

VALUE CREATION IN MINING 2015

# BEYOND BASIC PRODUCTIVITY



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# INTRODUCTION

**A**FTER SEVERAL TOUGH YEARS, creating value remains a challenge for mining companies. Commodity prices have fallen markedly from their peaks, and although unit costs have recently started to subside, margins are still being squeezed. For these reasons, and because of slowing production growth, the industry continues to struggle to deliver positive total shareholder return (TSR)—in sharp contrast to the performance of the S&P 500.

In response, many mining companies have introduced productivity programs. Some programs have been successful; others have struggled to gain traction or have simply stalled.

Productivity is clearly a crucial element in value creation. Despite some important strides, however, companies need to do more. Many productivity initiatives focus on achieving efficiency in physical assets, which is a natural place to start. But they never get past that focus. To achieve sustained results, companies need to search holistically for opportunities—not just so that they can realize efficiency in physical assets, but also to achieve effective management systems and people excellence. For example, in managing contractors, effective management systems can optimize vendor selection and other sourcing decisions. People excellence will foster a broader set of capabilities beyond negotiating skills, so that companies can better integrate and manage contractors in order to make the most of their contribution.

In the longer term, however, productivity alone is not enough to fuel value creation. Companies should not abandon the pursuit of profitable growth, either organically or through acquisition. In growing organically, it is important to reassess the project pipeline in order to identify which improvements are needed to ensure that projects still make sense in the new economic context. In addition, companies should look past the recent lull in M&A and explore opportunities to strike value-creating deals, especially if they are skilled at injecting value into acquisitions. At the same time, companies that are underutilizing their assets should be mindful that they might well find themselves to be an M&A target. Finally, companies would do well to take a fresh look at new technologies, not merely as tools or infrastructure, but as a vital—and potentially game-changing—source of value creation.

# SINCE 2010, A ROCKY ROAD

**S**INCE ITS PEAK IN 2010, the mining industry's performance has, in characteristic cyclical fashion, taken a sharp downward turn. Companies have continued to destroy value at a time when the S&P 500 has hit record highs.

## The State of the Industry

The Boston Consulting Group analyzed the performance of 101 mining companies in the period from 2010 through 2014. We found that these companies delivered a median TSR of –18 percent each year during that time. (See Exhibit 1.)

Looking only at 2014, we saw a slight improvement: a median TSR of about –4 percent. That is, roughly half the companies showed signs of recovery, while others declined further. (See Exhibit 2.)

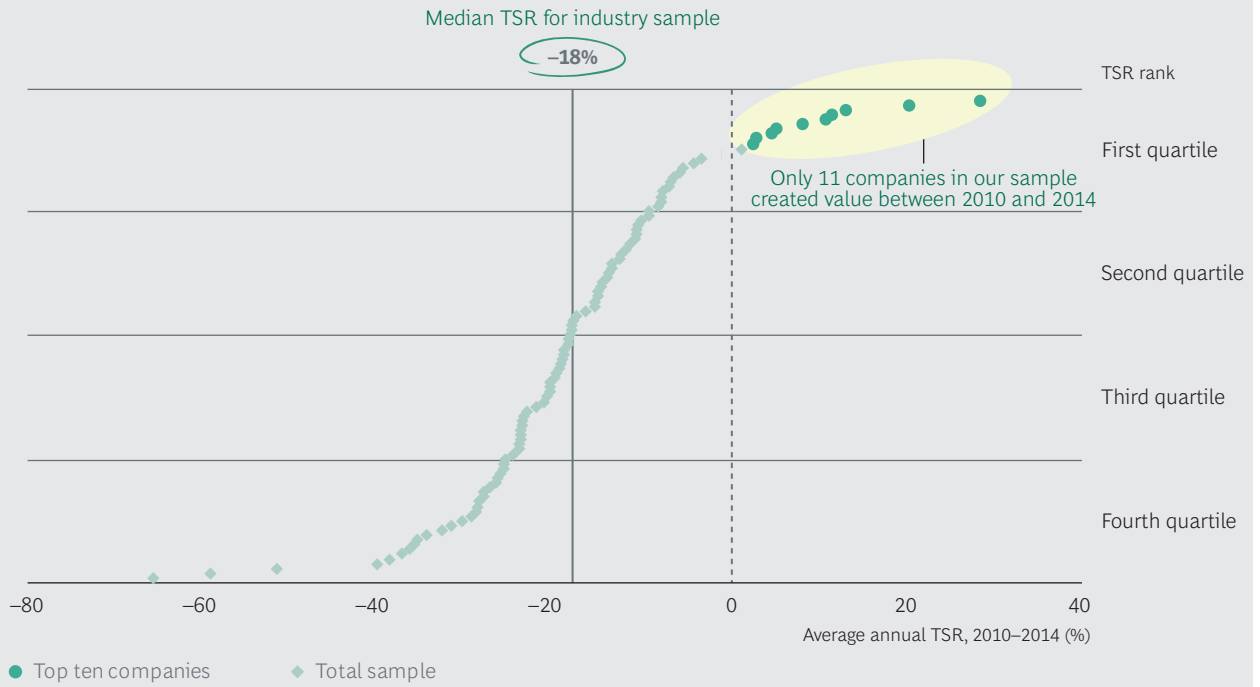
Coal companies were particularly hard hit; a rising abundance of natural gas and oil supplies depressed energy prices, including the price of coal. Slowing economic growth in China dampened demand for both metallurgical and thermal coal. In addition, heavy debt loads put downward pressure on valuation multiples. The impact on American coal companies proved especially harsh, and several now face financial difficulties. The gold sector started the year relatively strongly, but except for a handful of outperformers

(such as Newcrest Mining and Randgold Resources), its momentum reversed by year-end. The price of gold dropped by almost 40 percent to around US\$1,200 per ounce by the end of 2014 and has continued to decrease in 2015. Fertilizer companies, on the other hand, have performed relatively better, bolstered by improving prices for key crop nutrients. Many of these themes are continuing to play out in 2015.

Such disappointing results stand in stark contrast to those in 2000 through 2009. During that period, the China-driven price boom fueled growth in profits, unleashing a wave of new, often capital-intensive, projects designed to take advantage of surging demand. This robust growth boosted investor expectations, causing valuation multiples to expand. Together, these factors drove stock prices sharply upward, even after the effects of the financial crisis of 2007–2008 are taken into account. Indeed, the growth in production is still apparent today. More than 60 percent of the companies in our sample saw revenues increase during the period 2010 through 2014, despite falling commodity prices.

So what triggered the reversal of fortune? According to our analysis, three factors were largely responsible: falling commodity prices, rising costs (and, in turn, declining margins), and investors' loss of appetite for mining stocks.

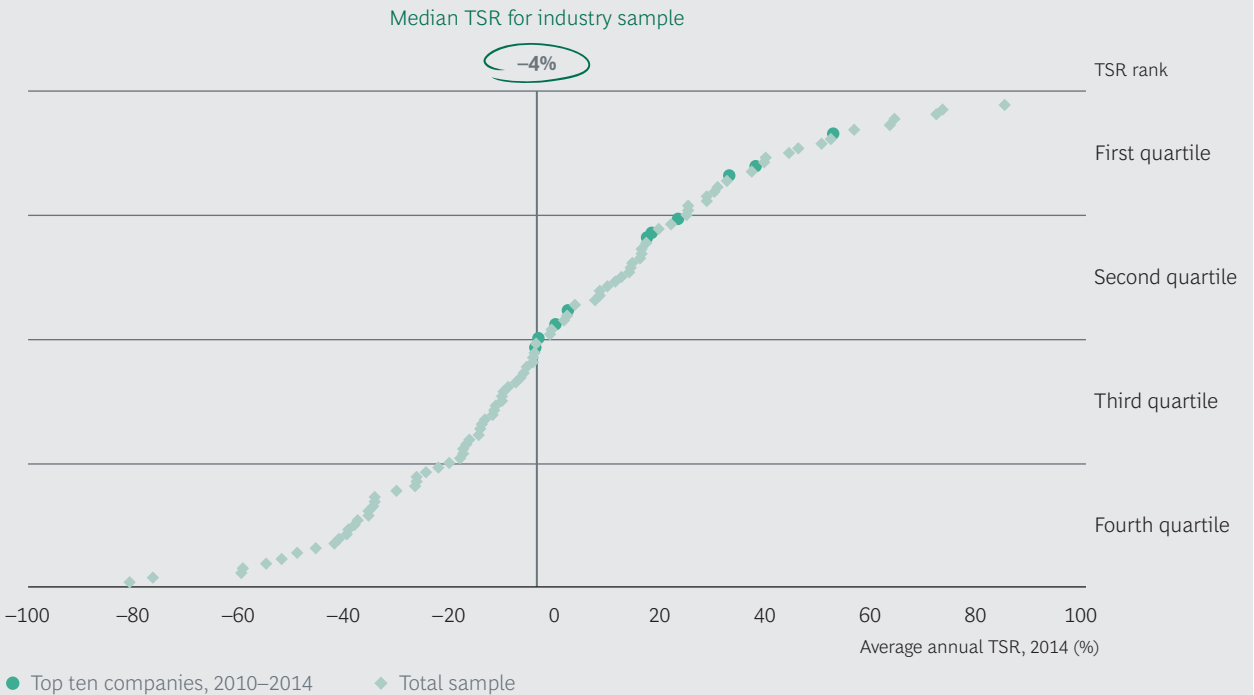
### EXHIBIT 1 | Few Mining Companies Have Created Value Since 2010



Sources: S&P Capital IQ; annual reports; BCG analysis.

Note: Our sample consisted of 101 mining companies with a market value greater than \$3 billion at year-end 2014 and/or a market value greater than \$3 billion at year-end 2010, at least 25 percent free float, and a positive EBITDA in both years. TSR was derived from calendar year data.

### EXHIBIT 2 | For Many Companies, 2014 Proved to Be Another Difficult Year



Sources: S&P Capital IQ; annual reports; BCG analysis.

Note: Our sample consisted of 101 mining companies with a market value greater than \$3 billion at year-end 2014 and/or a market value greater than \$3 billion at year-end 2010, at least 25 percent free float, and a positive EBITDA in both years. TSR was derived from calendar year data.

From 2010 through 2014, the increase in unit costs, coupled with the decline in margins, erased a median 7 percentage points of TSR from our sample. These trends more than offset the economic benefit of increased production. As a result, only one-third of the companies we analyzed experienced growth in profits over these years. In addition, investors' waning appetite for mining stocks during this time nudged valuation multiples lower; only 11 companies recorded a positive TSR for the period. (See Exhibit 3 and the sidebar "The Components of TSR.") Indeed, fully 70 percent of respondents to the BCG Investor Survey 2015 said they believe that the metals and mining sector will continue to underperform in 2015 in terms of TSR. The most likely reasons for investors' declining interest relate to their diminished expectations about the outlooks for prices and production: investors have become more skeptical that profitable growth options will materialize. They also question the quality of capital stewardship in the industry.

Geographically, performance results were mixed. Companies in Australia performed well over the period 2010 through 2013. Iron

ore prices had proved to be resilient for longer than other commodities, supporting Australian revenues even as margins underwent significant declines. In 2014, however, this resilience dramatically gave way as iron ore prices halved. This downward trend continued in 2015.

In response to these pressures, many companies have intensified their scrutiny of capital deployment. As boards and executive teams have grown more cautious about the outlook for prices and demand, they have scaled back, delayed, or canceled growth investments. Total capital expenditure by companies in our sample declined more than 20 percent from its 2012 peak. Industry debt levels remain historically high: with the decline in stock prices, they were at approximately 25 percent of enterprise value at the end of 2014. In the U.S. coal sector in 2015, this ratio exceeds 75 percent at many companies, which makes them particularly vulnerable to external shocks.

Divestments and spin-off activity also increased over the period 2010 through 2014, as companies sold noncore assets that no longer aligned with their broader strategy.

### EXHIBIT 3 | Companies Are Selling More but Earning Less

FACTORS CONTRIBUTING TO 2010–2014 TSR	MEDIAN CONTRIBUTION, BY FACTOR (%)	PERCENTAGE OF COMPANIES WITH A POSITIVE RESULT	
Revenue growth	3	63	Revenues generally grew, as increased production volumes overcame falling prices.
EBITDA margin change	-10	12	However, margins declined at the vast majority of companies.
Profit growth	-7	33	As a result, only one in three companies grew profits during this time . . .
EV/EBITDA multiple change	-5	33	
Dividend yield	2	96	
Share change	-0	22	
Net debt change and leverage	-7	10	
Free-cash-flow contribution	-6	25	
<b>MEDIAN TSR (%)</b>	<b>-18</b>	<b>11</b>	. . . and even fewer companies created shareholder value.

Sources: S&P Capital IQ; annual reports; BCG analysis.

Note: The sample consists of 101 mining companies. Because of rounding, numbers may not add up to the totals shown.



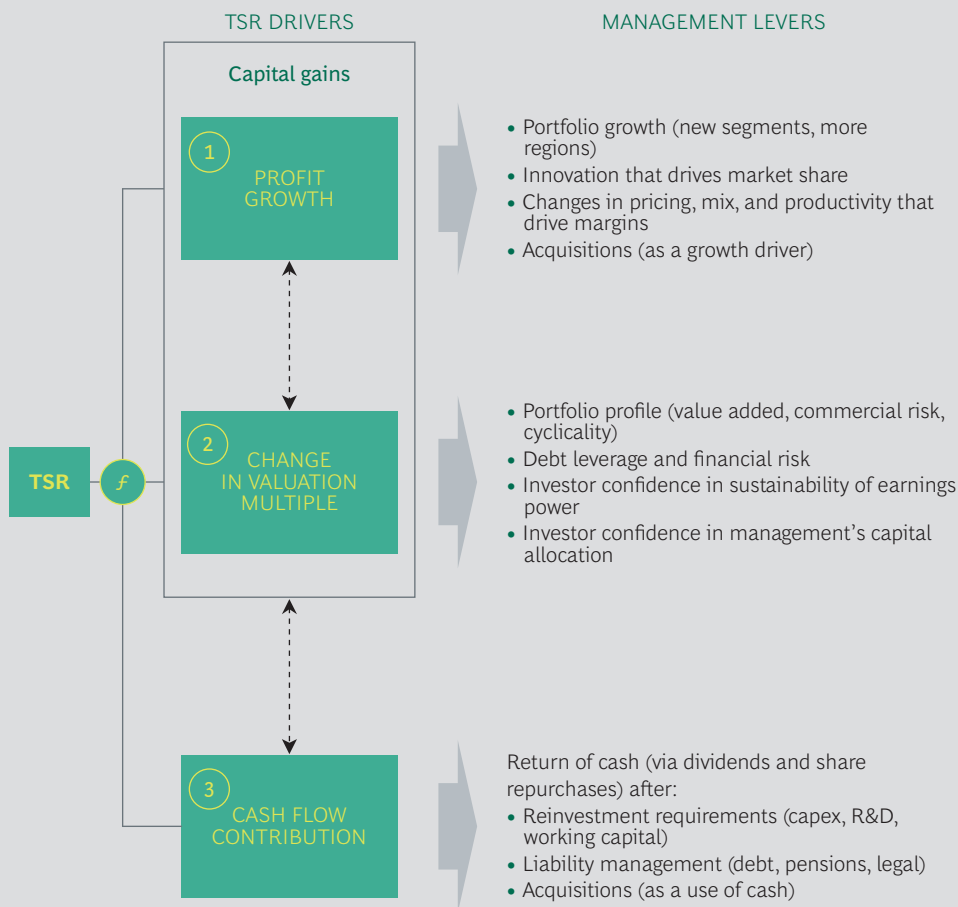
## THE COMPONENTS OF TSR

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 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 enterprise value. Finally, the model also tracks the distribution of free cash flow to investors and debt holders in the form of dividends, share repurchases, or repay-

ments 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 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.

Such moves have not been without challenges, however; assets have been hard to offload, and many remain “on the block” because buyers are not willing to match sellers’ price expectations. Still, we expect further divestments to occur as companies shore up their balance sheets, refocus their portfolios, and focus more sharply on returns than on growth.

Equally important, many companies have implemented or reinvigorated productivity programs and have publicly emphasized the importance of such programs and their results.

### Unfinished Business: A Productivity Update

Since 2010, approaches to productivity improvement have varied. Many companies tackled the simplest, most readily achievable improvements first—such as cutting overhead costs or focusing on high-grade zones within existing operations. Others took further steps, such as swiftly aligning their organizations around a productivity agenda, ensuring the organization is focused on the

highest-value activities, avoiding short-sighted decisions, and deploying technology to rapidly identify and realize value opportunities.

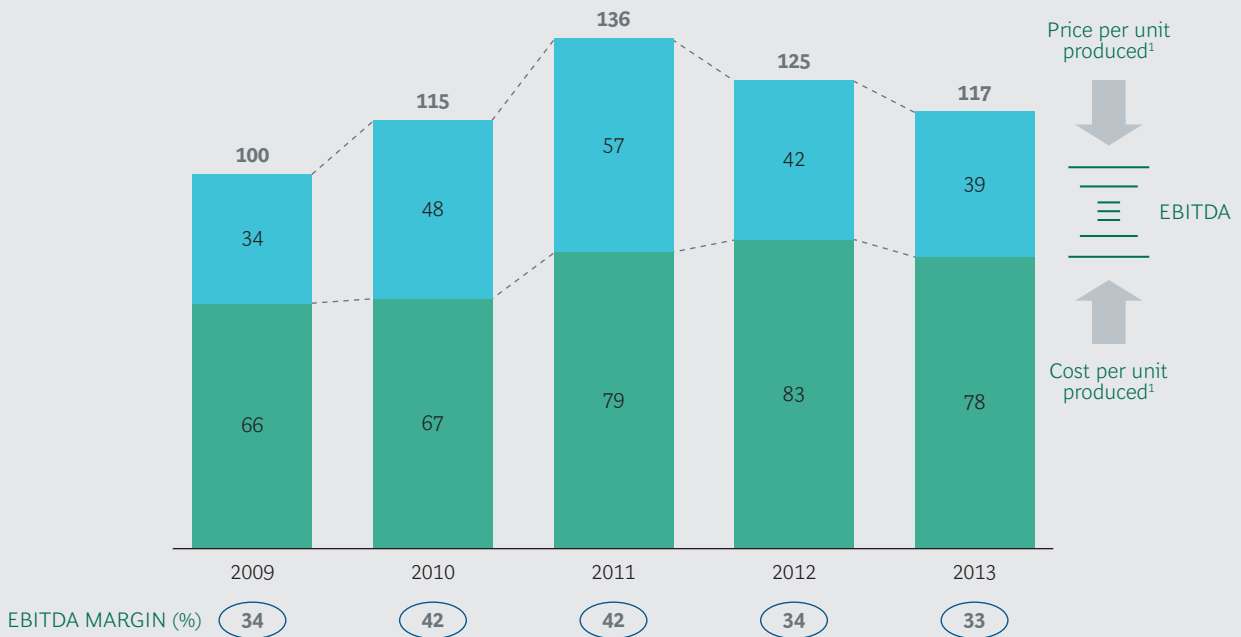
Indeed, the productivity programs have yielded initial results. In most regions—and for many commodities—unit costs have stabilized or started to decline after a decade of increases, although they are still well above the levels of 2009.

While this is good news, the decline in commodity prices since 2011 has erased much of the benefit that generally stable or reduced unit costs have provided. Industry margins have also continued to fall, from a high of 42 percent in 2010 and 2011 to 33 percent in 2013. (See Exhibit 4.) This trend continued into 2014, as prices for coal, gold, and iron ore declined further.

The impact of the margin “squeeze” has not been uniform, however. Our analysis of mining productivity highlights important differences across commodities and countries. For example, Exhibit 5 shows key drivers of unit cost increases throughout surface copper mines from 2010 through 2013.

#### EXHIBIT 4 | The “Squeeze” Is On

EVOLUTION OF COMMODITY PRICES AND UNIT COSTS, 2009–2013



Sources: Bloomberg; SNL Metals & Mining; annual reports; BCG analysis.  
<sup>1</sup>Indexed at 2009 prices.

## EXHIBIT 5 | Costs Increased at Surface Copper Mines

### CHANGE IN MINING COSTS, 2010–2013

	MINING COSTS, 2010	Labor	Consumables	Services	Diesel fuel	Other <sup>1</sup>	MINING COSTS, 2013
CHILE	\$2.03	+0.39 (+19%)	+0.26 (+15%)	+0.22 (+12%)	+0.19 (+17%)	-0.08 (-30%)	\$3.01 (+14%)
UNITED STATES	\$1.81	+0.13 (+8%)	+0.04 (+2%)	+0.05 (+5%)	+0.00 (+0%)	-0.00 (-1%)	\$2.03 (+4%)
PERU	\$1.30	+0.02 (+2%)	+0.21 (+13%)	+0.08 (+12%)	+0.17 (+15%)	+0.04 (+36%)	\$1.82 (+12%)
CANADA	\$1.74	+0.03 (+1%)	+0.13 (+12%)	+0.13 (+16%)	+0.01 (+1%)	+0.00 (+2%)	\$2.03 (+5%)
AUSTRALIA	\$3.03	+0.12 (+5%)	+0.33 (+10%)	+0.31 (+15%)	-0.02 (-1%)	+0.21 (+191%)	\$3.98 (+10%)
ZAMBIA	\$2.46	-0.01 (-1%)	-0.27 (-9%)	-0.26 (-14%)	+0.45 (+35%)	+0.11 (+52%)	\$2.47 (+0%)
DR CONGO	\$4.38	+0.11 (+8%)	+0.36 (+8%)	+0.15 (+3%)	+0.04 (+1%)	+0.01 (+2%)	\$5.06 (+5%)

Sources: Wood Mackenzie; BCG analysis.

Note: Mining costs refer to the cost per ton (in U.S. dollars) of material moved, excluding processing, logistics, and overhead costs. Values in parentheses are the average annual percentage increases. Because of rounding, numbers may not add up to the totals shown.

<sup>1</sup>“Other” includes such costs as electricity and contractors.

Here, mining costs are defined as the cost to move one ton of copper, including both waste and ore, regardless of grade. This example provides a useful starting point for assessing mining productivity (although, of course, the impact of grades, strip ratios, and other factors must also be considered). Clearly, increases in total mining costs varied widely, from virtually zero in Zambia to sustained 10 percent or greater average annual increases in Australia (10 percent), Peru (12 percent), and Chile (14 percent). Labor costs (particularly in Chile), consumables, and services represented some of the biggest areas of increase.

### Productivity: A Country-Level Report Card

When we look at other commodities, and consider the impact of geology and other factors, some country-level trends begin to emerge.

**Australia.** From 2010 through 2013, mining companies in Australia experienced considerable cost increases, with annual unit costs rising at surface copper mines (10 percent),

underground gold mines (9 percent), surface gold mines (8 percent), and surface iron-ore mines (6 percent).

Geology had a relatively neutral effect on productivity overall. Ore grades improved in surface copper and gold mines, contributing 4 to 10 percent annually to mining productivity. However, this benefit was more than offset by worsening strip ratios, which reduced productivity by 9 to 11 percent annually over the same period.

While the weaker Australian dollar provided some relief, the exchange rate impact can be fleeting. Currency is not a reliable productivity lever. Australian mining operations should instead continue to pursue fundamental improvements, particularly in production efficiency and labor productivity.

**Canada.** During the 2010 through 2013 period, Canada faced a different productivity challenge than Australia. Unit costs of moving material grew by a relatively modest 5 percent each year at surface copper mines, and actually declined at surface gold mines.

Labor productivity appears to have improved by up to 3 percent annually over the same period, and some mines also enjoyed diesel fuel efficiency (as measured by the volume of diesel required to produce a unit of output).

However, when the net impact of changes in grade and strip ratio are factored in, the unit costs of production increased by 10 to 22 percent annually from 2010 through 2013 for copper, gold, and iron ore. In the future, Canadian mining companies will need to extend production efficiencies even further, while they continue to strategically optimize mine plans, in order to ensure a positive contribution to TSR.

**Chile.** Of all the countries we analyzed, Chile suffered the most dramatic increases in costs of material moved in surface copper and gold mines: from 2010 through 2013, costs grew by 14 to 15 percent each year. Labor costs (pay rates as well as number of employees) and consumables were the biggest factors.

Improved strip ratios helped to offset rising costs somewhat, though unit costs of metal production still rose by about 10 percent annually. In 2013, improved strip ratios yielded only a modest benefit. To remain cost competitive, Chile will need to address the drivers of cost inflation and labor productivity; it can no longer count on geology as a means of continually improving productivity.

**The United States.** Over the same period, U.S. mining companies succeeded in containing increases in the cost of moving material at surface copper and gold mines to single-digit percentages. Labor productivity appears to have improved slightly over this period.

However, perennially low grades and declining strip ratios continued to exert upward pressure on the cost of metal mined, especially at surface copper mines. These conditions are unlikely to improve in the near term. Hence, mining executives should consider further investments in technology as an avenue for boosting productivity—whether in the mine, the mill, or downstream.

## On the Right Track, but More Progress Needed

Clearly, companies are making progress in tackling their productivity challenges. Yet, it is too soon to claim victory: productivity efforts haven't gone far enough to reverse declining TSR.

Basic productivity efforts are hitting a wall in two respects: in their ability to achieve further cost decreases and in the sustainability of their first-wave results. If economic trends are any indication, commodity prices cannot be relied on to revive ailing TSR—at least not in the near term. Companies will need to re-focus their productivity efforts, squeezing the most out of current efforts and identifying new sources of improvement.

# THE PRODUCTIVITY AGENDA

DIGGING DEEPER FOR VALUE

**M**ORE THAN EVER, MINING companies need to take a smart, end-to-end approach to productivity—one that goes beyond easy wins. To achieve breakthrough productivity—the kind that leads to sustainable improvements in margin—executives and operators need to think differently about how their assets are organized and managed, where costs and value accrue, and where costs might best be cut for maximum impact.

## Getting More, Through the MOST Framework

BCG's holistic approach to productivity improvement is maturity-based, optimized, sustainable, and transformational—hence the name MOST. Developed through our experience with more than 150 projects worldwide over the past several years, MOST is both a diagnostic and an improvement framework. It helps companies optimize not only their internal operations—within and across functions, processes, and systems—but also their external interactions with suppliers and customers. And because it is based on a strategic view of the asset—that is, mine, milling, and processing facilities (and sometimes transportation equipment)—MOST enables companies to transform their operations to align with their role in the total portfolio.

In incorporating MOST, companies assign a maturity level to the organization (whether an

individual site or the entire company) based on its stage of development, degree of sophistication, and degree of stability: *foundational* (disjointed and unstable); *proficient* (optimized only within silos and only partly stable); *best practice* (stable, and optimized across the value chain); and *breakthrough* (world-class, utilizing leading-edge technology and top people).

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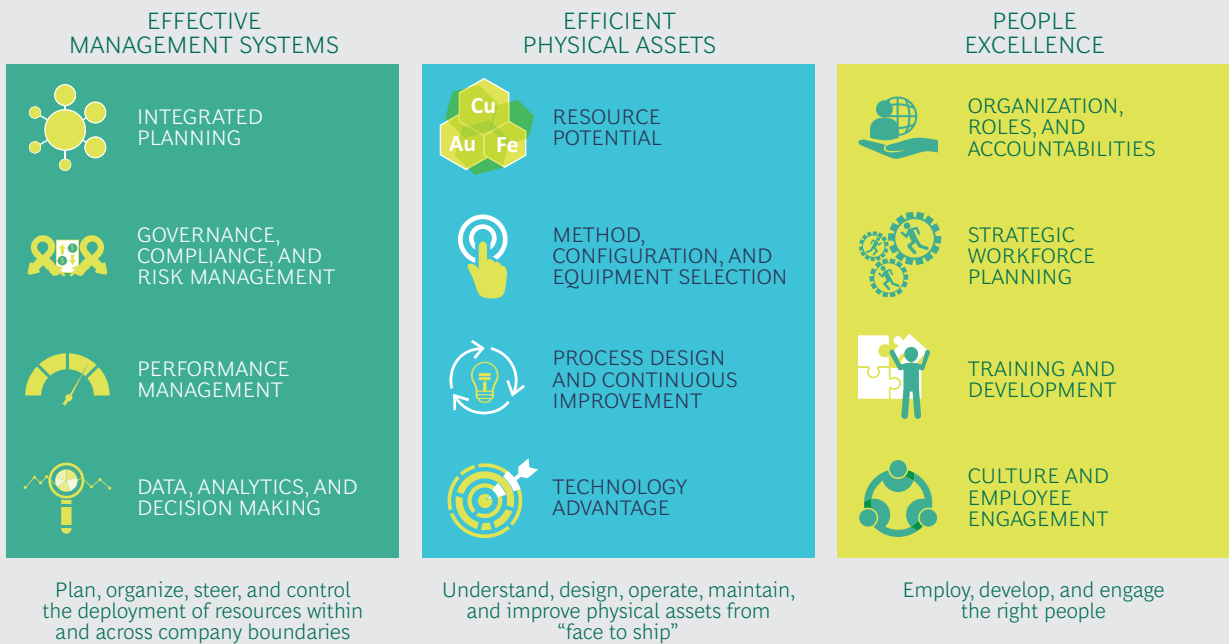
Achieving breakthrough productivity requires a smart, end-to-end approach.

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They then design a productivity program that deals with the operation's performance in three dimensions: the *efficiency of physical assets*, the *effectiveness of management systems*, and the *level of people excellence*. (See Exhibit 6.) Taking a triage approach, MOST targets the least mature areas—that is, the weakest links—first. In executing improvements, MOST also applies proven principles of change management in order to ensure that the changes stick.

Companies that adopt MOST recognize the importance of the interrelationships among the three dimensions. They understand that achieving efficiency with physical assets amounts to more than eliminating produc-

## EXHIBIT 6 | The MOST Framework



Source: BCG analysis.

tion bottlenecks. It calls for having a better understanding of each resource’s potential; for reevaluating the mining method, configuration, and equipment selection; and for seeking a technology advantage through targeted investments that boost throughput and reduce costs. They also recognize that effective management systems reinforce achieving efficiency in physical assets. In addition, they understand that realizing people excellence—having a motivated, accountable, and properly skilled workforce—is a key ingredient in achieving sustainable gains. Performance excellence in any one dimension reinforces excellence in the others.

### Finding Hidden Value in Contractor Management

It takes an all-inclusive view—of internal operations as well as of external relationships—to get a true picture of productivity. One area of expenditure that traditional productivity and lean programs often struggle with—but that holds great potential—is contractor management.

Contractors play an important role in mining and mineral processing, yet the opportunities

to improve contractor productivity are not always visible to senior executives and other decision makers. Successful contractor management goes far beyond squeezing rates and payment terms, moves that can ultimately be counterproductive. The most effective approach to contractor management touches all three pillars of the MOST framework:

- Efficient Physical Assets.* Contractor effectiveness is partly influenced by the physical environment in which contractors work, as well as by the layout of the assets. Opportunities to boost contractor productivity exist in areas such as process design, reduction of transport times, maintenance optimization, and the continuous improvement of contractor activities.
- Effective Management Systems.* Contractor management is primarily about having effective management systems to decide which categories are insourced or outsourced, how contractors are selected, and how they are managed and compensated. Data, analytics, and decision-making capabilities are central to this effort.

- *People Excellence.* Optimizing the use, productivity, and integration of contractors on site requires a broad set of capabilities that go beyond negotiating skills. The development of such capabilities requires mining companies to invest in strategic workforce planning as well as capability- and skill-building among their staff.

An integrated approach maximizes results. And it is this approach that separates MOST from a set of tactical measures that might yield incremental gains, but might also miss out on step-change breakthroughs.

There are three broad aspects to contractor management, all of which offer opportunities for productivity improvement:

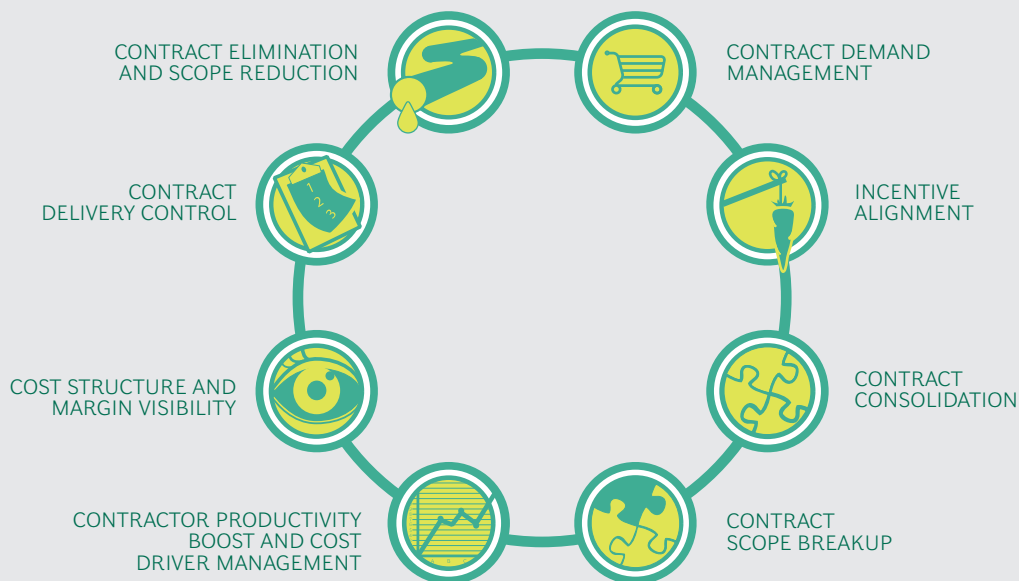
- *Service Contracts Strategy.* For each step of the value chain—from blasting and equipment leasing to mine development and industrial surveillance—executives must decide whether to outsource or execute in-house. Once the decision to outsource a function is made, executives must consider how best to design contracts, identify potential contractors, run an efficient selection process, and manage the delivery of the contract.

- *Service Contracts Organization and Planning.* What is the best way for the company to administer and plan its contracting and procurement functions? The more reliant an operation is on contractors, the more professional its contracts function must be.
- *Specific Contract Value Levers.* How can companies generate the most value from each contract—that is, the lowest cost or the greatest increase in throughput or service quality? They need to look at each element of the contractor relationship in order to identify opportunities to improve efficiency or quality.

**A Closer Look at Contract Value Levers.** We have identified eight value levers that companies can apply in order to enhance value. (See Exhibit 7.) A close look at several of these contract value levers illustrates the many often overlooked avenues for mining value.

For instance, *contract demand management* calls for reviewing service standards, required procedures, or technical standards (or all three), as well as simplifying contract requirements and reporting structure. In blasting contracts, for example, downsizing the size of the truck fleet (which is generally sized to

### EXHIBIT 7 | Value Levers for Contractor Management



Source: BCG analysis.



accommodate peak demand) can yield significant savings.

The *contract consolidation* lever involves consolidating small contracts, setting a common base for contract fees, and reducing general and administrative expenses. One company that consolidated its four different auxiliary-equipment leases realized a savings of 15 to 25 percent of its annual expenditure.

*Contract scope breakup* seeks opportunities for efficiencies by segmenting contracts that require different services or capabilities on the basis of the scope of their component parts. Among other things, it enables more competitive bidding than an integrated contract. For example, a haul truck maintenance contract was rescoped to allow local contractors to perform some lower-skilled activities at a rate below that charged by a full-service, integrated services provider. This saved the company about 15 percent of the annual contract cost.

The *contractor productivity boost and cost driver management* lever addresses the proportion of non-value-added time that contractors spend on site (some of which is imposed by the mining company itself), as well as the total amount of tool time that is actually required. This lever seeks opportunities to reduce total tool time (that is, to make services more efficient) as well as the amount of time wasted waiting to perform those services. Both actions reduce contractor hours, but, if done well, also increase the uptime and throughput of a facility.

*Contract delivery control* involves implementing systematic controls to monitor prices and fee adjustments, guarantee service delivery, and ensure that contractual penalties are applied when appropriate. In one case, a company earned US\$1.2 million from inventory-level penalties that were contractually negotiated but that had been overlooked during the execution of the contract.

To maximize the value of contractor management, of course, companies will want to apply as many value levers as are appropriate to any given contract. On average, applying multiple levers can generate a total savings of 10 to 20 percent of the contracted cost.

**Three Examples of Contractor Management Success.** The following examples, drawn from actual projects, illustrate the potential impact of various contract value levers.

A mining company we worked with, for instance, modified the way a contractor was being paid to better align incentives and reduce costs. Recently, the company discovered that, over the previous 12 months, the actual cost of a maintenance contract exceeded the contractor's base cost by 13 percent. More than half of the added cost was incurred by hours spent by the contractor replacing mill liners. The contractor was being paid on an hourly basis to perform this task; without sufficient oversight, the man-hours billed for this task increased significantly. By establishing a fee schedule for component replacement that was based on standard times provided by the manufacturer, the company was able to save 7 percent of the annual contract amount.

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Using multiple value levers can generate an average savings of 10 to 20 percent.

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Another company used the contractor productivity boost lever to identify a gap in tool time and improve plant throughput. At that site, contract maintenance jobs were taking longer than expected, causing low plant availability. A detailed, on-the-ground assessment of contracted maintenance activities revealed that tool time was averaging just 25 percent of total shift time—below the benchmark and far below best-practice levels. The reasons for this poor showing were necessary (but time-consuming) tasks, such as coordinating with others, obtaining required materials, holding prestart and supervisory meetings, and reporting. In order to achieve a minimum tool time of 40 percent, it was necessary to turn an additional hour and 50 minutes per shift into productive time. Further analysis pinpointed improvement measures that delivered a quick payback: kitting parts before the job, streamlining the multitude of reporting forms required by the site, and creating an “opportunity jobs” backlog to use



time efficiently before equipment was released back to the operation. All told, these actions significantly increased tool time and plant availability, and, as a result, contributed to improved plant throughput.

Still another company used a criticality assessment to identify substantial scope-reduction opportunities. This company was required to build a leak detection system in order to monitor tailings. The leak detection system cost US\$46 million, and included high-perfor-

mance piping along an 80-kilometer stretch. But the criticality assessment revealed that only a 25-kilometer stretch required high-performance piping; a lower-specification pipe was sufficient for the remainder. Rescoping the project in this way immediately reduced the total cost of the contract by 20 percent—without any loss in system performance.

# VALUE CREATION BEYOND PRODUCTIVITY

**S**UCCESSFUL COMPANIES RECOGNIZE THE role that a long-term and integrated productivity program plays in value creation. Productivity growth helps fund the future. Moreover, by adding value to acquisitions, productivity makes a company into a more capable acquirer. But productivity is not enough. Other levers are needed to fuel value creation. Chief among them is profitable growth, both organic and through acquisitions.

## Reassessing the Project Pipeline

Given the extremely long lead times inherent in getting growth projects into production, companies with the means to do so should begin upgrading their project pipelines. Mining executives will want to reexamine projects not yet under way, perhaps even performing a radical rethinking of available options by stepping back to the prefeasibility level of study. This is especially important for projects that were proposed before the global financial crisis and the sustained levels of economic and market volatility that have ensued.

Executives might also want to revisit projects already under way, reassessing them in light of the revised outlook for commodity prices, costs, and capital. This review should include reevaluating the options afforded by new technologies that have become available

since the projects commenced. This logic applies not only to major capital projects but also to sustaining capital—that is, capital expenditure required to maintain existing operations—an area that has often been overlooked in the past.

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Companies that can should upgrade project pipelines.

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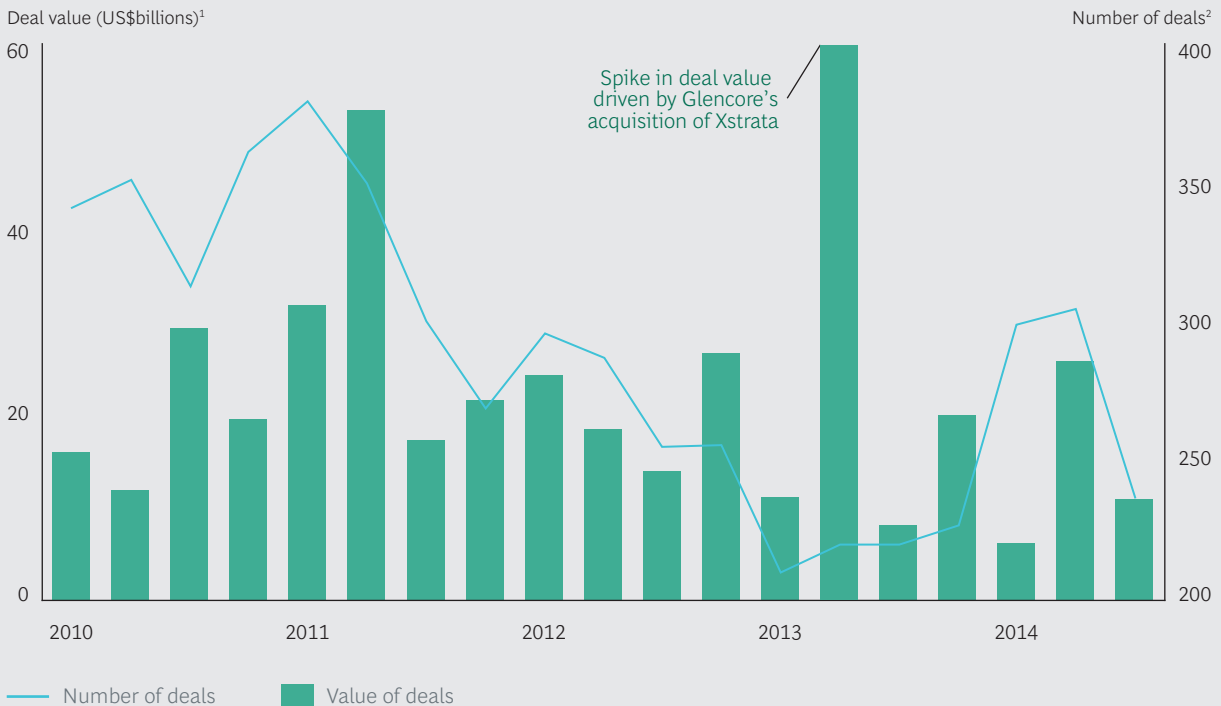
## Pursuing M&A Opportunities

Mining company valuation multiples, transaction multiples, and acquisition premiums are all low relative to prior years. With the exception of Glencore's acquisition of Xstrata, however, M&A activity has remained subdued since hitting a low in 2013. (See Exhibit 8.)

Companies with the financial means have engaged in selective acquisitions to take advantage of the current low valuations: for example, First Quantum Minerals's acquisition of Inmet Mining and Agnico Eagle Mines and Yamana Gold's joint acquisition of Osisko Mining's Malarctic mine.

Some acquirers have been very successful. Northern Star Resources, based in Australia, grew from being a gold explorer to a prolific (350,000 ounce per year) producer following a

## EXHIBIT 8 | Global Mining M&A Activity Remains Subdued



Sources: Thomson ONE Banker; BCG analysis.

<sup>1</sup>Enterprise values include the net debt of targets.

<sup>2</sup>The total number of deals comprises 19,666 M&A transactions in the metals and mining industry from 2010 through the first nine months of 2014 (including pending deals), with no transaction-size threshold, and excludes repurchases, exchange offers, recapitalizations, and spin-offs.

series of well-timed, well-executed buys—largely of assets divested by larger companies. This strategy has rewarded Northern Star’s shareholders well, delivering an annual TSR of more than 100 percent since 2010.

Now is the time for companies to evaluate opportunities to strike value-creating deals. Opportunities over the next few years will be especially important for those companies and teams with a differentiated ability to add value to acquisitions.

Likewise, companies that are underutilizing their assets will increasingly become the target of acquisition hunters and activist investors. For this reason, such companies should take pains to ensure that they are generating the utmost value—and that their efforts are properly communicated to investors.

### Recognizing Technology’s Value-Creating Power

Technologies such as robotics, the industrial internet, real-time data monitoring, and ana-

lytics have radically transformed manufacturing and production processes in a range of other industries. Industries with controllable environments—those under one roof, such as automotive manufacturing—have integrated their processes end-to-end using automation.

Mining, however, is a geographically dispersed business with inherent variability in geology and weather. This variability has traditionally been accepted as a reality that comes with the territory—and a limiting factor for the application of advanced technologies.

Today, however, some companies are discovering opportunities to use automation and the industrial internet to drive greater integration throughout the mining value chain. But apart from their many other benefits—greater employee safety, reduced energy use, lower environmental impact—next-generation mining techniques are fundamentally a means of improving productivity. Autonomous drilling, trucks, and trains allow companies to achieve massive gains in surface min-

ing, as well as greater yields in mining more complex deposits.

Access to real-time operational data is also advantageous: when integrated with maintenance data, real-time operational data enables companies to monitor plant productivity, plant utilization, availability, hourly output, and reliability more accurately. With real-time information flows, companies can analyze performance at any time, on an ongoing basis—and make smarter, more informed decisions in the field.

There is still considerable value to be gained from traditional productivity programs. As these programs run their course, however,

new technologies will allow progressively higher levels of productivity to be achieved, along with improved cash flows and future growth options.

Taking advantage of any of these value-creation levers—project reassessment, the pursuit of M&A opportunities, and new technologies—requires financial health. This is, yet again, another argument for pursuing breakthrough productivity: it endows companies with the ability to look toward longer-term profitable growth.

# CONCLUSION

**I**N THE PAST FEW years, creating value has been a struggle for the mining industry. Lower commodity prices and increased costs have taken a steep toll on TSR. Over the near to medium term, enhancing productivity has become critical to value creation.

A range of productivity efforts are under way within mining companies today, and many have delivered considerable value. As the supply of “low-hanging fruit” is exhausted, however, it has become increasingly necessary to go beyond traditional approaches to productivity improvement. Traditional productivity programs often focus on the efficiency of the physical assets at a site. But companies need to consider two additional pillars of performance: effective management systems and people excellence. Considered holistically, opportunities can be sought both within and *across* these pillars. This not only provides a greater range of opportunities to consider, but also increases the likelihood of success.

One effective, though often neglected, avenue to productivity is contractor management. But numerous other measures are at companies’ disposal, as the MOST framework

demonstrates. When applied collectively, these measures can have considerable impact in reducing unnecessary costs, boosting efficiency, and enhancing value.

Once in a position to do so, executives need to consider other value-creation levers, including resuming the pursuit of profitable growth. Management teams must prepare themselves now to be in the most favorable position to capitalize on opportunities as they arise. To generate value in organic growth, they need to refine the quality and certainty of their project-development pipeline. To reap greater value from acquisitions, they will need to streamline the processes by which deals are selected and benefits realized. Beyond these actions, strategic investments in technology can unlock even greater value for both present and future operations. While the past few years have been challenging, there is still great potential to create value in mining—and moving beyond basic productivity is one avenue for doing so.

# NINE KEY QUESTIONS FOR MINING EXECUTIVES

**B**ELOW, WE OFFER NINE key questions that mining company executives should consider as they seek ways to boost value creation.

1. What are your value-creation aspirations for your company over the next three, five, and ten years?
2. From where will your company generate value? How much value needs to come from productivity improvements?
3. Where have your productivity efforts been focused? On the efficiency of physical assets? The effectiveness of management systems? People excellence?
4. What has worked and what hasn't? Will future improvements keep pace with past successes?
5. What do you believe is the next wave of opportunities? Which opportunities have previously been overlooked or deemed too difficult—and should be revisited?
6. Do your current efforts also include evaluating contractors? Is there hidden value to be unlocked through such assessments?
7. Given rapid advancements in technology, what opportunities exist to accelerate improvements in productivity? Which opportunities are likely to emerge in the coming years?
8. Beyond productivity improvements, what other value-creation levers are you actively pursuing?
9. How well positioned are you to take advantage of today's difficult market conditions in order to pursue M&A opportunities?

# APPENDIX

## COMPANIES ANALYZED

The exhibits that follow provide information on the 101 mining companies we analyzed for the Value Creation in Mining 2015 report. The first lists the names of the companies;

the second shows the locations of their primary listings around the world and the primary minerals they produce.

### The Study Sample Consisted of 101 Mining Companies

- Adaro Energy
- African Rainbow Minerals
- Agnico Eagle Mines
- Agrium
- Alliance Resource Partners
- Alpha Natural Resources
- Anglo American
- AngloGold Ashanti
- Anhui Hengyuan Coal-Electricity Group
- Antofagasta
- Arch Coal
- Banpu
- Barrick Gold
- BHP Billiton
- Boliden
- Bukit Asam (Persero)
- Cameco
- Centerra Gold
- CF Industries
- China Coal Energy
- China Molybdenum
- China Nonferrous Metal Industry's Foreign Engineering and Construction
- China Shenhua Energy
- Compañía de Minas Buenaventura
- Consol Energy
- Datong Coal Industry Co.
- Eldorado Gold
- Exxaro Resources
- First Quantum Minerals
- Fortescue Metals Group
- Franco-Nevada
- Freeport-McMoRan
- Goldcorp
- Gold Fields
- Grupo México
- Guizhou Panjiang Refined Coal
- Harmony Gold Mining
- Hecla Mining
- Henan Shenhua Coal & Power
- Hochschild Mining
- Iamgold
- Iluka Resources
- Imerys
- Impala Platinum
- Indo Tambangraya Megah
- Industrias Peñoles
- Inner Mongolia Yitai Coal
- Israel Chemicals
- Jilin Jien Nickel Industry Co.
- Jizhong Energy Resources Co.
- K+S
- KAZ Minerals
- KGHM Polska Miedz

## The Study Sample Consisted of 101 Mining Companies

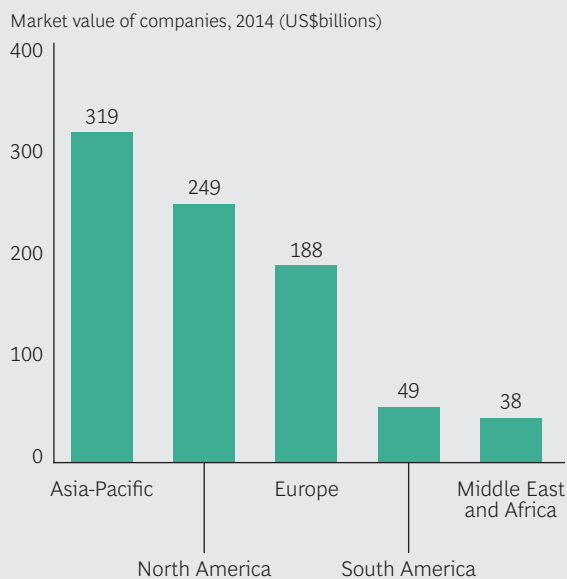
(continued)

- Kinross Gold
- Lonmin
- Lundin Mining
- Minsur
- The Mosaic Company
- Natural Resource Partners
- Newcrest Mining
- New Gold
- New Hope Corporation
- Newmont Mining
- Norilsk Nickel
- OZ Minerals
- Pan American Silver
- Peabody Energy
- Petropavlovsk
- Pingdingshan Tianan Coal Mining
- Potash Corporation of Saskatchewan
- Qinghai Salt Lake Industry Co.
- Randgold Resources
- Rio Tinto
- Royal Gold
- Saudi Arabian Mining Company (Ma'aden)
- Semirara Mining and Power
- Shandong Gold Mining
- Shanghai Datun Energy Resources
- Shanxi Lanhua Sci-Tech Venture
- Shanxi Lu'an Environmental Energy Development
- Shanxi Xishan Coal and Electricity Power
- Shenzhen Zhongjin Lingnan Nonfermet
- Silver Wheaton
- SQM
- Teck Resources
- Tongling Nonferrous Metals Group
- Vale
- Vedanta Resources
- Volcan Compañía Minera
- Washington H. Soul Pattinson
- Western Mining Co.
- Whitehaven Coal
- Yamana Gold
- Yangquan Coal Industry Co.
- Yanzhou Coal Mining Co.
- Yara International
- Yunnan Copper
- Yunnan Tin
- Zhaojin Mining Industry Co.
- Zhongjin Gold
- Zijin Mining Group

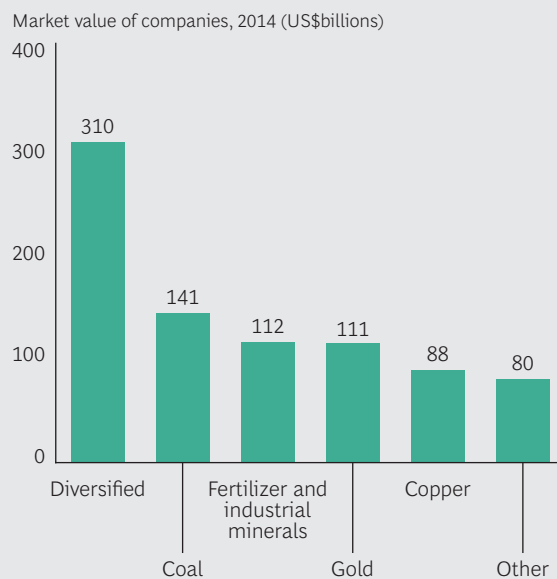
Sources: S&P Capital IQ; BCG analysis.

## The Study Sample Covered All Major Regions and Commodities

LOCATION OF PRIMARY LISTING



PRIMARY MINERALS PRODUCED



NUMBER OF COMPANIES

42

32

13

5

9

13

30

9

23

10

16

Sources: S&P Capital IQ; 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.

## **Value Creation for the Rest of Us**

The 2015 Value Creators Report, July 2015

## **Tackling the Crisis in Mineral Exploration**

A report by The Boston Consulting Group, June 2015

## **Turnaround: Transforming Value Creation**

The 2014 Value Creators Report, July 2014

## **Value Creation in Mining 2013: The Productivity Imperative**

A report by The Boston Consulting Group, May 2014

## **Flex in Operations: How to Boost Efficiency in Asset-Intensive Industries**

A Focus by The Boston Consulting Group, February 2014

## **Beyond Cost Cutting: Six Steps to Achieving Competitive Advantage Through Cost Excellence**

A Focus by The Boston Consulting Group, August 2013

## **High-Performance Culture: Getting It, Keeping It**

A Focus by The Boston Consulting Group, June 2013

## **Value Creation in Mining 2012: Taking the Long-Term View in Turbulent Times**

A report by The Boston Consulting Group, December 2012

# NOTE TO THE READER

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## For Further Contact

This report was sponsored by BCG's Industrial Goods practice, which works with its clients to deliver solutions to the challenges discussed in this report. These clients include some of the world's largest and most successful mining companies in both developed and emerging economies. If you would like to discuss the insights in this report or learn more about the firm's capabilities in the mining industry, please contact the authors.

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