

ESG Industry Report Card: Metals And Mining

June 3, 2019

(Editor's Note: Our ESG Industry Report Cards include an analysis of ESG factors for a selection of companies. We intend to expand our ESG Industry Report cards to include more companies throughout the year.)

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Key Takeaways

- Environmental risks for metals and mining companies are among the highest across all sectors.
- Main social tensions arise from fears of pollution, water usage conflicts, and economic/landscape impacts on nearby communities.
- Governance of high-rated companies tend to be the best, especially for those located in jurisdictions with long histories in mining.

The ESG Risk Atlas

To calibrate the relative ranking of sectors, we use our environmental, social, and governance (ESG) Risk Atlas (see "The ESG Risk Atlas: Sector And Regional Rationales And Scores," published May 13, 2019). The Risk Atlas provides a relative ranking of industries in terms of exposure to environmental and social risks (and opportunities). The sector risk atlas charts (shown below) combine each sector's exposure to environmental and social risks, scoring it on a scale of 1 to 6. A score closer to 1 represents a relatively low exposure, while 6 indicates a high sectorwide exposure to environmental and social risk factors (for details see the Appendix). This report card expands further on the Risk Atlas sector analysis by focusing on the credit-specific impacts, which in turn forms the basis for analyzing the exposures and opportunities of individual companies in the sector.

Environmental (Risk Atlas: 6)

Mining is by nature hazardous to the environment. In all its forms, mining has the potential to release toxic elements to the air, water, or soil. Open-pit and underground mining involve the crushing and treatment of large amounts of ore, which may alter ecosystems if containment isn't proper. Other forms of mining, such as heap leaching, use toxic fluids (i.e. cyanide, sulfuric acid) that can be devastating if leaked into the environment. If an accident or leakage takes a significant human toll, as witnessed in Brazil Samarco (2015) and Vale (2019), it can take a toll on credit ratings.

The production of steel and aluminum are extremely power-intensive. Most steel is still produced with blast furnaces, releasing large amounts of carbon dioxide, nitrogen oxide, and particulate matters into the air. Despite the efforts to scrub the toxins before they are released, the process is in essence detrimental to the environment. That said, we expect electric arc furnaces, which generally have a lighter environmental impact, to gradually replace blast furnaces.

Some in the industry see aluminum as the metal of the future. Aluminum is lighter, stronger, and has better connectivity than steel, making it advantageous to, say, auto manufacturers, who are in a race to build lighter--thus more fuel-efficient--vehicles. Moreover, once produced, aluminum can be easily recycled with very low costs. However, the production of aluminum consumes about 10 times more energy than the production of steel, and about 70%-80% of the costs of aluminum production are energy related. About 50% of the electricity used to produce primary aluminum worldwide comes from environmentally-friendly hydro-electric power and other renewable, nonpolluting sources. A further 3.5% comes from nuclear power, which is substantially free from CO2 emissions but has its own set of risks.

Complying with the different environmental regulations around the world remains a significant capital expenditure (capex). For example, in Europe the companies have CO2 quotas, making them slightly less competitive than their peers in Asia. Other capital expenditures targets include the need to reduce costs and improve technology. As a result, steel and aluminum companies will continue to devote a sizable portion of their annual capital spending to improve their energy efficiency and gas emissions.

Coal-fired power plants are heavy air polluters, and governments are increasingly limiting them and incentivizing greener forms of energy. The United Nations' Paris Agreement, which the EU and other developed economies signed, aims at reducing greenhouse gas (GHG) emissions by at least 40% by 2030 compared to 1990 levels.

Chinese coal miners and steel makers rank at the top in the list of issuers exposed to environmental credit risk, due to their government's decision to reduce air pollution, which so far has led to the closure of more than 150 million tons of steel capacity there.

Social Exposure (Risk Atlas: 5)

The social risks for metals and mining entities mainly stem from the sector's exposure to safety management and social cohesion. Safety management is a key risk given the heavy use of large and dangerous equipment as well as the fact that some mining sites are located in remote and sometimes hostile environments. Typically, companies in the sector track and manage to incidents and have specific programs in place to educate its work force. Over the years we saw a clear trend of improvement in the lost time injury frequency rate (LTIFR). For example, the average rate for the steel industry in 2017 was 0.97x compared to 4.55x in 2006.

Social cohesion refers specifically to social license to operate, given the land use and disruptions that mining sites can create for the local communities in proximity. Governments around the globe are increasingly demanding social infrastructure and other forms of social responsibility from miners. Poor management of these factors typically leads to reputational issues, license suspension/termination, adverse litigation, staffing issues, and unrest.

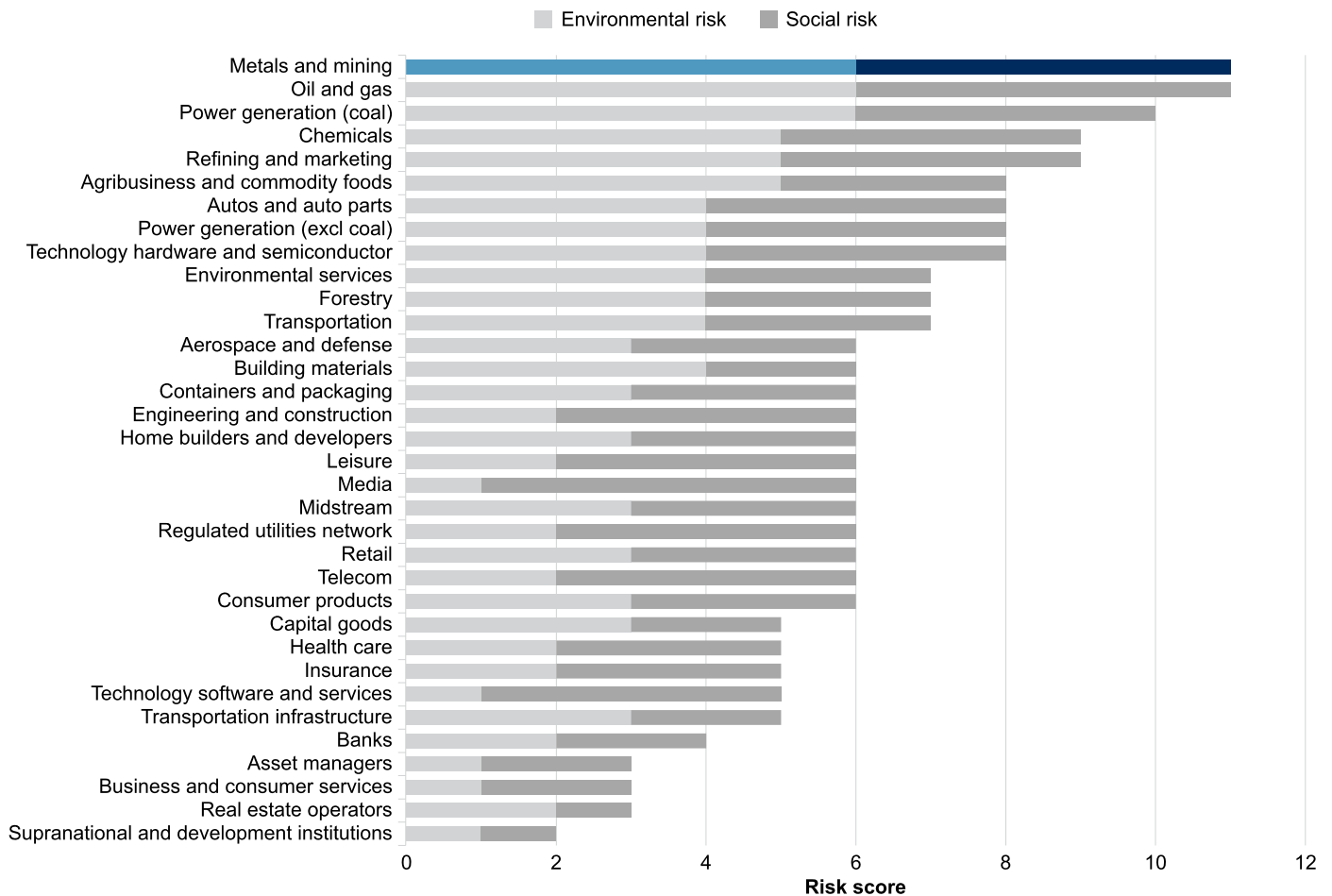
Given that natural resources are also national resources, we note that governments can seek to renegotiate or change tax and royalty agreements, particularly at times of rising prices. Companies will tend to be pragmatic and reach an amicable solution. However, in some situations, the companies may stop some operations or investments, translating into tensions with the local communities.

Governance

Governance risks in metals and mining are largely driven by the entities' risk culture, degree of complexity, and location of businesses. Long-term business continuity is key, as it ensures alignment between stockholders and stakeholders. Poorer governance tends to be more recurrent among junior mining companies whose financial strength is generally weaker, and who do businesses in riskier jurisdictions and are more focused on short-term gains.

Some large, state-owned mining companies are more focused on long-term sustainability than some privately owned companies, and usually there's a high barrier to entry to the industry in their home countries. Family owned businesses are also fairly common in mining, especially in emerging countries, and they usually pursue long-term growth strategies and have longstanding presences. Some large groups started out as mining companies and grew in size and diversification, strengthening governance standards as they became multisector entities.

ESG Sector Risk Atlas



Source: S&P Global Ratings.
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Environmental, Social, And Governance Risks In Metals & Mining--Upstream

Table 1

Company/Issuer Credit Rating/Comments	Country	Analyst
<p>Anglo American PLC (BBB/Stable/A-2)</p> <p>Anglo's portfolio is spread over a wide range of products and geographies, which can make ESG management more challenging. Still, in the last five years there have been no significant industrial accidents apart from leaks at its greenfield iron ore project in Brazil. The completion of the divestment of less-cost-competitive operations should reduce its environmental footprint and provide better oversight of its ESG risks. The company aims to reduce GHG emissions by 30% by 2030, against a 2016 baseline. Currently, it meets around 12% of its energy needs from renewables. In our view, its operations in South Africa (accounting for about 40% of EBITDA and more than 70% of its workforce at the end of 2018) will remain sensitive to social pressures over the coming years, translating into weaker business and investment conditions. Anglo's activities in South Africa include iron ore mines, platinum mines, thermal coal mines, and some diamond mines. We continue to view South Africa's country risks as significant, and will continue to monitor the business climate under the new presidency. We understand that Anglo takes an active role in developing and supporting local communities, and this may become more important given the risks associated with securing social license to operate. Governance, in terms of disclosures and board and management processes, is at least on a par with other large miners and international companies.</p>	U.K.	Ozana Breaban
<p>AngloGold Ashanti Ltd. (BB+/Stable/--)</p> <p>We view AngloGold Ashanti's regulatory and social licenses to operate as being dependent on strict management of multiple factors, including environmental risk. Moreover, we view broad management and governance structures as ratings supportive. We view containment and environmental safety of tailings and mine site rehabilitation, and responsible use of cyanide in gold extraction processes, as the company's most impactful environmental management issues, while responsible water and energy use are also essential to sustainability and good practices. Workforce safety, security, and health are particular challenges in deep-level mining. Financial implications of safety issues include lower production, higher maintenance capex, and potential legal claims. In 2018 some South African gold miners reached a settlement with lawyers representing the claimants in the silicosis and tuberculosis class action litigation. The companies provided for an estimated settlement of approximately \$400 million (of which AngloGold's portion was \$63 million). In South Africa, setting and meeting acceptable employment equity targets and maintaining solid labor relations (given the highly unionized workforce and potential for strikes) are business imperatives.</p>	South Africa	Omega Collocott
<p>Barrick Gold Corp. (BBB/Stable/A-2)</p> <p>In our view, environmental and social risks are most relevant to Barrick's credit quality. The company is among the largest gold producers in the world, with highly energy- and water-intensive operations requiring the use of hazardous chemicals, a key source of environmental risk exposure for Barrick and the gold industry in general. As an example, the company faced legal consequences after several cyanide spills at its Veladero mine in Argentina; it has since sold half of its stake in Veladero. The company also operates large mines in certain high-risk jurisdictions (i.e. Mali and the Democratic Republic of Congo [DRC]), which we believe presents heightened social risk exposure. However, we view governance as neutral for the rating, and consider Barrick to have a good disclosure regarding sustainability. Moreover, Barrick has achieved high rates of recycled water use, with steadily improved health and safety metrics and reduced energy use.</p>	Canada	Phalguni Adalja
<p>BHP Group Ltd. (A/Stable/A-1)</p> <p>ESG factors came into the spotlight for BHP back in 2015, in relation to the dam failure at the Samarco iron ore mine (a 50/50 joint venture [JV] with Vale) in Brazil. As of year-end 2018, BHP has put \$1.2 billion towards settlement costs and established new risk management protocols for JVs. Also, similar to the other big miners, BHP has sustainability targets in place, such as a commitment to reduce fresh water withdrawal by 15% from 2017 to 2022, and to maintain total operational GHG emissions at or below 2017 levels over the same horizon as the business continues to grow. The company continues to have a good safety record. For example, in 2018, the company's TIFR was 4.4 (with three fatalities), similar to the level in 2017. Governance, in terms of disclosures and board and management processes, is at least on a par with other large miners and international companies.</p>	Australia	Elad Jelasko
<p>China Minmetals Corp. (BBB+/Stable/--)</p> <p>Environmental and social factors are significant in our credit analysis for Minmetals. The company does mining, refining, and construction, all industries that face tighter standards as China implements curbs on pollution and strengthens occupational safety rules. The company's diversified geographic operations and vast presence mitigate such risks. The company has reduced unit energy consumption and GHG emission consecutively in the past three years, and increased safety-related spending since 2015. In our view, though these costs may constrain the company's profitability in the near term, its strong financial metrics have reflected the extra spending. We view Minmetals' management and governance as satisfactory, reflecting the expertise and experience of its senior management, its comprehensive risk</p>	China	Christine Li

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management policies, its consistent business strategy, and its excellent execution on overseas operations.

China Shenhua Energy Co. Ltd. (A+/Watch Neg/--)

China

Danny Huang

Chinese coal miners like Shenhua are subject to increasingly tighter regulations and controls over environmental protection and mine safety. Shenhua has no record of significant environmental accidents and a fairly good production safety history. To reduce its environmental impact on areas surrounding its mines, it has reused coal gangue, and taken steps on land reclamation, subsidence restoration, and treatment and reuse of waste water. It has also adopted an online monitoring platform, pursued the continuous upgrade of equipment, and tightened internal inspection standards. The company's fatality rate per million tonne of coal has remained between 0 and 0.01 since 2015, which is low compared to global coal miners. We also view Shenhua's corporate governance to be satisfactory, which reflects the company's effective strategic planning, good record of internal control, independent board, transparent financial reporting.

Cleveland-Cliffs Inc. (B+/Stable/--)

U.S.

Chiza Vitta

Cleveland-Cliffs operates one iron ore mine in Michigan and three in Minnesota. The mines are located near the Great Lakes, and matters associated with water quality are an important focus. The company estimates that capital expenditures for environmental improvement projects in its Mining and Pelletizing segment will total approximately \$10 million in 2019. These projects will target various water treatment, air quality, dust control, tailings management, selenium management, and other miscellaneous environmental initiatives. Cleveland-Cliffs' predominantly serves steel producers that employ blast oxygen furnaces (BOF) taking in iron ore and coal as primary inputs. However, as steelmaking capacity continues to shift towards electric arc furnace (EAF) producers that typically use scrap and pig iron as inputs, the sector is expected to decrease its carbon footprint. The company views the introduction of its new hot briquette iron (HBI) plant to the Great Lakes EAF market as taking steps in that same direction by offering feedstock to less polluting, more sustainable EAF producers, while also enabling them to produce higher quality steel. We view Cleveland-Cliffs' management and governance as satisfactory, reflecting management's controlled transition out of lagging Eastern Canadian iron ore, Asia Pacific iron ore, and North American coal, and growing the domestic iron ore pellets operations, improving the company's financial performance in the process.

Corporacion Nacional del Cobre de Chile (Codelco) (A+/Stable/--)

Chile

Diego Ocampo

Mining in Chile happens predominantly in arid places near small mining towns, so companies have fewer social frictions than in other places. There is little evidence of environmental problems in the long history of mining in Chile, owing to a combination of factors, including monitoring by the government, world-class regulation of waste treatment and safety, companies exhibiting high standards of social responsibility, and the population embracing mining as the country's main economic activity. Codelco, the largest copper miner in the world, is a government owned entity. The main source of friction has been over water, which is scarce in northern Chile, where most of the mining is done. Codelco is in the process of building a 630 liter desalination plant, expandable up to 1,680, and a 160 kilometer (km) pipeline to bring sea water to the Atacama region, where its Chuquicamata, Radomiro Tomic, and Ministro Halles operations are located. Codelco's governance is well established, with the Chilean government holding the majority of ownership and providing a high degree of support for business strategy and financing needs.

Covia Holdings Corp. (BB/Stable/--)

U.S.

Chiza Vitta

Covia is subject to various federal, state, and local laws and regulations governing, among other things, hazardous materials, air and water emissions, environmental contamination and reclamation, and the protection of the environment and natural resources. As of Dec. 31, 2017, the company had \$13 million accrued for future reclamation costs. Covia's goal of good resource management is reflected in its mine planning, process engineering, and production management, which are organized to optimize performance while reducing the footprint. The company serves various industrial end markets including oil and gas exploration and production companies that use hydraulic fracturing technology to extract oil and gas from shale formations. This is relatively new technology compared to conventional mining and drilling methods, and its full environmental impact and any related regulatory responses continue to evolve. Covia was established in 2018, and is majority owned by Antwerp-based Sibelco NV SCR. We assess Covia's management and governance as fair, reflecting the parent's conservative culture despite the limited track record of the new entity.

Fortescue Metals Group Ltd. (FMG) (BB+/Stable/--)

Australia

Minh Hoang

FMG's carbon emissions compare favorably to key peers, and the company remains on track to achieve its stated 25% decrease in emissions intensity in electricity generation from fiscal year (FY) 2015 levels, and 5% decrease in emissions intensity in energy consumption in the production process from FY2017 levels. As of FY2018, FMG had achieved 15% reduction in electricity generation and a 3.7% reduction in energy consumption. The company is focused on the progressive rehabilitation activities of its mine sites throughout each stage of the mining lifecycle, which in our view is commensurate with industry best practices. This includes integrated rehabilitation monitoring procedures that are tailored to local environmental issues. FMG's track record of safety encompasses zero fatalities since fiscal 2014 and no significant environmental accidents. We also note FMG is a large employer of indigenous Australians, which reinforces its social license to operate. We assess FMG's management and governance as satisfactory, reflecting management's depth and breadth of experience, good financial performance, and prudent capital management.

Freeport-McMoRan Inc. (BB/Stable/--)

U.S.

Vania Dimova

Freeport operates in multiple countries and must adhere to numerous and ever-changing environmental and safety regulations. At the end of 2018, the Indonesian government became a majority owner of the Grasberg mine (which constituted over 50% of 2018 consolidated

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operating income). This followed pressure from the Indonesian Parliament and Indonesia's Ministry of Environment and Forestry (the MOEF) concerning the Grasberg mine's impact on river systems and forests. The Grasberg mine in particular has been at the center of tensions among mine workers, law enforcement, the military, community activists, and various political factions. In certain cases, these tensions escalated into violence and operations had to be temporarily halted. We assess Freeport's management and governance as satisfactory based on a high degree of operational transparency. In 2015, Freeport reached a \$138 million settlement related to its \$20 billion acquisition of Plains Exploration & Production Co. and McMoRan Exploration Co., which appeared to involve conflicts of interest due to overlapping boards and ownerships.

Glencore PLC (BBB+/Stable/A-2)

Jersey

**Elad
Jelasko**

Glencore has operations in some jurisdictions with non-counterparties to the Organisation for Economic Co-operation and Development (OECD), as well as material exposure to thermal coal. These factors make the company more exposed to ESG risks compared to peers. And the company is the subject of an ongoing U.S. Dept. of Justice investigation in relation to its operation in the DRC. Glencore has sought to address environmental criticisms by publishing extensive sustainability materials and by committing to cap its coal production at current levels. Social issues in relation to local communities and miners, when they occur, appear to be addressed directly and in line with industry practices. Fatalities at mines occur a little more often than industry averages, and Glencore attributes these in part to its standards and values not yet being fully assimilated at all assets. Given that natural resources are also national resources, we note that governments can seek to renegotiate or change tax and royalty agreements, particularly at times of rising prices. Glencore, in common with peers, tends to adopt a pragmatic position in these situations, as in DRC most recently. Governance, in terms of disclosures and board and management processes, is on a par with other large miners and international companies. When issues have arisen, they have usually been at acquired assets, as for example at Katanga in relation to accurate reporting of copper production. We see the remaining significant equity interests held by management and traders as a positive factor, specifically in terms of risk management and alignment of incentives between the company and its owners.

Grupo Mexico S.A.B. de C.V. (GMX) (BBB+/Stable/--)

Mexico

**Alexandre
Michel**

In Nov. 2018, a bill was sent to Mexico's Congress that may alter how that country grants mining concessions. Although the bill would set additional conditions related to environmental and social requirements, we don't expect it to have a significant impact on GMX's mining operations. GMX has also faced delays in its Tia Maria project, in Peru, due to social conflicts, given complaints of water contamination in the Arequipa region. Tensions seem to be dissipating given the importance of the sector for Peru. GMX has also had environmental accidents, including an explosion in 2006 and a sulfuric acid spill in 2014, which resulted in fines and remedy costs but with no material impact to credit ratios. We assess GMX's management and governance as fair, mostly based on failures faced in the past while executing and controlling its operations.

Murray Energy Corp. (CCC+/Negative/--)

U.S.

**Vania
Dimova**

Environmental and social factors are material to our credit analysis for Murray Energy Corp. Transition to lower-carbon emission sources for electricity generation is one of the key drivers of declining demand and weakening profit margins for U.S. coal companies. According to the U.S. Energy Information Administration (EIA), coal's share of domestic electricity generation will fall to about 25% over the next five years, from nearly 45% a decade ago. The Trump administration's proposal to replace the Clean Power Plan with the Affordable Clean Energy rule won't fundamentally change the trajectory of U.S. coal-fired capacity retirements. Besides natural gas being a cheap and abundant alternative to coal, technological improvements have made gas fired power plants relatively easy and economical to build; and they emit about half of the carbon dioxide of coal, and have well established infrastructure for distribution, especially in the Eastern U.S. Another important social factor is safety: Murray is required to comply with health and safety regulations in the U.S. and the Republic of Colombia. In 2015, Murray idled its Hillsboro mining complex (operated by subsidiary Foresight Energy L.P.) due to a major fire incident. The complex remained idled until January 2019 and incurred asset impairments and litigation costs.

Peabody Energy Corp. (BB-/Stable/--)

U.S.

**Vania
Dimova**

Environmental and social factors are significant to our credit analysis for Peabody. As with other U.S. coal companies, it faces declining demand and weakening profits as coal's share of domestic electricity generation falls. Peabody continues to reweight investments toward greater seaborne thermal and metallurgical access to capture higher-growth Asian demand. Another important environmental factor is land restoration. Peabody reclaims 1.4 acres for every acre disturbed and has been recognized with dozens of awards around the world in recent years for its leading practices in land restoration. Safety is a social factor, and Peabody complies with health and safety regulations in the U.S. and Australia. Peabody's global safety incidence rate of 1.45 accidents per 200,000 hours worked marked the fifth successive year below the 1.5 mark (vs. 3.7 industry average in 2017) and was 22% better than the level of 2013. In 2018, there was a major fire incident in its North Goonyella Mine in Australia, and the mine has since been idled. No injuries resulted from the event. The company will incur costs related to the incident of \$30 million to \$35 million per quarter in 2019, which will partially be offset by the \$125 million in insurance benefit recorded in the first quarter of 2019.

PT Bumi Resources Tbk. (CCC+/Stable/--)

Indonesia

**Vishal
Kulkarni**

Because coal usage for thermal purposes is being reduced worldwide, coal producers bear meaningful substitution risks. Also, Bumi's coal mines are open pit, meaning they are likely to create air and noise pollution from regular blasting and transport of large amounts of ore. Bumi

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uses local river network for barging its coal production to nearby ports to ship it. That exposes Bumi to water pollution risks, although no events have been reported lately. We assess Bumi's governance as weak due to its history of debt overuse, related-party transactions leading to cash leakages, and history of debt restructurings.

Rio Tinto PLC (A/Stable/A-1)

U.K.

Ozana
Breaban

We believe Rio Tinto's large scale operations across several commodities and assets should enable the company to avoid rating volatility from most one-off ESG events. Rio Tinto set a public objective to reduce its GHG emission intensity by 24% between 2008 and 2020. It has already achieved a 28.9% reduction as of the end of 2018, and is working on setting objectives for the coming years. Compared to other big miners, Rio Tinto is the only one to have integrated aluminum operations, of which the smelting of alumina into primary metal is energy-intensive. Importantly, however, Rio Tinto's Canadian smelters are hydro-powered, resulting in lower CO2 emissions and more competitive costs, positioned well ahead of its peers. Rio Tinto is a large employer and its social practices in relation to local communities are at least in line with industry standards. The company continues to have a good safety record. For example, in 2018, the company's LTIFR was 1.35 (with 3 fatalities) compared to an average of about 2.2 of the mining industry in Australia. Governance, in terms of disclosures and board and management processes, is at least on a par with other large miners and international, large, publicly listed companies. Rio Tinto's past operations in Guinea and Mozambique have exposed it to allegations of corruption and bribery, similarly to peers. Rio Tinto does not have active operations in these emerging markets, which are subject to ongoing investigations and charges against former employees respectively. We do not currently anticipate consequent negative rating impacts.

Shandong Energy Group Co. Ltd. (BB/Stable/--)

China

Crystal
Wong

Shandong Energy has maintained a generally good environmental protection record in the past few years. The company has been innovating methods of land reclamation, and has established facilities to utilize waste water and residual heat to store energy. The company's historical production safety record has also been generally good. It has been promoting automation to reduce labor and enhance mining site safety management. However, we see room for improvement as a rock burst accident happened at one of its mines in October 2018 and caused 21 casualties. Though rock bursts are difficult to predict, coal miners can take preventive measures (such as optimizing the mining methods and adjusting mine layout). We view Shandong Energy's corporate governance as fair. The company has reasonable depth and breadth in its management teams and is generally free of legal liabilities.

South32 Ltd. (BBB+/Stable/A-2)

Australia

Minh Hoang

South32 has sought to address some water management exposures by developing desalination plants at various sites and thereby reducing the consumption of municipal water. Meanwhile, the company is constructing a six-hectare solar photovoltaic farm at Cannington, Australia, to prevent between 4,000 and 6,000 tons of greenhouse gas emissions per year while offsetting the gas consumed previously. In our view, these actions demonstrate the company's commitment to transitioning to its publicly stated target of net zero carbon emissions by 2050. Social issues in relation to local communities and employees appear to be addressed directly and in line with industry practices, and have included community initiatives and activities that South32 aims to align with UN Sustainable Development guidelines. Employee safety remains a priority, demonstrated by a downward trend of total recordable injury frequency since 2016; however, the company recorded one fatality in fiscal 2018. We view governance as satisfactory. The company aligns a portion of executives' compensation to sustainability key metrics that aim to reduce injuries, GHG emissions, and occupational exposure limits for carcinogens.

Teck Resources Ltd. (BBB-/Stable/--)

Canada

Phalguni
Adalja

We view environmental risks as important considerations for Teck's credit quality, and its management and governance structures as supportive of the ratings. The company primarily produces metallurgical coal and base metals from several open pit mining sites in the Americas. In addition, the company operates one of the world's largest zinc and lead smelting and refining facilities. From these operations, Teck has high exposure to GHG emissions, and to hazardous substances and waste. In addition, the high water-intensity of its operations, its management of numerous active and inactive tailings facilities, and its land development pose additional environmental risks. Social factors are also important, mainly related (but not exclusive) to workforce health and safety and community relations with local groups. However, the company has demonstrated strong governance of current and future risk exposure, with high transparency on performance and targets for various measures. As an example, the company has committed to eliminating fresh water use for its Quebrada Blanca 2 project by introducing the use of desalinated seawater in northern Chile. Teck is consistently named to the Dow Jones Sustainability World Index (sustainability practices in the top 10% of the 2,500 largest companies in the S&P Global Broad Market Index).

Vedanta Resources Ltd. (B+/Negative/--)

U.K.

Vishal
Kulkarni

Vedanta Resources' sizable resource extraction operations have a direct bearing on the environment and on neighboring communities, and the company has a mixed track record on managing some of these risks. The environmental compliance record at its zinc and oil operations in India is reasonably good, but its copper smelting facilities there were closed due to alleged air and water pollution that affected nearby communities. These closures reduced Vedanta's EBITDA by 5%-7%. The matter is still under judicial consideration. Additionally, a recent U.K. Supreme Court judgment allowed a Zambian village to sue the company for possibly polluting its rivers. Vedanta's operating performance also remains exposed to its vendors and suppliers' ability to manage environmental compliance and social aspects. Vedanta has bauxite off-take agreement with Orissa Mining Corp. (OMC), a state-owned entity. OMC fell short of receiving all necessary environmental clearances for a mining project in Niyamgiri region in the state of Odisha, India. Additionally, OMC faced social resistance to the project, and eventually had to withdraw its mining plans and supply bauxite to Vedanta from alternative sources; this delayed Vedanta's

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aluminum ramp-up and profitability. The company's labor relations and health and safety standards are not significantly different from its peers of similar size. Vedanta's recent structured investment from its Indian subsidiaries to the group parent highlight the importance of governance aspects. Such structured investment diverts cash flows from their stated purpose of reducing leverage and improving liquidity, especially at the subsidiaries.

Zhaojin Mining Industry Co. Ltd. (BB+/Stable/--)	China	Christine Li
Environmental factors are significant because the company's production process involves the use of sodium cyanide, discharge of waste water, and emission of waste gas. But Zhaojin has maintained a fair environmental protection record in the past years, developing technologies to minimize the cyanide content in tailings, increase the gold recovery rate, and improve the recycling of sulfur dioxide; it has also been implementing land reclamation and greening at mines. Zhaojin has also kept a generally good production safety record, though a roof collapse accident in Feb. 2011 caused one casualty. Zhaojin has a few deep-shaft operations, and adopted refrigeration and central air-conditioning systems to provide a safer working site for the employees. We view Zhaojin's corporate governance as fair, based on the depth and breadth of its management team and its general lack of legal liabilities.		
Zijin Mining Group Co. Ltd. (BBB-/Stable/--)	China	Christine Li
Environmental factors are significant because the company's production process involves the use of sodium cyanide, discharge of waste water, and emission of waste gas. Zijin had two notable accidents in 2010: the leakage of copper-containing acidic wastewater into a local river and a tailing pool dam collapse, causing pollution and casualties. After the accidents, Zijin made restitution and put effort into strengthening environmental protection. It now conducts safety inspections on a weekly, quarterly, and annual basis. It also hired Environmental Resources Management to provide inspection services. In the past five years, Zijin has maintained a generally good record in environmental protection, developing technologies to improve the treatment and utilization of tailings and waste water, which also helps to improve the metal recovery rate. It also lowered its emission of sulfur dioxide and nitrogen oxide by 25%-27% year-over-year in 2017. Zijin has substantial operations overseas and we view its community relationships to be generally harmonious. We also view Zijin's corporate governance as fair, partly reflecting the depth and breadth of its management teams and its transparent financial reporting.		

ESG Risks In Metals & Mining--Downstream

Table 2

Company/Issuer Credit Rating/Comments	Country	Analyst
AK Steel Corp. (B/Stable/--)	U.S.	William Ferara
Environmental and worker safety considerations are among the most relevant ESG considerations for our view of AK Steel's credit quality. AK Steel operates older integrated steel manufacturing technology as well as newer electric arc furnaces for its steel production. AK Steel's integrated steel mills contribute to 90% of the company's CO2 emissions. Tighter environmental regulations could make these facilities less competitive compared to electric arc furnaces, which are materially increasing market share of global steel production. AK Steel's focus on employees' safety translated into a relatively low injury rate of 0.64 per 200,000 labor hours in 2018.		
Alcoa Corp. (BB+/Stable/--)	U.S.	Donald Marleau
Environmental and health and safety considerations are among the most significant ESG factors for Alcoa's credit quality. In 2018 the company had labor disruptions at its bauxite mines and smelters due to lockouts and dismissals, which we view as social risks. Fatal and serious injuries increased by 42% in 2017, the persistence of which could have a negative impact on ratings, particularly if it causes changes in operations and costs increase. The company is also party to health and environment related lawsuits, with total environmental liabilities amounting \$280 million as of 2018 and environment-related expenditures of around \$150 million. Governance appears on a par with other large public companies, and the company has responded to safety concerns with personnel changes and improved training.		
Aluminum Corp. of China Ltd. (Chalco) (BBB-/Stable/--)	China	Calvin Ge
Chalco has a generally good environmental protection record in the past years. The company developed its own technology for red mud ecological restoration, reducing pollution. While the company depends on coal-fired power for the production of aluminum, it has lowered its emission of sulfur dioxide, nitrogen oxide, and dust. We view Chalco's corporate governance to be satisfactory, which partly reflects the company's effective strategic planning, good record of internal control, and transparent financial reporting.		
ArcelorMittal (BBB-/Stable/A-3)	Luxembourg	Elad Jelasko
The company operates along the steel value chain in various jurisdictions, turning ESG into a fairly complex risk. As a top steel producer, ArcelorMittal, continues to position itself as a role model for the rest of the industry, especially in making steel into a more sustainable product; for example, its AHSS (Advanced High Strength Steel) for the auto industry is creating products that are lighter and stronger. The company has set a target of reducing its carbon emissions per tonne of steel by 8% by 2020 compared to 2007, and has achieved 6% to date. We understand that the company aims to reduce its CO2 emissions even further, reaching a		

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carbon neutrality in its European operations by 2050. In the years 2015 and 2017, the company's CO2 footprint remained around 207 tonnes, with similar level of steel production of about 93 tonnes. The company reduced its LTIFR to 0.7x in 2018, ahead of the industry's average, from more than 2.0x ten years ago. At the same time, the company had 10 fatalities in 2018 (compared to 23 fatalities in 2017). As of Dec. 31, 2018, ArcelorMittal employs approximately 209,000 people directly, as well as a large number of contractors and part-time workers. Governance, in terms of disclosures and board and management processes, is on a par with other large miners and international companies. Earlier this year the board decided to form a sustainability committee.

Century Aluminum Co. (B/Negative/--)

U.S.

Clara McStay

Environmental and health and safety considerations are among the most significant ESG factors for Century. The company is subject to new U.S. Occupational Safety and Health Administration (OSHA) safety requirements for workers coming into contact with beryllium, contained in alumina, expected to come into effect in the next 12 months. Century is currently in negotiations with the OSHA regarding the application of these new rules, as they would require significant capital expenditures and likely increase production costs. We also see Century as exposed to potential environmental risks as its operations are highly energy-intensive. However, about 30% of Century's primary aluminum capacity is produced by less-environmentally hazardous hydroelectric and geothermal power from its production facilities in Iceland. The rest of its operations are in the U.S. and rely on nonrenewable and renewable energy sources, such as wind, nuclear, coal, and natural gas.

China Baowu Steel Group Corp. Ltd. & Baoshan Iron & Steel Co. Ltd. (A-/Stable/--)

China

Christine Li

Baowu and its subsidiary Baoshan spend around 10%-15% of maintenance capital expenditure on environmental upgrades, leading to reduction in the emission of pollutants such as sulfur dioxide and nitrogen oxide as well as improved energy efficiency in terms of reducing coal consumption in its steelmaking process, resulting in cost savings. Despite the spending, Baowu and Baoshan managed to maintain a leading cost position in China's steel industry. We view Baowu and Baoshan's governance as satisfactory, reflecting management's expertise, strategic planning, and excellent execution of the merger and acquisition of Wuhan Iron and Steel Co. Ltd. Both companies have demonstrated ability in risk management, adequate internal control, and prudent financial policies.

Gerdau S.A. (BBB-/Positive/--)

Brazil

Flavia Bedran

Governance factors were in the spotlight for Gerdau in 2016 when allegations of tax evasion took a toll on the company's reputation, leading us to revise our management and governance score from satisfactory to fair, but with no change to the overall rating. Although investigations are still ongoing, we believe the company has considerably improved compliance controls and also implemented a fully professionalized executive team, moving family members to the board level while sustaining a solid operating performance and benefiting from geographic diversification. We also believe the company's balance sheet has some headroom for potential contingent liabilities, but timing of and amounts arising from judicial processes are uncertain. Only two mines or around 15% of Gerdau's mining operations use upstream dams, similar to those that collapsed in Mariana and Brumadinho. Only one of Gerdau's dams is active, while the other has all certifications to operate. The company is in the process of decommissioning them and moving on to dry waste processes. Its steel business is energy-intensive and a heavy polluter of CO2. However, we believe Gerdau is able to limit these effects for the half of its production coming from mini mills. Also, it uses scrap iron and so is less polluting than companies that depend on blast furnaces. We believe Gerdau's diversified asset base and integrated operation soften social risks related to potential strikes or union requests, as well relating to trade restrictions to reach markets.

Gopher Resource LLC (B/Stable/--)

U.S.

Clara McStay

Gopher participates in the concentrated lead-acid battery recycling industry, which is heavily regulated due to its potential environmental impact. The company has only faced four EPA actions, which is significantly fewer than the average of 20 actions for its peers. Nevertheless, the risk of severe disruption in the company's cash flows is a key rating constraint, because such facilities have been closed for the cleanup of severe long-term contamination.

Nippon Steel Corp. (BBB/Stable/--)

Japan

**Makiko
Yoshimura**

Nippon Steel has been developing technology to curb CO2 emissions in the steelmaking process, and is a front-runner in the production of high-tensile steel, which can reduce weight of vehicles, further helping to lower its carbon footprint. While the cost of these initiatives could recede in the near future, standards for emissions are likely to get stricter, so additional investments may be needed beyond 2020. Nonetheless, these costs are in line with our base case and have no material impacts on cash flows. Regarding social risk, because steel production is by nature capital-intensive and machinery is prone to obsolescence, safety risk assessments are periodic and the company regularly spends on machinery revamping. The company is increasing capital expenditures by 100 billion yen per year in 2018-2020 for facility refreshment and upgrade, which may put some pressure on its cash flow measures, but the major financial ratios are still within the rating tolerance.

Novelis Inc. (BB-/Stable/--)

Canada

Phalguni Adalja

In our view, environmental and social risks do not have a material impact on Novelis' credit quality. The company operates numerous aluminum processing facilities that are well diversified globally. Novelis' operations are highly energy-intensive and contribute risk exposure mainly related to GHG emissions. However, recycled content has steadily increased over the past several years to 61% of its production over the past 12 months, which limits waste. Water use and worker injuries are also low relative to upstream miners. The company has established several targets for these environmental and social risk factors. We believe its

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levels of disclosure is sufficient from a credit profile perspective, but limited beyond near-term objectives.

<p>Nucor Corp. (A-/Stable/A-1)</p> <p>Environmental and worker safety factors are among the most relevant ESG considerations for our assessment of Nucor's credit quality. We view Nucor's competitive position as less exposed to potential tighter environmental regulations compared to some of its blast oxygen furnace (BOF)-dependent peers. The company produces steel using electric arc furnaces (EAF), which have lower energy utilization and emit significantly fewer pollutants compared to the BOF production method. The company's EAF mills use 73% scrap steel for feedstock compared to 25% for BOF, contributing to its smaller environmental footprint compared to older integrated producers. In addition, Nucor's 2018 employee injury rate of about 1.19 per 200,000 labor hours was about 50% lower than the average for steel mills in North America, indicating relatively sound preventive risk programs.</p>	<p>U.S.</p>	<p>William Ferara</p>
<p>POSCO (BBB+/Positive/--)</p> <p>POSCO tracks and discloses key environmental metrics such as energy consumption, GHG emission levels, air pollutants, water usage, and waste generation. As a result, POSCO has been in RobecoSAM's Dow Jones Sustainability Index for 13 consecutive years. The company has also been recognized for its efforts by CDP, the global carbon information disclosure project. On the social front, POSCO has been working to improve safety measures for its employees and has reduced the number of accident cases (including partner companies) in 2017. The company's LTIFR was 0.1 in 2017 as against the global steel industry average of 1.25, based on the data from the company and World Steel Association. We do not find any material deficiency in POSCO's corporate governance. The company has adequate internal controls and maintains independence of the board.</p>	<p>Republic of Korea</p>	<p>Shawn Park</p>
<p>Steel Dynamics Inc. (SDI) (BB+/Positive/--)</p> <p>Environmental and worker safety considerations are among the most relevant ESG considerations for our view of SDI's credit quality. The company produces steel using electric arc furnaces, which have lower energy utilization and emit fewer pollutants compared to traditional blast oxygen furnaces, which are among the largest contributors to greenhouse gases. The company's EAF mills use 80% scrap steel for its feedstock compared to 25% for BOFs, meaning it has a smaller environmental footprint compared to older integrated producers. SDI's steel mills reuse nearly all of their total water needs, which is positive from an environmental perspective and is also cost efficient. SDI's employee injury rate has significantly improved over the years and is now approaching 1 per 200,000 labor hours from over 2 in 2015, indicating relatively sound risk preventive programs.</p>	<p>U.S.</p>	<p>William Ferara</p>
<p>Tata Steel Ltd. (BB-/Positive/--)</p> <p>We believe Tata Steel has comprehensive monitoring of resource usage and emissions from their manufacturing process. In addition to necessary permits being in place and compliance with regulations, the company has active programs to reduce these impacts over time, which in our opinion is commensurate with the significant environmental impact of the steelmaking process. In our opinion, the periodic renewal or continuity of local resource use, land use, and pollution permit requirements at their India iron ore mining operations is an ongoing business risk that sets them apart from global peers. Tata Steel's labor, vendor, and community relationship management initiatives are on par with large metals and mining companies we rate. Going forward, we expect no significant financial contribution from Tata Steel for the funding of pension plan at its European operations. We believe Tata Steel demonstrates satisfactory governance standards led by an independent board that is an active decision-making body in areas such as business ethics, management remuneration, and grievance redressal. There are no significant regulatory, tax, or legal liabilities and we believe there is transparency in financial reporting as well as consistency in communication of messages.</p>	<p>India</p>	<p>Krishnakumar Vishwanathan</p>
<p>United States Steel Corp. (B/Positive/--)</p> <p>Air and water quality, as well as worker safety and relations, are important ESG considerations for U.S. Steel's credit quality. The American steel manufacturing and fabrication industry is heavily regulated, and a company like U.S. Steel owns assets that have been operating since before 1900. Even with industry-standard practices today, the company remains exposed to a combination of current environmental risks and contamination that may have occurred decades ago. As such, the company is engaged in numerous cleanup or remediation activities. As of Dec. 31, 2018, U.S. Steel reported more than 20 environmental lawsuits or proceedings under federal and state environmental laws, in addition to thousands of asbestos claims. Environmental capital expenditures accounted for 12% (\$125 million) of capital expenditures in 2018, and environmental remediation liabilities accounted for almost \$190 million. The company has reduced employee related injuries by almost 90% in the past 10 years by improving safety training and procedures.</p>	<p>U.S.</p>	<p>Donald Marleau</p>

Glossary

AIFR--All injury frequency rate is a measure of all reportable injuries--lost time injuries, restricted work injuries, and medical treatment cases--per 200,000 hours worked.

LTIFR--Lost time injury frequency rate refers to the amount or number of lost time injuries, that is, injuries or fatalities that occurred in the workplace that resulted in an employee's inability to work the next full work day, which occurred in a given period relative to the total number of hours worked in the accounting period. The severity of injury is not considered in the number. The LTI definition excludes pre-existing conditions that weren't sustained during the reporting period. In many countries, the figure is typically calculated per 1,000,000 hours worked.

TRIFR--Total recordable injury frequency rate is the number of fatalities, lost time injuries, substitute work, and other injuries requiring treatment by a medical professional per million hours worked.

Appendix: Components In The Sector ES Risk Atlas

Here is a list of examples of factors we consider in evaluating sector-specific environmental exposure. For example, we examine to what extent each sector is relatively exposed to:

Greenhouse gas emissions (GHG): Actual or potential regulations such as carbon taxes, emissions trading schemes, and other direct or indirect costs. The GHG emissions under the Kyoto climate change agreement are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Sensitivity to extreme weather events: Incremental costs or the potential physical impact on assets associated with recurring (for example, hurricanes) or infrequent (droughts) severe weather events.

Sensitivity to water scarcity: Potential costs related to the need for extracting or sourcing large quantities of water, or requiring on-site water treatment, in comparison to other water users of the same water basins or utilities.

Waste, pollution, and toxicity: Potential fines or rising costs associated with prevention and treatment of waste and pollution, including hazardous waste and air pollution.

Land use and biodiversity: Asset retirement obligations, developing natural land or potential operating constraints, or increased costs associated with protecting plant and animal life.

The following is a list of examples of factors we consider in evaluating sector-specific social exposure. For example, we analyze to what extent each sector is relatively exposed to:

Human capital management: A sector's capacity to develop a long-lasting productive workforce while reducing potential operational disruptions from workforce mismanagement; diversity and inclusion attributes; exposure to strikes and the sector's general exposure to dealing with emerging skills scarcity or surplus labor.

Changing consumer or user preferences: We recognize that changes in consumer behavior are often the result of complex dynamics, such as changes in technology or fashion or other disruptive business trends. Therefore, we treat a change in consumer preferences as a social factor related to sustainability, health, safety, the environment, privacy, financial mis-selling, or community and human rights, particularly when an entity has triggered the change.

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Demographic changes: Potential costs or opportunities related to population growth and composition, such as an aging population, urbanization, changing living standards, or a growing middle class

Safety management: Potential direct or indirect costs resulting from problems related to the safety of a sector's production processes and final customer products.

Social cohesion: Potential or actual costs in direct operations or in the supply chain resulting from geopolitical or community-related events such as conflicts, community unrest, and terror attacks.

This report does not constitute a rating action.

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