.

Steps mining and metals companies can take to respond to this risk

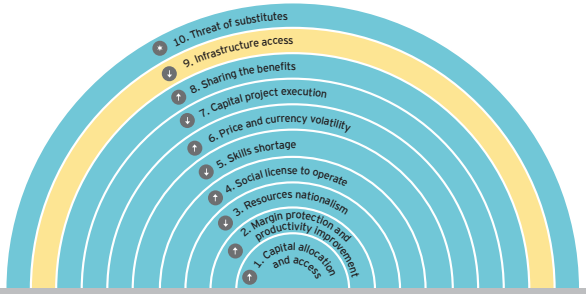
- Assess stakeholder claims in the context of mine valuation
- Obtain trade-offs that limit the impact on mine valuation
- Use risk transfers as a value creating trade-off
- As sharing the benefits is short term, locking in the stakeholders for the long term is a positive trade-off
- Increase the transparency in reporting stakeholder benefits from a mine or a facility

2. "The unexamined massacre of the Marikana miners," *The Guardian*, 21 March 2013, http://www.guardian.co.uk/commentisfree/2013/mar/21/marikina-miners-south-african-protest, accessed 10 May 2013.

09

Infrastructure access

(3 in 2012)



Economic growth in rapidly developing economies continues to put pressure on mining and metals companies to increase supply through the development of new or existing mineral deposits. Increasingly, new deposits are found in the so-called frontier countries where development is challenged through the lack of infrastructure.

Infrastructure for transport, water and energy is a significant portion of any capital allocated to a mining and metals development project. It can account for up to 80% of the mine development costs, up from around 40% in the late 1990s.[1] In addition to general inflationary effects, this increase is largely attributable to the increasing remoteness of many new deposits and the resultant scale and complexity of the required developments to bring the resource to market. For example, the development of the Meadowbank mine in Nuvanut, Northern Canada, required Agnico-Eagle to develop an all-weather road to supply fuels, an airstrip for worker movement and extra storage for an entire year's inventory as the mine has only seasonal access to supply fuels. These needs are in addition to the standard mine infrastructure, which included eight major buildings and an electricity generation plant.[2]

Increasing regulation in the form of permit requirements from various agencies and provincial governments (railways (private), land (provincial) and/or ports (federal)) are further impediments that elevate development costs and risks of success for a project. For example, Rio Tinto had to write down its Mozambique coal assets as it could not economically export coal out of the region due to the need for substantial investment in supply chain infrastructure.[3] Australian miners have also argued that significant amounts of red and green tape are adding to the overall cost of development in Australia, eroding the competitive advantage of the sector compared to overseas markets.

Need to ramp up infrastructure — public making way for private

The increase in development costs is being compounded by the current economic climate and subsequent pressure on funding. This is a perfect storm of high costs and capital constraints resulting in a significant infrastructure funding gap where neither governments nor miners are able to fund all of the mining infrastructure needs.

Weak budgetary positions has meant that governments across the globe are less willing and able to fund infrastructure and want the private sector to take the lead in the funding, design and construction of the required infrastructure. Additionally, smaller economies do not always have the necessary means to support the huge capital spend requirements. For example, in Guinea, the capital spend required to construct two railway lines and one port to support the development of two iron ore mines is equal to the country's GDP and around 10 times its national budget.[4]

What is clear is that the private sector will need to respond to deliver the required investment in infrastructure. Doing so will require changes to historical approaches to infrastructure investment, which have typically been government-led, to one which places third-party capital at the forefront. Potential capital sources include both miners and infrastructure investors, and in some jurisdictions (Australia, Canada), there is a growing trend of such investors looking to take long-term ownership positions in multi-user infrastructure assets. The risk allocation needs to reflect the genuine exposures and appetite of the various transaction participants (miner/user, debt funder, investor, government) as this is key to delivering such investment.

> "In our experience, it is not so much a lack of availability of financing but that the risk allocation is not appropriately structured to support positive investment decisions. Construction, volume and pricing risks, expansion rights, and open access issues all need to be carefully structured and allocated."
>
> **Neal Johnston**
> **Infrastructure Advisory,**
> **Ernst & Young**

In addition, the cautious lending approach of banks and the weaker balance sheets of many miners mean that they are not always prepared to lend into infrastructure. The introduction of Basel III norms in the coming years is also likely to drive up the cost of debt for long-term projects.

1. "Where have all the minerals gone?," *Mining Magazine*, 28 August 2012.
2. "The future of mining in Canada's north," The conference board of Canada, January 2013, pg.32.
3. "Rio's $3 Billion Mozambique Coal Bid Held Up by Transport," *Bloomberg*, 20 February 2013.
4 "Challenges and Opportunities Facing African Mining," International Finance Corporation, PDAC Conference 2013.

"Access to infrastructure is a fundamental part of doing business in any market, and while the challenges remain more or less the same, the solutions are becoming increasingly creative and collaborative."

Mark White
Partner, Mining & Metals
Ernst & Young Australia

To fill this funding gap, mining and metals companies are having to reassess their infrastructure needs and revise their strategies as follows.

1. Majors — selective in their capital allocation

Large organizations, under increased shareholder pressure, are allocating capital to projects where the margins are highest.[5] They have also deferred projects and announced significant capital expenditure cutbacks. For example, Anglo American cut its 2012 capital expenditure by US$1.2 billion,[6] Teck Resources deferred around US$1.5 billion in capital spending[7] and Fortescue Metals cut its 2013 capital expenditure guidance from A$6.2 billion to A$4.6 billion.[8] BHP Billiton has deferred its Olympic Dam expansion and its Port Hedland Outer Harbor expansion project and embarked on a significant cost reduction program. In a similar vein, Rio Tinto has focused on cost reduction and rationalization of core and non-core assets.[9]

2. Juniors — increasing collaboration

Junior mining and metals organizations lack adequate resources to self-fund infrastructure development. These miners are either collaborating with each other or larger off-take customers to eliminate the project risks and come to a funding arrangement. Governments in Africa also appear to be collaborating and are using a development corridor approach to develop deposits on the continent. For example, the proposed Niger development corridor covers several African countries (including Senegal, Gambia, Mali, Nigera and Nigeria) to exploit iron ore, aluminum, uranium, oil and natural gas, tin, and phosphates.[10]

3. All organizations — selling stakes in infrastructure assets

Companies that own infrastructure or have made significant investments in the sector are focusing on optimizing their assets through cost control and proper utilization of infrastructure assets. Fortescue Metals Group, which originally owned and funded port and rail assets in Pilbara, has offered to sell stakes in the asset to lower its debt and unlock the value of existing assets.[11] Last year's decline in iron ore prices has caused companies to reassess their asset base. Similarly, GVK Group recently sold a 51% interest in Hancock Coal Infrastructure to Aurizon to jointly develop rail and port infrastructure in the Galilee Basin.[12]

These trends show that organizations are changing the way they view control of infrastructure. In an ideal scenario they would prefer single-user systems that provide complete control of infrastructure development. This would enable them to control the speed of project development and bring on various parts of the infrastructure, such as rail and port capacity, synchronously and more efficiently. In a shared infrastructure solution, asset owners and miners may respond differently to emerging price signals. The infrastructure operator earns regulated returns and may not be as incentivized as a miner to alter capacity. Despite this, in the current operating environment, a shared approach to infrastructure appears to be a more appropriate and creative solution.

Government participation — supporter not investor

Despite their inability to fund whole infrastructure projects, governments continue to have a significant influence on how infrastructure projects are developed. Lack of clarity from governments over long-term development plans may make companies hesitant to fund infrastructure when there are no guarantees about competing facilities being established in close proximity. In frontier markets, there is the added risk that the government may terminate agreements or, even worse, expropriate or take control of the infrastructure. Nevertheless, in some jurisdictions, governments have been very proactive in establishing plans and policies to develop the projects. For example, Canada's favorable tax and finance system includes provisions to recover a significant portion of capital investment before paying taxes. The Australian Government's compulsory land acquisition rights are well ahead of countries such as India and Indonesia. Policy certainty in terms of regulatory and legislative framework would allay investors' concerns in funding longer-term projects.

Governments looking to stimulate investment may also consider providing support to lower the residual value risk of some long-term assets. Third-party investors will seek to match the amortization profile of infrastructure assets to the underlying mine life. While this is entirely appropriate, it does not take into consideration either the potential for future use of the assets by other parties or later

5. "Interim results, Half year ended 31 December 2012," BHP Billiton, 20 February 2013.

6. "Anglo cuts $1.5bn capex, promises $200m platinum cut by year-end," *Mining Weekly,* 27 July 2012.

7. Teck Resources Q3 profit plunges, capex deferred," *Mining Weekly*, 24 October 2012.

8. "Fortescue cuts A$1.6bn from capex, curtails expansions," *Mining Weekly*, 4 September 2012.

9. "Rio Tinto aims to cut almost half of jobs at London HQ," *Reuters*, 29 April 2013.

10. "Exploiting natural resources for financing infrastructure development," African mining vision, http://www.africaminingvision.org/amv_resources/AMV/Financing%20mining%20related%20infrastructure%2030%20Nov%202011.docx, accessed on 30 April 2013.

11. "Fortescue to offer infrastructure stake," *Australian Financial Review*, 17 December 2012.

12 "Aurizon, GVK Hancock collaborate on A$6bn Galilee rail, port project," *Miningweekly.com*, 11 March 2013.

mine expansion. With its longer-term investment horizons and desire for growth in the market, governments could consider providing a form of usage guarantee beyond the original mine life – this will push out the amortization of the asset, drive lower take-or-pay charges and improve project economics.

While governments are providing the private sector with incentives to infrastructure development, they are also asking organizations to provide additional alternate capacity for social development. Mining and metals companies are responding by assuming a greater role in educating governments about their ability to fund infrastructure. In addition, they are building social infrastructure and involving governments and communities at an earlier stage.

Non-traditional financiers

Mining and metals companies are increasingly collaborating with non-traditional financiers such as customers and equipment suppliers to develop infrastructure and projects.[13] Such financiers are typically from emerging countries and tend to have government backing. They seek off-take agreements and look for larger control over the project. In these situations, mining and metals companies have little choice but to share or surrender control in exchange for otherwise scarce funding.

Funding from these emerging market companies has gradually increased over a period of time, with funding assistance from emerging markets now comparable in scale to traditional official development assistance (ODA) from OECD countries. China is the most active non-OECD financier in this regard and is using the Resource for Infrastructure model to finance these projects. Under this model, loan repayment is made in exchange for natural resources. This model is being used widely in Africa and is especially attractive for countries that do not qualify for funding from traditional development financial institutions as companies cannot provide adequate guarantees for loan repayment.

Another subgroup of investors showing interest in the resources sector is private equity. Data indicates a substantial increase in private equity fund raisings targeted at resource sector investments, with amounts greater than US$10 billion per annum projected.[14] There are potential control issues as private equity investment is typically equity, but it is clearly a funding source that should be explored.

Institutional investors

Institutional investors, such as superannuation/pension funds, sovereign wealth funds and infrastructure funds have emerged as other sources of infrastructure funding. These funds are interested in long-term stable returns and prefer take-or-pay contracts. The public private partnership (PPP) model is also being employed to develop infrastructure projects: the Indian Government's recent proposed PPP model for coal development in the country being a case in point.[15]

Outlook

Organizations are torn between shareholders' desire for short-term gains and restricted capital spending, with the need to maintain a healthy pipeline of projects in the long term. The challenge therefore is to be ready with projects when market conditions improve or risk losing market share to competitors. Development of these projects, a significant part of which is infrastructure development, will require increased coordination and collaboration between mining and metals organizations and other organizations. For their part, mining and metals companies will have to look for innovative commercial solutions and be willing to share control of the infrastructure.

Steps mining and metals companies can take to respond to this risk

- Consider the extent infrastructure deficits may impact on enterprise value
- Understand the return on all capital expenditure, including infrastructure, and consider appropriate financing
- Identify other stakeholders to co-develop a solution with shared benefits
- Investigate partnerships with potential stakeholders in expanded infrastructure to innovate financial arrangements including off-take
- Improve mine planning to assist in assurance over optimal levels of take-or-pay commitments
- Work with governments to co-develop infrastructure solutions that address the commercial, financing, delivery and regulatory risks of all parties

13. "Chinese infrastructure giant eyeing Canadian gold," *Mineweb*, 15 February 2013.

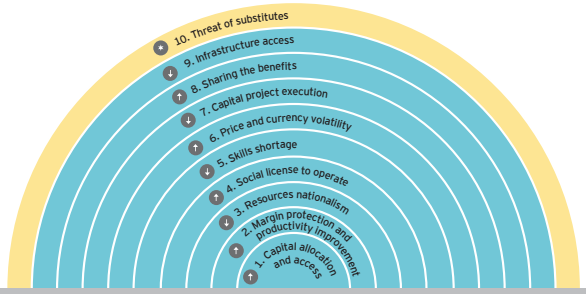
14. "Q&A with Ken Hoffman, Sector Head – Mining & Metals from Bloomberg Industries," *minesandmoney.com*, 12 March 2013.

15. "Oz miners eye India's PPP model for Coal India," *Business Standard*, 8 March 2013.

10

Threat of substitution

(new)



For single commodity organizations, or organizations where one commodity dominates the product mix/profit share, substitution is a very credible and looming threat, especially when the commodity's recent price has been high or there is a regulatory push that affects its prolific use.

While substitution affects some commodities more than others, there are major drivers that are early indicators of a threat. Once substitution starts occurring, it could cause a structural shift in consumer habits, making it potentially irreversible.

Major drivers of substitution include:

- Regulatory push
- Market drivers – cost of commodity and supply of commodity or so called price-driven substitution as seen in the substitution of palladium for platinum
- Products with low profit margins and less dependence on quality and performance
- Environmental concerns
- Advances in technology

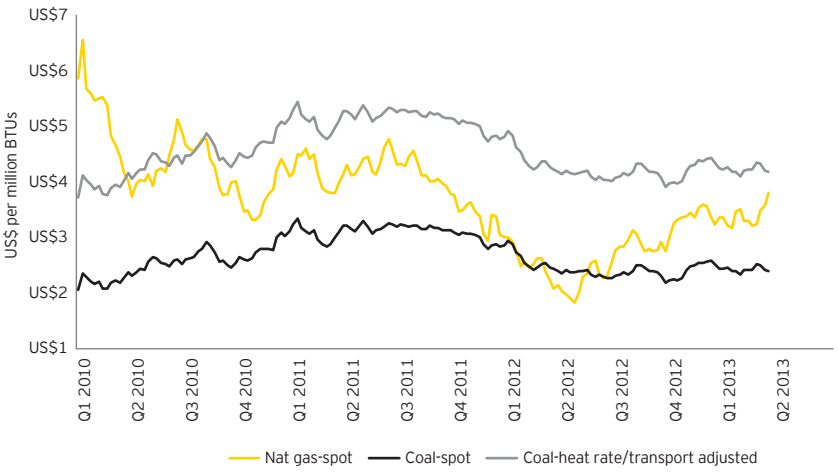
Threat of substitution is one that can unexpectedly build momentum, should the right conditions prevail. None is more prevalent than the shale gas-for-coal substitution that has occurred in North America. Not only has it impacted this market, but it is changing the way this industry group is operating.

Shale gas for coal substitution

The transformational effect that shale gas has had on the outlook for the US energy market has been unprecedented. The increase in US gas production, together with the associated fall in gas prices, has created the perfect environment for large-scale coal-to-gas switching. In 2012, coal's share of power generation stood at around a third,[1] or 40%, and natural gas accounted for approximately 30%. This is in stark contrast to 10 years ago when natural gas made up just 18% of US electricity production, compared with 50% for coal.[2]

Furthermore, the International Energy Agency has projected that the US is set to attain virtual energy self-sufficiency by 2035.[3] This will exacerbate this trend as the abundance of inexpensive natural gas, and low natural gas prices will see further large-scale substitution of thermal coal for natural gas as an economically attractive decision. Government regulations such as the US Environmental Protection Agency's Mercury and Air Toxics Standards rule (finalized on 16 December 2011 and updated on 28 March 2013) are just further encouragement for power and utility companies to substitute natural gas for coal.[4]

Competitive fuel prices: 2010–13 (weekly averages)



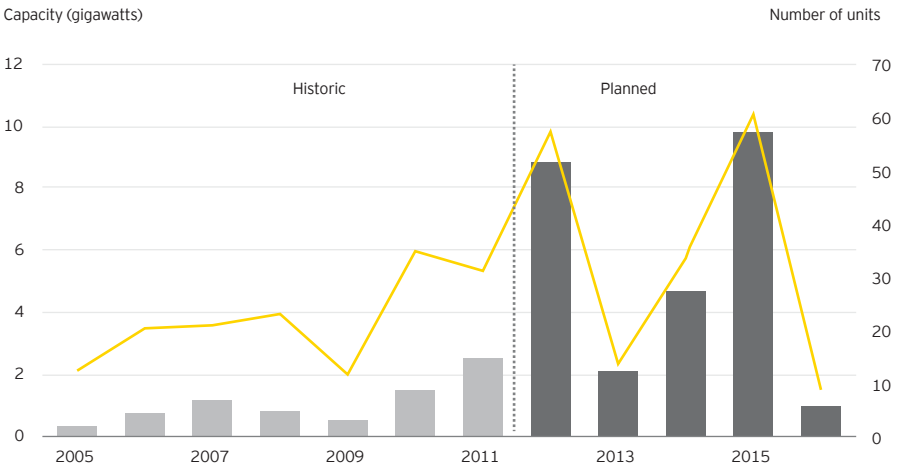
Source: Natural Gas Week, Energy Intelligence, Thomson Reuters, Ernst & Young analysis

1. "The shale revolution," *Credit Suisse*, 13 December 2012.
2. "Rush to natural gas has coal-fired utilities seeing red," *Wall Street Journal,* 23 January 2013.
3. "Business Pulse – Exploring dual perspectives on the top 10 risks and opportunities in 2013 and beyond: global report," Ernst & Young, 2013.
4. Coal Unit Shutdowns – *current as of 2 May* 2013, American Coalition for Clean Coal Electricity, www.americaspower.org, accessed 6 May 2013.

The drop in coal demand has seen the closure of more than 50 mines in the US over the last two years. To survive, a number of coal producers are diversifying out of just thermal coal into metallurgical coal and gas:

- Consol Energy is reducing its planned capital expenditure by about 11.5% to between US$1.29 billion and US$1.5 billion, with between US$835 to US$935 million earmarked for the expansion of the company's natural gas operations.[5]
- Georgia Power, a subsidiary of Southern Company, has announced plans to retire 2,000 megawatts of fossil-fired generation, shedding 15 coal and oil facilities. Five years ago, the parent's fuel mix consisted of 70% coal, which has since dropped to 47%.[6]
- Duke Energy plans to shutter 6,800 megawatts of coal-based electricity by 2015. It will spend US$9 billion to upgrade its generation fleet, which involves mostly the construction of natural gas units, as well as an advanced coal gasification plant that will become operational later in 2013.[6]

Historic and planned retirements of coal-fired generators



Source: U.S.Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

Note: Data for 2005 through 2011 represent actual retirements. Data for 2012 through 2016 represent planned retirements, as reported to EIA. Data for 2011 through 2016 are early-release data and not fully vetted. Capacity values represent net summer capacity.

Excess supply finds new markets

The shale gas boom in the US is beginning to have a large knock-on effect around the world. The US Powder River Basin (PRB) is seen as a massive source of cheap coal supply, and it dominates the US market for steam coal. But the declining competitiveness of coal as a fuel for electricity generation in the US leaves PRB coal looking for more robust markets such as China and India. If port and rail constraints are removed and demand from Asia continues to grow, PRB exports to Asia could surpass those of South Africa but will still remain shy of export totals from Indonesia and Australia.[7]

US coal has increasingly found its way into European markets, where it has displaced more expensive gas as a feedstock for power stations. This has seen utilities increase their use of coal, despite EU environmental policies designed to curb polluting fossil fuels in the energy mix. But many experts believe coal's European revival will be short-lived, and in the long-term, coal's comeback will inevitably fall foul of EU environmental policy. This policy calls for a 20% reduction in carbon emissions from 1990 levels by 2020 and a growing role for solar, wind and biomass in electricity generation.[8]

Due to the shale gas revolution and the lack of material natural gas export capacity, natural gas pricing in North America has become disconnected from other regions of the world. Henry Hub prices now stand around US$4.08 per million metric British thermal unit (MMBtu), far lower than in Europe or Asia.[9]

5. "CONSOL Energy Announces Expected Net Investment in 2013 of $835-$865 Million," CONSOL Energy news release, 14 January 2013.

6. "Coal to gas moves are generating economic waves," *Forbes*, 13 March 2013.

7. "Coal in Asia and the impact of the shale gas revolution," Mark Thurber, Associate Director of the Program on Energy and Sustainable Development at Stanford University interviewed by The National Bureau of Asian Research, 21 March 2013.

8. "Shale gas boom sparks EU coal revival," *FT.com*, 3 February 2013.

9. As at 9 April 2013.

"As a newcomer to the top risks in the sector, threat of substitution has been transformational for the US coal market with global ramifications. For other commodities, it has the capacity to radically change their market should the right conditions prevail."

Bob Stall

Americas Mining & Metals
Transactions Leader, Ernst & Young

Over the past year, the disparity between Henry Hub prices and European or Asian prices has encouraged North American natural gas producers to consider exporting LNG to access overseas markets. The impact this could have on natural gas prices elsewhere in the world has attracted interest.[10] In the short term, Asian buyers are motivated by this price differential. However, if they do successfully lock into North American gas prices, they will be making a significant change to the risk profile of their LNG supplies. They will swap oil price risk (reflecting the possibility of conflict in the Middle East, OPEC production quotas and the like) for Henry Hub risk. The latter is much more about US gas supply/demand and longevity of the shale gas revolution. The export of gas will likely raise US gas prices and lower those for the rest of the world. This will make gas more competitive against coal elsewhere.

In the near term, coal is likely to remain vital to the energy requirements of many nations. In time, there will be a rebalancing of coal, with most nations reducing their reliance on coal. However, the biggest impact is unlikely to be felt until after 2020, with China's ability to follow the US's lead and effectively utilize its large-scale shale gas resources being the key swing variable. Some say that from 2020 onward, gas's dethroning of coal looks increasingly inevitable, as China and India move to diversify their energy mix.[11] Until such time, US coal producers are likely to remain under pressure in their domestic market, but export opportunities should offer them some comfort. Ernst & Young suggests that US coal producers keep an eye on changes and developments in the oil and gas market and ensure they are ready to ship their coal into these emerging growth markets.

The shale gas success story in the US has resulted in heightened speculation over the potential for shale gas to transform energy markets in other regions. In Europe, exploration is under way in a number of countries. However, supply and infrastructure issues mean that the experience in the US may not be easily replicated in Europe, making the impact less transformational. Other countries in the early stages of developing their shale resources include the UK, Australia and Argentina; however, differences in the geological and operating environment mean that new technological innovations will be necessary.

Though early stage, use of natural gas in steelmaking is gaining traction as another alternative for lowering carbon costs. Gas can be used as an alternative to pulverized coal injection coal and also in the production of direct reduction iron, a substitute for scrap metal in electric arc furnace. The abundance of shale gas in the US and its increased usage in steelmaking would negatively affect US-focused metallurgical coal producers.[12]

Other substitutes

Aluminium for steel

Government policy can influence the move towards substitution. None is more prevalent than the US Government's new emissions standards, which have challenged manufacturers to make cars more fuel efficient by making them lighter. This has led to a steel-for-aluminium substitution, with the steel producers turning to high-tech steel products as a means of defending their market share. But aluminium is set for gains over the next decade as the US slashes the weight of pick-up trucks and SUVs, while high-strength steel grades are likely to dominate in Europe.

Palladium for platinum

Platinum group metals (PGMs) are characterized by high and volatile costs, leading consumers to consider substitutes. Palladium can now be substituted for platinum on a one-for-one, ounce-for-ounce basis, which has strengthened the market for palladium in gasoline catalytic converters. Advances in catalytic converter technology include a continual fine-tuning of the technology to steadily thrift down the PGMs in order to meet a given emission standard.[13]

Aluminium, plastics, fiber optics or steel and graphene for copper

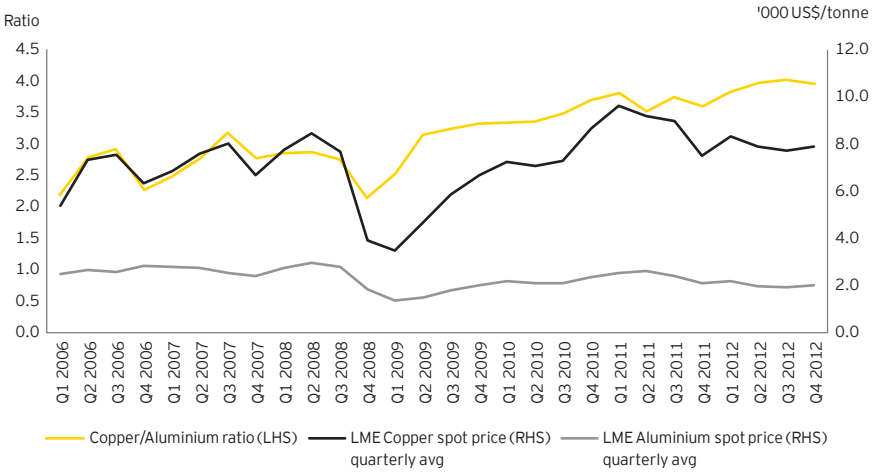
Copper is most at risk of substitution in roofing, plumbing tubes, refrigeration, air-conditioning and computer chip interconnects, with substitution reducing copper demand by 400,000 to 500,000 tonnes in 2012.[14] One of the most prevalent substitutes, aluminium, has largely replaced copper in automotive precision tubing to reduce vehicle weight. It is also threatening copper tubing in refrigeration and air-conditioning.

Price is the driver for copper substitution. Aluminium's increasing price advantage is reflected in the current copper/aluminium price ratio of 4:1 compared with the historic ratio of between 2:1 and 3:1. Aluminium has been trading at around US$1,860/tonne since the beginning of April 2013 – a quarter of the prevailing copper price. Once this ratio crosses 3:1, substitution between the metals typically gathers pace.

Despite the recent slump in pricing, in 2012 and early 2013 copper prices remained historically high at US$7,500–US$8,500/tonne, prompting consumers to shift to cheaper alternatives. The good news for

10. "A volatile mix," *Utilities unbundled: Issue 13*, Ernst & Young, December 2012.
11. "The shale revolution," *Credit Suisse*, 13 December 2012.
12. "Global coking coal," *JP Morgan*, 11 December 2012.
13. "Global palladium supply faces substantial deficit-Stillwater Mining," *Mineweb*, 27 September 2012.
14. "Copper Substitution Seen by KME Accelerating on Slow Growth," *Bloomberg.com*, 5 March 2013.

Copper price versus aluminium price



Source: Thomson Datastream, Ernst & Young analysis

copper is that many applications highly reliant on copper's conductivity, such as building wire, power generation infrastructure and electrical connectors, cannot use substitutes and account for nearly 50% of its demand. However, if prices remain at present levels, the balance of total end-use copper demand could be lost to substitution in the medium to long term.

Pig iron for nickel

Chinese nickel pig iron (NPI) production – China's answer to avoiding nickel imports – remains a major issue for global nickel supply. Although this market is very sensitive to price fluctuations, its present overcapacity is a buffer to the upturn in nickel prices.

The cost of importing the low-grade nickel-bearing ore from Indonesia and the Philippines, which the NPI production process depends on, varies with the price and grade of nickel in the ore. However, the high energy consumption involved in the production of NPI can make the process cost prohibitive at times of weak nickel prices and sluggish demand from the stainless steel industry.[15] The threat of the Indonesian ban on nickel ore exports could eventually force the NPI industry to migrate from China closer to the ore in Indonesia and the Philippines (both countries produced their first NPI in 2012).[16]

Potential rare earths substitution

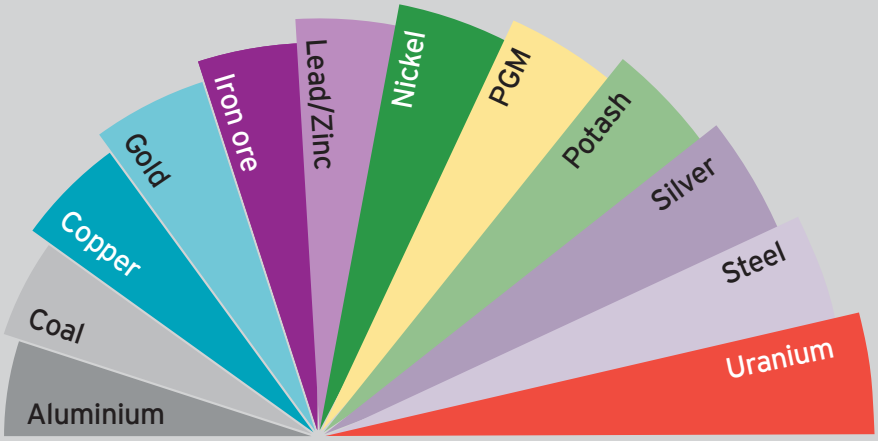
In the last few years, rare earths have gained global attention as China, which produces more the 90% of global supply, repeatedly clamped down on exports, causing prices of the individual oxides, alloys and metals to soar. Given the associated challenges of availability and security of supply, automakers, clean tech developers and rare earth substitute makers are looking for alternatives to reduce their exposure to these expensive raw materials.[17]

Steps mining and metals companies can take to respond to this risk

- Keep an eye on government regulations and actively participate in sector discussion around policy changes
- Be in a position to plan by having in-house trading operations and the ability to access global markets, should the domestic market dry up
- Monitor interdependent sectors, e.g., power and utilities, oil and gas. Coal companies should monitor market developments to avoid being caught by surprise when increasingly prominent substitutes increase their share of the global energy mix
- Engage in a balanced and proactive discussion with regulators, the public and their shareholders on the perceived risks associated with producing unconventional sources[18]

15. "Chinese NPI producers not likely to increase production soon," *Metal Bulletin*, 21 September 2012.
16. "Indonesia's first nickel pig iron smelter starts output," *Reuters news*, 1 November 2012.
17. "Analysis: search for rare earth substitutes gathers pace," *Reuters news*, 22 June 2012.
18. "Turn risks and opportunities into results: Exploring the top 10 risks and opportunities for global organizations – Oil and gas sector," Ernst & Young, 2011.

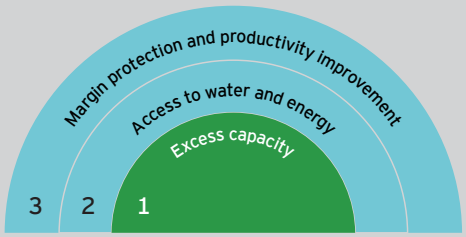
Top risks for commodities



While the top 10 risks will affect all of the commodities to a greater or lesser extent, the top 3 risks for each commodity draw out the issues that are especially pertinent to that commodity.

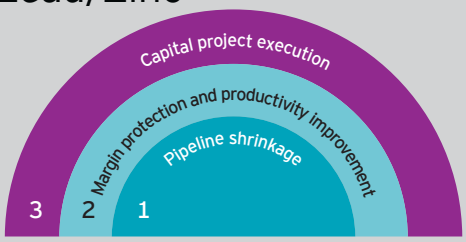
Volatility in the market over the past few years has taken its toll, propelling margin protection and productivity improvement to pole position for many of the commodities exposed to lower prices, with companies and shareholders now looking for long-term optimization of operating costs and capital allocation. Price and currency volatility has created problems for most commodities as

Aluminium



Coal

Lead/Zinc



Copper

Gold

Iron ore

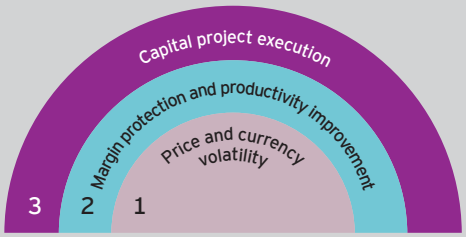
production occurs in multiple currencies, and the large swings in the commodity prices can quickly render mines unprofitable. It stands to reason why gold has ranked price and currency volatility as its number one risk as the metal has experienced highs of US$1,800 and lows of US$1,350 an ounce in a matter of months (2012/2013).

Steel and aluminium pulled excess capacity from outside of our risk radar as we witnessed smelting supply growth outpacing demand, with capacity utilization rates remaining stubbornly below 80% for steelmakers. Slowdown in demand growth from China and subdued steel prices will continue to weigh on the global steel sector in 2013. The market continues to be oversupplied, and the overproduction versus domestic demand from China is likely to persist as the country's steel mills are required to maintain employment and GDP targets.[1]

The large silver and copper deposits in South America have been swept up in the new wave of resource nationalism, with companies investing in these new and developing markets tipping resource nationalism in their top risks. This is true for many of the developing markets where new deposits are increasingly being developed. Post-Fukushima-style issues have challenged Uranium in the form of social license to operate, and Germany's proposed move away from nuclear power has done little to help the commodity's reputation. Newcomer, threat of substitutes, is the greatest risk to the coal sector, specifically in North America, where shale gas-for-coal substitution continues to have a large impact.

1 "Global steel 2013: A new world, a new strategy," Ernst & Young, 2013.

Nickel



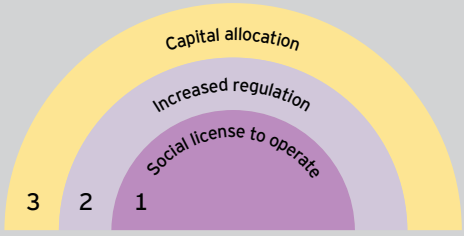
PGM

Potash

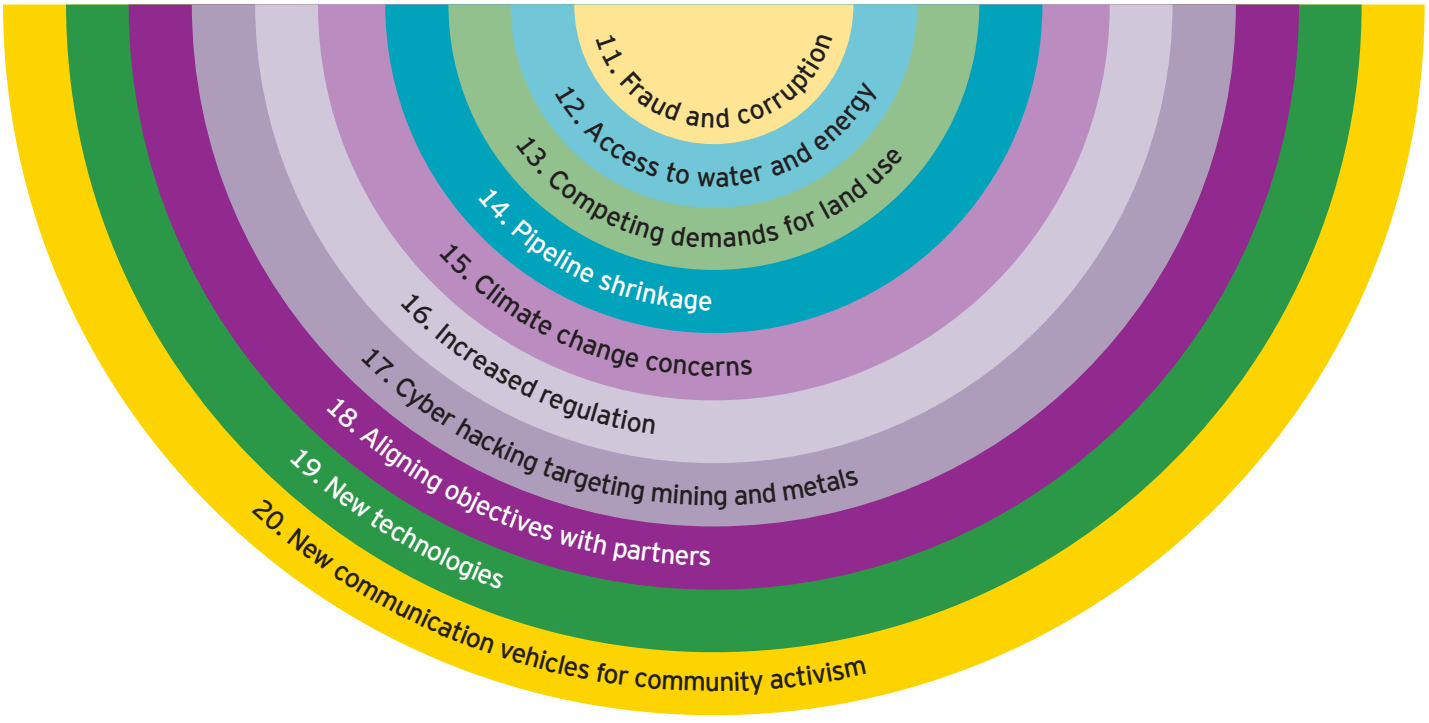
Silver

Steel

Uranium



Under the radar



We would view these as the horizon-watchers because while they are not as critical at the moment, they need to be monitored and mitigated by mining and metals companies as risk profiles can change very rapidly in a volatile market.

There are two newcomers to this section. Fraud and corruption has slipped one place from above to below the radar. While this is still an important risk, it has been widely addressed by the industry following the introduction of the Dodd-Frank Act and the UK Bribery Act. Moving into the radar is cyber hacking targeting mining and metals, as this risk can be vicious, well-organized and undertaken by highly skilled operators. The effects can be very damaging to an organization or operation, so investing in the prevention of such an attack will be less costly than the downtime, loss of IP and time spent fighting such an attack. Other important risks below the radar include access to water and energy, competing demands for land use, pipeline shrinkage, climate change, increased regulation, aligning objectives with parties, new technologies and new communication vehicles for community activism.

11 Fraud and corruption

(10 in 2012)

Although fraud and corruption remains a significant risk for mining and metals companies, it has dropped out the top 10 risks as awareness of the new regulatory regimes continues to increase and frontier investment has slowed. For instance, the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) introduced by US regulators, along with The Bribery Act 2010 introduced by UK regulators, have evoked significant anti-bribery enforcement actions.[1]

Over the past couple of years, countries have renewed their push to enforce actions related to bribery and corruption. Enforcement agencies such as the U.S. Department of Justice, the Australian Federal Police and the UK Serious Fraud Office have launched investigations into some of the world's biggest mining and metals companies for alleged involvement in corruption, which shows how high the stakes are. Much of this activity is related to historic investments in frontier countries.

Given lower prices, the return on new projects has shrunk, and as a result, mining and metals companies are more risk adverse. However, some companies are still exposed to elevated fraud and corruption risk associated with prior investments. For instance, Africa, which is rated as very high risk on the Fraser Institute's Corruption Index,[2] attracted 17% of the total exploration budget during 2012, making it the second most popular destination globally.[3] In regions with less stringent laws, mining and metal companies are often exposed to government patronage of third-party agents, vendors or job applicants. Accordingly, some companies have felt forced to ink deals that compensate a number of third parties, just to do business in these areas.

Continued expansion into developing countries requires ongoing vigilance around fraud and corruption risk and a focus on complying with regulations. However, the mere existence of this risk does not mean that companies should refrain from cross-border operations. It can be mitigated and managed to tolerable levels by effective contract management, targeted control procedures in high-risk geographies, the use of risk assessment techniques or by the use of anti-bribery and corruption data analytics.

1 "Maintaining standards as market widens," Ernst & Young, 2012.

2 "Survey of mining companies 2012/2013,"*Fraser Institute Annual*, 2013.

3 "Worldwide exploration trends 2013," Metal Economic Group, March 2013.

12 Access to water and energy

(11 in 2012)

Access to water and energy remains a concern due to their high cost, relative scarcity, and competing interests from both governments and communities for these resources.

Energy is a significant part of total operational costs for the mining and metals industry worldwide. Sustainable access to cost-effective energy is therefore one of the major risks. For example, in South Africa, Eskom, which provides electricity to most of country's mines and smelters, has applied for an average annual increase of 16% in electricity tariffs over the next five years. Due to this significant increase in prices and the potential for future shortages, companies in South Africa are reassessing the viability of their businesses.[4]

To satisfy the competing interests of governments and communities and to maintain their social license to operate, mining and metals companies have to consider the creation and funding of a long-term sustainable supply of energy when initiating or expanding operations. Environmental regulations have increased the cost of using non-renewable energy sources to ensure companies increase their use of renewable sources of energy. However, the availability of renewable energy sources at mine sites is often limited and can require considerable capital outlay to set up renewable energy infrastructure, particularly in remote locations.

Water scarcity and associated stringent environmental conditions are increasing the costs for mining companies in particularly dry regions, such as South America and Australia. Water consumption can lead to a significant increase in costs and, where water is scarce, may limit the prospects of expanding projects. Mining and metals companies are competing with local residents, who need water for drinking, agriculture or manufacturing activities, for limited resources. For instance, Rio Tinto decided to invest US$310 million in the Pilbara region of Western Australia to ensure a sustainable water supply for its iron ore operations and to accommodate its expansion projects after authorities raised concerns about their high water usage.[5] Often the solution for access to water is based on access to cheap and reliable energy that can power water pumps and deliver electrification to provide drinking water.[6]

In existing projects, depleting reserves and declining ore quality can increase the consumption of water, leading to a significant increase in the cost per tonne of ore. Larger mining and metals companies are continuing to identify innovative ways of decreasing water consumption in their operations and proactively respond to the increasing demands of community stakeholders in this respect.

13 Competing demands for land use

(13 in 2012)

Traditionally, this issue has been couched as a clash between indigenous peoples with a strong cultural/spiritual connection with the land and mining and metals organizations seeking to access it. Miners, farmers, indigenous groups and local governing bodies are competing for land use, with environmental and food security issues also raising concerns about the best use of land.

Land management is critical for companies as it impacts biodiversity and attracts increased scrutiny by regulators, local communities, investors and non-government organizations (NGOs). For instance, the Australian New South Wales Government has released a strategic regional land usage policy. It emphasizes the up-front protection of agricultural land and water resources through strong new requirements at the initial exploration stage, together with a strengthening of existing measures.[7] In India, the Government dropped the land acquisition plan for a major five million tonne per annum steel project as 90% of the area required for the project fell under the category of irrigation land.

Stakeholder expectations are increasing with national and local governing laws becoming more stringent about land use. Accordingly, companies are focusing on measures to offset or minimize the impact of their operations on biodiversity by the use of offsets. For example, BHP Billiton established a five-year alliance with Conservation International to preserve areas of high conservation value in collaboration with local partners.

Restricted access to land is becoming the new normal. This will inevitably push up the scarcity premium for many minerals. Ultimately, the economic argument for providing access will prevail, but at a much higher cost. Those projects with lower cost of access will continue to be more attractive for future investment.

4 "South Africa faces the energy bullet," *Energy Economist* ©Copyright 2013 McGraw-Hill, Inc. via Factiva, 1 March 2013.

5 Rio Tinto website, http://www.riotinto.com/media/18435_media_releases_20951.asp, accessed 6 March 2013.

6 "UN-Energy Draft Summary of First Thematic Consultation 21 February 2013," UN, 21 February 2013.

7 "Strategic regional land use policy," NSW Government, September 2012.

14 Pipeline shrinkage

(17 in 2012)

The project pipeline for most commodities has improved, with a strong scarcity premium in underlying commodity prices over the past decade. During 2012, despite a slowing of Chinese economic growth and lingering economic concerns in Europe, global non-ferrous exploration rose to an all-time high of US$20.53 billion, an increase of 19% y-o-y.[8] The recovery in prices of major commodities such as gold, silver and copper resulted in increased budget allocation for almost all the major mining and metals regions.

However, due to the lower metal prices and uncertain macroeconomic factors, investor interest in exploration programs has decreased over the past year. Investors prefer exploration of more advanced assets to expand known resources in comparison to high-risk, early stage exploration. For instance, Vale has announced plans to defer its US$5 billion Simandou project in Guinea, this being a trickledown effect of softening iron ore prices. Similarly in Russia, despite having a well-developed mining and metal sector, geological exploration is declining due to a slowdown in investment.[9]

The change in investor sentiment and risk appetite has made it difficult for junior explorers to raise sufficient capital for exploration projects. In the current low risk environment, it seems unlikely that companies will increase exploration spending in the near term. This does not auger well for junior explorers and for the mining and metal sector in general, the long-term sustainability of which is dependent on investment in new discoveries.

While prices are lower today, with a lower scarcity premium included, the lack of new exploration spend will only increase that scarcity in the future as today's discovery will not be brought into production for more than 10 years. This, in turn, will increase the roller coaster ride on exploration and development activity and the counter-cyclical investors will stand to benefit the most.

15 Climate change concerns

(14 in 2012)

Mining and metals companies are under pressure to adopt a more sustainable approach to doing business. Climate change concerns have increased the sensitivity of projects for regulators, external stakeholders and employees. For instance, in 2012, Australia introduced carbon pricing. Though the real impact of an Australian carbon tax will not really be known for some time, it will impact industries with higher energy costs and pricing of fugitive emissions.[10]

The increasing regulation emerging as a response to carbon emissions is being caught up with other policy objectives. The US energy policy, wealth redistribution in Australia and South Africa, air pollution reduction in China and funding technology advances in India are all examples of this. This policy mix suggests it will become a feature in the sector with relative project attractiveness set to be affected by differing carbon emissions profiles. For example, Rio Tinto has a target of a 6% reduction in greenhouse gas emissions intensity between 2008 and 2013.[11]

Weather, in the form of wind, floods or drought, is a key operational risk for mining and metal companies. How mining and metals operations adapt to extreme weather events arising from climate change will become increasingly important to protecting value. Issues that need to be considered include:

- Energy transmission/transport and availability for remote operations
- Health and safety conditions for workers in extreme climates
- Access to reliable water for staff and mineral processing
- Plant and equipment performance
- Forecasting of extreme events and preparation for minimal business interruption
- The impact to finance of uninsurable risks from extreme weather

Understanding the local climate and the impact of the aforementioned issues will be critical for adaptation planning and execution.

16 Increased regulation

(16 in 2012)

Regulations can facilitate or restrict business operations. Mining and metals companies are increasingly required to navigate a barrage of new legislation around resource nationalism, employment and migration, and environmental compliance. Additional challenges include, but are not limited to, increased regulatory and reporting requirements relating to land access, permitting, environmental approvals, fraud and corruption, climate change, conflict free mineral independent verification, and disclosure of government payments.

Companies are also investing a lot of time and capital in maintaining their reputations as good corporate citizens by being transparent and adhering to regulatory requirements. Corporate reputation is critical – it not only provides a competitive edge through better access to capital and solid government relationships, but also provides a platform to gain access to the next project.

Furthermore, the risks and costs associated with regulatory compliance have increased. Non-compliance with obligations and failure to meet the expectations of regulators can lead to fines, forfeitures, business restrictions and reputational damage. To curb the cost and time involved in these activities, in-house compliance teams should keep the scope and framework of these obligations highly visible and actively communicate them to corresponding functional and delivery personnel.[12] This will improve the cost efficiency of reporting enterprise-wide risk to top management.

8 "Worldwide exploration trends 2013," Metal Economic Group, March 2013.

9 "Merger, acquisition and capital raising in mining and metals, 2012 trends 2013 outlook," Ernst & Young, March 2013.

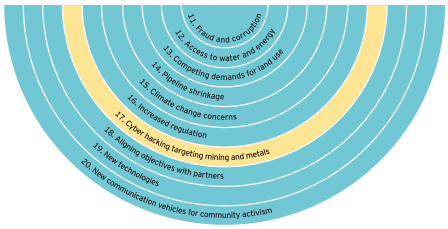
10 "Australia introduces controversial carbon tax," 2 July 2012, Daily the Pak Banker ©Copyright 2012. Right Vision Communications Private Limited via Factiva.

11 Rio Tinto Website, http://www.riotinto.com/ourapproach/17212_goals_targets.asp, accessed 7 March 2013.

12 "Effective capital project execution in mining and metals," Ernst & Young, 2011.

17 Cyber hacking targeting mining and metals

(new)



> "Mine automation is intended to unlock cost and production efficiencies, but one of its greatest threat is the current level of robustness, integrity and resilience of the IT systems."
>
> **Clement Soh**
> **Director, Advisory**
> **Ernst & Young Australia**

It was once thought that hackers were rebellious young students who would target symbols of authority as a protest and a reflection of their technological prowess. Consumer and financial organizations were thought to be at most risk. However, the list of cyber-adversaries has grown to include criminals, national governments and hacktivists, and their target list has likewise grown. With the relative importance, mining and metals plays in the global, regional and local supply chains, it has now become a priority target.

Criminals are attracted to the sector because of the massive cash flows on investment. They understand the increasing dependence mining and metals has on technology and are actively looking for ways to threaten the denial of access to data, processes and equipment. Today's versions of kidnapping, extortion, blackmail and protection rackets are real threats. For example, a criminal could take a long position in copper on the LME and then proceed to use cyber hacking to disrupt supply at key copper production facilities causing prices to spike.

These threats are heightened by the centralization of many business functions across the supply chain as a result of increasing cost rationalization. This has translated into the need for a more sophisticated IT system and network infrastructure to connect the geographically diverse workforce, which increases an organization's exposure to, and dependency on, the internet. Operations technology (OT) (e.g., PCN, safety systems or sensors) is increasingly connected. With the trend towards remote operation to improve cost efficiency, there is a convergence of IT and OT and this provides cyber hackers with an access path to the operation systems from the Internet. Furthermore, OT systems are inherently less secure as many old systems were not designed with security in mind.

Intelligence agencies and the military of sovereign states, and their funded unofficial affiliates, have become increasingly active in cyber warfare. Their enormous capabilities are being directed at economic warfare and espionage to target key industries, posing a real threat to mining and metals organizations. The objective may be the passive collection of commercially sensitive intelligence to assist national or state-owned companies in contract negotiations. However, the possibility of it being more sinister, with the use of malware to incapacitate important facilities (made infamous by the Stuxnet attack on the Iranian nuclear facilities), should not be ruled out. It is worthwhile considering the impact of disabling a remote operations center that controls trucks, drills, trains, ship loaders, mills or concentrators, or even the individual physical equipment being disabled.

Advanced persistent threats (APT) are attacks that are conducted over a long period of time and use attack vectors that could be outside the control of the organization, e.g., attacking vendors or employees' home systems. These are rumored to be state funded and, hence, have the capability to pull off highly sophisticated, complex and extended attacks. These hacking teams probably have more resources (knowledge, manpower and time) at their disposal than any of their targets.

In trying to maintain their social license to operate, mining and metals companies endeavor to meet as many stakeholder demands as they can. They will invariably not meet all demands, many of which are competing, nor may they choose to. Some more militant and extreme activists with unsatisfied demands have turned to hacking to disrupt mining and metals companies' activities, expose confidential information and create communications mischief such as defacing websites or triggering false announcements. Hactivists' use of cyber hacking to pursue a political agenda is a real risk in today's operating environment.

Mining and metals companies have been slower to react to this growing threat. In Ernst & Young's Global Information Security Survey 2012, 77% of respondents saw an increase in external threats, with 31% experiencing an increase in the number of security incidents. However, mining and metals companies appeared less concerned by these worrying trends, with less than a third reporting external security incidents.

As Shawn Henry, a former FBI cyber investigator, recently remarked: "There are two types of companies: those that have been breached, and those that don't know they have been breached."[13] This is true of all risks and, while cyber hacking may not translate into a reality for many organizations, its rising profile and an increasing understanding of the threat it presents suggests it should not be ignored.

13 "Boards must consider internet's dark side," *ft.com*, 12 December 2012, http://www.ft.com/cms/s/0/764a60ec-4442-11e2-932a-00144feabdc0.html#axzz2V7CvBEB1, accessed 10 May 2013.

18 Aligning objectives with partners

(12 in 2012)

Working with partners, otherwise known as partnering, is becoming an increasingly popular business model for managing risk – across a portfolio – in a climate of lower returns. This is not a signal that mining and metals companies are negative about projects in frontier countries, rather, bringing in a partner enables them to limit the amount of capital allocated to these projects while maintaining their involvement. Furthermore, partnering allows capital-constrained project owners to share the associated risks of new development projects, including scale and complexity.

Joint ventures offer exciting combinations of resources, assets, capital, expertise and labor. The right joint venture can optimize these to shape a dynamic, long-term growth strategy for a project. They are a common structure in the mining and metals sector and are likely to remain popular as a means of strategic growth. The forecast increase in both steel production and demand in emerging markets, together with smaller companies facing constrained financing, escalating costs and subdued commodity prices, will result in joint ventures to access new markets and technical know-how.[14] Potential partners with special relationships with national banks have a clear advantage. With lower forecast project returns, political risk requires even greater management to justify new or continued investment. Bringing in partners with strong government influence, such as a state-owned enterprise of a major trading partner, can substantially reduce the political risk.

Once in a joint venture, increased regulation and scrutiny can impact all partners, and they need to ensure their contractual rights allow them to act in their own best interests. Moreover, the implementation of new financial standards could affect compliance with regulatory requirements.[15] For some joint arrangements, the accounting is about to change significantly, and arrangements commonly described as joint ventures or joint arrangements may not continue to be accounted for as in the past. This change means careful assessment will be required.[16] Partners in joint venture are now under pressure to be transparent in both their operations and in reporting compliance.

It has become increasingly critical for joint venture partners to evaluate risks and complexities associated with the business operating model, business processes, information systems, corporate culture, structure and governance. This is key to a long-term sustainable growth strategy and to avoid losing out on opportunities.

19 New technologies

(15 in 2012)

Depleting reserves and falling grades at older and more established mines, together with higher operating costs, are making cost-effective production challenging. Usually high-grade and easily accessible ore is mined first, making the extraction of the remaining low-grade ore more difficult and costly. For instance, as mines in Chile age, copper ore grades are deteriorating and companies are requiring large expenditures simply to maintain output, making mining difficult.[17]

With rising demand and margin pressure, mining and metals companies have increased their focus on innovation and implementing new technologies. This will enhance productivity and efficiency in complex and difficult-to-mine environments. Innovation is enabling companies to recover more resources in lower-grade/difficult metallurgical deposits, access ore more quickly at depth, increase the probability of success from exploration, automate to save labor costs or remove hazards. For instance, under its Mine of the Future program, Rio Tinto is developing a next generation airborne gravity gradiometry system, which has the potential to significantly increase the sensitivity and resolution of land surveys.[18] The "Mine of the Future" program is also hoping to solve the skill shortage and decrease operating costs by deploying driverless trucks, drills and trains.

As mining processes become more integrated and mining technologies become more advanced, the need for strategic alliances between mine operators and equipment developers will become more crucial. Although the costs and challenges associated with automation in the mining and metals sector are substantial, it seems the only way for resource companies to maintain their long-term competitiveness against a backdrop of depleting reserves and increasing competition.

14 "Merger, acquisition and capital raising in mining and metals, 2012 trends 2013 outlook," Ernst & Young, March 2013.

15 "What do the new consolidation, joint arrangements and disclosures accounting standards mean to you?," Ernst & Young, 2011.

16 "Refining IFRS – Managing the risk of joint ventures," Ernst & Young, 2011.

17 "Copper grades on the retreat," The Australian, 19 November 2012.

18 Rio Tinto Website, http://www.riotinto.com/ourapproach/17203_mine_of_the_future_17279.asp, accessed 8 March 2013.

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New communication vehicles for community activism

(19 in 2012)

New communication vehicles such as social networking, cloud computing and smart mobility have emerged as the new form of community activism. Today, social movements are shifting into virtual spaces, which have become a new platform for discussion, cooperation or coalition building. These communication channels are highly effective, with deep penetration, irrespective of geographical space or time zones. Public concerns or objections around mining and metal operations are finding new platforms, increasing the risk of regulatory scrutiny on company operations. Social media has provided a medium for community activism that greatly accelerates the positive and negative implications of a project. It thrives on poor transparency and allows rumor to be given greater carriage. How mining and metals companies deal with this often depends on their speed to identify and act. For example, in early 2013, Whitehaven Coal was confronted by a fake press release from an anti-coal activist who purported to announce that its major financiers had withdrawn an A$1.2 billion loan. This temporarily wiped out A$314 million of market capitalization. Whitehaven responded in 23 minutes to correct the record.[19]

To mitigate the risk of opposition by NGOs or local self-help groups at an advanced stage, a number of organizations are monitoring social media and involving these groups in discussions and feedback from the preliminary stage of a project. It has become critical for companies to create a sustainable development map for mining. The consequences of not doing so could be far reaching and can seriously impact a company's reputation and social license to operate and, in turn, its bottom line.

A recent example is POSCO's India project, worth US$12 billion, which has been significantly delayed due to opposition by the local community and NGOs. New communication channels offered a very strong platform for the activists who were opposing the plant, leading to significant delays in land acquisition and other necessary approvals. Due to violent protests by the local communities and significant pressure by the NGOs, the company has scaled down its land requirement from 4,004 acres to 2,700 acres of land. Moreover, the first phase of the plant, which was supposed to start production at the end of 2011 may now conclude in 2016 or 2017. POSCO has not only lost a lot of capital and time, but also its reputation as one of the best foreign steelmakers during this disagreement in India.[20]

19 "The seamless short-term hoax," *The Australian Financial Review*, 9 January 2013.

20 "Government to review delays in $12 billion POSCO project," *The Economic Times*, 30 January 2013, ©2013 The Times of India Group via Factiva.

Ernst & Young's Global Mining & Metals Center

With a strong but volatile outlook for the sector, the global mining and metals industry is focused on future growth through expanded production, without losing sight of operational efficiency and cost optimization. The sector is also faced with the increased challenges of changing expectations in the maintenance of its social license to operate, skills shortages, effectively executing capital projects and meeting government revenue expectations.

Ernst & Young's Global Mining & Metals Center brings together a worldwide team of professionals to help you achieve your potential – a team with deep technical experience in providing assurance, tax, transactions and advisory services to the mining and metals sector.

The Center is where people and ideas come together to help mining and metals companies meet the issues of today and anticipate those of tomorrow. Ultimately, it enables us to help you meet your goals and compete more effectively. It's how Ernst & Young makes a difference.

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