BCG

REPORT

VALUE CREATION IN MINING 2012

Taking the Long-Term View in Turbulent Times

THE BOSTON CONSULTING GROUP

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EXECUTIVE SUMMARY

THIS REPORT IS THE culmination of several months of analysis, research, and compilation of best practices and new ways of thinking about managing a mining company. The insights and lessons it contains are drawn from The Boston Consulting Group's extensive research and work with leading companies around the globe, both within and outside the mining industry.

The Value Creation in Mining series is an offshoot of BCG's annual Value Creators report, an analysis of the world's top value creators across a range of industries. This year's report examines the performance of 34 leading mining companies over the ten-year period 2001 to 2011. It analyzes the primary drivers of performance, looking in particular at the top ten value creators and how they achieved their extraordinary results.

The mining sector delivered significant shareholder value from 2001 to 2011—a decade hit hard by the global financial crisis. Continued economic expansion in emerging markets (and the resulting rise in commodity prices) helped fuel total shareholder return, along with growth in production and margins.

- Over the decade, the sector averaged an annual TSR of 18 percent—15 percentage points more than the S&P 500. Revenue increases due to rising commodity prices accounted for nearly 14 percentage points of the total 18 percent.

- The remaining 4 percentage points of TSR were derived from production increases (5 percentage points), margin expansion (6 points), and contributions from cash flow (1 point), all of which were offset by declining investor expectations (–8 points).

The top ten industry performers achieved an average annual TSR of 39 percent, more than double that of our industry sample. We attribute their performance to three factors.

- *Excellent Capital Stewardship.* The top ten companies deftly managed their capital expenditures and thus were able to optimize cash flows and streamline their use of debt and equity issuance.

- *Robust Organic Growth.* Strong organic growth yielded rapid increases in profitability for the top ten compared with their peers.

- *A Strong, Credible Outlook for Value Creation.* A successful track record and strong value-creation outlook kept the valuation multiples of the top ten healthy during the decade, in contrast to their industry peers.

Although average TSR performance was impressive throughout the decade, there were two distinct periods of value creation.

- Most of the value was generated during the first five-year period (2001–2006).

- During the second half of the decade (2007–2011), mining companies were hurt by slowing revenue growth, persistent cost pressures, a slackening of capital discipline, and diminishing investor expectations that eroded valuation multiples. The top ten, however, were able to continue creating value throughout this period.

The coming years promise continued uncertainty and volatility. Three major risks loom large for mining companies.

- There is persistent uncertainty in the financial and capital markets, as well as in the customer market.

- The economics are increasingly challenging due to a combination of declining ore quality and the need to dig deeper and mine farther afield.

- Social and policy risks are growing. These risks underscore the importance of planning for a range of scenarios and boosting organizational agility and adaptiveness as scenarios change.

We have identified four levers that companies will need to apply in order to continue creating value amid prolonged uncertainty. Although each one is undoubtedly familiar to mining executives, it is essential to consider them holistically as part of a multidisciplinary effort. In this way, companies can truly achieve bottom-line impact and enduring competitive advantage.

- *Revisit and pressure test the value creation strategy.* Getting capital allocation and portfolio management right is critical. To create long-term value, mining executives need to balance their business, financial, and investor strategies.

- *Manage country risk and stakeholder relations.* Early-stage, proactive, and ongoing stakeholder management and community development are increasingly necessary to developing, operating, and sustaining mine sites. Success requires new approaches, new skills,

and new types of talent beyond those that served the industry well during past challenges.

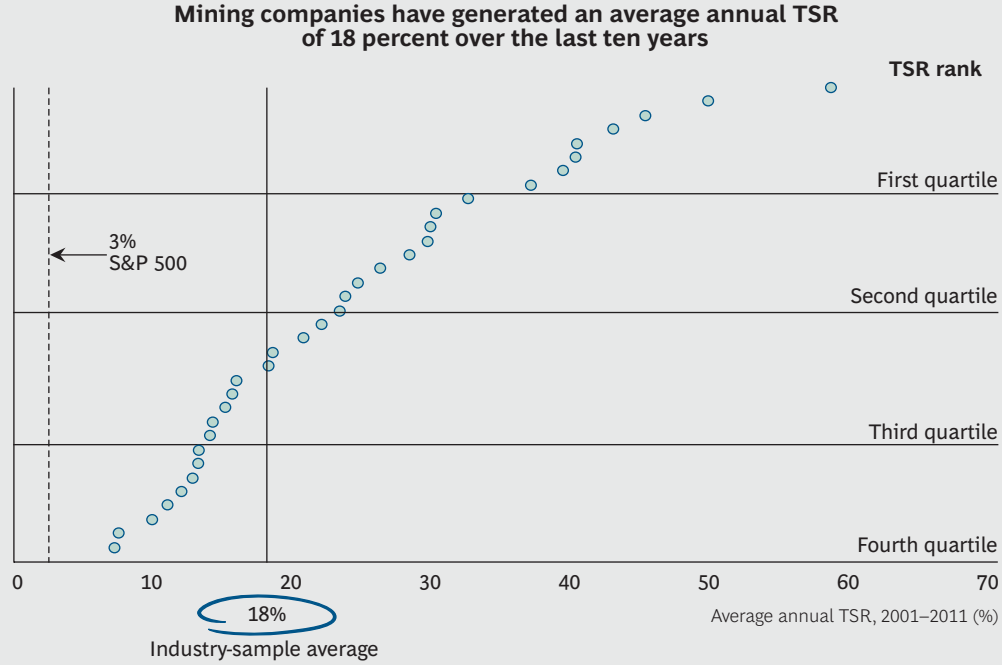
- *Up the odds of project success.* Project execution has grown more complex, and megaprojects have become the norm rather than the exception. By focusing on project excellence, companies can achieve desired outcomes while containing capital expenditures—and, in turn, profitably expand production and maintain credibility with investors.

- *Develop an advantaged operating system.* Operating margins remain under pressure owing to uncertain demand, rising costs, ever-harsher economics, and declining labor productivity. Companies can counteract these impacts by leveraging untapped opportunities in existing assets, exploring next-generation mining techniques such as automation, and building a strong talent pipeline.

A BONANZA DECADE FOR VALUE CREATION

In terms of value creation, the decade 2001 to 2011 was a bonanza for the mining industry. Consider the record of 34 of the industry's largest companies.[1] During this decade, average annual total shareholder return for these companies was 18 percent—15 percentage points more than the S&P 500.[2] (See the sidebar "The Components of TSR" and Exhibit 1.) Even the lowest performers on the list proved to be respectable investments. Given that the second half of the decade was overshadowed by the global financial crisis—a crisis that earned the decade the distinction of being a "lost decade" for investing—such overall performance is remarkable.

Exhibit 1 | Mining Created Substantial Value Over the Decade 2001–2011



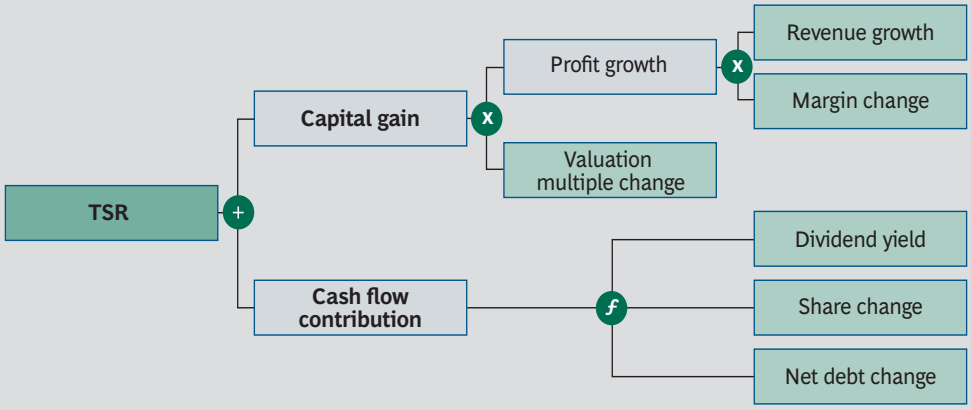
Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.
Note: TSR derived from calendar-year data and weighted by market capitalization.

THE COMPONENTS OF TSR

Total shareholder return is the product of multiple factors. Regular readers of the BCG Value Creators report will be familiar with BCG's methodology for quantifying the relative contribution of the various sources of TSR. (See the exhibit below.) The methodology uses the combination of revenue (that is, sales) growth and change in margins as an indicator of a company's improvement in fundamental value. It then uses the change in the company's valuation multiple to determine the impact of investor expectations on TSR. Together, these two factors determine the change in a company's market capitalization. Finally, the model also tracks the distribution of free cash flow to investors and debt holders in the form of dividends, share repurchases, or repayments of debt in order to determine the contribution of free-cash-flow payouts to a company's TSR.

The important thing to remember is that these factors all interact, sometimes in unexpected ways. A company may grow its earnings per share through an acquisition and yet not create any TSR, because the new acquisition has the effect of eroding the company's gross margins. And some forms of cash contribution (for example, dividends) have a more positive impact on a company's valuation multiple than others (for example, share buybacks). Because of these interactions, we recommend that companies take a holistic approach to value creation strategy.

TSR Is the Product of Multiple Factors



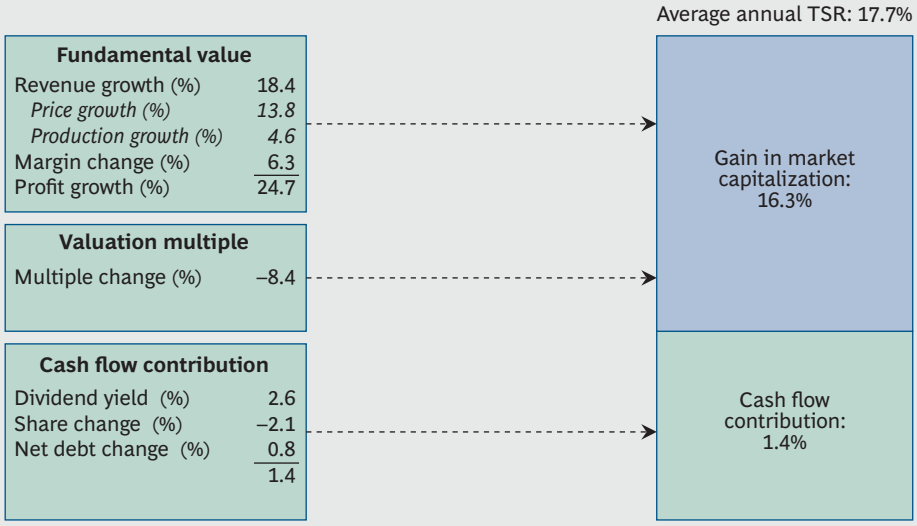
Source: BCG analysis.
Note: "Share change" refers to the change in the number of shares outstanding, not to the change in share price.

The mining industry clearly benefited from the continued economic expansion in emerging markets, which led to steadily rising commodity prices. Value creation was also fueled by production growth, margin expansion, and cash returned to equity holders. Using BCG's TSR disaggregation methodology, we analyzed the factors that drove the impressive performance of the industry. (See Exhibit 2.) Revenue increases due to rising commodity prices accounted for nearly 14 of the total 18 percentage points of TSR. The other factors driving TSR—those resulting from deliberate action—were production gains (which delivered 5 percentage points of TSR); margin expansion (6 points); and contributions from cash flow (1 point). Declining investor expectations, as reflected in the drop in the enterprise value to EBITDA multiple, offset these increases by 8 points.

Finding Alpha

Even more spectacular than the industry's overall 18 percent TSR was the performance of its top-ten value creators—a mix of rapidly growing midtier developers (such as First Quantum Minerals and Randgold Resources)

Exhibit 2 | BCG's Disaggregation Methodology Identifies the Sources of TSR



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.
Note: This calculation is based on the sample average; the contribution of each factor is shown in percentage points of average annual TSR from 2001 to 2011. Apparent discrepancies in totals are due to rounding.

and established global producers (including Antofagasta and Cliffs Natural Resources). (See Exhibit 3.) These companies generated an average TSR of approximately 39 percent per year—more than twice that of the total sample.

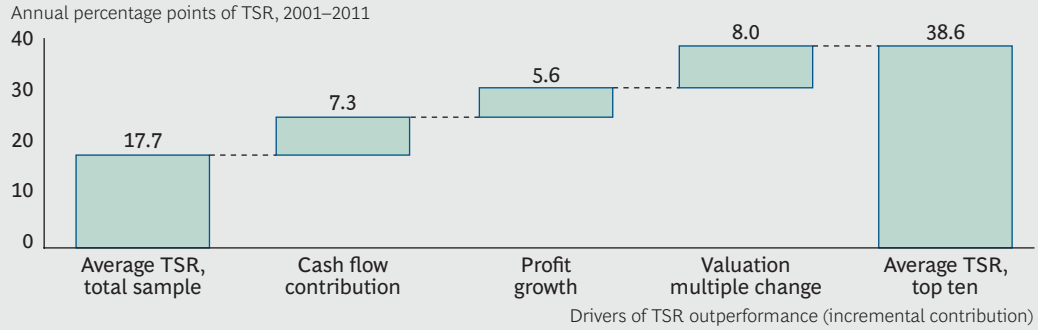
In every dimension—from profit growth to cash flow contributions to multiple expansion—the top ten mining companies outperformed the rest of the sample. (See Exhibit 4.) Even more impressive was the fact that commodity exposure had little impact on outperformance; the top ten included a broad range of mineral producers, from gold and copper to coal and industrial-mineral companies. (For a similar analysis of the largest companies in our sample, see the sidebar "Broader Lessons from the Large-Cap Companies.")

Exhibit 3 | The Mining Industry Top Ten, 2001–2011

Rank	Company	Domicile	Average annual TSR, 2001–2011 (%)	Market value[1] ($billions)
1	Industrias Peñoles	Mexico	58.2	17.8
2	Grupo México	Mexico	49.5	21.6
3	Randgold Resources	United Kingdom	45.0	9.4
4	First Quantum Minerals	Canada	42.7	9.5
5	Inner Mongolia Yitai Coal	China	40.2	7.3
6	Cliffs Natural Resources	United States	40.1	8.9
7	Exxaro Resources	South Africa	39.2	7.5
8	Sociedad Química y Minera de Chile (SQM)	Chile	36.9	15.1
9	Antofagasta	United Kingdom	32.4	18.7
10	Yanzhou Coal Mining	China	30.1	10.5
	Average[2]		**38.5**	

Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.
Note: The sample comprises 34 global companies with a market valuation greater than $7 billion and a free float of at least 25 percent.
[1]As of December 31, 2011.
[2]Weighted by market capitalization.

EXHIBIT 4 | The Top Ten Outperformed in All Components of TSR



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

BROADER LESSONS FROM THE LARGE-CAP COMPANIES

The lessons derived from the top ten value creators also apply to the largest companies in our sample. Companies whose 2011 market value exceeded $25 billion delivered an aggregate TSR of 16 percent per year from 2001 through 2011—a return close to that of the total 34-company sample.

The best three of these companies, however, outperformed their large-cap peers with an average TSR of 28 percent. They did so using the same approaches characteristic of the top ten companies in our overall sample. They enjoyed stronger revenue and margin growth, reduced their debt loads, paid out heftier dividends, and limited equity dilution. They also resisted the squeeze on multiples that others suffered.

The top three large-cap companies earned their performance premiums in different ways. (See the exhibit below.) MMC Norilsk Nickel (of Russia) generated the biggest gain in valuation multiple (8.3 percent); Vale (Brazil) enjoyed strong sales growth (25.6 percent); and PotashCorp (Canada) had the greatest margin improvement (11.2 percent). Clearly, the lessons of our study apply to any company, regardless of size.

The Best Large-Cap Companies Created Significant Value Using Different Levers

					TSR Disaggregation[1]					
Rank	Company	Location	TSR[2] (%)	Market value[3] ($billions)	Sales growth (%)	Margin change (%)	Multiple change[4] (%)	Dividend yield (%)	Share change (%)	Net debt change (%)
1	MMC Norilsk Nickel	Russia	29.5	30.2	13.1	1.7	**8.3**	2.9	1.2	2.3
2	Vale	Brazil	28.2	110.1	**25.6**	5.3	–6.7	4.4	–1.0	0.6
3	PotashCorp	Canada	23.6	35.9	15.4	**11.2**	–6.6	0.9	0.9	1.8
	Average for the top three large-cap companies		**28.0**	**176.2**	**21.0**	**5.3**	**–2.0**	**2.8**	**–0.2**	**1.1**
	Average for the large-cap sample		16.3	655.1	19.1	5.7	–9.9	2.4	–1.4	0.3

Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.
Note: In 2011, ten global companies had a market capitalization greater than $25 billion and a free float of at least 25 percent.
[1]The contribution of each factor is shown as a percentage of the ten-year average annual TSR. Any apparent discrepancies in TSR totals are due to rounding.
[2]Average annual total shareholder return, 2001–2011.
[3]As of December 31, 2011.
[4]Change in EBITDA.

Lessons from the Top Ten

What's behind the top ten's dramatic outperformance? We have identified three factors.

They were excellent stewards of capital. The top ten managed their capital expenditures and consequent cash flows wisely. The result was evident in their debt management, limited equity dilution, and dividend policies. Together, these elements contributed an additional 7 points of TSR for the top ten.

Some of the top ten invested more selectively (or in less capital-intensive projects) than their peers but earned a higher return on capital employed when they did invest. (See Exhibit 5.) This was the case for companies such as Antofagasta, Industrias Peñoles, and Grupo México.

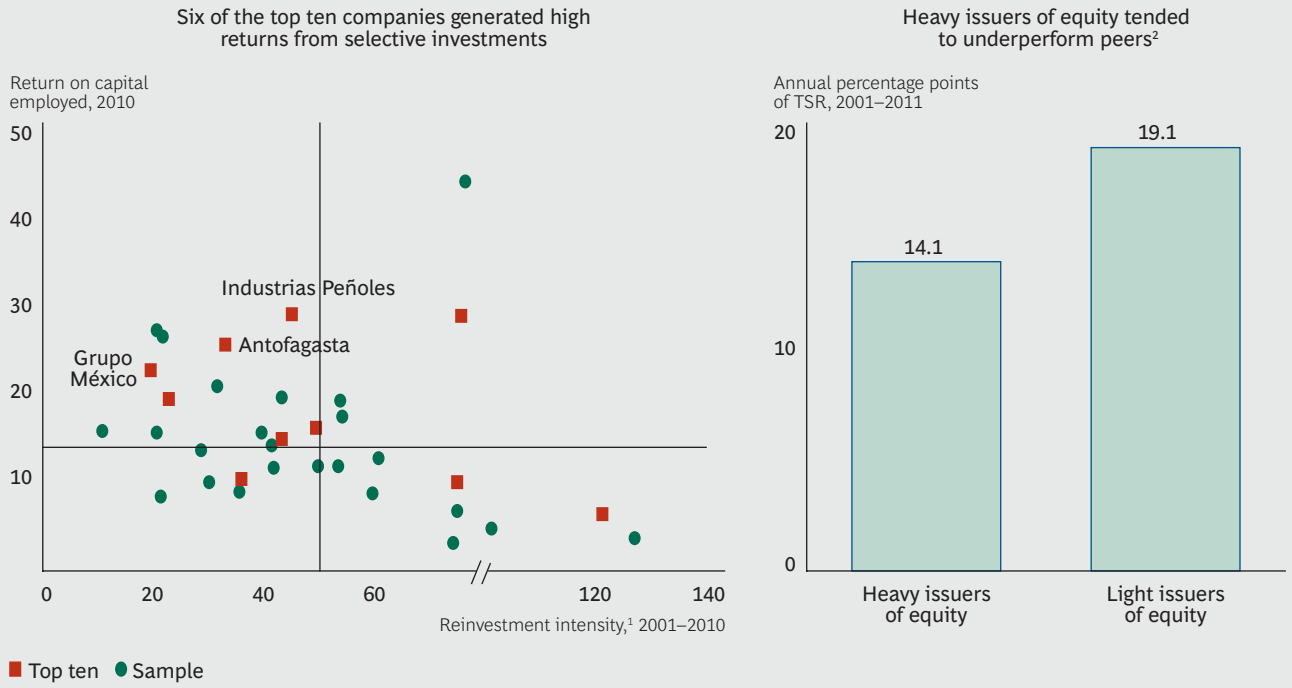
As a result, in debt management, the top ten stood out dramatically from their industry peers. Through skillful cash management and the disciplined use of capital, some top-ten companies were able to reduce their leverage ratios. Randgold, for example, managed to limit its need for additional debt despite having several projects in development.

> The top ten companies managed their capex and consequent cash flows wisely.

The top ten companies also showed restraint in issuing equity, thus avoiding the dilutive effect of increasing the number of shares outstanding without an accompanying payoff in production growth. Equity dilution occurred mostly in the gold sector, where issuances were frequently used to fund projects and acquisitions that ultimately fell short in generating value. Finally, the top ten paid higher dividends than the overall sample.

They oversaw robust organic growth. The top ten grew for the most part organically, whereas other companies in the sample

Exhibit 5 | High-Performing Companies Were Prudent Users of Both Capex and Equity



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.
[1]Reinvestment intensity is a measure of the ratio of capex to EBITDA over the ten-year period.
[2]Heavy/light issuers are those companies whose net equity issuance was greater than/less than average for the sample (n = 17).

expanded their production volume largely through mergers and acquisitions. This growth strategy, combined with slightly larger price increases in their product mix, yielded more rapid growth in profitability for the top ten as compared with their peers. In total, these factors contributed 6 percentage points of TSR outperformance each year.

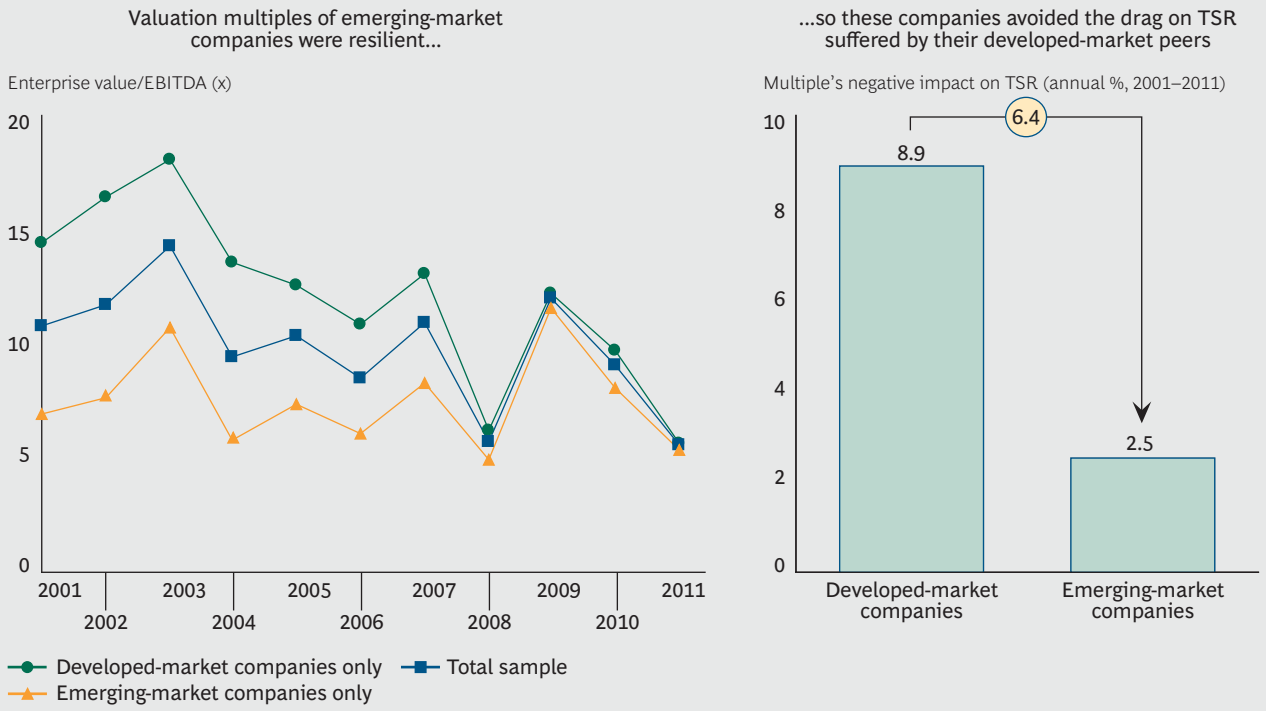
They built a strong, credible outlook for value creation, as reflected in their valuation multiples. This earned the top ten companies 8 percentage points of TSR outperformance. Just ten years earlier, many top-ten companies were midsize regional players operating in rapidly developing economies.[3] By demonstrating a track record of success and a strong pipeline of opportunities, the top ten companies won over investors. They matured fast, adopting many of the world-class management practices described above: prudent investment, restraint from issuing equity, sound risk management, and above all, the pursuit of value-creating growth. The valuation multiples of the top ten proved to be remarkably resilient, and a few (notably Exxaro Resources) even enjoyed healthy gains—an impressive achievement in a decade when most companies, regardless of industry, saw their multiples fall.

Beyond the top ten, companies operating in rapidly developing economies generally experienced a similar effect. These companies began the decade with lower valuation multiples than their industry peers, and by the end of the decade they managed to close the gap. (See Exhibit 6.)

In a Two-Speed Decade, the Top Ten Prevail

Much of the top ten's outperformance derived from the value created between 2006 and 2011, a period when many of the group's peers found themselves struggling. Although 90 percent of the companies had total annual shareholder returns above 18 percent in the first half of the decade, only 35 percent managed to achieve such returns

Exhibit 6 | The Top Ten Operate Largely in Emerging Markets, Partly Explaining Their Valuation-Multiple Resilience



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

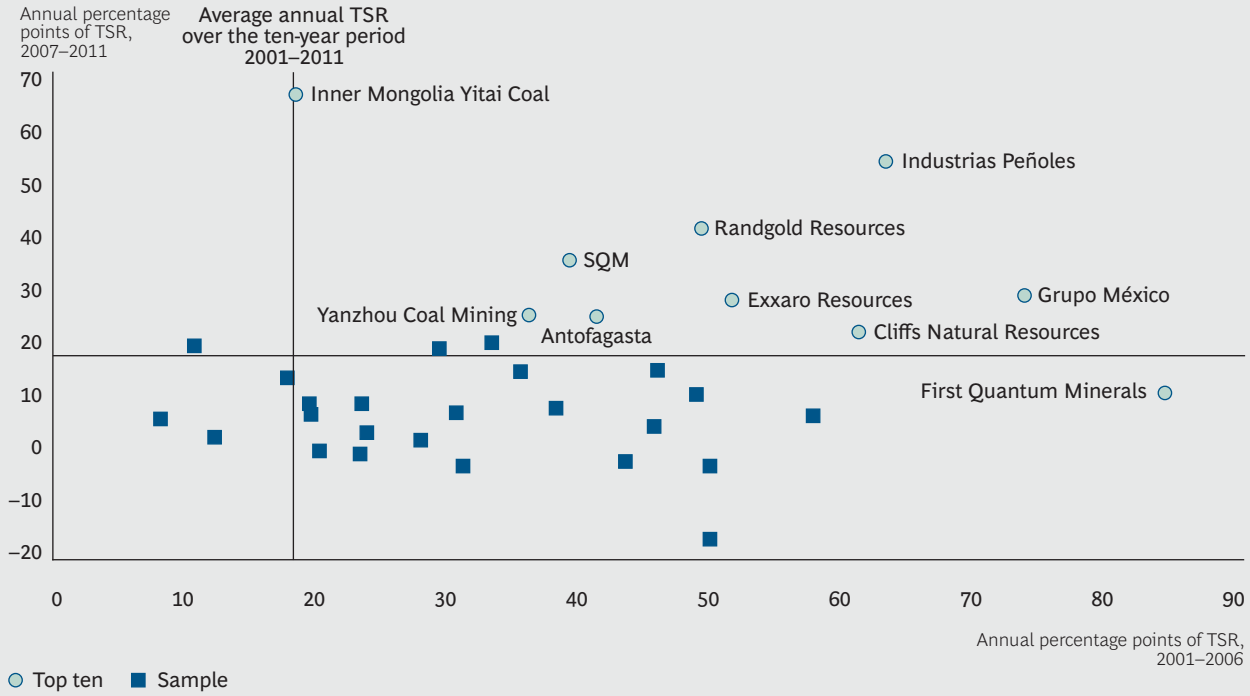
between 2007 and 2011. The top ten stand out for their consistent performance in both the first and the second half of the decade. (See Exhibit 7.)

What's behind this distinct shift in value creation patterns over time—and the difficulty companies faced in creating value during the past five years? And what does this trend bode for the near future?

NOTES

1. These are companies with more than $7 billion in market capitalization, at least a ten-year history of total shareholder return, and a minimum of 25 percent of company stock that is openly tradable. See the Appendix for a list of the 34 companies included in our survey.
2. Average TSR is weighted by market capitalization.
3. For simplicity's sake, we use the term rapidly developing economy to refer to countries in Latin America, Africa, and Asia and to a number of other individual countries (such as Russia), even though not all countries in these regions are developing at the same pace. Developed economies include those in Europe, North America, Australia, and New Zealand.

EXHIBIT 7 | The Top Ten Created Value in Both Halves of the Decade 2001–2011



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

THE OUTLOOK FOR AN UNCERTAIN FUTURE

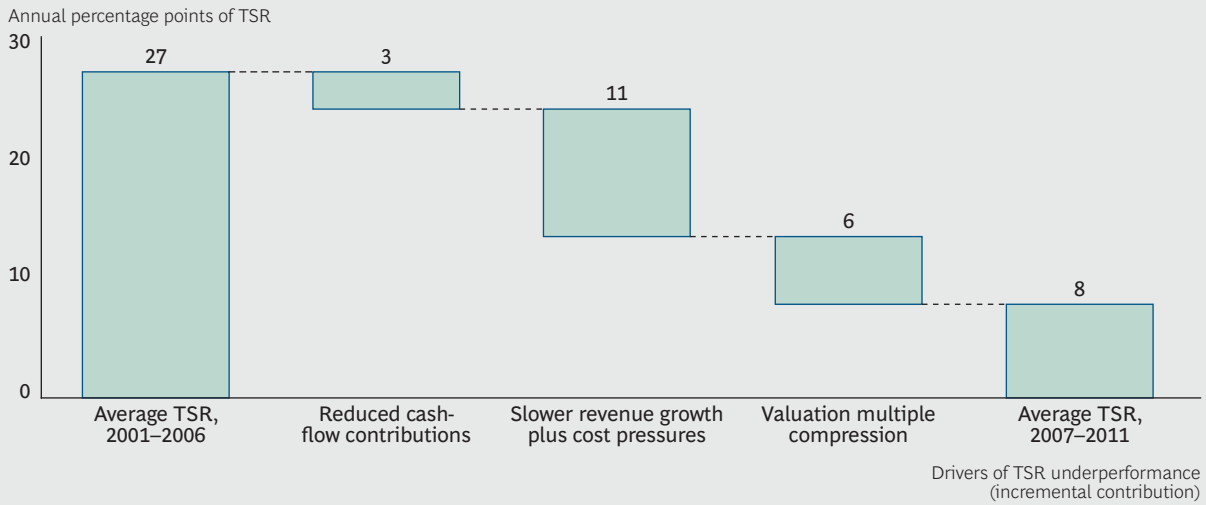
THREE MOUNTING RISKS

Overall, average TSR performance was strong throughout the period 2001 to 2011, but the decade comprised two distinct periods of value creation. (See Exhibit 8.) Most of the value was generated in the first five years, from 2001 to 2006, the result of robust commodity-price growth and optimism about the industry's continued growth. Our 34-company industry sample garnered an average TSR of 27 percent each year during this period. From 2007 to 2011, however, TSR declined by 19 percentage points to just 8 percent a year. What explains the slowdown? We see four clear causes.

- *Revenue growth has slowed, a function of decelerating price and production growth.* The TSR contribution of price increases, for example, fell to 12 percentage points in the second half of the decade, from 16 in the first half. The revenue slowdown resulted in a loss of 3 points of TSR.

- *Cost pressures, especially in fuel, labor, and capital equipment, have been persistent.* Across many major mining regions, electricity and fuel costs increased fourfold during the decade, labor costs grew fivefold, and steel prices increased

Exhibit 8 | The Past Five Years Saw a Distinct Slowdown in TSR



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

tenfold. While commodity prices rose rapidly, particularly during the first half of the decade, input cost inflation (and the annual 10 percent growth of unit costs that resulted) was not an issue. Although prices grew more slowly in the second half of the decade, costs continued to grow at almost the same rate. Margin growth fell, reducing its contribution to TSR from 10 percentage points to 2 percentage points. The slowdown in price growth—which was dramatic for copper, platinum, aluminum, nickel, and, most recently, iron ore—makes rising costs hard to ignore.

- *Capital discipline has slackened.* The rapid increase in project costs, as well as extensive acquisition activity, left less cash available for shareholders. This resulted in lower dividends, fewer equity repurchases, and higher debt levels than would otherwise be the case. The cash flow contributions of the sample declined by 3 percentage points of TSR from 2001 to 2006 to zero in the second half of the decade.

- *Diminishing expectations have eroded valuation multiples.* Investor expectations rose early in the decade. As companies "grew into" these expectations, multiples naturally contracted. Future expectations have been tempered, mainly as a result of the European financial crisis, economic fragility in the United States, and fears of a slowdown in China. Uncertainty about potential new tax regimes (a carbon tax and new mining taxes, for example), along with rising expropriation risk in politically unstable regions, also depressed expectations.

When we extrapolate our findings, we see three significant trends that could make the road to healthy returns far bumpier: prolonged and more pronounced market uncertainty, the increasingly challenging economics of the mining business, and elevated social and policy risks.

Market Uncertainty

Heightened market uncertainty has become a familiar feature of the post-financial crisis environment. Commodity prices enjoyed consistent increases during the first part of the decade but much greater volatility in the last five years. Price volatility has, in turn, triggered heightened volatility in mining companies' stock prices. Many companies have postponed or cancelled a number of high-profile projects as a result of cost inflation, sagging revenues, and growing doubts about future prices and demand.

Interestingly, fluctuations in metal prices from 2001 to 2012 mirror the fluctuations in China's real GDP growth rate to a startling degree. (See Exhibit 9.) It's important to keep this correlation in mind as we examine the macroeconomic prospects of China.

Three significant trends could make the road to healthy returns far bumpier.

Given current levels of uncertainty, companies should plan for a range of scenarios—particularly ones that challenge incremental assumptions—rather than rely on simple projections or sensitivities to a single trend.

According to a bullish scenario, for example, based on the theory of a commodities "supercycle," recent history is merely a bump in the road. This view holds that industry demand will continue unabated. China's growth—indeed, that of all emerging economies—will remain strong and increasingly decoupled from the West's, with European and U.S. macroeconomic woes insufficient to dent demand. In addition, existing supplies of mineral commodities will be depleted faster than they are restored (from, for example, successful exploration), which will keep prices stronger for longer. Further supporting the bullish scenario is absolute demand: even if GDP growth in the emerging world were to slow, GDP would still be growing from a much larger base than ten years ago.

In contrast, the bearish view holds that we are experiencing a more protracted downward shift in commodity prices triggered by a

Exhibit 9 | Metal Prices Track Fluctuations in Chinese GDP Growth

Sources: Bloomberg; Economist Intelligence Unit; BCG analysis.

significant slowdown in China, worsening debt problems in Europe, and persistent low growth in the United States. According to this scenario, macro imbalances increase the risk of sudden demand shocks, and new projects will eventually lead to a supply glut. Consumption in China, moreover, will not be sufficient to absorb the slack. Supporting this view is the recent slowdown in Chinese exports, along with the dramatic drop in the price of iron ore (as low as $89 per ton in September 2012).

Both these scenarios have many adherents, are both are quite plausible, which demonstrates the importance of considering a range of likely scenarios. And executives should also recognize the possibility that, regardless of scenario, conditions could change rapidly. (See the sidebar "Light at the End of the Tunnel.")

Increasingly Challenging Economics: Declining Ore Grades and Higher Strip Ratios

The economics of mining have grown progressively more challenging in recent years. The decline of ore grades worldwide has been well documented for some time. (See Exhibit 10.) Copper grades have fallen from 4 percent to 1 percent over the past century, while average iron-ore grades of approximately 50 percent in 2005 are projected to drop roughly 5 percent by 2020. The result, of course, is increased pressure on unit costs and productivity that will eventually affect prices and can trigger substitution risk. But lower ore grades are just one part of the problem. Miners also face higher strip ratios and deeper deposits, which are increasingly located in far-flung locations with limited infrastructure.

The economics of mining have grown more and more challenging in recent years.

However, history shows that over the longer term, operational and technological developments can mitigate and sometimes erase these obstacles. Continual improvements in equipment productivity, for example, have been fueled by the ever-increasing size of haul trucks and loading equipment. Step-change breakthroughs have occurred with the introduction of new technologies and methods like froth flotation, heap leaching, and, more recently, autonomous (driverless) min-

LIGHT AT THE END OF THE TUNNEL

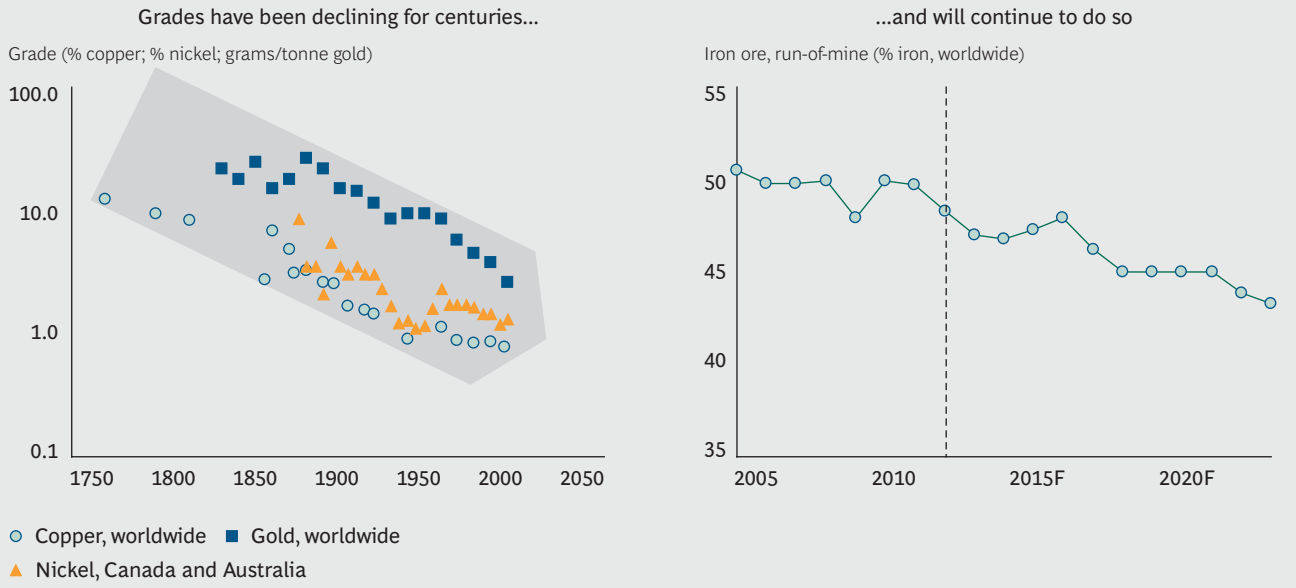
To get an idea of how rapidly market conditions can change, and the havoc that rapid change can unleash, one need only look at the coal mining industry in the United States. From a position of relative strength as recently as early 2011, the industry has suffered declining coal prices and falling demand. This sudden weakness is primarily the result of large quantities of cheap shale gas entering the market, along with new sulfur-emissions regulation. Metallurgical coal producers, particularly those at the higher end of the cost curve, are also struggling with weaker demand. The hoped-for growth in coal exports to China, which could have offset slowing U.S. demand, has failed to materialize.

These combined impacts have been striking. Margins have been halved (or worse) since the beginning of 2011, projects have been delayed or cancelled, and several mines have closed. The stock price of most large U.S. coal companies dropped by 60 to 80 percent in the 18 months since early 2011, owing to falling profitability and multiples. One major company was forced to file for bankruptcy protection under Chapter 11.

The U.S. coal industry provides a cautionary example of just how quickly industry fortunes can change. Still, opportunities to create value clearly exist: companies with healthier balance sheets can acquire good assets at reasonable prices (or even average mines cheaply, as effectively "out of the money" call options). Another strategy—doubling down on operational excellence programs—can generate proportionately more value now than during periods when high prices prevail. Finally, companies with a superior employee value proposition can attract good talent that has been displaced, gaining an intangible asset that promises a considerable future return.

In other words, companies that have exercised discipline in their value-creation strategies and execution can take advantage of turbulent times to seize opportunities—and build for the future.

EXHIBIT 10 | Ore Grade Decline Is a Permanent Feature of the Industry



Sources: "Changing Copper Yields and Ore Grades, "*Mining Journal*, October 7, 2011; AME Group; Gavin Mudd, *The Sustainability of Mining in Australia: Key Production Trends and Their Environmental Implications for the Future*, Monash University and Mineral Policy Institute, October 2007.

ing equipment. Companies that seize technological opportunities and innovate can come out ahead. (For more on these innovative technologies and processes, see the chapter "Rising to the Challenge," below.)

Given the outlook for grades, investment in innovation will again become an important driver of competitive advantage for mining companies. In addition, the search for higher grades and better deposits has encouraged explorers and major players alike to seek out geologically promising, underexplored regions. Such regions are often in the early stages of economic development. To operate effectively in these environments, mining companies need to develop very different capabilities than those that served them so well in the past.

Heightened Social and Policy Risks

Mining companies cannot choose where ore deposits are located, of course. Yet the risks in their operating environments—in the developed and developing world alike—have been escalating in recent years. Indeed, social and labor unrest have been on the rise, from Peru to Indonesia to South Africa.

Uncertainty regarding government policy is widespread. Recent regulation (and, increasingly, court decisions and executive fiat) includes environmental measures (such as the U.S. EPA's sulfur-emissions policy and Department of the Interior's withdrawals), as well as trade-related actions (such as Indonesia's export controls). These moves follow the political winds and public opinion, and are thus difficult to predict and respond to. The same is true of tax and royalty changes, which are on the rise as governments throughout the world seek new revenues to meet widening deficits or to fund their development agendas. Traditionally "safe" jurisdictions such as Australia have introduced windfall taxes and unexpected increases in royalty rates (for example, the Minerals Resource Rent Tax in 2011 and the Queensland royalty increases in September 2012). Cash-strapped governments, such as those in South Africa and the Ivory Coast, are also pursuing royalty increases.

Investment in innovation will become an important driver of competitive advantage.

Taxation and royalty hikes are just two forms of resource nationalism. At the extreme end is outright nationalization, a trend that threatens to escalate when economies deteriorate. Recent instances include the Democratic Republic of the Congo and Argentina, and other countries are flirting with the idea. Indonesia, for its part, is pursuing the forced spinoff of ownership stakes held by foreign mining companies.

As mining companies make more forays into new regions than they make into new minerals, it becomes all the more important that they have a clear strategy for dealing with resource nationalism and related policy risks.

RISING TO THE CHALLENGE

Regardless of macroeconomic scenario—whether a rebound in the commodity supercycle or a protracted downturn—uncertainty and risk promise to persist. Companies must be prepared to navigate this uncertainty skillfully and profitably.

Clearly, executive teams are under tremendous pressure to create value in the current environment. Avoiding value-destroying traps, such as top-of-the-cycle acquisitions (or the converse, an anemic growth pipeline)—becomes critically important. Our observations and analysis suggest that four key levers can help executives in their value-generating efforts.

- *Revisit and pressure test the company's value-creation strategy.* Getting capital allocation and portfolio management right is critical. Companies should address value creation and risk in a systematic way, across different investment options, so they can be confident of making the right tradeoffs.

- *Manage country risk and stakeholder relations.* Early-stage, proactive, and ongoing stakeholder management and community development are increasingly necessary in developing, operating, and sustaining mine sites. Success requires new approaches, new skills, and new types of talent—entirely different capabilities and approaches from those used to improve safety and environmental performance. For that reason—and because the stakes are so high—it's crucial that companies not relegate the management of country risk and stakeholder relations to either their health and safety or environmental departments.

- *Up the odds of project success.* Project execution has grown more complex, and megaprojects have become the norm rather than the exception. By focusing on project excellence, companies can achieve desired outcomes while containing capital expenditures—and, in turn, profitably expand production while maintaining credibility with investors.

- *Develop an advantaged operating system.* Operating margins remain under pressure owing to uncertain demand, rising costs, ever-harsher economics, and declining labor productivity. Companies can counteract these impacts by leveraging untapped opportunities in existing assets, exploring next-generation mining techniques, and building a strong talent pipeline to lead in the current and future industry environment.

Mining executives will be familiar with these levers, which are already at the heart of many companies' strategies. But they are of-

ten difficult to implement—largely because each requires a multidisciplinary effort. Achieving their bottom-line impact can therefore be elusive.

Lever 1: Revisit and Pressure Test Your Value-Creation Strategy

To create long-term value, executives need to balance their business, financial, and investor strategies. But equally important—and less appreciated—are the fundamentally disparate investment horizons of mining companies and their investors. It typically takes years, if not decades, for a capital investment to produce returns. Yet equity investors often hold shorter-term performance expectations. Because investors set the value of a company, it makes sense to understand their relatively shorter-term interests when developing long-term value-creation plans.

Take the investor into account. To incorporate investor strategy into business planning without falling prey to "flavor of the month" thinking, it's important to first assess objectively what your investor base is seeking. What role does your company play in your investors' portfolios? Does your strategy align with their needs? Identifying mismatches between business and investor objectives creates opportunities to adjust strategies and unlock value.

There are a variety of tools companies can use to understand investor perceptions and what drives (or hinders) their stock's performance. BCG's Smart Multiple methodology, for example, disaggregates the drivers of a company's valuation multiple, with specific weightings for capital allocation, asset profitability, debt, and other key factors. Executives can incorporate it into their strategic-planning efforts to objectively assess the impact of different initiatives using the common yardstick of TSR. Investor interviews, an important complement to the Smart Multiple methodology, highlight opportunities and areas of dissatisfaction that might not surface in other types of analysis. They can also help set priorities in capital allocation.

A natural resources company recently pursued this approach. The Smart Multiple model explained the company's historical stock price over the past decade, and the company then used it to determine the full TSR impact of different strategic options. Based on the analysis and investor interviews, the company decided not to make any major new acquisitions and instead raised its dividend significantly. Investor reaction was unambiguous. In the week following the announcement of the company's new capital-allocation strategy, its stock outperformed that of its peers by more than 10 percent, gaining more than $1 billion in market value.

It's important to assess objectively what your investor base is seeking.

Get capital allocation and portfolio management right. In theory, every investment should be evaluated against a comprehensive set of investment criteria. In reality, however, it is more practical to explicitly consider different types (or subportfolios) of investments, such as exploration, growth projects, and investments in productivity improvements. Companies should set guidelines for target allocations by investment type. These guidelines can be refined as part of the annual planning cycle. Every investment decision, whether organic or M&A-related, can then be assessed against comparable alternatives. This approach allows specific lenses to be applied to each investment type, giving the company the ability to consciously accommodate different levels of risk.

For example, smaller deals with junior exploration entities or mining companies are an important component of overall M&A activity, making up between 80 and 90 percent of total deal volume (and 10 to 20 percent of total deal value). Juniors, in fact, often serve as long-term call options, contributing to future resources, reserves, and project flow. Maintaining a strong pipeline of relationships with juniors is therefore a key success factor in many mining growth strategies. However, such deals have a very different risk-return profile than that of an expanded existing operation or a major

new capital project. Companies need to assess these investments differently and be deliberate in the tradeoffs they make.

Through our work with clients, we've distilled several best practices related to capital allocation and portfolio management:

- *Maintain capital discipline.* Companies should resist the temptation to use cash just because it has accumulated. Unless a compelling investment opportunity presents itself, it's often best to save extra cash for dividends. One useful tactic: putting in place specific guardrails for investing funds in each category.

- *Manage through the cycle.* For each portion of the portfolio, companies should develop a clear, long-term outlook and manage toward it, maintaining investment discipline even in tough times. This approach helps companies avoid spending cash when costs are high and helps them continue growing when costs are low. A number of natural resources companies have successfully followed this formula.

- *Be prepared for interim shocks.* Recall the companies that were overleveraged when the 2008 financial crisis struck and were forced to sell assets at a heavy discount. Apply the lessons of previous periods of market turbulence so you can seize the upside or mitigate the downside of short-term volatility.

Lever 2: Manage Country Risk and Stakeholder Relations

Country risk has always been intrinsic to mining, but as the world's supply of quality ore shrinks, companies will be even less able to avoid riskier, but geologically promising, jurisdictions. Beyond that, every jurisdiction carries its own mix of risks—local and universal. It is not enough to identify the many forms of country risk at the outset of an investment. Country risk is varied, wide ranging, and constantly morphing, and managing it in each location must therefore be a continuous effort.

Central to assessing and managing country risk is recognizing the importance of managing stakeholder relationships over the long term. Beyond an entry strategy, a company should identify the key stakeholders and the media landscape and know how it (and mining in general) is perceived by the population. Establishing thoughtful community-development efforts should be a priority. The benefits extend beyond removing obstacles to operating. Many companies (including several based in emerging markets) recognize that good relations are an investment for all sides, whether they involve building hydroelectric plants that also provide electricity to local communities or contributing to educational institutions that ultimately build labor capacity.

Managing country risk in each location must be a continuous effort.

Recognizing that good, longstanding community relations can be difficult to achieve, the World Economic Forum and BCG launched the Responsible Mineral Development Initiative in 2010 to explore the challenges of responsible mineral development from the perspective of stakeholders.[1] Through extensive surveys and interviews conducted in 30 mining regions worldwide, the study examined participants' views of the social and economic contributions and costs of mineral development throughout a mine's life cycle. It also unearthed important insights into the actions taken by mining companies that stakeholders considered most helpful (or most counterproductive). (For more on cultivating stakeholder relationships as an integral part of managing sovereign risk, see the sidebar "Building Blocks for Responsible Mineral Development: Perspectives from Stakeholders.")

Lever 3: Up the Odds of Project Success by Pursuing Project Excellence

Project excellence is the third major lever companies can apply to enhance TSR. Project excellence is achieved through a disciplined approach to capital expenditures. It also calls for strengthening project gover-

BUILDING BLOCKS FOR RESPONSIBLE MINERAL DEVELOPMENT
Perspectives from Stakeholders

A joint World Economic Forum–BCG study, *Responsible Mineral Development Initiative 2011*, offers a framework, based on extensive stakeholder feedback, of six building blocks for responsible mineral development:

1. Progressive capacity building and knowledge sharing among all stakeholders
2. A shared understanding of the costs and benefits, as well as the risks and responsibilities, related to mineral development
3. Collaborative processes for stakeholder engagement throughout the life cycle of mining projects
4. Transparent processes and arrangements
5. Thorough compliance, monitoring, and enforcement of commitments
6. Early and comprehensive dispute management

The study also identifies practical applications by companies of these building blocks—applications considered by community members to be the most helpful in advancing responsible mineral development. Among them: using and contributing to a global repository of sound practices, creating tailored training and development programs (from basic literacy education to mining-specific skills for local suppliers), establishing a multistakeholder platform for a national dialogue, and preparing effective mechanisms for resolving disputes.

nance, managing projects with an end-to-end view, and managing project resources strategically.

Discipline in project management is particularly vital during periods of market uncertainty, when demand and price volatility can jeopardize performance. Yet a recent trend—the rise of the megaproject—poses one of the greatest challenges to project excellence. More and more mining projects qualify as megaprojects—those costing upwards of $1.5 billion. In copper alone, megaprojects account for more than 75 percent of future production growth.

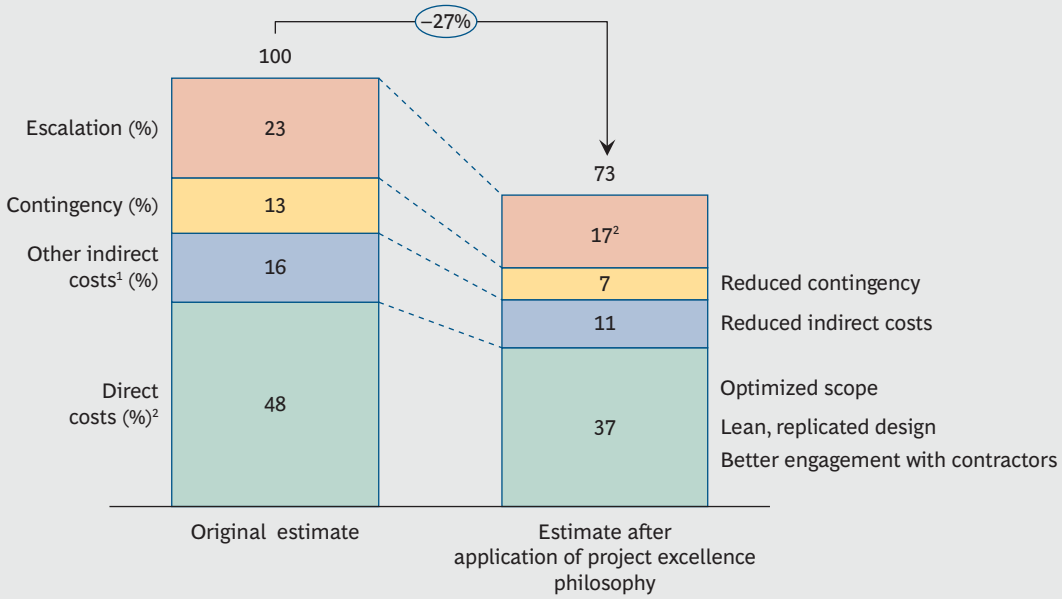
What's behind this trend? Mining locations have become more complex, often because they are in the early stages of development and need major infrastructure investments. Capex costs, from machinery and underground equipment to processing, have been rising steeply.

Not surprisingly, megaprojects entail greater execution risk than smaller, simpler projects. According to the research firm Independent Project Analysis, 70 percent of all megaprojects fail.[2] Of those that do, the average capex overrun is 33 percent, even after adjusting for input cost inflation. In the past three years, the companies in our sample likely incurred up to $45 billion in additional costs owing to capex overruns.[3]

But capex overruns and missed deadlines are not the only value destroyers. Companies also grapple with lower-than-expected ore grades and higher-than-expected maintenance capex and operating costs. These costs are the result of overengineering, of failing to adequately consider future operations and maintenance needs, and of taking shortcuts during construction.

Project excellence can counteract these value destroyers, reducing capital intensity by 20 to 40 percent. Consider the approach that one major mining company followed as part of its project-excellence program. (See Exhibit 11.) The company sought to compress its capex pipeline (worth billions of dollars) while still delivering successful projects on time. By op-

EXHIBIT 11 | Through Project Excellence, One Company Achieved a Significant Reduction in Capital Intensity



Source: BCG case experience.
[1]Common distributables, EPCM, owner's team, operations development and IM costs.
[2]Same escalation factor applied to lower base.

timizing scope, adopting a lean approach to design and operations, and boosting engagement with contractors, the company reduced its capital intensity by 27 percent. (For more on how to contain capex, see the sidebar "Lessening Capital Spend.")

Capex discipline is a critical means of achieving project excellence. Companies also have a variety of enabling tools at their disposal—tools that are too often overlooked, despite their paramount importance to project outcomes.

- *A Sound Project-Governance Model.* The model should clearly define who's responsible for what at every stage of the project, what decision-making process will be followed, and the control and quality assurance parameters. It should also outline plans for project management and risk management, as well as performance measurement.

- *A Strong Owner Team Whose Skills Match Project Requirements.* Studies by Independent Project Analysis show that projects overseen by owner teams that lack the necessary qualifications are far more likely to experience capex overruns, schedule slippage, and operational problems after startup.

- *Strategic EPC/EPCM Contracting and Relationship Management.* Because projects are becoming increasingly large in scale and complex—and because engineering, procurement, and construction (EPC) and engineering, procurement, and construction management (EPCM) contractors are often responsible for project design and construction—companies should be more strategic in their selection of these contractors. (One approach is to establish preferred bidder relationships or to contract out multiple projects.) This will help avoid costly changes midstream. Once contractors are chosen, companies should actively manage and monitor the relationship.

- *Rigorous Resource Planning.* One of the most routine causes of schedule slippage is resource bottlenecking—whether of heavy equipment or skilled labor—during the project construction phase. Companies can minimize bottlenecking and improve control costs by anticipating critical resources at the outset.

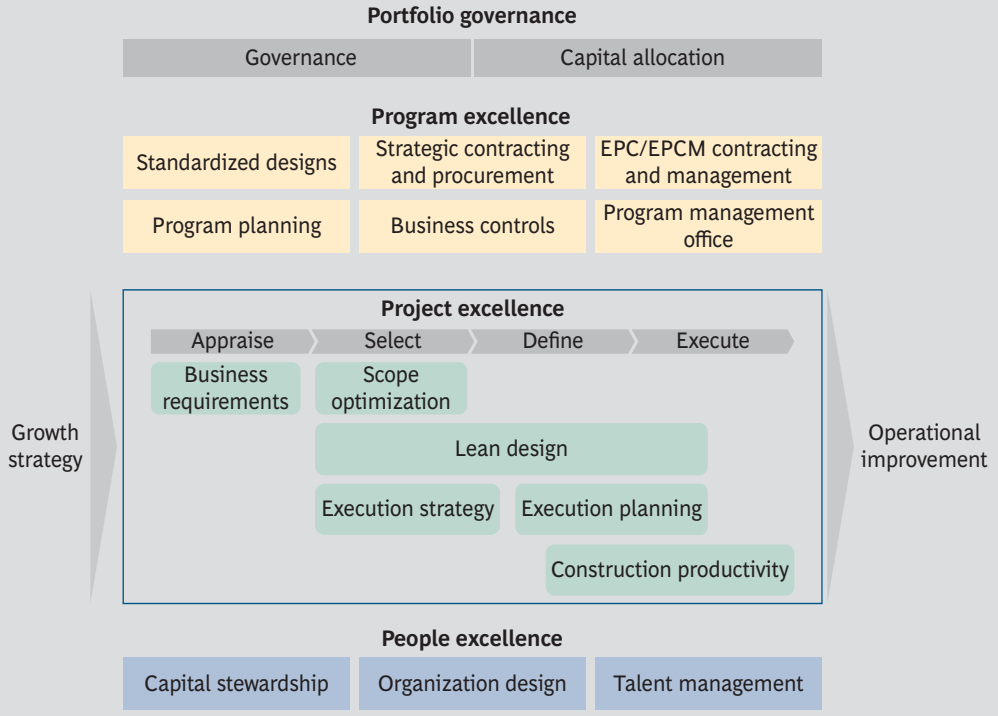
LESSENING CAPITAL SPEND

Companies can streamline project execution sustainably, without sacrificing quality or productivity, by applying BCG's LESS approach. This framework promotes practices that are lean, efficient and effective, standardized, and structured and systematic.

- *Lean* addresses the widespread problem of overengineering beyond the point of payoff; it eliminates unnecessary scope and specifications. Lean entails such practices as optimizing site layout, standardizing and replicating design, simplifying design to reduce construction time and cost, and modularizing to reap schedule and offsite fabrication benefits.
- *Efficient and effective* stresses practices that maximize tool time and equipment utilization to minimize downtime on site.
- *Standardized* emphasizes standardizing and replicating facilities over time to realize efficiencies.
- *Structured and systematic* refers to a rigorous change-management process that relies on decision rights, tools, and templates to support fact-based decision making.

LESS can be applied at every level of project organization, as the exhibit below shows. In portfolio governance, it can institutionalize a gated project-development process. In program excellence, it can guide leaders in strategically sourcing external providers. In project excellence, it helps clarify the right execution strategy. And in people excellence, it can help companies define and develop leadership capabilities.

The LESS Approach Can Be Applied Across the Project Organization



Source: BCG analysis.

- *A Holistic View of the Project Pipeline.* Silos are barriers to improvement. By taking an integrated view of the project pipeline, companies can disseminate best practices across projects, adopt standards that create efficiencies, and identify opportunities for savings (notably, in procurement).

Like the four levers, many of these strategies and techniques are familiar. But in recent years, process discipline has come under pressure from more ambitious deadlines and project complexity. We cannot understate the importance of these project-excellence tools—and the significance of their aggregate impact.

Lever 4: Develop an Advantaged Operating System

For most of the past ten years, the mining business has been exceptionally profitable. Many mining companies adopted the "bar none" operating philosophy: essentially, throw any and all resources at the mine because everything pays. But as we've discussed, the world has changed. The demand outlook remains uncertain, costs keep rising, and labor productivity is declining. In such a precarious environment, agility—the ability to adapt to changing conditions—becomes ever more important.

Next-generation mining is emerging as a way to meet industrywide challenges.

To achieve a step change in economics, mining companies need to think about their operations differently—and develop an advantaged operating system. Such a system has three essential elements.

Get the fundamentals right. First and foremost, companies should make the most of existing assets. They should question long-held beliefs, leverage scale to optimize procurement, share best practices, and improve repeatability. Common metrics should be implemented across sites, and those who pursue improvements should be rewarded. External benchmarks, when used carefully, can help pinpoint further opportunities for efficiency and improvement. At most companies, we see much untapped potential for value creation. Organizational silos are among the greatest barriers to realizing this value. For that reason, culture and change management should be integral to any transformation program. (For more on realizing large-scale efficiencies, see *Overhauling Maintenance: Creating Competitive Advantage in Transportation*, BCG Focus, July 2012, and "You Can't Grow Your Way Out of Inefficiency," BCG article, September 2010.)

Investigate next-generation mining techniques. We use the term next-generation mining (NGM) to describe technology-enabled changes in mining. NGM is emerging as a way to meet some of the industrywide challenges outlined in this report, supported by the increasing commoditization (and thus, availability) of many applicable technologies. In the 1990s, for example, original equipment manufacturers such as Caterpillar and Komatsu started experimenting with autonomous trucks using radar technology that had been developed for the military. Today, that same technology is being used in luxury automobiles for a fraction of the cost. Similarly, connectivity via wireless broadband now permits operations to be performed remotely in a way that was not possible only a few years ago.

NGM encompasses more than islands of technology. It involves new approaches to physical processes, greater availability and use of information, and new ways of working that both enable and are enabled by technological and IT developments. The result is a fundamental shift in competitive position. Indeed, it is inevitable that miners will have to follow this path to stay competitive.

Among the new physical processes being explored by the industry are advances in automation, both in surface mining and underground operations, and the use of remote operations, in which control centers are located in major population centers. This reduces labor costs, expands the pool of available tal-

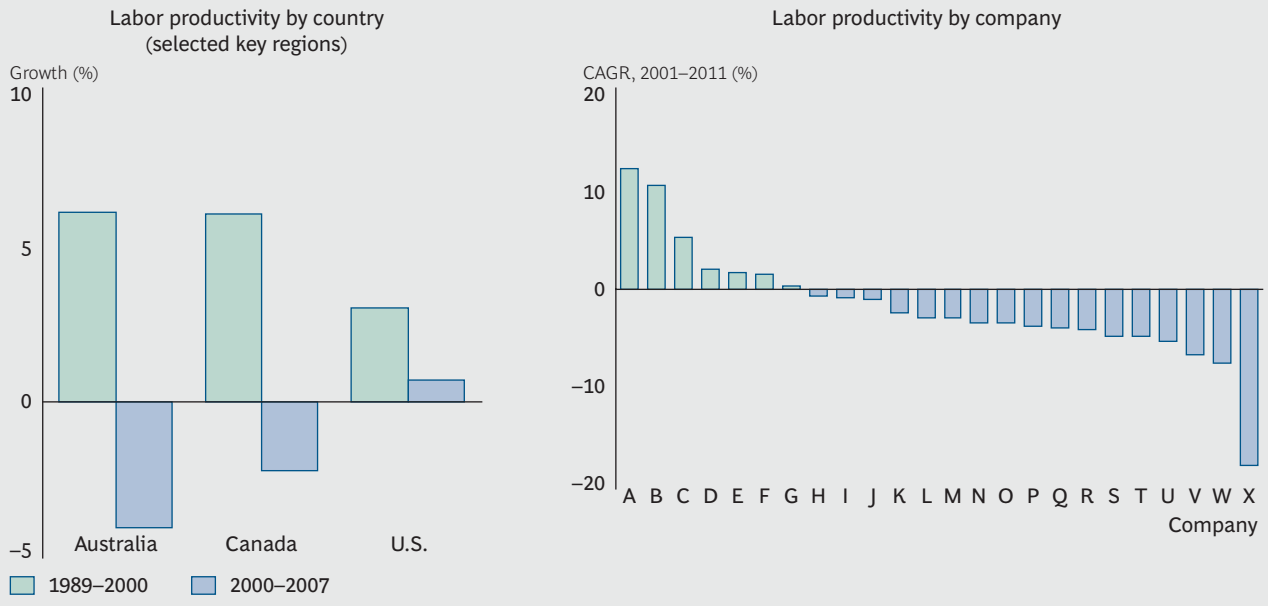
ent, and greatly increases the opportunities for cross-functional collaboration. There are also a number of new or improved technologies that allow companies to reach previously inaccessible ores and extend the life of existing operations—both important game changers. Such technologies include new recovery and refining methods, tunnel-boring machines for underground development, high-angle conveyors for surface mining, mobile in-pit crushing, and new sensing and ore-sorting technologies.

The increasing prevalence of instrumentation on mining equipment, and the increasing integration of engineering systems and enterprise systems, yield vastly more—and more accurate and timely—data. This abundance of better data supports everything from end-to-end production and supply chain efficiencies to enhanced scheduling, planning, and decision making. Companies can get more reliable information (real-time and historical) on the ore body, inventory, and asset health, and they can apply advanced analytics to historical data to support long-term improvement.

Finally, new technologies and new ways of using information make it imperative that executives reexamine how their business operates. Geographically dispersed people and skills can become more connected by means of either colocation in operations centers or virtual collaboration tools. Production and maintenance planning can become more tightly integrated. Operations can become more predictable and decision making more proactive. As collaboration across functional silos becomes easier, companies can unlock value by making better systemwide tradeoff decisions. Additionally, advances in NGM will require new workforce skills. For instance, as IT and automation become more important strategically and operationally, companies will need to attract more people with deep analytical, IT, forecasting, and programming skills. Companies will also need operators with a different skill set: computer dexterity.

Create people advantage. Mining companies face two pivotal human-capital challenges. As in most industries, talent is in short supply. (In North America, the shortage is exacerbated by attrition from mass retirement.) A second, less visible—and almost counterintuitive—challenge is the decline of labor productivity in mining, at both the industry and company levels. (See Exhibit 12.) Declining grades and increasing strip ratios cause outputs to shrink, while also making extrac-

Exhibit 12 | Labor Productivity in Mining Is Declining Significantly



Sources: Australian Bureau of Resources and Energy Economics, *Resources and Energy Quarterly*, September 2011; annual reports; BCG analysis.
Note: Labor productivity is calculated as output per full-time employee (with FTE defined by the companies included in the analysis).

tion more difficult and costly. Growth in support functions and overhead has only aggravated these trends.

Drawing on BCG's extensive research on talent and people management, we see four ways that mining companies might address the talent shortage and mitigate the decline in labor productivity:

1. *Define the employee value proposition (as part of developing employer brand)*. The mining industry rarely shows up on leading lists of the best places to work. As we observed earlier, executives must go beyond traditional mining-oriented talent to attract people with new skills that can help their company secure long-term competitive advantage.

2. *Adopt strategic workforce planning to ensure an adequate pipeline in key skill areas based on projected future demand*. Strategic workforce planning also allows companies to improve sourcing of indirect labor and nonproduction functions, thus enhancing their social license to operate. Companies will need to tap more deeply into underrepresented talent pools, including women, indigenous people, and those from other engineering disciplines.

3. *Manage talent on a continuing basis*. This includes sourcing and developing employees in strategically important categories, as well as providing leadership development, career development, and succession planning programs that advance individuals while building capacity.

4. *Centralize talent and people management efforts—where it makes sense to do so*. The corporate center has the resources and the reach to implement and manage the three preceding elements of people management. If it does them well, it can also manage indirect labor and overhead, coordinate initiatives, and institute productivity measures.

Talent and productivity issues require long-term effort. For that reason, companies ought to take advantage of market uncertainty to upgrade their talent, address demographic risk, and improve their employer profile. (For more on creating people advantage, see *Creating People Advantage 2012: Mastering HR and People Challenges in a Two-Speed World*, BCG report, October 2012.)

NOTES

1. World Economic Forum and The Boston Consulting Group, *The Responsible Mineral Development Initiative 2012,* http://www3.weforum.org/docs/WEF_MM_Report_2011.pdf.

2. Edward W. Merrow, *Industrial Megaprojects: Concepts, Strategies, and Practices for Success* (John Wiley & Sons, 2011). Independent Project Analysis defines failure as exceeding budgeted capex or schedule by more than 25 percent.

3. Based on the application to our sample of Independent Project Analysis results.

THE LONG-TERM VIEW

The turbulence of recent years is likely to continue. Demand will remain volatile. These difficulties promise continuing challenges for mining companies in bringing projects online and in everything from winning stakeholder support and getting permitted to managing ever-growing capital costs and complexity. Operating costs will continue to climb, driven by rising input costs, declining grades, and increasingly challenging geology. Left unchecked, these pressures can severely hamper any mining company's ability to create value.

Definitive action is a must. Yet where should companies focus their energy? The answer will be different for each company and even each operation, depending on individual circumstances and the tradeoffs that must be made. Creating long-term value in turbulent times requires a tailored approach—one informed by a clear value-creation strategy and supported by a disciplined and agile organization.

KEY QUESTIONS FOR MINING EXECUTIVES

Below is a series of questions that can help mining executives think about avenues for value creation—the choices they entail and the tensions within and between them.

Lever 1: Revisit and pressure test your value-creation strategy

- Does your organization have a comprehensive value-creation plan that incorporates and balances business, financial, and investor strategies?
- Does your value-creation plan consider different macroeconomic scenarios?
- Have you explicitly prioritized your capital-allocation options, and do you know how investors will react to each one?
- What are likely to be the biggest hurdles to achieving your value-creation objectives in the next one to three years? The next five to ten?

Lever 2: Manage country risk and stakeholder relations

- Does each of your sites have a stakeholder management strategy and plan?
- Where they exist, how well are they used? Where are they lacking and why?
- Do your stakeholder-engagement and community-development functions perform equally well in different locations?
- Are they staffed with the appropriate skills for each location?
- What do your stakeholder-management and community-relations programs entail? What information, resources, and other inputs do you use to develop and refine them?

Lever 3: Up the odds of project success

- What is the likelihood of your projects running over budget or schedule? What mitigations have you put in place?
- Do you apply the same rigor to your project organization and how it functions as you do to the rest of your business?
- How much value might be disappearing as a result of inconsistent planning or overengineering—or simply because people are not seizing opportunities for standardization?
- How would a new owner look at your existing operations? What would he or she change?

Lever 4: Develop an advantaged operating system

- How much of a step change in your economics would next-generation mining techniques provide? Do you have an NGM blueprint to guide your efforts?

- Is your organization built to withstand short-term shocks—or to capitalize on fleeting opportunities?

- What do you use to assess current and future workforce needs? What plans have you developed to fill key gaps today—and to attract those with the new skill sets needed for the future?

APPENDIX

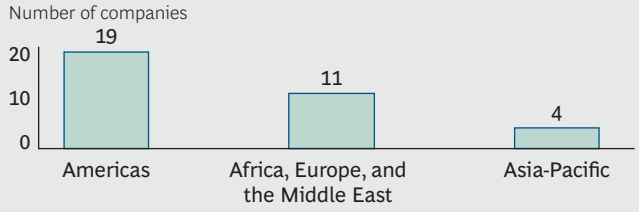
The Mining Industry Top Ten, 2001–2011

					TSR Disaggregation[1]					
Rank	Company	Domicile	TSR[2] (%)	Market value[3] ($billions)	Sales growth (%)	Margin change (%)	Multiple change[4] (%)	Dividend yield (%)	Share change (%)	Net debt change (%)
1	Industrias Peñoles	Mexico	58.2	17.8	22.8	10.5	9.0	6.2	0.4	9.3
2	Grupo México	Mexico	49.5	21.6	14.3	16.5	–5.1	3.6	1.4	21.5
3	Randgold Resources	United Kingdom	45.0	9.4	32.5	0.0	13.9	0.3	6.9	5.2
4	First Quantum Minerals	Canada	42.7	9.5	34.1	26.6	–13.4	0.6	7.6	2.5
5	Inner Mongolia Yitai Coal	China	40.2	7.3	30.6	24.3	–19.2	4.7	0.0	–0.3
6	Cliffs Natural Resources	United States	40.1	8.9	34.6	18.0	–7.0	0.9	–5.4	–0.9
7	Exxaro Resources	South Africa	39.2	7.5	8.7	5.0	15.0	4.5	1.7	7.8
8	Sociedad Químicay Minera de Chile (SQM)	Chile	36.9	15.1	14.7	6.2	9.4	3.4	0.0	3.2
9	Antofagasta	United Kingdom	32.4	18.7	23.0	5.8	6.5	5.1	0.0	5.1
10	Yanzhou Coal Mining	China	30.1	10.5	23.0	4.2	9.2	4.5	0.7	4.5

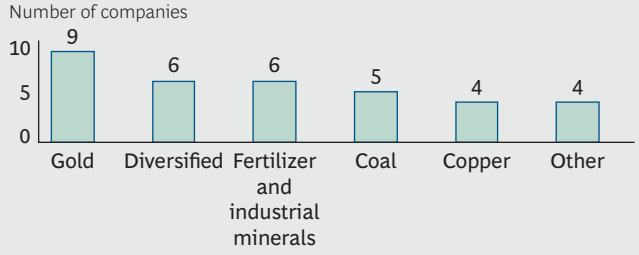
Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.
Note: The sample comprises 34 global companies with a market valuation greater than $7 billion and a free float of at least 25 percent.
[1]The contribution of each factor is shown as a percentage of the ten-year average annual TSR; any apparent discrepancies in TSR totals are due to rounding.
[2]Average annual TSR, 2001–2011.
[3]As of December 31, 2011.
[4]Change in EBITDA.

The Study Sample Comprised 34 Major Mining Companies

Location of primary listing



Primary minerals produced



The sample

- Agrium
- Anglo American
- AngloGold Ashanti
- Antofagasta
- Barrick Gold
- BHP Billiton
- Cameco
- Campañia de Minas Buenaventura
- Cliffs Natural Resources
- Consol Energy
- Exxaro Resources
- First Quantum Minerals
- Freeport-McMoRan Copper & Gold
- Gold Fields
- Goldcorp
- Grupo México
- Impala Platinum
- Industrias Peñoles
- Inner Mongolia Yitai Coal
- Israel Chemicals
- K+S Group
- Kinross Gold
- MMC Norilsk Nickel
- Mosaic Company
- Newcrest Mining
- Newmont Mining
- Peabody Energy
- PotashCorp
- Randgold Resources
- Rio Tinto
- Sociedad Química y Minera de Chile (SQM)
- Teck Resources
- Vale
- Yanzhou Coal Mining

Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

FOR FURTHER READING

The Boston Consulting Group publishes many reports and articles that may be of interest to mining management teams. Recent examples include the publications listed here.

Capital Procurement: The Cornerstone of Successful Projects
A Focus by The Boston Consulting Group, October 2012

Eight Key Levers for Effective Large-Capex-Project Management
A Focus by The Boston Consulting Group, October 2012

Mastering HR Challenges in a Two-Speed World
The BCG 2012 Creating People Advantage report, October 2012

Stakeholder Management: How Much Relationship Capital Do You Have?
BCG article, October 2012

How Companies Can Rise Above Faustian Economics
BCG article, October 2012

The 2012 BCG 50 Chinese Global Challengers: End of Easy Growth: Fast-Growing Companies Face Headwinds as They Expand
A Focus by The Boston Consulting Group, September 2012

Improving the Odds: Strategies for Superior Value Creation
The BCG 2012 Value Creators report, September 2012

How M&A Can Grow Portfolio Value
A report by The Boston Consulting Group, August 2012

Six Steps to Stability
BCG article, August 2012

Overhauling Maintenance
A Focus by The Boston Consulting Group, July 2012

Effective Community Engagement: Lessons from the Natural Resources Industry
BCG article, May 2012

Winning Practices of Adaptive Leadership Teams
A Focus by The Boston Consulting Group, April 2012

A Framework for Advancing Responsible Mineral Development
A joint report by The Boston Consulting Group and the World Economic Forum, February 2012

You Can't Grow Your Way Out of Inefficiency
BCG article, September 2010

Mastering Complexity
A White Paper by The Boston Consulting Group, July 2010

Ignore Short-Term Indicators, Focus on the Long Haul
BCG article, May 2010

NOTE TO THE READER

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