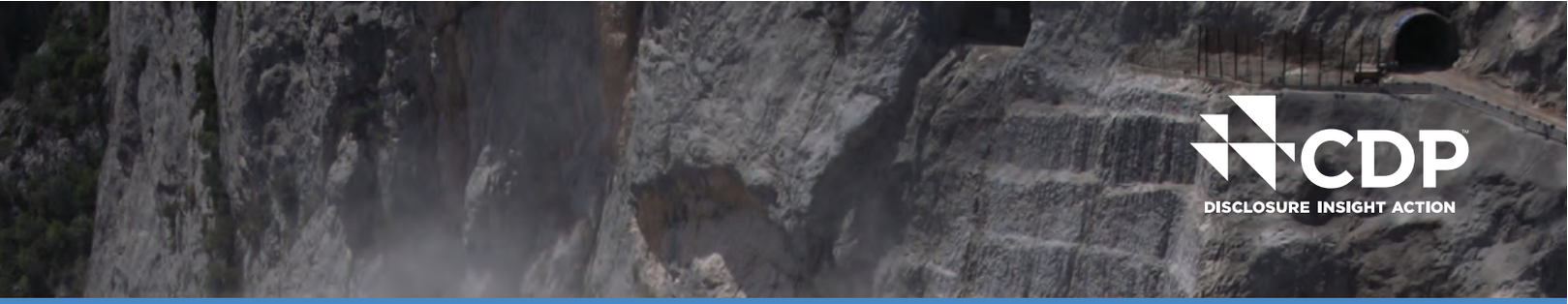

IN TOO DEEP

Analysis for institutional investors of critical water security issues facing the metals and mining sector

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To read 2018 company responses in full and to access a database of tailings dam data, please access CDP's Investor Portal

ABOUT THIS REPORT

CDP has been collecting water-related data from companies across the metals and mining sector for more than a decade. Here we present five year trend analysis of corporate water security data from 54 of the world's largest listed mining companies. These companies have a total market capitalization of US$1.04 trillion and employ 1.8 million people worldwide.

This report builds on a sectoral study published by CDP in 2013 – Metals and Mining: A Sector Under Water Pressure. Here we analyze the evolving implications of water security[3] for the sector, shedding light on how these companies continue to be affected by water-related issues and how they are responding, in order to build both short and long-term resilience. In order to facilitate effective dialogue and engagement between investors and companies, we have provided a snapshot of each company response in Appendix I. CDP extends its thanks to the Alcoa Foundation, which made this study possible.

KEY FINDINGS

Disclosure and transparency amongst companies in this sector has stagnated

- 5 years on from our last report on the sector, just 21 more companies disclose business critical water-related data to investors. In 2018, more than half (52%) of those requested chose not to disclose. A full list can be found in Appendix I.

Operating in this sector remains risky business

- In 2018, the majority of respondents (91%) reported exposure to water-related risks with an estimated financial impact totaling US$24.9 billion - 6% of the responding companies market capitalization[4]. These risks are of immediate concern with the majority (61%) of the risks reported expected to materialize over the next three years. Some risks, such as those from tailings dam failures and pollution liabilities appear to be overlooked.

Over the last five years, the sector has been disproportionately impacted by water-related issues

- In 2013, CDP analysis indicated that water security issues were already affecting the financial performance of responding companies. Analysis suggests that the situation remains the same, with just under half of respondents (44%), on average, having already suffered water-related financial losses amounting to US$11.8 billion over the last five years. This is disproportionately high compared with the cross-sector average of 27%.

Companies must ensure that water security issues are meaningfully embedded into corporate governance and strategy

- Moving risk mitigation from reactionary site-specific interventions to enterprise-wide strategic decision making is an imperative to mitigate risk and ensure business continuity. It's disappointing therefore that only 39% of respondents have board level oversight of water issues; integrate water into long term business objectives and have a publicly available water policy in place.

Tailings dam failures have catastrophic impacts on water security for people, places and profit

- Avoiding tailings dam failures is a necessary requirement for improved water security and business continuity. For the first time, CDP is able to provide data and insight into the ways in which mining companies are responding to and managing tailings dam failure risk. A total of 806 tailings dams, either in operation or inactive, spanning 42 countries, were reported through CDP in 2018. And yet, our analysis indicates that just 26% (10) of respondents have any form of C-suite approval for tailings dams risk management procedures.

INTRODUCTION

Companies involved in the extraction, refining, processing and supplying of minerals are "on the front line" in the struggle for a water secure future. For companies in the metals and mining sector, no water means no business. Access to water and the ability to store and discharge it, are critical factors in all mining developments and operations, making this sector one of the most water intensive.

Principally, water is used to extract the raw material from the ground, to extract the desired element from the raw material and in the transport and storage of excess slurry among other processes[5]. In the United States for example, the U.S Geological Survey estimates the sector represents 1% of total countrywide withdrawals and in some states, such as Texas, as much as 28%[6]. This high dependency means that future business growth depends increasingly on having access to adequate volumes of water, something that can no longer be guaranteed in many regions. Mining operations can also produce significant volumes of water, either through the 'dewatering' of mines to access minerals below the water table or as a by-product of extraction or processing. This water can be highly acidic and contain toxic amounts of metals or other pollutants which need to be disposed of safely and in adherence to local regulations[7]. The potential for this sector to detrimentally impact water quality – both ground and surface water — is high, posing a significant risk to a companies licence to operate.

Tied to vast, local mineral reserves, companies in this sector do not have the luxury of transferring their operations to less challenging, more water secure environments. As such, they must work to align and adapt their practices and procedures with the environmental constraints and objectives of the countries and communities housing them. The decisions they make about how to exploit these reserves, will make or break a countries ability to achieve its water-related and other sustainability and economic development goals.

The water-related decisions these companies take also have implications for those financial institutions fuelling them. It is perhaps unsurprising therefore, that water management has emerged as one of the preeminent sustainability issues within the sector and one receiving greater levels of investor scrutiny. The recent tailings dam disasters in Brazil, which have devastated local freshwater resources in addition to the communities dependent upon them, demonstrates in stark terms, the financial implications of poor governance. — **Vale** (VALE3 BZ) lost a quarter of its market capitalization — or nearly US$19 billion — since its tailings dam collapse in January of 2019, killing more than 230 people[8], Brazil's most deadly mining accident[9]. While worsening water security did not lead to the failure of the dams, it was one of a number of devastating consequences. Worryingly, another dam operated by Vale, just 60km from the previous disaster is on the brink of collapse, threatening the lives and livelihoods of some 30,000 residents in the town of Barão de Cocais[10].

In 2018, CDP introduced sector specific questionnaires for high impact sectors including food, beverage and tobacco, metals and mining, oil and gas, electric utilities and chemicals. For the metals and mining sector, CDP is now able to provide investors with deeper insights into the number of tailings dams a company has in its control, along with the associated management processes and procedures in place to mitigate the inherent risks associated – the only publicly available global repository of such information.

A HISTORY OF FINANCIAL IMPACTS

11.8 US$ billion
in financial impacts over the last five years

In 2013, CDP analysis indicated that water security issues were already affecting the financial performance of responding companies. Analysis of response data since then suggests that the situation remains the same, with just under half of respondents (44%), on average, reporting financial impacts amounting to US$11.8 billion over the last five years. This is disproportionately high compared with the cross-sector average of 27%.

Water-related financial impacts materialize in a variety of ways. While the most commonly reported impacts include increased costs (both operational and capital) as well as production disruptions and fines, companies also report significant impacts related to intangibles, like brand damage and constraints to growth.

In a capital intense sector where profitability is closely linked to productivity, unexpected impacts and operational disruptions hit the bottom line. Disruptions to production as a result of water scarcity is a recurring theme. For example, **Goldcorp** - now Newmont Goldcorp (NYSE: NEM), reported that the average financial loss of revenue for a halt in daily production is US$1 million/day and considers it a substantive amount that triggers the search for opportunities for improved water management.

In 2018, the total combined value of the impacts reported via CDP reached over US$6 billion – this is mostly accounted for by **Vale's** (VALE3 BZ) quantification of the 2015 incident at the Mariana dam in Brazil, amounting to US$5.1 billion. With just 17 of 24 respondents able to provide a financial figure for the water-related impacts they have experienced in 2018, the actual total value of financial impacts experienced is underreported.

Largest impacts by company reported through CDP and external sources in 2018

Company	Country	Type of impact	Total financial impact (US$ million)	Description of impact[11]	2018 EBITDA (million US$)	Water related impact/ EBITDA
Vale (VALE3 BZ) **BHP Billiton** (BHP LN)	Brazil	Fines, penalties or enforcement orders	5139	In November 2015, the Fundao tailings dam owned by Samarco S.A. failed, flooding communities and impacting the environment. Samarco and its shareholders, Vale and BHP Brasil Ltda., entered into a settlement agreement on March 2016 with federal and state governmental authorities, creating a foundation to develop and implement remediation and compensation programs over many years. The financial figure is likely to rise, with estimates put at US$ 39.9 billion.	18913	27%
Newmont-Goldcorp (NYSE: NEM, TSX: NGT)	Mexico	Production disruption	233	In March of this year, Mexico's second largest silver mine owned by the newly merged Newmont-Goldcorp suspended its operations due to community opposition over its excessive water use. Reports indicate a potential loss of 20 million ounces of silver a year, the equivalent of US$233 million by current market price[12].	2584	9.0%
Norsk Hydro (NHY NO)	Brazil	Impact on company assets	174.2	Following a period of extreme rainfall which caused concern that flooding led to harmful bauxite spills, Norsk Hydro was ordered by Brazilian authorities to operate its Alunorte plant at 50 percent of its capacity. Alunorte is Norsk Hydro's largest alumina refinery - and one of the largest in the world. The financial figure disclosed refers to loss of revenue in Q2 of 2018 and the company reports that it is uncertain when production will revert to normal levels.	15796	1.1%

Figure 1. % of companies reporting water-related financial impacts and associated financial values in US$
Source: CDP water security data 2013 - 2018

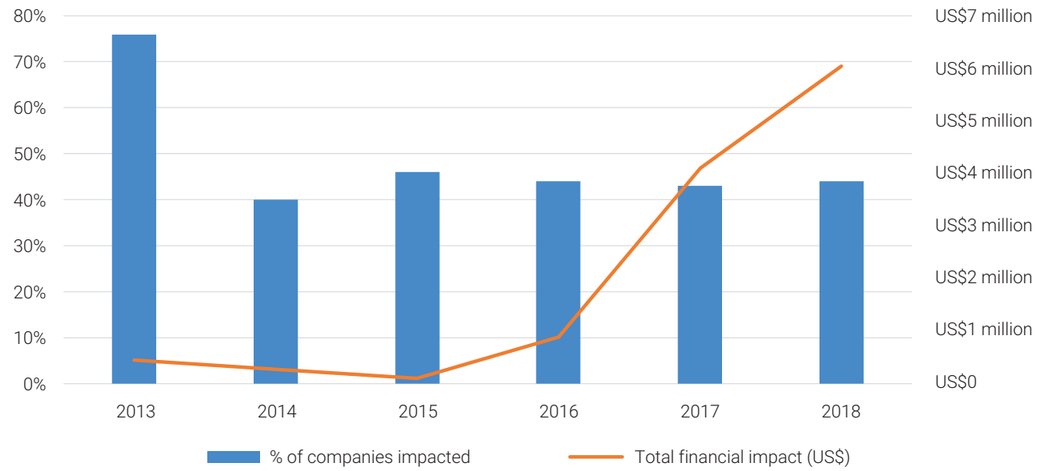


Figure 2. Driver of financial impact by type
Source: CDP water security data 2018

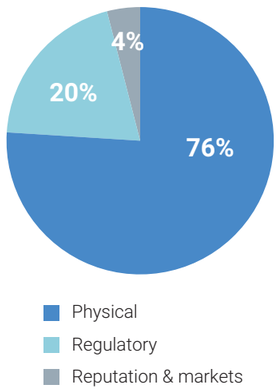


Figure 3. Top reported drivers of financial impact
Source: CDP water security data 2018

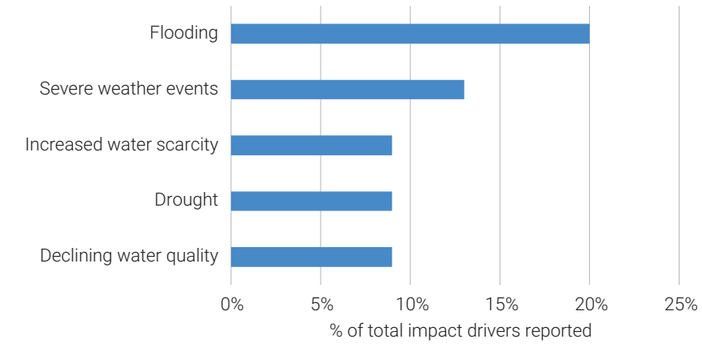
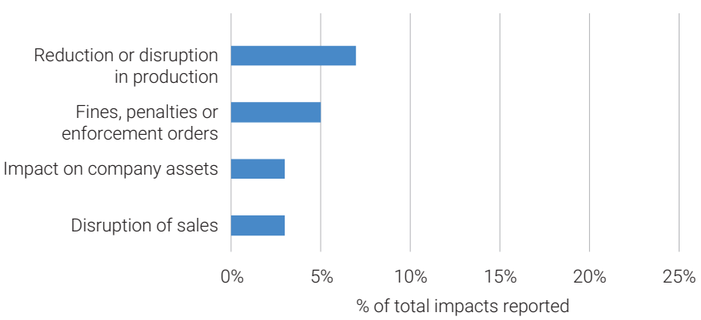


Figure 4. Top reported financial impacts
Source: CDP water security data 2018



OPERATING IN THIS SECTOR REMAINS RISKY BUSINESS

Greater demand for resources and extraction of mineral reserves in often water-scarce locations where a stable supply of water is no longer guaranteed, continues to jeopardize existing and future operations.

24.9 US$ billion financial value at risk

The financial implications of the risks reported through CDP are anticipated to be significant, with the combined value at risk hitting US$24.9 billion, representing 6% of the reporting companies aggregate value[12]. Just one company alone, **Vale** (VALE3 BZ), accounted for more than a third of this value at risk, citing in its CDP response a potential US$8.4 billion reduction in revenue due to climate driven water stress in the São Luis region of north-eastern Brazil.

Water security risks are an immediate concern for the majority (91%) of respondents in the sector. In 2018:

- 287 water-related risks that could lead to substantive business impairment were reported;
- 61% of these risks are expected to materialize in the next three years; and
- 50% of the risks are classed as high likelihood, with 30% and 20% ranked as low and medium probability respectively.

These risks are anticipated to lead to substantive production disruption, increased operating costs as well as a plethora of fines, penalties and enforcement orders. Interestingly, infrastructure failings, such as tailings dam collapse, were not identified as a risk by respondents. Further, pollution liabilities were the lowest ranked risk of all – surprising given the cumulative effect pollution incidents have and its threat to maintaining a license to operate.

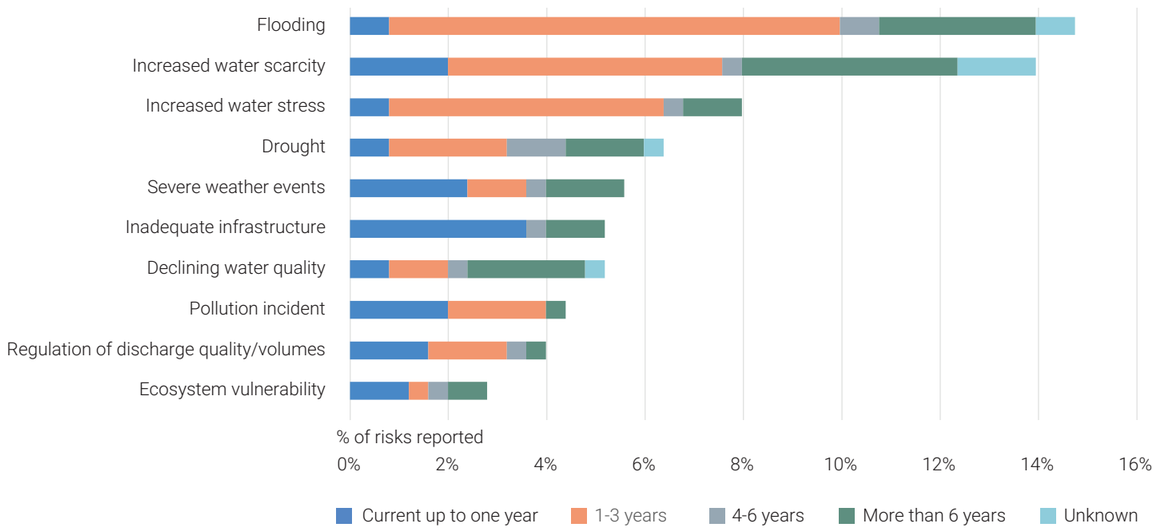
Although not a direct comparison given the difference in sample constituents, the perception of risk drivers in 2013 differs markedly in some important ways. Noteworthy is the absence in 2018 of reputational damage, community opposition and a broader range of regulatory responses such as higher water pricing, water withdrawal regulation and constraints to operating permits.

African Rainbow Minerals (ARI SJ) for example report exposure to water scarcity issues in South Africa that have the potential to disrupt production. The company was hit by this issue back in 2017, when 3-4 weeks of production were lost due to water supply interruptions, resulting in US$100 million of lost revenue.

Harmony Gold Mining Co Ltd (HAR SJ) report that intermittent water supplies in South Africa pose a significant threat to its operational continuity and profitability. A halt in operations at one site results in US$200,000 revenue losses per day. In response, the company has adopted a group-wide campaign to re-use process water in order to reduce dependency on groundwater.

Lonmin (LMI LN) cite that increases in water tariffs, estimated company-wide to be over US$450,000 per year, have a direct impact on its operating costs and pose a risk to the sustainability of its business. As the cost of their product is fixed, it is unable to account for the increase in operating cost and thus has a direct impact on its profit. In response, it is committed to the continuous improvement of its water use efficiency and between 2012 and 2017 it achieved an 11% improvement.

Figure 5. Top reported risk drivers and associated timeframe of potential impact[13]



MITIGATION COSTS ARE LIKELY TO RISE

According to a 2013 report by Moody's[15], 70% of the mines of the six biggest companies are in countries with high or moderate water stress, along with two-thirds of projects being developed. As such, the company issued a warning that water scarcity could increase rating pressure on global mining companies.

In water scarce regions, miners face a new business reality of weighing up the economics of large-scale capital investments in alternative water resourcing to mitigate risks, such as desalination plants, against the value of ore reserves, or the prospect of extending mines' useful lifetimes. For miners, whose spending on water, according to EY, increased from US$3.4 billion in 2013 to nearly US$12 billion in 2014 — a 250% increase[16] — costs are likely to keep rising.

CDP's data suggests that this trend in water-related investment holds true. In 2018, 44% of respondents anticipate an increase in water-related capital expenditure and 33% anticipate future increases in water-related OPEX. For **POSCO** (005490 KS), its water-related investment represented more than a quarter of its total operational expenditure in 2018.

In 2018, 54 companies report a combined US$6 billion of estimated costs for water risk mitigation, representing 14% of their combined capital expenditure for the year[17]. Given that more than half (59) of companies requested to disclose to CDP chose not to, this figure is likely to eclipse that reported by EY in 2014. **Freeport-McMoRan Inc** (FCX US) for example, estimate the cost of a new desalination plant and delivery pipeline to be US$1.4 billion, in response to their inability to expand operations in Chile with current water availability and allocation. This represented over 70% of its total capital expenditure in 2018. And **Anglo American** (AAL LN) estimate costs associated with water management at three of its North American sites to be US$100 million annually due to impacts associated with water quality.

Many regulators are revisiting, re-evaluating and re-positioning water management regulations, often tightening requirements and thus increasing the costs of compliance for companies operating in or buying from these markets. This means companies can no longer undertake a project and later spend more when a water problem arises. Now, as with **Barrick Gold's** (ABX CN) Pascua Lama Mine, miners need to demonstrate how operations will maintain local water supplies before they can start operating.

The result is that *"projects will take longer to complete, be costlier and riskier, with credit-negative implications for the entire industry"* according to Moody's Investors Service. According to the report, *"environmental factors, such as water scarcity, could adversely affect the ratings of global mining companies if they fail to proactively manage the accompanying operational and political risks to their businesses."*

THE TAILINGS DAMS ISSUE

While worsening water security is generally not a dominant driver of tailings dam failures, the consequences of tailings dam failures for the water security of the people and environment downstream of the dam, and the subsequent impact this has on corporate valuation, can be catastrophic. Given CDP's mission to improve water security and establish a thriving economy that works for people and planet, shining a light on the ways in which mining companies govern tailings dams is important to our mission.

Used to store the by-products of mining operations such as ground-up rock or sand along with the often-toxic chemical reagents and process water used to extract the given commodity, are tailings ponds, often more like lakes that can be square-kilometres in size[18]. The integral structure that holds this waste in place is known as a tailings dam, often an earth-filled structure or built from the sand or rock generated in the mining operation. The design and construction of the tailings dam must ensure it stands in perpetuity. According to Bowker and Chambers (2015)[19], tailings dams have a failure rate significantly higher than conventional water retention dams principally for two reasons. The first being the construction materials used are more susceptible to failure, and the second that tailings dams are constructed in sequential 'lifts' over several years that make quality control more challenging[20]. A high degree of surveillance and maintenance is needed both during its operation and long after the mining operation has shut down when the generation of cash flow and profit has ceased[21].

Less than four years on from the Samarco tailings dam collapse, a joint venture between **Vale** (VALE3 BZ) and **BHP Billiton** (BHP LN), what was then Brazil's worst environmental disaster, we find ourselves here again. In January of 2019, an earth embankment tailings dam operated by Brazilian mining company **Vale** failed, killing 308 people, causing untold environmental damage and wiping out US$19 billion in the company's market value[22]. The not-for-profit organization WorldMineTailingFailures.org suggests that the upward trend of high-severity tailings failures is indisputable. The organization, which has built a global repository of all failure events, states that "without major changes to law and regulation, and to industry practices, and without new technologies that substantially reduce risk and increases loss control, current prediction is for 19 Very Serious Failures between 2018 and 2027."[23]

Companies associated with the operation of tailings dams have come under increased scrutiny from investors into the processes they have in place to manage the risks associated. In April of 2019, a group of 96 investors with US$10.3 trillion in assets demanded increased transparency and disclosure from more than 683 listed extractives companies on this issue[24].

Recognizing the importance of standardized and comparable information, CDP introduced a set of sector specific questions in 2018, designed to facilitate transparency and accountability on this issue. Data users can explore by river basin and country the number of active and inactive tailings dams a company has in its control, along with the associated management processes and procedures in place to mitigate the inherent risks associated. In 2018, CDP respondents disclosed more than 347 tailings dams in operation with a further 459 inactive tailings dams under control, spanning 42 countries. A database of this information, the first of its kind, is available on CDP's investor portal.

Implementing strong and comprehensive management procedures and controls is essential to avoid catastrophic social and environmental consequences of tailings dam failings. Of the respondents disclosing tailings dam information, encouragingly 100% report having procedures in place to manage potential impacts to human health or water ecosystems.

Of the respondents with tailings dams under control:

- 80% have an operating plan to manage potential risks;
- 64% have either site level or company-wide guidance and standards on acceptable risk levels; and
- 61% have an assurance program in place to ensure sites are audited to required standards.

By far the most important aspect of tailings dam management however is corporate governance and oversight. Yet despite this, of the companies reporting to CDP in 2018:

- Just 26% report tailings dams risk management procedures that have any form of approval by a C-suite officer.

Given the severity of the risks associated with a tailings dam failure, strategic oversight and accountability is vital to ensuring effective risk mitigation and demonstrating serious commitment to the issue.

A step in the right direction has been the response from The International Council on Mining and Metals, an industry trade group. It has announced that an international standard will be developed for the design, construction, maintenance and closure of tailings dams[25]. This will likely mean an increase in capital expenditure to meet these new independently verified standards. **South32** (S32 AU) for example reported a projected US$57 million capital expenditure on tailings management in its first half yearly report for 2019. This is in stark contrast to the company's half-year reports for 2017 and 2018, which did not mention tailings management or dams at all[27].

For investors wishing to engage on this topic, Appendix I, at the end of the report, provides a company by company snapshot against KPI's for the sector. One such KPI is whether a company reported C-Suite oversight and assurance of tailings dam's management.

Fig 6: Very serious and serious tailing storage facility failures 1958-2017
Source: World Mine Tailings Failures.org August 2018

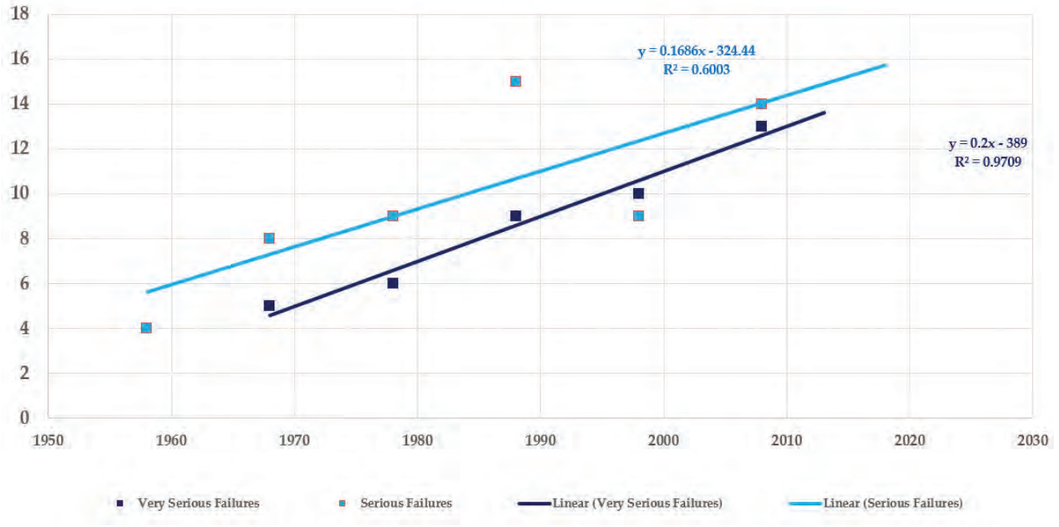


Fig 7: Number of tailings dams reported per country through CDP in 2018

THE EVOLUTION OF WATER RISK MITIGATION STRATEGIES

CDP has defined five critical aspects of corporate water management for the metals and mining sector as a proxy of effective water risk mitigation. These are metrics that any investor can use to engage with a company and are aligned with CDP's scoring methodology.

1 **Transparency:**
Measurement, transparency and accountability are the essential tools that enable the global community to track and assess the progress being made toward a water-secure world.

2 **Governance and strategy:**
Given the fundamental importance of water to the sector, robust water governance is essential. Water-related issues need to be embedded into corporate governance mechanisms and long-term business objectives.

3 **Measuring and monitoring:**
Robust water accounting data is necessary to inform business planning and forecasting as well as risk identification and response. As the saying goes, what gets measured gets managed.

4 **Risk assessment:**
A company considering its water use alongside the physical, regulatory, social, environmental and temporal context within which it operates, has a far greater chance of understanding and enhancing its resilience.

5 **Targets and goals:**
Companies must set and achieve ambitious targets to reduce impacts on water availability and quality.

Transparency

48% of respondents respond to investor requests for information via CDP[25]

In the five years since our last report, CDP has increased the number of companies invited to provide business critical water-related data to investors (113 in 2018, up from 69 in 2013). In the same period, we have seen an increase in the number of companies responding, although not in the same order of magnitude (54 up from 33).

While the growth should be celebrated, it is important to reflect on the make-up of those companies not responding. Since 2013, some of the larger market participants, including **BHP Billiton** (BHP LN), **Barrick Gold Corporation** (ABX CN), **Fortescue Metals Group** (FMG AU), **Imerys** (NK FP) and **Rio Tinto** (RIO AU) have stopped responding to investor requests for information via CDP. With the response rate sitting at 48% in 2018, more than half of respondents failed to disclose critical water information to their investors.

Although some of these companies are reporting water-related data in CSR reports, our analysis of this data suggests that it is rarely comparable, complete or consistent. Independent analysis from Norges Bank Investment Management (Fig 9), one of the world's largest sovereign wealth funds, suggests that companies disclosing through CDP verses in CSR Reports, outperform both in terms of data quality and water performance. There is a need for investors to insist that companies start or continue disclosing through CDP to ensure the availability of robust, comparable and actionable data.

Figure 8: Sector response status breakdown

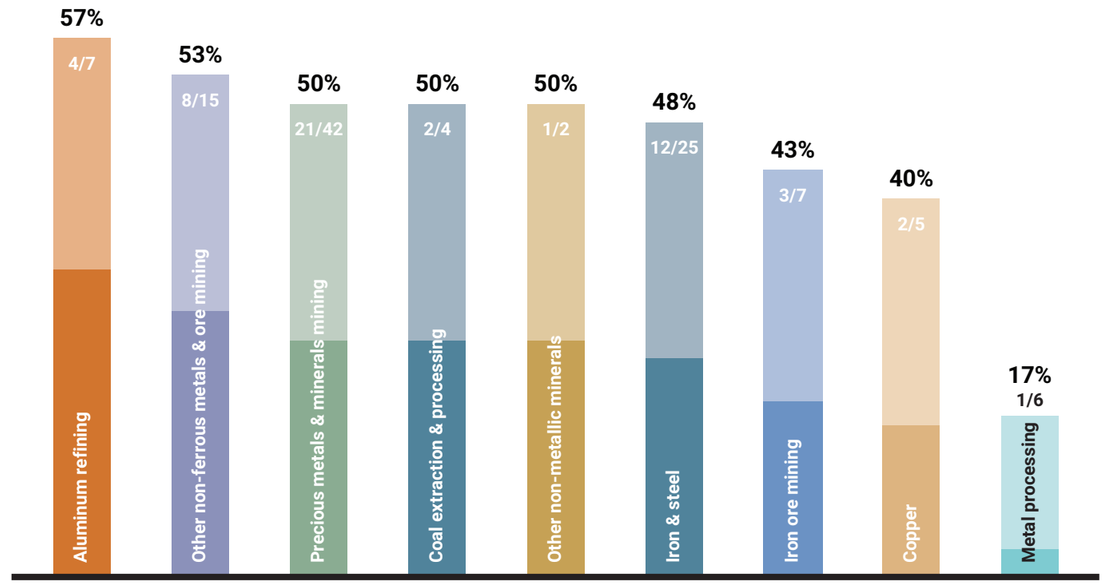
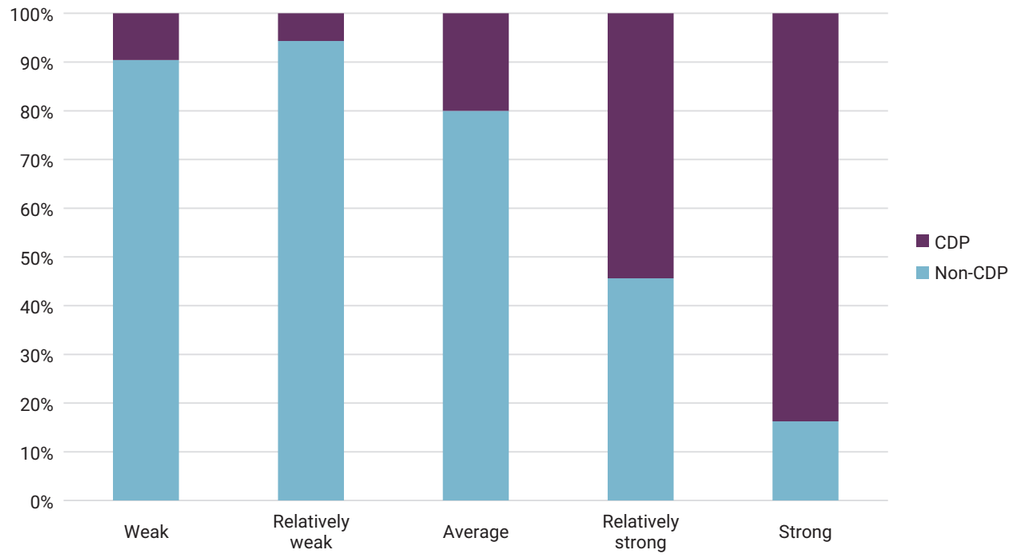


Figure 9: Independent analysis from NBIM - CDP and quality of reporting
% of companies per NBIM score bracket having responding to the CDP water security questionnaire in 2018



Governance & Strategy

39% of respondents have:

- Board-level oversight of water issues;
- Integrated water into long-term business objectives; and
- A publicly available water policy

Moving risk mitigation from reactionary site-specific interventions to enterprise-wide strategic decision making is an imperative to mitigate risk and ensure business continuity. Having board-level oversight of water issues; integrating water into long term business objectives and having a publicly available water policy in place are the key steps companies can take to drive the strategic mitigation of water-related issues from the top down. Only 39% of respondents including **Alcoa Corp.** (AA US), **Glencore plc** (GLEN LN) and **PanAust** (PNA AU) have all of these elements in place.

For the first time in 2018, we are able to assess just how many companies in the sector are rewarding C-Suite officers for performance on water-related issues. Encouragingly, over half (55%) cited the use of such incentives, more than the cross-sector average of 31%. At **Anglo American Platinum** (AMS SJ), water-specific indicators are embedded into the CEO's performance contract and those of other C-Suite employees which represents 4% of the yearly bonus. Whereas for **Centamin plc** (CEY LN) the performance bonus for the CEO is directly linked to the year-on-year increase in the rate of water recycling.

Measuring and monitoring

80% of respondents measure and monitor all water aspects at 75% of sites

Encouragingly, the vast majority of responding companies report that they have strong measurement and monitoring practices in place. This rate is significantly higher than the cross-sector average of 59%, reflecting the critical importance of water to mining activities.

Taking into account that just under half (40%) of respondents cite that 100% of their facilities are exposed to substantive water risk, innovation around improving efficiency and reducing dependency is key. 41% of companies including **Agnico-Eagle Mines Limited** (AEM CN), **Goldcorp Inc.** (G CN) and **Teck Resources Limited** (TECK/A CN) reported that they recycle or reuse more than half of water withdrawn. To put this into perspective, only 10% of respondents within all other sectors recycle or reuse more than half of water withdrawn.

Risk assessment

76% of respondents conduct a regular risk assessment including river basin management authorities

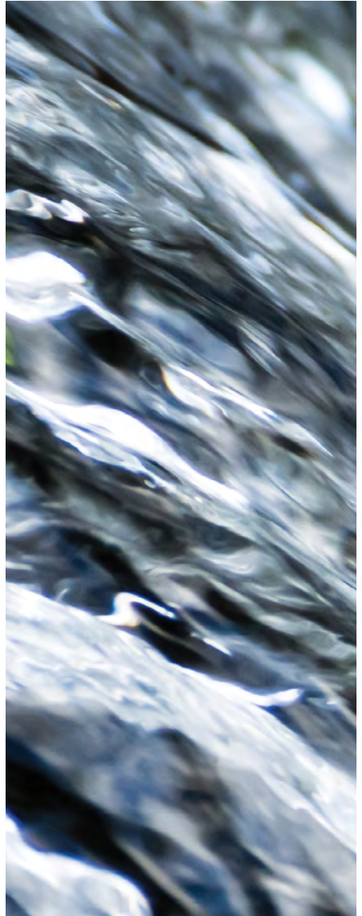
The majority of respondents (76%) report that they conduct regular water-related risk assessments that include important local actors such as river basin management authorities. **Gold Fields Limited** (GFI SJ) for example, recognize engagement with local communities as an essential element of its risk assessment in order to ensure its social licence to operate. Whereas **Lonmin** (LMI LN) work collaboratively with other water users in the catchments where they operate to mitigate the potential risk of conflict regarding water availability in already water stressed areas.

Targets and goals

46% of respondents set targets and goals that are monitored at the corporate level

Given that 91% of respondents in this sector report exposure to substantive water risk, it's disappointing that under half (46%) are setting water targets and goals that are monitored at the corporate level.

Companies must set and achieve ambitious targets to reduce impacts on water availability and quality. Targets can be set at different levels within the company from facilities to business activities to regions, but all should be tracked at the corporate level. This allows the targets to be incorporated into the company's overall strategy and KPIs, enhancing the chance of success. **Impala Platinum Holdings** (IMP SJ) for example implemented a company-wide, year-on-year rolling target of a 40% increase in water recycling in response to worsening water security effecting its operations. The company reports that reducing its demand for freshwater will enhance its own resilience against water insecurity, as well as that of local communities. Whereas **Lonmin** (LMI LN) set a company-wide target for all operations to reduce water withdrawals by 15%. By setting this target at the corporate level, the company reports that it is able to effectively monitor progress at site level and allocate capital to initiatives needed to meet the target.



CONCLUSION

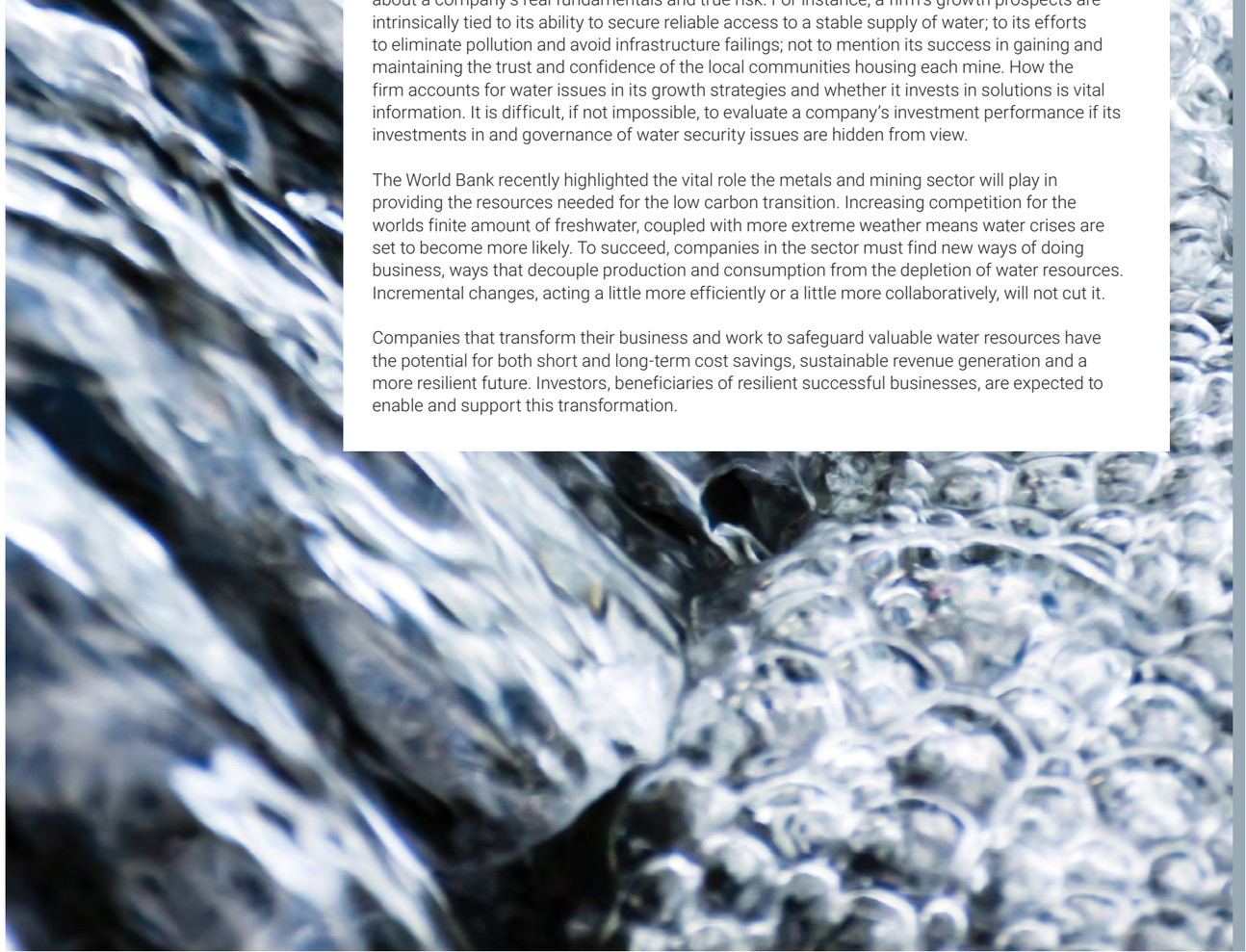
While there has been some progress since CDP's sector assessment in 2013, the pace and scale of change is insufficient to deal with the water security challenges that the sector is facing both today and in the future.

CDP's analysis indicates that companies in the metals and mining sector remain exposed to a variety of large, short-term, high probability risks. These risks are driven by the physical effects of worsening water security, the impacts the companies themselves have on water security and the government, community and civil society response to this. The disconnect between the worldwide increase in the number of tailings dam failures, the lack of reporting of this risk by respondents and the low levels of C-Suite accountability for tailings dam assurance, suggests that companies may be unprepared for significant, water security risks. Whilst flooding dominates the risk perception of the sector, and indeed, has been the water-related issue that has resulted in most financial losses to date, it is noteworthy that tailings dam failures, tightening of water regulations and loss of social licences to operate, fail to register as dominant risk drivers. In addition, that risks associated with water pollution incidents are perceived by just a handful of companies is also interesting, particularly given that it was concerns over Barrick Golds impact on ground water quality that lead to the stranded asset that is the US$8.5 billion Pascua Lama Mine.

Water-related transparency is a fundamental step in transforming this situation and the reasons are straightforward. Less information means less certainty for investors. When a company is not transparent about how it is addressing water security issues, investors can never be sure about a company's real fundamentals and true risk. For instance, a firm's growth prospects are intrinsically tied to its ability to secure reliable access to a stable supply of water; to its efforts to eliminate pollution and avoid infrastructure failings; not to mention its success in gaining and maintaining the trust and confidence of the local communities housing each mine. How the firm accounts for water issues in its growth strategies and whether it invests in solutions is vital information. It is difficult, if not impossible, to evaluate a company's investment performance if its investments in and governance of water security issues are hidden from view.

The World Bank recently highlighted the vital role the metals and mining sector will play in providing the resources needed for the low carbon transition. Increasing competition for the worlds finite amount of freshwater, coupled with more extreme weather means water crises are set to become more likely. To succeed, companies in the sector must find new ways of doing business, ways that decouple production and consumption from the depletion of water resources. Incremental changes, acting a little more efficiently or a little more collaboratively, will not cut it.

Companies that transform their business and work to safeguard valuable water resources have the potential for both short and long-term cost savings, sustainable revenue generation and a more resilient future. Investors, beneficiaries of resilient successful businesses, are expected to enable and support this transformation.



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APPENDIX I
ENGAGEMENT TOPICS PER COMPANY

See p.12-14 for metric methodologies

Company name	Country HQ	Response status	Access	Activity	Market Cap (US$ million)	Ticker	CDP water security score	Governance and strategy	Risk assessment	Experienced detrimental water related financial impact	Reports risks expected to materialize in next 3 years	Targets and goals	C-Suite oversight and assurance of tailings dams management
Acacia Mining	United Kingdom	Not submitted	NA	Precious metals & minerals mining	552	ACA LN	F						
African Rainbow Minerals	South Africa	Submitted	Public	Iron ore mining	1988	ARI SJ	B	NO	YES	YES	YES	NO	YES
Agnico-Eagle Mines Limited	Canada	Submitted	Public	Precious metals & minerals mining	8073	AEM CN	C	NO	YES	NO	NO	NO	NO
Alacer Gold	Turkey	Not submitted	NA	Precious metals & minerals mining	612	AQG AU	F						
Alamos Gold Inc.	Canada	Not submitted	NA	Precious metals & minerals mining	1739	AGI CN	F						
Alcoa Corp.	United States of America	Submitted	Public	Aluminum	6408	AA US	B-	YES	YES	YES	YES	NO	NO
Alrosa Company Ltd	Russian Federation	Not submitted	NA	Precious metals & minerals mining	11575	ALRS RM	F						
Alumina	Australia	Submitted	Public	Aluminum	5998	AWC AU	D	YES	YES	YES	YES	NO	NO
Aluminium Bahrain BSC	Bahrain	Not submitted	NA	Aluminum	1615	ALBH BI	F						
Aluminum Corporation of China	China	Not submitted	NA	Metal processing	4997	2600 HK	F						
Anglo American	United Kingdom	Submitted	Public	Precious metals & minerals mining	29130	AAL LN	A-	YES	YES	YES	YES	NO	NO
Anglo American Platinum	South Africa	Submitted	Public	Precious metals & minerals mining	8340	AMS SJ	A-	YES	YES	YES	YES	NO	NO
AngloGold Ashanti	South Africa	Submitted	Public	Precious metals & minerals mining	3439	ANG SJ	B-	NO	YES	YES	YES	NO	NO
Antofagasta	United Kingdom	Submitted	Public	Other non-ferrous ore mining	10323	ANTO LN	C	NO	YES	YES	YES	NO	NO
Arcelor Mittal South Africa Ltd	South Africa	Not submitted	NA	Iron & steel	501	ACL SJ	F						
ArcelorMittal	Luxembourg	Submitted	Public	Iron & steel	30941	MT NA	B-	NO	YES	YES	NO	NO	NA
Assore Ltd	South Africa	Not submitted	NA	Iron ore mining	3036	ASR SJ	F						
Aurubis AG	Germany	Not submitted	NA	Copper	3005	NDA GR	F						
Barrick Gold Corporation	Canada	Not submitted	NA	Precious metals & minerals mining	12231	ABX CN	F						
Beadell Resources	Australia	Not submitted	NA	Precious metals & minerals mining	116	BDR AU	F						
Bengang Steel Plates Co. Ltd.	China	Not submitted	NA	Metal processing	1154	000761 CH	F						
BHP	Australia	Not submitted	NA	Iron ore mining	115927	BHP LN	F						
BlueScope Steel	Australia	Not submitted	NA	Iron & steel	6961	BSL AU	F						
Boliden Group	Sweden	Not submitted	NA	Copper	7167	BOL SS	F						
BORUSAN MANNESMANN BORU SANAYİ VE TİCARET A.Ş.	Turkey	Not submitted	NA	Metal processing	194	BRSAN TI	F						
Centamin plc	United Kingdom	Submitted	Public	Precious metals & minerals mining	1439	CEY LN	B-	NO	NO	NO	YES	NO	NO
China Steel Corporation	Taiwan, Greater China	Submitted	Public	Iron & steel	12884	2002 TT	B	YES	YES	NO	YES	NO	NA
Cia. Siderurgica Nacional - CSN	Brazil	Submitted	Non public	Iron & steel	2995	CSNA3 BZ	D	Private	Private	Private	Private	Private	Private
Coeur d'Alene Mines Corporation	United States of America	Not submitted	NA	Precious metals & minerals mining	1512	CDE US	F						
Daido Steel Co., Ltd.	Japan	Not submitted	NA	Iron & steel	1974	5471 JP	F						
Detour Gold Corporation	Canada	Not submitted	NA	Precious metals & minerals mining	1517	DGC CN	F						
Eldorado Gold Corporation	Canada	Submitted	Public	Precious metals & minerals mining	529	ELD CN	C	NO	NO	NO	YES	NO	NO
EREĞLİ DEMİR VE ÇELİK FABRİKALARI T.A.Ş.	Turkey	Not submitted	NA	Iron & steel	6258	EREGL TI	F						
Evolution Mining	Australia	Not submitted	NA	Precious metals & minerals mining	3241	EVN AU	F						
Evraz PLC	Russian Federation	Not submitted	NA	Iron & steel	10090	EVR LN	F						
First Quantum Minerals Limited	Canada	Submitted	Non public	Other non-ferrous ore mining	8655	FM CN	B-	Private	Private	Private	Private	Private	Private
Fortescue Metals Group	Australia	Not submitted	NA	Iron ore mining	8647	FMG AU	F						

See p.12-14 for metric methodologies

Company name	Country HQ	Response status	Access	Activity	Market Cap (US$ million)	Ticker	CDP water security score	Governance and strategy	Risk assessment	Experienced detrimental water related financial impact	Reports risks expected to materialize in next 3 years	Targets and goals	C-Suite oversight and assurance of tailings dams management
Freeport-McMoRan Inc.	United States of America	Submitted	Public	Copper	20342	FCX US	C	NO	YES	YES	NO	NO	YES
Fresnillo plc	Mexico	Submitted	Public	Precious metals & minerals mining	8593	FRES LN	C	YES	YES	YES	YES	NO	NO
Gerdau S/A	Brazil	Not submitted	NA	Iron & steel	6420	GGBR4 BZ	F						
Glencore plc	Switzerland	Submitted	Public	Coal extraction & processing	59427	GLEN LN	B	YES	YES	YES	YES	YES	YES
Gold Fields Limited	South Africa	Submitted	Public	Precious metals & minerals mining	2019	GFI SJ	B	NO	YES	YES	YES	NO	YES
Goldcorp Inc. (now Newmont Goldcorp)	Canada	Submitted	Public	Precious metals & minerals mining	9375	G CN	B-	YES	YES	NO	YES	NO	NO
Grupo Mexico S.A.B. de CV	Mexico	Not submitted	NA	Copper	22809	GMEXICOB MM	F						
Harmony Gold Mining Co Ltd	South Africa	Submitted	Public	Precious metals & minerals mining	826	HAR SJ	B	NO	YES	YES	YES	NO	NO
Hindalco Industries	India	Not submitted	NA	Aluminum	7532	HNDL IN	F						
Hindustan Zinc	India	Submitted	Public	Other non-ferrous metals	17284	HZ IN	B	YES	YES	NO	NO	YES	NO
Hitachi Metals, Ltd.	Japan	Submitted	Non public	Iron & steel	5154	5486 JP	B-	Private	Private	Private	Private	Private	Private
HudBay Minerals Inc.	Canada	Submitted	Public	Other non-ferrous ore mining	1464	HBM CN	C	NO	NO	NO	NO	NO	NO
Hyundai Steel Co	Republic of Korea	Not submitted	NA	Iron & steel	6487	004020 KS	F						
IAMGOLD Corporation	Canada	Submitted	Non public	Precious metals & minerals mining	1760	IMG CN	C	Private	Private	Private	Private	Private	Private
Iluka Resources	Australia	Not submitted	NA	Other non-ferrous metals	2932	ILU AU	F						
Impala Platinum Holdings	South Africa	Submitted	Public	Precious metals & minerals mining	1470	IMP SJ	Not available	NO	NO	YES	YES	YES	NO
Independence Group	Australia	Submitted	Public	Precious metals & minerals mining	1808	IGO AU	Not scored	NO	NO	NO	NO	NO	NA
Ivanhoe Mines	Canada	Submitted	Public	Coal extraction & processing	1567	IVN CN	C	NO	YES	YES	NO	NO	NO
JFE Holdings, Inc.	Japan	Submitted	Non public	Iron & steel	13473	5411 JP	B	Private	Private	Private	Private	Private	Private
JSW Steel	India	Not submitted	NA	Iron & steel	13517	JSTL IN	F						
KARDEMİR KARABÜK DEMİR ÇELİK SANAYİ VE TİCARET A.Ş.	Turkey	Not submitted	NA	Iron & steel	699	KRDMD TI	F						
KAZ Minerals	Kazakhstan	Submitted	Public	Copper	2833	KAZ LN	D-	NO	NO	NO	NO	NO	NO
KGHM Polska Miedź S.A.	Poland	Not submitted	NA	Other non-ferrous ore mining	4934	KGH PW	F						
Kingsgate Consolidated	Australia	Not submitted	NA	Precious metals & minerals mining	117	KCN AU	F						
Kinross Gold Corporation	Canada	Not submitted	NA	Precious metals & minerals mining	3754	K CN	F						
Kobe Steel., Ltd.	Japan	Submitted	Non public	Iron & steel	3057	5406 JP	C	Private	Private	Private	Private	Private	Private
Korea Zinc Co Ltd	Republic of Korea	Not submitted	NA	Other non-ferrous metals	6874	010130 KS	F						
KOZA ALTIN İŞLETMELERİ A.Ş.	Turkey	Not submitted	NA	Precious metals & minerals mining	1087	KOZAL TI	F						
KOZA ANADOLU METAL MADENCİLİK İŞLETMELERİ A.Ş.	Turkey	Not submitted	NA	Coal extraction & processing	343	KOZAA TI	F						
Kumba Iron Ore	South Africa	Submitted	Public	Iron ore mining	6325	KIO SJ	B-	YES	YES	YES	YES	NO	NO
Lonmin	South Africa	Submitted	Public	Precious metals & minerals mining	157	LMI LN	A-	NO	YES	NO	YES	YES	NO
Lynas Corporation	Australia	Not submitted	NA	Coal extraction & processing	888	LYC AU	F						
Mahindra Sanyo Special Steel Pvt. Ltd	India	Submitted	Public	Aluminum	0	0821582D IN	B-	NO	NO	NO	NO	NO	NA
Maruichi Steel Tube Ltd.	Japan	Not submitted	NA	Metal processing	2887	5463 JP	F						
Medusa Mining	Australia	Not submitted	NA	Precious metals & minerals mining	110	MML AU	F						
Mitsubishi Materials Corporation	Japan	Submitted	Public	Copper	3743	5711 JP	C	NO	YES	NO	YES	NO	NO

See p.12-14 for metric methodologies

Company name	Country HQ	Response status	Access	Activity	Market Cap (US$ million)	Ticker	CDP water security score	Governance and strategy	Risk assessment	Experienced detrimental water related financial impact	Reports risks expected to materialize in next 3 years	Targets and goals	C-Suite oversight and assurance of tailings dams management
MMC Norilsk Nickel OSJC	Russian Federation	Not submitted	NA	Other non-ferrous ore mining	27188	GMKN RM	F						
New Gold Inc.	Canada	Not submitted	NA	Precious metals & minerals mining	478	NGD CN	F						
Newcrest Mining	Australia	Submitted	Non public	Precious metals & minerals mining	10762	NCM AU	Not scored	Private	Private	Private	Private	Private	Private
Newmont Mining Corporation (now Newmont Goldcorp)	United States of America	Submitted	Public	Precious metals & minerals mining	16554	NEM US	B	NO	YES	YES	NO	NO	NO
Nexa Resources SA	Brazil	Submitted	Non public	Coal extraction & processing	1468	NEXA CN	Not scored	Private	Private	Private	Private	Private	Private
Nippon Steel & Sumitomo Metal Corporation	Japan	Submitted	Non public	Iron & steel	19159	5401 JP	B-	Private	Private	Private	Private	Private	Private
Nisshin Steel Holdings Co., Ltd.	Japan	Not submitted	NA	Iron & steel	1551	5413 JP	F						
Norsk Hydro	Norway	Submitted	Public	Aluminum	11946	NHY NO	B-	YES	YES	YES	NO	NO	YES
Northam Platinum Ltd	South Africa	Submitted	Public	Precious metals & minerals mining	1279	NHM SJ	B-	YES	YES	NO	YES	NO	NO
Nucor Corporation	United States of America	Not submitted	NA	Metal processing	20444	NUE US	F						
PanAust	Australia	Submitted	Public	Coal extraction & processing	744	PNA AU	C	YES	NO	NO	YES	NO	YES
Petropavlovsk Plc	Russian Federation	Not submitted	NA	Precious metals & minerals mining	274	POG LN	F						
Polyus PJSC	Russian Federation	Not submitted	NA	Precious metals & minerals mining	8672	PGIL LN	F						
POSCO	Republic of Korea	Submitted	Public	Iron & steel	25573	005490 KS	A-	NO	YES	YES	YES	YES	NA
Ramelius Resources	Australia	Not submitted	NA	Precious metals & minerals mining	52	RMS AU	F						
Randgold Resources (now New Barrick Group)	United Kingdom	Submitted	Non public	Precious metals & minerals mining	6158	RRS LN	B-	Private	Private	Private	Private	Private	Private
Resolute Mining	Australia	Not submitted	NA	Precious metals & minerals mining	570	RSG AU	F						
Rio Tinto	United Kingdom	Not submitted	NA	Iron ore mining	84634	RIO AU	F						
Royal Bafokeng Platinum Ltd	South Africa	Submitted	Public	Precious metals & minerals mining	668	RBP SJ	B	YES	YES	NO	YES	YES	NO
Sandfire Resources NL	Australia	Submitted	Public	Precious metals & minerals mining	763	SFR AU	C	YES	YES	NO	NO	NO	NO
Saracen Mineral Holdings	Australia	Submitted	Public	Precious metals & minerals mining	1037	SAR AU	C	NO	NO	NO	YES	NO	YES
SeverStal PAO	Russian Federation	Not submitted	NA	Iron & steel	13508	SVST LI	F						
Sibanye Stillwater	South Africa	Not submitted	NA	Precious metals & minerals mining	1409	SGL SJ	F						
Silver Lake Resources	Australia	Not submitted	NA	Precious metals & minerals mining	71	SLR AU	F						
Sims Metal Management	Australia	Submitted	Public	Iron & steel	1877	SGM AU	C	NO	YES	NO	NO	NO	NA
South32	Australia	Submitted	Public	Aluminum	14328	S32 AU	B-	YES	YES	NO	YES	NO	NO
Southern Copper Corporation	United States of America	Not submitted	NA	Other non-ferrous ore mining	33734	SCCO US	F						
SSAB	Sweden	Not submitted	NA	Iron & steel	4271	SSABA SS	F						
Sumitomo Metal Mining Co., Ltd.	Japan	Submitted	Public	Metal processing	9415	5713 JP	B	YES	YES	NO	YES	NO	YES
Tata Steel	India	Submitted	Public	Iron & steel	9538	TATA IN	B-	YES	YES	YES	NO	YES	NA
Teck Resources Limited	Canada	Submitted	Public	Other non-ferrous ore mining	14003	TECK/A CN	B-	NO	NO	NO	NO	NO	YES
thyssenkrupp AG	Germany	Submitted	Non public	Commercial services	14421	TKA GR	C	Private	Private	Private	Private	Private	Private
Troy Resources	Australia	Not submitted	NA	Precious metals & minerals mining	68	TRY AU	F						
United States Steel Corporation	United States of America	Not submitted	NA	Metal processing	4888	X US	F						
Vale	Brazil	Submitted	Public	Iron ore mining	73237	VALE3 BZ	C	NO	YES	YES	NO	NO	NO
Vedanta Ltd	India	Not submitted	NA	Copper	11934	VEDL IN	F						
Vedanta Resources PLC	United Kingdom	Not submitted	NA	Copper	1615	VED LN	F						
Voestalpine AG	Austria	Submitted	Public	Iron & steel	7928	VOE AV	B-	YES	YES	NO	NO	YES	NO
Yamato Kogyo Co., Ltd.	Japan	Not submitted	NA	Iron & steel	1914	5444 JP	F						
Zijin Mining Group Co., Ltd	China	Not submitted	NA	Precious metals & minerals mining	8607	601899 CH	F						

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