



C A M B R I D G E A S S O C I A T E S L L C

# AN OVERVIEW OF PRIVATE EQUITY INVESTING IN THE MINING SECTOR

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# An Overview of Private Equity Investing in the Mining Sector

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Private equity investing in the mining sector is appealing, though not without risk. Private mining strategies offer investors exposure to base and precious metals, industrial minerals, and bulk commodities such as iron ore and coal. When compared to the oil & gas industry, the mining sector is relatively underexploited, with only a handful of private equity managers offering significant exposure. This creates ample investment opportunities for a focused manager that has the right mix of technical and financial expertise to source, evaluate, manage, and exit development stage mining projects. Private equity managers have produced strong returns for investors, although the level of realizations varies by manager and recent returns have been buoyed by rising commodity prices. While not conclusive, the performance of the mining-focused private equity funds tracked in the Cambridge Associates database indicates that private managers can generate returns superior to public market equivalents, justifying the higher fees and illiquidity associated with the private equity structure.<sup>1</sup>

In this paper, we discuss the basics of investing in the global mining sector. We also identify the key drivers of value and the potential risks associated with investing in the sector.

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<sup>1</sup> An analysis by Cambridge Associates shows that in aggregate private equity mining funds outperform the MSCI World Metals and Mining Index. This analysis assumes capital is invested in the public index in the same amount and at the same time as the private equity funds call capital. In our analysis private equity funds generate a 38% net internal rate of return (IRR) and a 2.4 total value to paid-in capital multiple through December 31, 2010, compared to an 18% net IRR and a 1.3 total value to paid-in capital multiple for the MSCI World Metals and Mining Index over the same time period. The analysis compares ten private equity mining funds across the following vintage years: 1998 (1), 2000 (1), 2001 (1), 2003 (1), 2006 (3), 2007 (1), 2008 (1), and 2009 (1).

## Overview of Strategy

The most common investment strategy for private equity managers is to supply development capital to bring closer to production identified mineral resources owned by small, or junior, mining companies with market capitalizations of less than \$250 million. The proceeds of a private equity manager's investment most commonly go into the company to fund drilling or third party feasibility studies. Private equity managers try to capture the value that is created as risks associated with the resource's development are reduced. Private equity managers do not depend on bringing mines into production to achieve attractive exits. The managers do not typically invest in companies with early-stage exploration projects.

Occasionally, managers provide capital to companies with mines in production, aiming to increase company earnings through better operational and financial management or increase the value of the investment through an expansion of the resource base. A manager may also provide capital to a management team to acquire a non-core development stage asset from a larger mining company. Leverage and commodity price hedging, if they happen at all, are used only for resources in production.

## Commodity Exposure

The growth of emerging markets is increasing demand for all natural resources. Investors in private equity mining funds will gain indirect rather than direct commodity exposure for the most part since most investments will not yet be revenue generating. Investments will benefit from rising commodity prices as reflected in increased exit valuations, rather than in current yield. Such indirect exposure is similar to private equity

managers pursuing oil & gas exploitation strategies in which cash flow is used for debt service. Indirect may not mean insignificant—private equity oil & gas managers generated attractive returns on the back of the rising oil price environment from 2003 to early 2008. Conversely, falling commodity prices may impact exit valuations; however, as discussed below, private managers attempt to mitigate this downside scenario by investing in mines that are in the bottom half of the cost of production curve.

Investors should see any commodity price movement as an ancillary component of a private equity mining strategy. Given the focus on development of mines, private equity mining managers' returns should not be highly correlated with other private equity managers, including those focused on oil & gas. Investors should expect to see volatility in quarter-to-quarter returns for publicly listed investments that may not reflect changes to underlying economic viability since stock prices can be significantly impacted by commodity price movements.

## The Development Curve

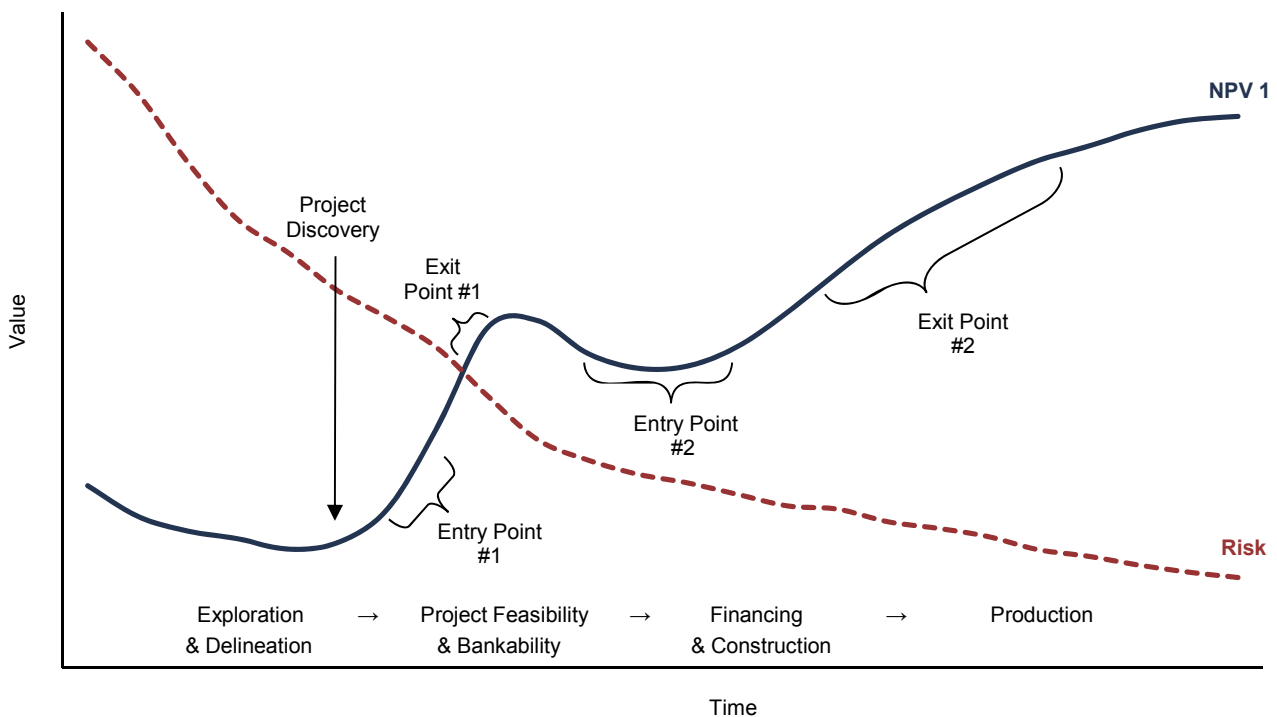
### The Basics

Every successful mining project moves along a development curve, shown in Figure 1, until it reaches production. As projects move from exploration and resource delineation to progress through various stages of commercial feasibility, project financing, construction, and ultimately production, risk is removed (dashed line in Figure 1). As this occurs, valuation, as represented by a net present value (NPV) calculation, increases because of greater clarity about the project's expected cash flows, and the discount rate decreases as the project becomes less risky. The valuation associated with each stage of development is illustrated by the solid line in Figure 1.

### Exploration & Delineation

Early-stage exploration is the first and riskiest step in the lifecycle of a mine. During this phase, companies use geological modeling to identify areas with the potential for mineral deposits. Areas that had previously been explored may be reassessed

**Figure 1. The Development Curve**



Source: Cambridge Associates LLC.

in light of changed commodity prices and/or technical advancements in exploration, exploitation, or production. After initial research, property leases are acquired, and the resource definition process commences with various forms of surface testing. If there is sufficient mineralization from the initial testing, then further exploration drilling is required to delineate the resource. This involves shallow drilling and more detailed financial modeling and metallurgical testing. Resource delineation results in an inferred resource, meaning the physical concentration of minerals in the earth is identified, and the size, grade, and metallurgical character indicate the potential for an economically viable project. More studies are required to confirm the resource as economically exploitable. Inferred resources have a 25% to 75% error margin. Capital invested in the exploration and delineation stage may be completely lost if the resource is not economically viable.

Early-stage exploration is often funded by the equity of publicly traded junior mining companies. Retail investors supply most of the capital to juniors that pursue early-stage exploration. A 2010 study by Metals Economics Group shows that from 2004 to 2008 junior mining companies spent more on exploration than major mining companies, intermediates, governments, or other organizations. Junior miners may have several projects underway simultaneously to help screen for the most attractive opportunities.

### **Feasibility & Bankability**

After an inferred resource is delineated, it enters the three-part feasibility stage consisting of scoping, prefeasibility, and bankable feasibility. For less complex projects, scoping or prefeasibility study stages are sometimes omitted to accelerate development and value creation. A company must conduct studies through these stages to prove that the resource is economically viable. This process varies by mineral type and geography but averages between 18 and 24 months. Depending on the size

of the resource, the cost of these studies can vary from \$5 million to \$50 million.

Feasibility studies create a blueprint for mine development by testing the metallurgy of the ore body, piloting concentration and/or refining facilities, evaluating infrastructure needs, and assessing environmental impacts. This stage also includes specific quotes for construction and equipment. Each successful study adds to the credibility and NPV of the resource, shown as the steady incline of the solid line in Figure 1. Additional geological testing, including extensive in-fill drilling to more accurately define the known resources, extensional drilling to evaluate local geological trends, and advanced statistical modeling help further determine the value of the resource. All the feasibility tests ultimately merge into the bankable feasibility study, which states the likelihood of financial success. The completion of a bankable feasibility study means that the resource is proven (i.e., measured and additional probable reserves may be present).

When reporting results from feasibility studies, public companies must adhere to mineral resource classification systems used by stock exchanges to protect against fraud. The classification systems, known as JORC in Australia and NI 43-101 in Canada, are strict guidelines for how public companies can disclose scientific and technical information prepared by third-party consultants. The Securities and Exchange Commission uses different criteria, which has resulted in few U.S. listings of junior mining companies.

### **Financing, Construction & Production**

The bankable feasibility study is a prerequisite to raising the project financing needed to develop and construct the mine. Once determined economically viable, the project's market value normally adjusts downward to reflect the multi-year process of securing permits and financing, negotiating economic terms with government entities, and constructing new mine operations, as

seen in Figure 1. Delays, the emergence of unforeseen issues, and cost overruns are common during this stage. As a project nears production, value begins to rise to reflect expectations of earnings from operation. The time it takes to bring a mine from bankability to production depends on the engineering complexity of the mine, but averages 18 to 36 months.

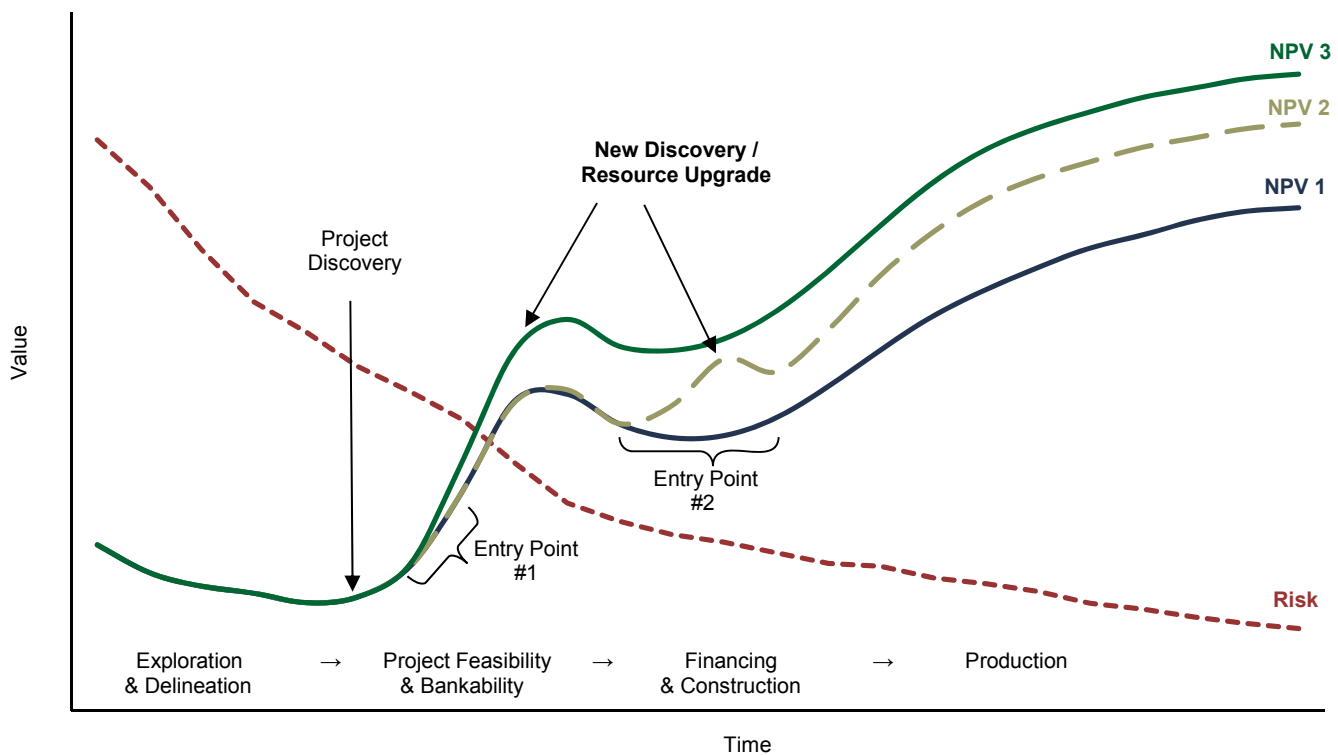
### Potential Upside

One of the attractions of investing in mine development is the potential gain created by delineating more mineral ore in the vicinity of existing mineral ore. This increases the fundamental value of a mining asset because of expectations of additional future cash flows. Value can rise because production volumes will be greater or the mine's production life gets extended. However, if physical constraints

preclude higher production volumes, increasing a mine's life from, say, 20 to 30 years will not have a significant impact on the current valuation given the nature of NPV calculations.

A new discovery can occur throughout the development cycle, as illustrated by the upward migration of the curve shown in the NPV 2 and NPV 3 in Figure 2. Notably, the discovery, delineation, or feasibility of prospective resources can continue at any point along the development curve, even while the construction for the known resource is underway (as shown below). Additional drilling, and a strong understanding of the geological attractiveness and metallurgical characteristics of the ore body, are critical to assessing the ultimate size of the resource. They also help determine future operating revenues.

**Figure 2. Impact of Increase in Resource Base**



Source: Cambridge Associates LLC.

## Private Equity Strategy

### Private Equity's Role

Private equity managers add value by providing their technical expertise and insights, making introductions to the most appropriate third party technical consultants, enhancing or replacing management teams and board directors, assisting in capital raising, making introductions to potential buyers, and providing credibility that is an impetus for broader institutional support. Having greater certainty of funding allows management teams to focus on executing the business plan rather than on investor relations, fund raising, and promotion. By not having to announce positive exploration results, private companies have the ability to acquire adjoining property rights before the success of their drilling programs becomes public.

### Private Equity Underwriting

Projects prior to scoping studies have insufficient information to calculate an NPV, so private equity managers value such resources based on exploration cost plus a premium or industry comparable valuations. After scoping studies, valuation metrics are based on discounted cash flow analysis. Discount rates of between 20% and 30% are used for projects in development and rates between 10% and 15% for projects in production. The calculation of future cash flows requires technical and financial expertise and is based on assumptions about long-term commodity prices.

### Private and Public Companies

While there are nuances in managers' strategies, most invest in both private and public companies. Private companies often have more attractive entry valuations and allow for an increased level of control. Some managers are comfortable with, and may prefer, significant minority stakes. Others prefer controlling positions or negative control stakes achieved through structured securities,

such as convertible bonds. Structured investments have the benefit of reducing risk, although from the board of directors' perspective there is not a total alignment with common stock holders.

Private equity managers may start with small ownership positions and then make further investments at points when the project's risk factors have been minimized. In public companies, small positions may be taken to ascertain if there will be a sufficient alignment of interest with management and the board of directors before committing significant capital. Board representation is a common requirement following a meaningful investment.

### Public Equity Markets and Entry Prices

The willingness of public equity markets to fund project development depends on the commodity price cycle, general economic conditions, and investors' tolerance for risk. Short-term commodity prices affect entry valuations for public companies and so are critical to the investment underwriting process. When commodity prices are rising, private equity managers compete with hedge funds, long-only funds, and retail investors that bid up stock prices for mining companies with direct exposure to commodities. Public companies held by private equity managers can benefit from market euphoria by issuing common shares at attractive valuations.

Even when valuations are high, some junior mining companies with resources in the early stages of development are overlooked by public market investors. Private equity managers with deep industry contacts and networks can find such opportunities throughout the commodity price cycle.

When commodity prices and stock prices are depressed, private equity managers have the opportunity to invest in equity placements on terms not generally available to other public investors.

This and the ability to invest in private companies are some of the reasons that private equity managers have the potential to outperform other types of managers.

### **Origination and Competition**

The private equity managers are staffed by industry veterans who see the vast majority of opportunities based on their established networks. There are over 600 junior publicly listed mining companies and an equivalent number of private companies. Although this universe is small relative to other private strategies, the universe of managers is noticeably smaller. Given the relatively small number of managers with expertise in mining, the relatively large number of opportunities, and the extensive geological due diligence required before investing, competition among private equity firms for deals is typically limited. This may explain the lack of overlap in the portfolios of private equity managers.

### **Entry and Exit for Private Equity Managers**

Private equity managers generally provide capital to complete various feasibility studies and prove economic viability of the resource. This is represented in Figure 1 as entry point #1. By investing post discovery, private equity managers avoid pure exploration risk and instead focus on creating value by qualifying and quantifying the resource and helping management move it through the development process. Geological and mine operational expertise is essential to understanding the resource risk and the potential gain from increasing the size of the resource. Private equity managers have different risk appetites that guide how early in the resource definition phase they will invest.

Private equity firms manage risk by providing incremental capital based on continuing success, so that the potential for large losses at this stage is reduced. Near completion or the completion of

the bankability study represents a common exit point, shown in Figure 1 as exit point #1. As the chart shows, entry and exit points #1 provide the greatest rate of value creation potential, translating into potentially the most attractive IRRs and multiples on invested capital. This approach avoids the later-stage risks in mine development but does not provide the upside potential of further resource delineation that can occur during those later stages.

As noted above, after a company obtains a successful bankability study, the market begins to discount the NPV of the resource as it waits for construction to begin and project financing to be secured. The investment opportunity at this point is to fund the last amounts required to get a mine into production, as represented in Figure 1 investment entry point #2. Private equity managers entering at this stage typically exit their investment as the mine gets closer to production, or is in production, as shown in Figure 1 by exit point #2. Notably, some private equity managers may hold investments through the life cycle of the project if they believe the potential for additional resource discovery exists and returns on incremental amounts invested are sufficiently attractive. Such firms can generate higher dollar gains with longer holding periods even though the return on the incremental dollars invested in later stages of the curve may be lower. Such longer holding periods may result in cross fund investing.

Most managers will also consider turnarounds or restarts of existing mining operations if there is the ability to add significant value and earn returns similar to those available earlier along the development curve or to reduce risk in the portfolio.

### **Commodity Price—Managing the Downside**

Private equity managers attempt to mitigate exposure to the commodity price cycle by investing in projects that are at or below the midpoint of production costs and by using sustainable long-term commodity

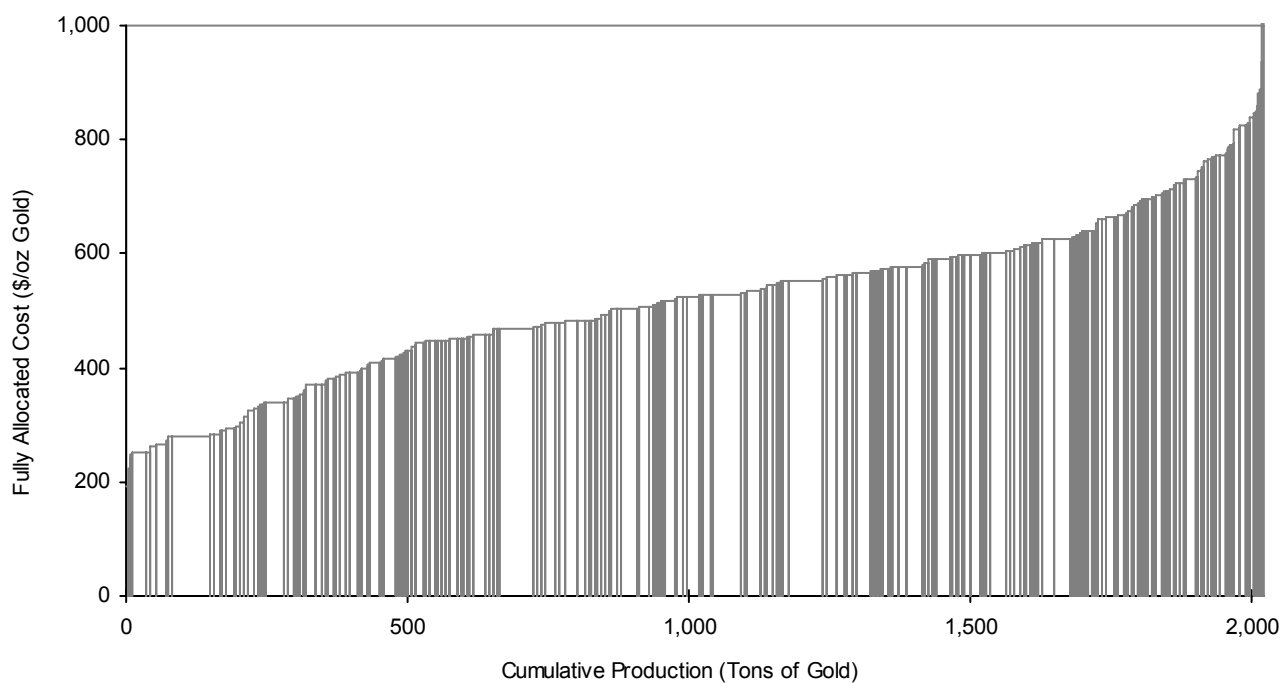
price assumptions. A commodity tends to revert to a price supported by the cost structure profile of the universe of mines. Therefore, while short-term fluctuations in commodity prices can increase or reduce profitability at a given time, a mine's long-term profitability is defined by its location on the cost of production curve. The midpoint on the cost curve is chosen because demand would have to collapse 50% for that mine to become the marginal producer. A 50% demand reduction for most metals occurred only during the Great Depression.

A mine's place on the cost curve depends on a variety of factors, including resource grade—the concentration of commodity per ton of material—and extraction and delivery costs. High-grade resources that are easy to extract and have developed transportation infrastructure often have the best chance of landing in the bottom quartile of the cost curve and are typically owned by large, multinational mining companies. Naturally, when short-term spot prices are high, more mines further up the cost curve become profitable, creating pressure on private equity managers to stay disciplined when evaluating new investment

opportunities. When prices rise, some managers choose to invest at an earlier stage in a mine's development, or in private transactions, as a way to avoid higher entry valuations. When prices fall in the short term, high-cost mines close, and investors cut back spending because the lower spot price cannot support operations or generate a return on development capital. Typically, the life of the average mine at 15 to 20 years spans between two and four economic cycles, allowing a mine to recover from short-term adverse commodity movements. Cutting back on operations and waiting for an eventual recovery can protect value as a last resort.

An example of a commodity cost curve is shown in Figure 3. The chart plots mines currently in production across the world against each mine's cost of production. The width of the bars represents the total production capacity for each mine. Operating costs include energy, labor, on-site administration, smelting, refining, transportation, and marketing costs. Financial costs, such as interest payments, royalties, taxes, depreciation, asset write-offs, and corporate overhead are also included in fully allocated costs. Private equity managers can

**Figure 3. Illustrative Cost of Production Curve**



Source: The Sentient Group.



extrapolate costs for new mines based on characteristics of similar mines.

## Risks

### Range of Risks

While commodity price risk is somewhat muted by a focus on low-cost mines and long-term projects, mining projects involve inherent geological, engineering, political, and environmental risks. As highlighted above, the risk of a resource decreases as a company completes feasibility studies and advances its resource closer to production. Later-stage risks include permitting, financing, construction, operation, political, and environmental risks. Private equity managers can avoid later-stage risks by monetizing an investment during scoping, pre-feasibility, or bankable feasibility stages.

### Geological Expertise Critical

The most important criteria for the success of a mine are the quality of the ore body and its location, since neither of these can be changed. Hence, geological and metallurgical expertise is a fundamental skill in evaluating the resource. Most private equity managers use a combination of internal and external expertise to qualify existing and potential resources.

### Management

Many junior mining companies have management teams that lack depth or may have technical skills but not commercial/financial skills, or vice versa. One of the most important ways for private equity managers to add value is their ability to identify and help fill gaps in management and boards of directors.

### Reliance on Capital Markets

As noted, the amount of capital required to bring projects into production may be more than a private equity manager is willing or capable of providing,

making the ability to attract and negotiate financial support from other capital providers a requisite skill for private equity managers. Respected, knowledgeable, and technically sophisticated investors, such as the mining-focused private equity managers, add credibility to the viability of projects. This, in turn, makes it easier for junior miners to raise capital from the public markets to advance a development project.

### Permitting Process

Mining companies must acquire regulatory approvals, licenses, or permits under various environmental, land-use, and social criteria to develop and/or operate natural resource properties, facilities, or assets. The permitting process is lengthy and can cause delays for the project. Occasionally, projects must secure permits to construct infrastructure for transportation, such as pipelines, roads, or ports, which can further delay a mine from reaching production. Private equity managers can facilitate the permitting process by working with management teams experienced in the region and using their networks and influence to secure approvals. Corruption is of particular concern in the permitting process and awareness of this risk and how it will be managed strongly influence where private equity managers will invest.

### Construction Risk

The construction of a mine can result in cost overruns that exceed the allowances incorporated into the bankable feasibility study. The bankability study includes estimates rather than fixed prices for total construction costs. Projects often encounter unforeseen delays, or complexities, that cause construction costs to run over budget. Inflationary pressures, including labor and equipment, may hurt returns. To reduce these risks, private equity managers limit exposure to large, complex developments.

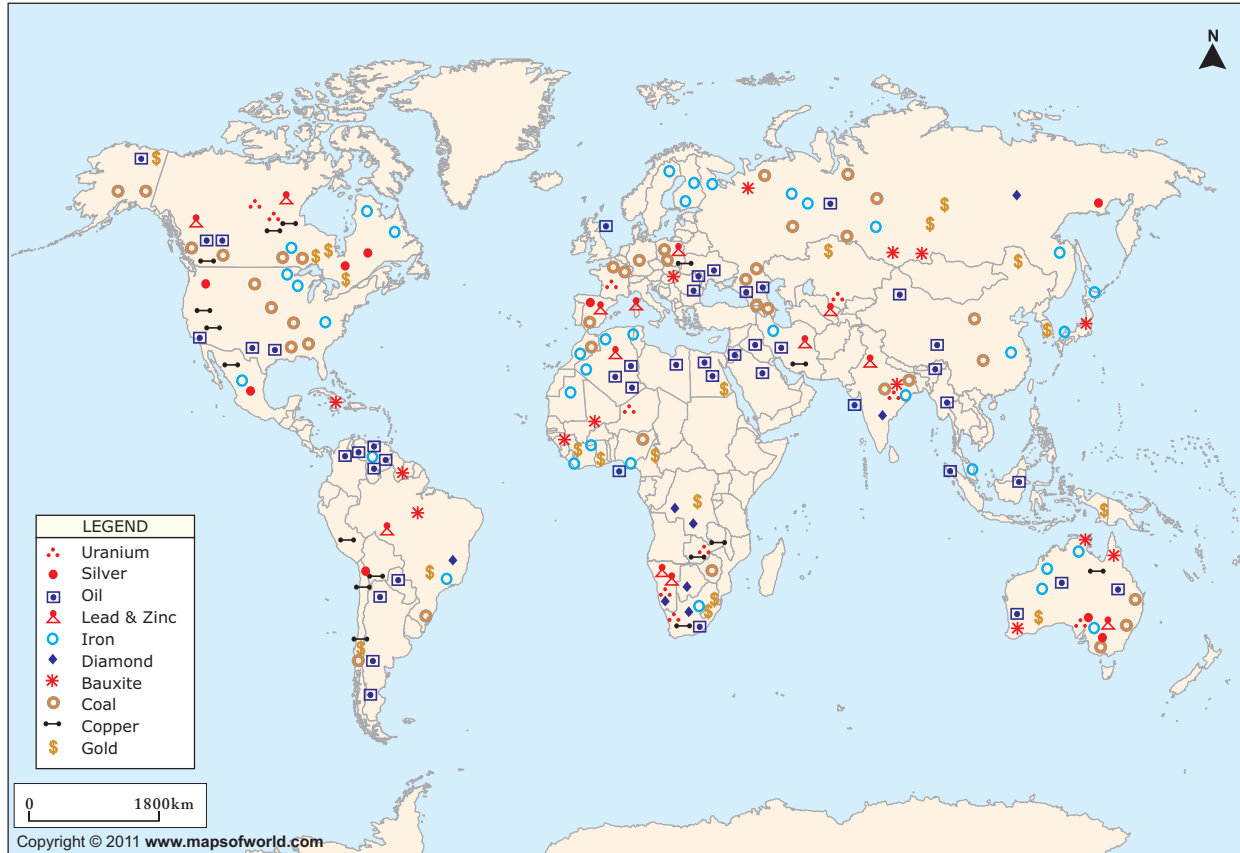
## Supply and Demand Risks

The risk that supply and demand conditions for the commodity could change due to unforeseen macroeconomic events or rising competition from other materials or suppliers creates uncertainty at the project level. Most private equity managers seek to exit a project before it gets to full production to limit market risk. For mines in production, sales agreements with end users can mitigate revenue risk and are typical in industrial metal projects. Again, many private equity managers can use their relationships in the mining community to help management teams negotiate off take and sales contracts.

## Geopolitical Risk

Attractive resources can be found across the globe with some of the more interesting opportunities in emerging markets and developing countries, especially in Africa, Asia, and Latin America (Figure 4). Many mining investments in these areas have greater risks of resource nationalism, expropriation, or corruption than those in developed markets. Analyzing the current government regime and the historical precedence of intervention in the resource sector are critical to evaluating such risks in a country. While some private equity managers purchase political risk insurance from multilateral or private insurers, most simply avoid projects in what they perceive to be less attractive countries. The countries acceptable for investment vary across private equity managers, with differences of opinion on the attractiveness of countries such as China and the Democratic Republic of Congo. Partnering with local management teams or groups

Figure 4. Mineral Map of the World



can help reduce political/country risk. However, some of the biggest geopolitical risks (corruption, governance, and local partner risks) are uninsurable. Geopolitical risk can also occur in developed markets. For example a recently proposed resources tax in Australia caused concern for investors before industry outcry led to a material reduction.

An appropriate sharing of the economics, through a resource tax or royalty fees, reduces political risks. Most governments, including those in the developing world, are sophisticated in this respect and have established royalty and tax protocols for mining projects inside their countries.

### **Environment Risks**

Investments in the mining sector are exposed to considerable environmental risk due to the high impact of the operations and potential danger associated with extracting materials. Possible issues include chemical spills, mishandling of extracted materials, failure to implement environmental protocols, worker safety, carbon taxes on energy commodities, unfavorable community relations, and cost overruns during mine reclamation. The impact on the local community must also be considered, including such things as competition for scarce resources like water. In most cases, private equity managers conduct extensive due diligence on the mineral extraction process to judge and quantify the environment risks associated with any natural resource development. Banks are unlikely to lend to projects that do not meet the World Bank's environmental standards. The environmental issues likely in various geography, geology, and political environments are taken into account by private equity managers in determining the viability of a project. ■