Sustainability and Materiality in the Mining Sector
About Sustainalytics

Sustainalytics is an international and independent sustainability research and services provider. Our global perspective is underpinned by nearly 20 years of experience in the responsible investment and traditional socially responsible investment markets. Sustainalytics has more than 50 analysts assessing environmental, social and governance performance, and has research methodologies for more than 40 different industries. Headquartered in Amsterdam, Sustainalytics also has local offices in Boston, Frankfurt, Paris, Madrid, Timisoara and Toronto; and representatives in Brussels and Copenhagen.

The information here in has been obtained from sources that Sustainalytics believes to be reliable; however Sustainalytics does not guarantee its accuracy or completeness.

Copyright ©2011 Sustainalytics. All rights reserved. No portion of this material may be reproduced without the expressed written consent of Sustainalytics.

For further information contact:
Sustainalytics
P.O. Box 22703
1100 DE Amsterdam
The Netherlands

Tel. +31 (0)20 205 00 00
Fax +31 (0)20 205 00 99
contact@sustainalytics.com
www.sustainalytics.com
About the Authors

Simon MacMahon – Global Director, Advisory Services

Simon MacMahon is the global director of Sustainalytics’ advisory services team. In this role he provides direction, coordination and expertise in the delivery of customized advisory services based on Sustainalytics’ research and analysis into corporate environmental, social and governance performance, trends and best practices. These services help investors and corporations make informed decisions on how to proactively manage environmental and social risks and adhere to ethical mandates. Simon provides counsel to both government agencies and natural resource companies on company and industry level sustainability performance.

Irene Sosa – Senior Analyst, Research Products

Irene Sosa is a senior analyst and team leader for the metals and mining sector and has over 10 years of experience related to the global mining sector. She recently wrote a chapter for a book on how socially responsible investment can influence corporate responsibility. Irene has conducted research on impact and benefit agreements between First Nations and mining companies in Canada, facilitated meetings of community representatives impacted by mining internationally, and has completed research on Canadian and Australian mining companies in Peru. She also completed a literature review for a non-governmental organization on the impact of large-scale mining on local communities.

Kathryn Morrison – Analyst, Advisory Services

Kathryn Morrison is an analyst for Sustainalytics’ advisory services team. She is involved in the design and facilitation of stakeholder engagements as well as the execution of client projects. In addition to her contribution to this report, Kathryn has co-authored several stakeholder analyses and benchmarking reports for clients in the natural resource sectors and contributed to a briefing on water risks to investors and business. In her previous work, Kathryn led an internal corporate sustainability program and CSR reporting cycle. She is a certified GRI trainer with a strong understanding of reporting and performance best practices.
# Table of Contents

- **INTRODUCTION** ................................................................. 5
- **SUMMARY OF FINDINGS** .................................................. 6
- **OUR APPROACH** ............................................................... 8
- **MINING SECTOR LINKAGES** ............................................... 11
  - Society and Community .................................................. 12
  - Employees ................................................................. 14
  - Environmental Operations (Tailings and Water Management) ........ 16
  - Climate Change ......................................................... 19
- **MESSAGE FOR COMPANY AND INVESTORS** .................. 21
- **ENDNOTES** ...................................................................... 22
- **REFERENCE LIST** .......................................................... 23
Introduction

The challenges related to sustainable development are nowhere more relevant than in the natural resource sectors. The extraction of renewable and non-renewable resources is crucial for economic growth and essential for raising the standard of living of all people. On the other hand, the impacts of extractive activities on local communities and on the environment are at the centre of public concerns around responsible production and consumption. In recent years, expectations around corporate social responsibility reached a tipping point in which sustainable development and responsible management rapidly transformed from fringe, feel-good issues into urgent agenda items requiring focused, top-level action.

The opportunity for investors in the metals and mining sector is significant. With our global population expected to reach 9 billion by 2050, the demand for many metals and minerals, particularly from emerging markets, is poised for strong growth. But, capitalizing on these opportunities requires the navigation of an increasingly complex and challenging business environment. The sector, which consists of the aluminium, iron and steel, precious metals and minerals, coal and base metal markets, faces a variety of pressures. The industry faces an overall decline in mineral reserves, lower grades of existing mineral projects, and challenges in attracting skilled workers. Added to the pile, is the fact that the sector carries with it a long list of risk factors stemming from environmental and social impact areas; and while many companies have impressed their stakeholders with strong management and performance in these areas, others have not.

In this environment it is vitally important to gain a better understanding of which corporate responsibility initiatives are linked to improved competitiveness and which are not. This understanding will allow firms to focus and prioritize efforts in order to lower costs, raise revenues and improve access to capital.

This is the first of a three part series, each focusing on a different natural resource sector: mining, paper and forest products, and oil and gas. Each sector was the subject of an intensive research process, which began with a thorough review of existing business case literature. For each of the more than 50 reports reviewed, Sustainalytics identified evidence that suggested a link between industry-specific business drivers and environmental and social performance areas. The links were then scored and findings were supported through interviews with industry analysts and case studies from Sustainalytics’ proprietary global database.
Summary of Findings

Positive Impact
Overall, we found that corporate responsibility performance in the mining sector is linked to business success and that a strategic focus on sustainable performance is aligned with mainstream business purpose. When an organization’s most significant environmental and social issues are addressed, business value is created.

Linkages Strongly Dependent on Stakeholder Expectations
Sustainability concerns and evolving stakeholder expectations are having a greater impact on the business environment than ever before. In all cases, the strength of the link depends on stakeholder and government expectations. It is prudent to acknowledge the degree to which these expectations are evolving and have evolved over the last five years. In addition, the business case is likely to strengthen in coming years, as stakeholder expectations continue to increase.

Multiple Measures
The business case is strongest when multiple drivers of business success are considered. Some of the strongest linkages that were identified in our analysis cannot be captured in a simple payback or return on investment calculation. Links that support reputation are difficult to monetize. Links that mitigate risk are hard to quantify. It is interesting to note that the environmental and social areas that generate the most business value do so through their impact on multiple business drivers.

Key Business Drivers for Mining
Of the eight measures of business success that we identified for the mining sector, operational efficiency was the one most affected by corporate responsibility performance. It was followed closely by reputation, the political environment and by access to both natural resources and labour.

Figure 1. Business drivers most affected by corporate responsibility
Key Environmental and Social Linkages for Mining

It is important to understand which areas of social and environmental impact are most linked to competitiveness. Our analysis revealed four areas in which mining companies are particularly well-advised to be proactive in their management efforts and transparent in their disclosures.

On the social side, maintaining strong relations with communities ensures project-level licence to operate, and strong relations with employees avoids labour stoppages and lowers recruitment and retention costs, which is particularly important in the face of workforce shortages.

On the environmental side, it is crucial that water, tailings and climate change impacts are managed responsibly as they were found to have impacts on multiple business drivers including the leveraging of supply and demand trends, maintaining access to the natural resources, influencing the political and regulatory environment, operational efficiency and reputation.

A more holistic view of business success is required - one that considers both financial results and underlying financial drivers.
Our Approach

Our research for this project focused on answering two key questions:

1) How strongly is the management of an environmental or social concern linked to a business driver that can create economic value? (Is there a link between sustainability and economic performance?)

2) How strongly does the evidence support the existence of the link between the management of environmental or social performance and economic performance? (How strong is the evidence for the link?)

STEP 1: CREATING A FRAMEWORK TO MEASURE ENVIRONMENTAL & SOCIAL PERFORMANCE

Sustainalytics currently tracks the ESG performance of approximately 100 companies in the mining sector globally. Based on a continuous review of external standards and norms, and engagement with the sector's key stakeholder groups, we have developed over the past 18 years a framework to accurately capture all the environmental, social and governance areas of performance relevant to mining companies. In the social and environmental areas there are five and four broad categories, respectively, as outlined in Table 1.

STEP 2: DETERMINING INDUSTRY SPECIFIC BUSINESS DRIVERS

Measures of corporate economic performance often focus on indicators such as revenue growth, the reduction of costs, as well as the ability to access capital, which are influenced by a firm's ability to manage various business drivers. In order to identify the mining sector's specific business drivers, we engaged with company representatives and mainstream financial analysts who cover the mining sector.
We asked them which business drivers they look at when evaluating firm value and direction. Figure 2 outlines the framework we use to connect competitiveness to the underlying drivers of company performance and table 2 (left) highlights the eight drivers identified by this process.

**STEP 3: EVALUATING THE LINKAGES BETWEEN ENVIRONMENTAL AND SOCIAL FACTORS AND COMPETITIVENESS**

We examined the nine areas of environmental and social performance in conjunction with the eight drivers of business competitiveness in order to determine at which intersections business value is created.

Our approach to investigating these questions included a review of existing literature, case studies and examples, and drawing insight from our work with major financial institutions and corporations in the field of corporate sustainability. Our review of existing literature included an analysis of more than 50 reports from credible sources that address the link between managing environmental and social performance and corporate economic performance. Every report was either relevant to or specifically about one or several natural resource sectors. This body of research is vast and diverse and includes:

- Descriptions of the links between sustainability issues and business performance
- Empirical correlation studies of business performance and particular aspects of sustainability performance
- Empirical studies of market returns of certain portfolios of companies
- Scenario-based assessments of how companies within a sector are poised to gain or lose from sustainability-related issues, in a relative sense
- Compendiums of case studies showing how individual companies have gained or lost from sustainability issues
- Guidelines to help companies make the business case in their own organizations

A report had to meet a number of criteria in order to be included in the review. A report had to address the business risks or opportunities of managing a company’s environmental or social performance. It had to assess the risks or opportunities on the basis of a specific methodology or expert option, and it had to be published by a credible organization.

Those included came from a number of sources, representing views from a wide range of organizations including investment banks, business associations, non-governmental organizations, consultancies, rating agencies, academics and intergovernmental organizations.

For each report, we classified each of the intersections between business drivers and areas of a company’s environmental and social performance as strong, moderate or weak according to the likelihood of it materially affecting revenues, costs or access to capital within the next five years. For each report we also assessed the strength of the evidence supporting the existence of the link based on the publisher and the methodology.

### TABLE 2 – BUSINESS DRIVERS IN THE NATURAL RESOURCE SECTOR

<table>
<thead>
<tr>
<th>Business Drivers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply and Demand Trends</td>
<td></td>
</tr>
<tr>
<td>Access to Natural Resources</td>
<td></td>
</tr>
<tr>
<td>Access to Labour</td>
<td></td>
</tr>
<tr>
<td>Political and Regulatory Environment</td>
<td></td>
</tr>
<tr>
<td>Operational Efficiency [costs]</td>
<td></td>
</tr>
<tr>
<td>Balance Sheet</td>
<td></td>
</tr>
<tr>
<td>Reputation</td>
<td></td>
</tr>
<tr>
<td>R&amp;D and Innovation</td>
<td></td>
</tr>
</tbody>
</table>
The findings from this process were tested through interviews with industry analysts and company representatives. For each report that we analyzed, we classified each of the intersections between business drivers and areas of a company’s environmental and social performance into one of three categories, indicating the strength as strong, moderate, weak or negligible. For each report we also assessed the evidence supporting the existence of the link as either strong or weak. After assessing the level of materiality and the strength of evidence in the respective reports, we calculated the average score per point of intersection (linkage) and assigned an overall colour and a coloured dot (see Figure 3).

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>CORE DRIVERS</th>
<th>Supplier &amp; Demand Trends</th>
<th>Access to Natural Resources</th>
<th>Access to Labour</th>
<th>Political &amp; Regulatory Environment</th>
<th>Operational Efficiency</th>
<th>Balance Sheet</th>
<th>Reputation</th>
<th>R&amp;D and Innovation</th>
<th>Link to Competitiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractors &amp; Supply Chain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Society &amp; Community</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee Relations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philanthropy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractors &amp; Supply Chain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The results of our analysis revealed eleven strong links between the management of environmental and social impacts and company economic performance (competitiveness). Our research suggests that the management of society and community impacts, employee relations, the environmental impact of operations (namely tailings and water management) and climate change all have strong potential to affect competitiveness though their impact on four business drivers: 1) access to natural resources, 2) the political and regulatory environment, 3) operational efficiency, and 4) reputation. In certain geographic regions, access to labour was also an important business driver that was impacted by sustainability concerns.

In the following sections each of the strong intersections, as denoted by the orange squares in Figure 3, are examined. After summarizing our findings in terms of the strength and evidence of the links, we provide examples of how each link impacts competitiveness.

The management of society and community impacts employee relations, the environmental impact of operations and climate change all have strong potential to affect competitiveness.
Society and Community

Mining has a direct impact on society and local communities. Impacts are especially apparent in regions where the regulatory environment is poorly defined and/or indigenous and human rights are not protected. This issue is relevant as seven of the top ten resource bases are located in developing countries with poor environmental and human rights records.

This point was emphasized in Sustainalytics’ interviews with financial analysts who said that the economic opportunity in certain undeveloped regions is so great that they cannot be overlooked, yet they would not hesitate to either discount significantly or recommend divestment from a company that was not addressing the associated risks effectively. It should also be noted that there is a perception within the investment community that the relationship between mining companies and local and indigenous communities is very regionally specific and that some regions are more challenging than others. Whatever country a miner chooses to operate in, engagement with local communities and stakeholders is crucial for earning and maintaining a social licence to operate.

Our methodological review of the business case literature, interviews with analysts, and the case studies compiled in our database revealed strong evidence to suggest that relationships with local communities (including human rights, particularly in emerging resource-based economies) is perhaps the most important issue related to corporate responsibility for miners. Societal and community issues related to mining were found to be strongly linked to three business drivers: access to natural resources, political and regulatory environment and a company’s reputation.

Understanding the Links:

**Access to Natural Resources:** A company’s ability to access natural resources is dependent on two interdependent variables: its ability to secure legal permits in a timely manner and its ability to earn and maintain a social licence to operate through effective engagement with local stakeholders. In an interview with a large project financier, it was stated that issues related to local communities and indigenous peoples in mining are so significant that a company’s ability to manage them is viewed as a proxy for its quality of management overall. Poor and ineffective engagement can prevent a company from earning the required legal permits efficiently, significantly delaying a company’s ability to access natural resources and to move the project forward. Historically, mining companies globally have underestimated the risks associated with local communities, or failed to acknowledge them at all. In significant cases, this has been the downfall of multi-million dollar projects.
The activities of Vedanta in the forests of Niyamgiri Mountain in the state of Orissa (India) provide a strong example as mining operations there have been a source of conflict between the company and the Dongria Kondh people since 2004. In December 2008, non-governmental organization (NGO) Survival International submitted a complaint, claiming that Vedanta was pushing ahead even though the Dongria Kondh tribe had never been consulted. In February 2010, the Church of England’s pension fund and three other investors (The Joseph Rowntree Charitable Trust, Marlborough Ethical Fund and Millfield House Foundation) divested from Vedanta. In August 2010, the Indian Ministry of Environment and Forests refused the final approval for the bauxite mine at Niyamgiri hills.

**Political and Regulatory Environment:** Allegations of human rights violations by mining companies have put the sector under scrutiny and can lead to more stringent regulations. Community opposition can impact the ability of firms to secure government approvals. For example, in 2003, the City Council of Esquel in Argentina imposed a moratorium on mining in response to escalating public opposition to Meridian Gold’s El Desquite project. Meridian put the project on hold and the company wrote down the value of the Esquel project in 2005.

**Reputation:** Mining companies are often the centre of media or NGO attention in regards to their community impacts. This is particularly true for those companies operating in countries with a record of human rights violations. In some cases a company’s mere presence in a conflict zone can subject it to media and public scrutiny in regards to real or potential connections to human rights violations by the company, the government, rebel groups or the military, which can be enough to tarnish its reputation. This, in turn, can affect a firm’s ability to attract joint venture partners, additional capital or insurance.

A United Nations report on the role of financial institutions in sustainable mineral development asserted that the issue of reputation is taken seriously by banks. Banks, often the only consumer-facing entity in a mining project, are targeted and subject to protests. Such was the case when the retail branches of Australian Westpac Bank were the target of protests, because of the bank’s involvement (as a major lender) in the controversial Jabiluka uranium mine.

Anvil Mining has been under scrutiny since 2005, when a report by the United Nations’ Mission in the Democratic Republic of Congo (MONUC) accused the company of providing logistical support to the Congolese army who raped, murdered and brutalized the people of Kilwa in a massacre in 2004. The incident became the subject of an investigation by the Australian police and NGOs campaigned against the UK Department for International Development for partnering with Anvil Mining. In November 2010, the NGO Canadian Association Against Impunity (CAAI) launched a class action lawsuit against the company, and in April 2011 the Superior Court of Quebec dismissed Anvil Mining’s attempt to have the case thrown out and ruled that the case can proceed to the next stage. It is a landmark decision in Canadian legal history: it is the first case concerning the alleged complicity in human rights by a company abroad ever to have been accepted by a Canadian Court.
Management theory suggests that corporate responsibility can have a positive impact on human resource performance. In general, a firm with good employee relations can lower its employee turnover rate and improve employee motivation. Though it may apply best to young white collar workers, the theory is generally confirmed by empirical studies, and the experiences of HR departments, who note that potential new recruits now often ask questions about corporate responsibility-related issues in interviews.

The ability to attract skilled labour for the life cycle of a mine is one of the foremost long-term challenges facing the mining industry worldwide. In Canada, which exported a total of CAD 66 billion worth of metals, non-metals, and coal in 2009, it is estimated by the Canadian Mining Industry Human Resources Council (MiHR) that during the next decade, between 6,000 and 9,000 new workers will need to join the sector every year if anticipated production targets are to be met. In Australia, the National Institute of Labour Studies (NILS) estimates that an additional 86,000 workers above the February 2008 level will be required by the minerals sector in 2020 to ensure Australia maintains its market share at projected growth in global mineral commodity demand. As a result of these challenges, health and safety and employee relations (training and development, diversity, union relations) are important firm-level and sector-level issues. In other regions, the proliferation of HIV/AIDS and other diseases has the potential to affect the long-term viability of the labour force.

Employee and labour relations are strongly linked to two business drivers: access to labour and operational efficiency. The mining specific evidence for these links is compelling, especially given the predicted shortage of workers, and when it is combined with the large supportive body of non-mining specific research that has been conducted.

A company’s overall sustainability performance is important to attracting new talent, in particular today’s environmentally conscious youth.
Understanding the Links:

Access to Labour: It makes intuitive sense that access to labour would be linked to labour conditions and there is a body of research that supports this link on a non-industry specific basis. In addition, the 2008 European Competitiveness report argued that the mining industry’s inability to attract top talent is linked to the negative public perceptions concerning health and safety in the industry. The MiHR argues that, in Canada, safety and a company’s safety record are key factors in attracting employees and that a company’s overall sustainability performance is important to attracting new talent, in particular today’s environmentally conscious youth.

Access to labour can be particularly challenging in areas that are affected by the prevalence of HIV/AIDS, and malaria, and tuberculosis (TB), such as sub-Saharan Africa. An article published in the American Journal of Public Health concluded that there is a strong correlation between volume of mining activity and incidences of TB among countries in sub-Saharan Africa, and that comprehensive TB control strategies should explicitly address the role of mining activity and environments in the epidemic. De Beers, which operates diamond mines in Southern Africa where HIV prevalence rates are high, has embedded HIV/AIDS management into its business processes and considers it a key part of business risk management.

Operational Efficiency: Although standards have been improving for a number of years, companies still incur significant costs from poor health and safety performance and poor labour relations. Poor performance in this area can lead to costly fines, legal settlements and work stoppages.

Examples of health and safety costs include the 2010 explosion at Massey Energy Company’s Upper Big Branch Coal Mine in West Virginia, which resulted in the death of 29 miners. The company estimated a cost between USD 80 million and USD 150 million related to benefits paid to the families of the fallen miners, rescue and recovery efforts, insurance deductibles, and legal and other contingencies.

Labour relations costs can be even more significant. Vale-Inco admitted, in a 2009 conference call to investment analysts, to a loss of USD 500 million in the first four months of a strike that went on to last 18 months. In 2007, Cananea mine workers of Southern Copper Corporation, a 100 per cent Grupo Mexico subsidiary, went on a three-year strike that cost the company approximately USD 3.5 billion.
Tailings are the materials left over after the process of separating the valuable fraction from the uneconomic fraction of an ore. In order to prevent the uncontrolled release of tailings material into the environment, mines usually have a disposal facility. The most common method of tailings disposal is in surface impoundments known as tailings dams. Other methods include storing tailings underground in mined out tunnels, a practice that has many benefits; and disposing of tailings in rivers, seas or lakes, a practice that poses more risk to the environment. While mining projects in developed countries must conform to stringent environmental standards, tailings are of considerable and growing concern among NGOs and regulators. In addition, many projects in developing nations do not take significant steps to prevent or mitigate environmental damage.

In January 2010, the U.S. Securities and Exchange Commission (SEC) clarified risk disclosure requirements for public companies by providing interpretive guidance that states that changes in the quality and availability of water can have material effects on companies. This is particularly relevant to mining companies as mining processes require constant supplies of water and some mines, particularly those involving lower grade deposits, can be quite water intensive, which can have a huge impact on the immediate and local area. For example, mines in the north-eastern Nevada desert pumped out more than 2.6 million litres of water between 1986 and 2001; the equivalent of more than a year’s supply to New York City. As a result, water availability and in some regions, water shortages amplified by climate change, are of concern to companies and investors alike.
Mining has the potential to affect water resources in a number of ways:

- Depletion of sources as water is used in the mining process
- Mining operations at times affect water resources through pollution, whether through planned releases to water or accidental leaking and tailings dam failure.
- Smelting and refining often rely on significant amounts of hydroelectric energy (particularly in the aluminium sector), which can affect the availability of withdrawals.
- Some mining operations extract ore from below the water table, which entails pumping groundwater to dewater the mine, a process that can affect aquifers.
- Finally, mining in mountain areas can also affect glaciers, which play an important role in local hydrology.

The evidence strongly denotes that a company’s water and tailings management has the potential to strongly impact competitiveness. Mining companies’ management of environmental impact in these areas is linked to four business drivers: the ability to access natural resources, the political and regulatory environment, operational efficiency and reputation.

Understanding the Links:

Access to Natural Resources: The management of the environmental impacts of mining operations and access to natural resources are strongly linked. Tailings and water management plans are important variables in the permitting process and expansion activities are often influenced by a company’s record of performance. In addition, where scarce water resources pose a physical constraint to mining, companies have at times been forced to suspend operations. Alamos Gold reports that in 2010 its gold production decreased by 13 per cent compared to 2009, largely as a result of “a lengthy drought followed by one of the most intense rainy seasons on record.” Lonmin has invested in developing a three-fold approach to secure the availability of sufficient water for its current and future mining operations and acknowledges that it must not affect the local communities’ access to potable water.
Political and Regulatory Environment: The risk of tailings dam failure has led some governments to adopt more stringent regulatory frameworks and even ban the use of certain substances such as cyanide. Water regulations from state and federal governments, such as in Australia, will force the mining industry to adopt comprehensive water measurement and accounting systems.

In addition, governments and courts respond to public environmental concerns by placing restrictions on mining and harshly penalizing operations that cause pollution. In the early 2000s, Manhattan Minerals’ Tambogrande project in Peru ran into significant community opposition, based primarily on concerns over the project’s impact on water resources, which were essential to the local economy. In a 2002 referendum, 94 per cent of voters came out against the mine, effectively stopping the project and preventing the company from developing an ore body with a projected value of USD 1.3 billion.

Operational Efficiency: Tailings dams are more than 10 times more likely to fail than conventional hydro or irrigation dams, and are potentially more dangerous because of the toxic substances they contain. Poorly managed tailings can result in significant cleanup costs, fines and penalties, long-term reclamation costs and lawsuits from local communities and other affected parties. One estimate places the average cost of a tailings dam failure between USD 70 and 150 million. Every year between two and five of the more than 3,500 tailings dams in the world experience major failures.

In some mining regions where energy prices are high, the cost of energy associated with wastewater treatment can be significant. In other parts of the world, where water is less abundant, minimization of water consumption is critical as the costs related to building desalinization plants and long pipelines from water source to operations are significant.

Reputation: Tailings dam failures are high profile accidents that garner significant media attention and can tarnish the reputation of companies, and the industry, for a long time. Recently, companies that practice riverine tailings disposal have been targeted by NGO and investor campaigns, which have led to undesirable financial outcomes. For example, Dutch pension giant ABP, the Swedish AP funds and the New York City Pension Funds are pressuring Freeport-McMoRan Copper & Gold over its controversial Grasberg operation in Papua New Guinea. In April 2010, the group filed a shareholder proposal calling on the company to appoint a board member with environmental expertise, arguing that criticism from external groups over the impact of riverine tailings disposal at Grasberg is damaging shareholder value. In January 2009, the Council of Ethics for the Norwegian Government Pension Fund divested from Barrick Gold Corporation, citing concerns about the environmental impact of riverine tailings disposal at the Porgera mine in Papua New Guinea.
Mining is not a very significant contributor to greenhouse gas (GHG) emissions. In 2008, the approximately 200 operating mines in Canada cumulatively accounted for less than 1 per cent of Canada’s total emissions. GHG emissions from the mining process are mostly associated with the consumption of energy and the use of diesel fuel in remote locations. Downstream, smelting and refining processes do require significant amounts of energy that, if derived from fossil fuels, can contribute significantly to climate change.

While the sector is not the largest GHG emitter relevant to other sectors, climate change will likely lead to additional costs related to energy use and possible disruptions or damages to operations from changes in climate. Climate change may also affect the supply and demand of certain minerals and metals.

Our analysis suggests that climate change is certainly of relevance to the mining industry in the long term. However, its link to firm level competitiveness in the short term is less strong, pending more stringent regulations and a price on carbon. Climate change affects the mining sector’s competitiveness in that it is strongly linked to two business drivers: operational efficiency and supply and demand trends.

**Understanding the Links:**

**Operational Efficiency:** Over 80 per cent of global mining companies surveyed by Acclimatise, a climate risk company, claim their physical assets would be affected by extreme weather events, yet only 13 per cent report taking action to protect assets critical to business success. The physical implications of climate change have the potential to affect buildings, transportation networks, slope stability and tailings dams. All these factors can result in production disruptions, higher repair and maintenance costs and higher environmental liabilities. For example, in March 2006, the operation of the ice road to the Daivik Diamond Mine in Canada’s Northwest Territories was suspended early due to deteriorating ice conditions resulting from unseasonably warm temperatures. Harry Winston Diamond Corp, one of the joint venture partners in the mine, warned investors that the mine is subject to special climate risks, including "unavailability of materials and equipment and increased transportation costs due to the later opening and/or early closure of the winter road."
Supply and Demand Trends: The internalization of climate change costs will eventually lead to an increased use of life cycle analysis that will impact usage behaviours. While function, cost and durability will remain the primary criteria of materials selection, some demand will likely shift in favour of metals or materials that have smaller carbon footprints throughout their life cycle, are more recyclable, or have environmentally beneficial applications (e.g. lightweight material). Demand will also adjust to reflect changes in the embodied cost of energy.

Mined resources that contain significant amounts of embodied CO₂ emissions (e.g. coal) or that can be linked to health and safety concerns (e.g. lead and other harmful materials) have experienced or are experiencing either absolute declines in demand or declines relative to historical rates of increase as competing or substitute materials are preferentially selected. On the supply side, the price of minerals and metals whose production is highly concentrated in one geographic region will be sensitive to climatic stress in that region. For example, Commonwealth Scientific and Industrial Research Organisation (CSIRO) linked climate change to more intense extreme rainfall in Australia. A major portion of the world’s supply of iron ore comes from Australia’s Pilbara region, which is highly affected by severe weather events. In early 2011, extreme weather and flooding in Australia and the southern Pacific caused dozens of coal and nickel mines to shut down and halted aluminium smelting. Australian iron ore producer Fortescue Metals Group Limited announced that continued and heavy rainfall across the Pilbara region is impacting the company’s mining operations, causing a reduction in iron ore production.

Although miners acknowledge that their operations would be affected by extreme weather events, few are taking steps to protect their assets.
Message for Companies and Investors

Sustainable development challenges are putting pressure upon almost every sector, but some, such as metals and mining must continually prove that their role in supporting economic development is greater than the environmental and social impacts of their activities.

The risks associated with failing this test are high. The responsible management of environmental and social impacts has the potential to affect important business drivers such as access to labour and the reputations of companies and projects, among others.

In order to mitigate these risks it is essential to understand which areas of social and environmental impact are most linked to competitiveness. Our analysis revealed four areas in which mining companies are particularly well-advised to be proactive in their management efforts and transparent in their disclosures.

---

On the social side, maintaining strong relations with communities ensures project-level social licence to operate, and strong relations with employees avoids labour stoppages and lowers recruitment and retention costs, which is particularly important in the face of workforce shortages.

---

On the environmental side, it is crucial that water, tailings and climate change impacts are managed responsibly as they were found to have impacts on multiple business drivers including the leveraging of supply and demand trends, maintaining access to the natural resources, influencing the political and regulatory environment, operational efficiency and reputation.

The critical question for company executives and for mining analysts is one of financial impact. Our analysis reveals that the management of environmental and social impacts in the mining sector is linked to business success and that a strategic focus on sustainable performance is aligned with mainstream business purpose. Companies that fail to demonstrate high standards with respect to sustainable development, in particular in the areas we identified, jeopardize their position in the marketplace, potentially impacting valuations. In contrast, when an organization’s most significant environmental and social issues are addressed, business value is created.
Endnotes

1 Riding with the Cowboys or Hanging with the Sheriff?, Citigroup (2006)
10 This does not include the USD 62 million impairment charge that the company later took for the property, plant and equipment deemed unrecoverable at the mine.
Reference List

Canadian Council of Forest Ministers. Forest Sector Innovation Framework. 2008
Citigroup. Towards Sustainable Mining: Riding with the Cowboys, or Hanging with the Sheriff? 2006.
Society of Investment Professionals in Germany. KPIs for ESG. 2010.
UBS Investment Research. Global Oil and Gas: Introduction to the Oil Industry. 2004
Women in Mining Canada. Ramp Up: A Study on the Status of Women in Canada’s Mining and Exploration Sector. 2010
World Resources Institute. The Next Bottom Line: Making Sustainable Development Tangible. 1998