

Making the grade

Are some miners chasing fool's gold?

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CDP's sector research for investors provides the best and most tailored environmental data in the market. CDP's team of analysts takes an in-depth look at high emitting sectors one-by-one, starting with the automotive industry, electric utilities, diversified chemicals and now metals & mining. Forthcoming sectors include oil & gas and consumer goods.

This report is available to CDP investor signatories and includes detailed analysis, methodology and recommended areas of engagement for investors to raise with company management teams. In addition, a separate engagement booklet providing further detail on company specific engagement ideas is available to CDP signatories on request.

For more information see

For more information see <https://www.cdp.net/en-US/Pages/events/2015/sector-research-for-investors.aspx>

Linking emissions-related metrics to earnings for diversified miners

- ▼ We launch our Super-League Table for diversified miners, ranking companies based on a number of emissions-related metrics which in aggregate could have a material impact on company performance.
- ▼ Highest ranked companies are: Vale and BHP Billiton.
- ▼ Lowest ranked companies: Glencore, First Quantum Minerals and Vedanta Resources.

Overview

This report, covering diversified miners, is the fourth in a series of investor-focused reports based on six high-emitting sectors (transport, electric utilities, materials, metals & mining, oil & gas and consumer goods). We have previously published reports on global auto manufacturers (February 2015), European electric utilities (May 2015) and global chemical companies (August 2015). Each report features the CDP Super-League Table (SLT) which ranks companies in an industry grouping on a number of mostly emissions-related metrics relevant to that industry. When taken in aggregate, we believe these metrics could have a material impact on company earnings and therefore investment decisions. In this report, we present a Super-League Table for diversified miners that ranks 11 of the largest (by market capitalization) and highest-emitting diversified mining companies.

Scope of report: key areas

There are five key areas in our SLT assessment:

- ▼ **Energy efficiency:** against a backdrop of deeper mining and lower ore qualities, which require greater energy to process, and increasingly remote locations of mining operations, with potential grid and transport constraints, leaders in energy efficiency will gain a competitive advantage and potentially enhanced earnings. Using emissions profiles as proxies, we assess each company's historical performance and future reduction targets.

- ▼ **Water resilience:** we assess the companies' exposure to water risk and how aware they are of these risks. We undertake facility-level analysis to assess which companies are at a greater risk of future production issues due to water stress.

- ▼ **Coal exposure:** coal faces tightening regulation and increasing competition from cleaner alternatives with implications for its economics. We examine the companies' exposure to both thermal and coking coal.

- ▼ **Carbon cost exposure:** we assess the emissions-related carbon cost exposure of mining companies in our study and the potential impact on earnings under current and future carbon price scenarios.

- ▼ **Carbon regulation readiness:** using InfluenceMap's¹ proprietary analysis, we assess each company's actions in supporting or opposing climate legislation. We believe that supportive firms are most likely to benefit from progressive climate agreements.

We note that the recent tragic Samarco mining disaster involving BHP and Vale has highlighted issues relating to tailings dams. This topic is outside the scope of our research, which focuses on climate change-related metrics; thus our SLT does not include analysis on tailings dam incidents. We have, however, undertaken some separate research (attached as an appendix to this report) that assesses the companies' exposure to tailings dams incidents. BHP and Vale are in the lower half of companies assessed. We reiterate this analysis is not included in our SLT.

1. A UK-based not-for-profit organization whose remit is to map, analyze and score the extent to which corporations are influencing climate policy and legislation (www.influencemap.org).

Condensed summary of the Super-League Table for diversified miners

SLT rank	Company	Country	Market cap YTD 2015 (US\$m)	Overall SLT Score	Energy efficiency grade	Water resilience grade	Coal exposure grade	Carbon cost exposure grade	Carbon regulation readiness grade	CDP performance band (2015) (ii)
1	Vale	Brazil	29,764	3.98	B	A	C	A	A	B
2	BHP Billiton	UK	109,548	4.26	A	B	D	B	C	B
3	Sumitomo Metal Mining	Japan	8,200	4.71	C	C	A	B	C	B
4	Rio Tinto	UK	75,617	5.66	B	C	C	C	D	B
5	Teck	Canada	6,078	5.76	C	B	D	D	B	B
6	Antofagasta	UK	10,017	5.79	D	E	A	B	A	D
7	Anglo American	UK	18,050	5.93	A	C	E	D	D	B
8	Freeport-McMoRan	USA	17,378	6.33	D	D	A	B	C	C
9	Vedanta Resources	UK	2,130	6.49	D	E	A	C	B	C
10	First Quantum Minerals	Canada	6,419	6.74	E	D	A	B	B	C
11	Glencore	Switzerland	45,814	8.95	E	D	E	E	E	C

Weights for each area (i)	40%	20%	15%	10%	10%	5%
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(i) Weightings are adjusted for Vedanta Resources, as it was not sent CDP's 2015 water questionnaire.

(ii) This is the CDP annual performance band (A to E) awarded to companies that respond to CDP's climate change questionnaire. The distribution of A to E grades is awarded relative to 2,233 companies that respond to CDP.

Source: CDP

Non-responders to CDP

Organisation	Country	Market cap YTD 2015 (US\$m)	First year approached by CDP	Reason for 2015 non-disclosure	Public disclosure of GHG emissions	Public disclosure of water use	Business activities & main commodity production
Norilsk Nickel	Russia	26,534	2005	Unable to disclose this year but want to in the future.	No	Partially	Vertically integrated metals & mining company with activities across exploration, extraction and mining spanning a number of commodities. World's largest nickel and palladium producer as well as a large copper and platinum producer.
Grupo Mexico	Mexico	21,838	2009	Company policy not to respond.	Partially	Partially	Integrated metals & mining company with operations in mining, smelting and refining areas with a focus on copper.
KGHM Polska Mied	Poland	5,582	2009	No response.	Partially	No	Mining and processing activities of various metals. World leader in the production of silver, also produces copper.

Source: CDP, company data

Key Findings

The diversified mining industry has significant work to do on emissions-related topics. Areas of concern include:

- ▾ Lobbying: the industry's lobbying activities are generally against low carbon regulation. Only two companies (Antofagasta and Vale) were found to be mildly supportive of low carbon regulation, the remaining nine companies appear to be obstructive.
- ▾ Coal exposure: more than half of the companies are involved in coal production, and together they represent 40% of the global seaborne (export) market in coking coal and 27% in thermal coal.
- ▾ Emissions reduction target setting: the diversified mining industry compares poorly with other industry groups featured in our previous research reports. Only six of the 11 companies have meaningful emissions reduction targets and none of the companies have both an absolute emissions and intensity target.

We differentiate between the higher ranked companies and the lower ranked companies in our SLT:

- ▾ The largest non-responding companies to CDP's 2015 climate change questionnaire were Norilsk Nickel, Grupo Mexico and KGHM Polska Mied. These companies collectively represent US\$54bn of market capitalization.
- ▾ Vale is ranked first with an overall SLT score of 3.98, notably ahead of second place (SLT score of 4.26). It ranked consistently well and achieved A or B-grades in all key areas, except for coal exposure where it received a C-grade (the highest grade available for companies with exposure to coal). It ranked first in both carbon cost exposure and water resilience and is supportive of progressive climate regulation - it achieved one of only two A-grades awarded for carbon regulation readiness.
- ▾ BHP Billiton is ranked second. It performed well in the two most important (and therefore highest-weighted) key areas. It is a leader in emissions reductions and related forward-looking targets. In May, BHP Billiton spun-off some of its assets to South32, a separate listed entity. This is not accounted for in our analysis as the latest available environmental data is for FY 2014.
- ▾ Sumitomo Metal Mining is ranked third. It is one of only two companies that achieved C-grades or higher across all key areas. It has amongst the lowest carbon cost exposure and has no coal activities.
- ▾ Rio Tinto is ranked fourth. It performed in the top half of companies in most key areas of our study, except for carbon regulation readiness where it received a D-grade. This suggests that, although Rio

Tinto appears to be obstructive to climate change regulation, particularly in Australia, it seems to be planning for a longer-term transition to a low-carbon environment.

- ▾ Glencore is a clear last place (SLT score of 8.95), with E-grades across all key areas except for water resilience. Its emissions intensity has been increasing over 2008-14 and it has significant thermal coal activities. It also appears to be obstructive to carbon regulation.
- ▾ Canadian miner First Quantum Minerals is ranked second from last. It performed badly in the two most important (and therefore highest-weighted) key areas; its emissions intensity has risen the most over 2008-14 and it has poor water resilience. However, it performed well across the other key areas, including carbon cost exposure, carbon regulatory readiness and coal exposure (it has no exposure to coal).
- ▾ The other Canadian company, Teck, is ranked fifth and receives a D-grade in both coal exposure and carbon cost exposure. It performed well in water resilience and carbon regulation readiness, receiving a B-grade in both key areas.
- ▾ Vedanta Resources, which primarily operates in India, ranked in the bottom three. It has the highest emissions intensity and received a D-grade for energy efficiency. In addition, it has the greatest proportion of its mining facilities in high risk areas for water stress and received an E-grade for water resilience.
- ▾ Antofagasta is ranked in the middle of the table (sixth place). Its performance was mixed. It performed well in three key areas, including carbon regulation readiness where it was one of only two companies that received an A-grade as it appears to be supportive of positive climate regulation. On the other hand it performed poorly in the two most important key areas, including water resilience where it received an E-grade, not helped by its operations being exclusively in Chile, a country with water stress issues.
- ▾ Freeport-McMoRan, the only American company, is in the lower half of the table (in eighth place). It performed badly in the two most important key areas and received D-grades for energy efficiency and water resilience. That said, it performed well in two of the key areas, carbon cost exposure and coal exposure (it has no exposure to coal).

Scope of report: company selection

We selected the group of companies for our study as follows:

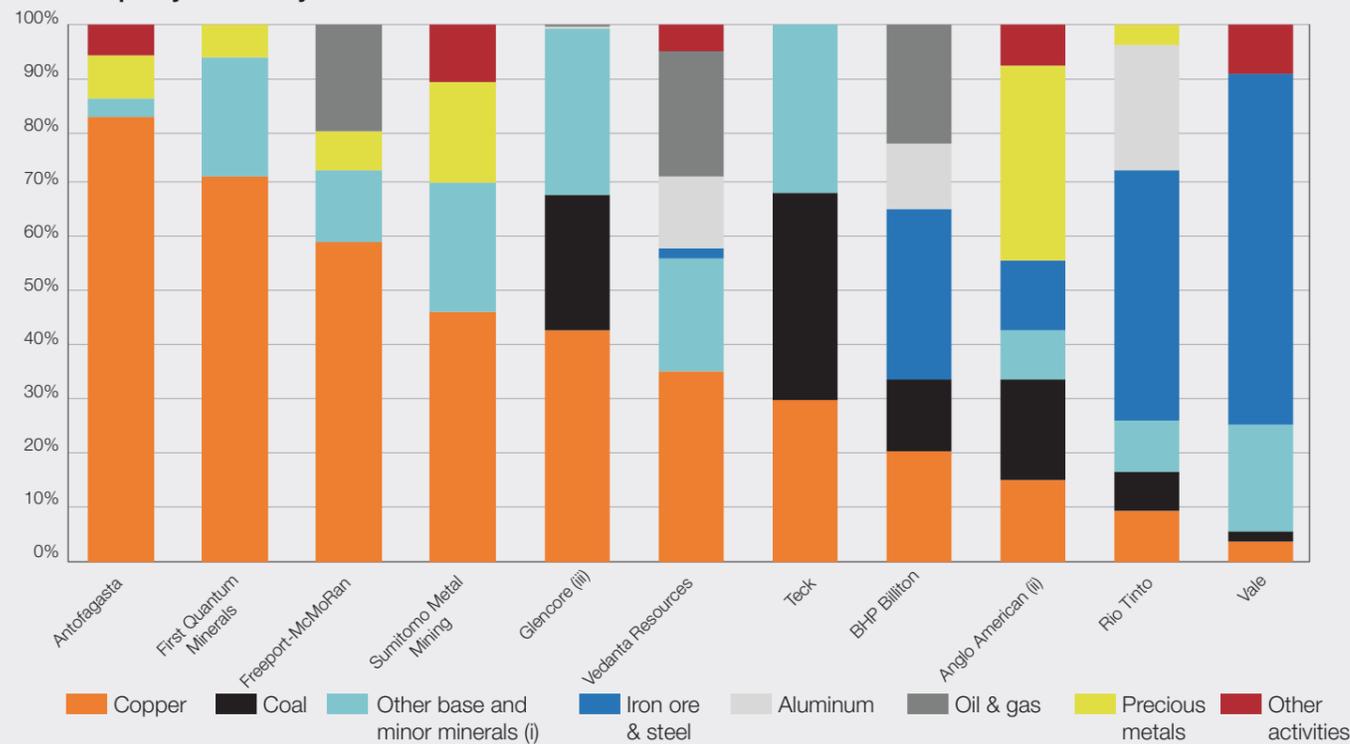
- Started with the 30 diversified metals & mining companies that responded to CDP's 2015 climate change questionnaire.
- Added Vale (often classified under the iron & steel sub-industry).
- Ranked the companies by market capitalization and selected the top 15 companies. This equated to companies with a total market value of about US\$358bn.
- Reviewed the business activities of the 15 companies which resulted in the exclusion of:
 - Hindustan Zinc and Vedanta Limited – two subsidiaries of Vedanta Resources. However, we added Vedanta Resources to the list as environmental and financial information reported on its behalf covers both subsidiaries.

- Mitsubishi Materials as its operations are largely focused downstream.
- Boliden and Lundin, not only for their lower emissions, but also due to their small market capitalization relative to the remaining companies.

The chosen 11 companies together represent approximately US\$329bn in market capitalization and account for 85% of the combined emissions (Scope 1+2) of the 30 companies that responded to CDP their operations span several commodity groups (see chart below) and are mostly upstream and extractive in nature, although several have mid-stream operations including metal refining and smelting (e.g. aluminum). Due to the dispersion of natural resources the majority of the companies' operations are global.

The SLT companies in aggregate represent 50% of the global seaborne (i.e. export) market in iron ore, 45% in copper, 40% in coking coal and 27% in thermal coal.

Revenue split by commodity in 2014



(i) Other base and minor metals include manganese ore and alloys, molybdenum, nickel and zinc.
 (ii) Precious 'metals' component for Anglo American relates mostly to De Beers diamonds.
 (iii) Glencore's revenue from marketing activities (85% share of its total revenue) is not included in the chart.

Source: CDP, company data

Linking our findings to investment choices

We recognize that investment decisions are based on a multitude of different factors and that some of these can be misaligned with emissions reduction efforts.

Our SLT rankings are not intended as definitive winners and losers for investment purposes, rather as a proxy for business-readiness in an industry likely to be significantly impacted by the more stringent carbon regulation needed to meet long-term climate objectives.

We would flag that companies towards the bottom of our SLT are possibly higher risk-investments from a sustainability perspective than those towards the top.

Methodology

We score each mining company based on a number of different metrics which are first ranked and then weighted within each of the five key areas (see below for individual weightings) to produce a weighted rank for each key area with an accompanying grade (A to E). We calculate the overall SLT score by apportioning the weighted ranks for each key area according to their respective weights.

Each of the key areas has a separate chapter within this report with accompanying information on the precise methodology for how we rank and grade each metric.

In addition to the five key areas, we also include CDP's climate score for 2015 in the SLT. It scores the 2,233 companies that respond to CDP's investor-backed climate change questionnaire based on their climate change readiness. A high overall score is a sign of completeness of the response to the questionnaire and implies a well-run business and forward-looking management team that is transparent about how climate change affects its business.

For further study

Areas of further interest to investigate include:

- Advanced carbon pricing modeling which would consider how companies alter their commodity production mix and choice of energy sources.
- Assessment of the economics of captive renewable plants versus fossil fuel alternatives in key mining locations.
- Assessment of how a low-carbon transition impacts demand across different commodities and where opportunities for miners exist.
- Undertake a forward-looking assessment of company exposure to forecasted future water-stressed locations.

Summary of key areas, associated metrics and relative weighting within the Super-League Table

Key area in SLT	Link to company earnings	Metric	Key area weighting in overall SLT	Metric weighting within each key area
Energy efficiency	Improvements in energy efficiency can lead to cost savings and thus enhanced earnings. This is especially pertinent against a backdrop of deeper mining and lower ore qualities and increasingly remote locations of mining operations.	i) Reduction in emissions intensity 2008-2014.	40%	24%
		ii) Emissions intensity 2012-2014.		6%
		iii) Quality of emissions targets.		25%
		iv) Performance against targets.		25%
		v) Emissions data transparency.		20%
Water resilience	Water stress issues at mining locations pose significant risks to production or require significant expenditure to rectify.	i) Water stress exposure.	20%	60%
		ii) Water governance and strategy.		30%
		iii) Water performance.		10%
Coal exposure	Coal faces increasing regulatory and market pressure in its downstream use which will negatively impact the economics of its upstream production.	i) Share of revenue from coal.	15%	40%
		ii) Percent thermal coal production.		30%
		iii) Emission intensity of coal activities.		20%
		iv) Life of reserves.		10%
Carbon cost exposure	Financial exposure to meeting carbon emission cost, both present and potential future.	i) Current carbon cost exposure.	10%	40%
		ii) Potential future carbon cost exposure.		40%
		iii) Internal carbon price.		20%
Carbon regulation readiness	Companies that are supportive of regulation which facilitate a low-carbon transition are more likely to be better placed to benefit from it.	i) InfluenceMap score.	10%	100%
CDP performance band	A good annual CDP score is a proxy for a generally well-run company. Well-run companies are better placed to succeed in a changing marketplace.	i) CDP annual performance score.	5%	100%

Source: CDP

Energy efficiency

- Five companies do not have any meaningful future emissions reduction target, and none have both an absolute and intensity emissions goal.
- BHP Billiton is ranked top and is a leader in emissions reduction performance and future targets.
- First Quantum Minerals is rock bottom. It ranks last across all areas. Glencore also performs poorly. Emissions intensity for both companies have materially grown over time.

Overview

Energy requirements represent a significant proportion of a company's operating costs (we estimate this to be up to 35% for the companies in our study²) and can be reliant on intermittent grid connections in remote locations or off-grid alternatives, such as captive diesel generators. Electricity price increases have persistently out-grown inflation in key mining locations such as Chile and South Africa. Furthermore, commodity resources are increasingly found deeper underground and of lower quality grades, which require greater energy to extract from the ground and process into commodities.

In this chapter, we assess energy efficiency trends of companies using emissions reduction data as a proxy. Leaders in efficiency will enjoy a reduced cost base and thus enhanced earnings. Efficiencies can be achieved in a number of ways, such as: advances in technology in prospecting and exploration practices; new technological options during ore crushing and grinding; process optimization; fleet automation and light-weighting of trucks; increased waste heat recovery; renewable energy sources³ use in captive power plants - this can also mitigate energy security risk in remote locations.

We identify five key metrics to differentiate companies in energy efficiency across three areas (emissions performance, future targets and data transparency):

Emissions performance

We analyze historic trends in company Scope 1+2 emissions intensity over the period 2008-14. We believe that this can be a proxy for energy efficiency performance. Scope 1+2 emissions are those directly controlled by the company such as emissions from the internal generation of power and transportation (Scope 1), combined with emissions from power purchased from third parties (Scope 2).

We use emissions intensity-related metrics rather than absolute levels to avoid penalizing companies that grow faster than others. Absolute emissions are normalized by both value-added (gross profit) and revenue.

Metric 1) Reduction in Scope 1+2 emissions intensity

This metric identifies the extent to which companies have reduced their emissions intensity over the period 2008-14. As cumulative carbon emissions matter from a global warming perspective (and increasingly on a cost basis), instead of using a compound annual growth rate (CAGR) calculation, which only looks at the first and final year's data, we apply a proprietary function which accounts for a company's emissions intensity profile over each of the years 2008-14. In addition, our function adjusts for anomalies and doesn't penalize companies with unrepresentative emissions data at the start and end of the period.

Metric 2) Scope 1+2 emissions intensity

This metric identifies those companies with the lowest emissions intensity. We acknowledge the challenges of comparing a set of diverse mining companies with varying commodity and location mixes and therefore assign just a 20% weighting to this metric versus an 80% weighting to metric 1) above. Nevertheless, this metric accounts for the consideration that companies with lower emissions intensities may find it more difficult to decrease these relative to companies which are reducing their emissions from a higher base.

Summary of companies with emissions reduction targets across our four sector reports

Industry	No. companies in SLT	No. companies with a meaningful target (i)	No. companies with a meaningful absolute and intensity target
Global diversified chemical companies	18	17	6
European electric utilities	13	12	7
Global automotive manufacturers	14	8	3
Diversified miners	11	6	0

(i) Either an absolute or an intensity target

Source: CDP

Future targets

We assess companies' emissions reduction targets using two forward-looking metrics. We believe they can be used as a proxy for a company's intentions towards future energy efficiency measures.

Disappointingly, only six of the 11 companies have meaningful emissions reduction targets and none of the companies have both an absolute emissions and intensity target. This is worse than other industries we have analyzed in our previous three sector reports (see table above).

Our proprietary analysis assesses the quality of each company's target as well as the performance of each company against its target. Our model assesses emissions performance on a yearly basis to recognize the cumulative effect of greenhouse gas emissions in the context of a global carbon budget.

Metric 3) Quality of target

This metric assesses whether each company's target is weaker or stronger than industry specific science-based targets which are consistent with limiting global warming to 2-degrees. We adopt a similar approach to that established by the Science Based Targets collaboration, in which CDP is a partner⁴.

Metric 4) Performance against target

This metric assesses each company's performance against its target. Our proprietary modelling enables us to assess the profile of the companies' historic emissions annually against their respective targets. This method highlights those companies whose emissions trajectory consistently outperforms what is required to meet their target. The benefits of this are two-fold: first, from a climate change perspective, reducing emissions on an annual basis is crucial, rather than, for example a company reducing emissions aggressively in the final year of its target. Second, companies that consistently outperform their emissions reduction targets are those that consistently benefit from energy efficiency cost savings.

Data transparency

We undertake a review of the quality, transparency and level of sophistication of the companies' responses to CDP on Scope 1+2 emissions. Investors require transparency as it reduces uncertainty.

Metric 5) Emissions data transparency

We form a scorecard that assesses the companies' emissions accounting procedures. The scorecard includes: method of consolidation for emissions (the reporting boundary), level of third party verification and assurance, scope of verification and any exclusions relative to the reporting boundary.

2. This includes electricity and transportation costs.

3. We would like to include a metric related to renewables in this chapter, however are unable to comprehensively assess the companies on renewables due to data limitations (see other limitations section at the end of this chapter).

4. Science Based Targets is a joint collaboration between CDP, the United Nations Global Compact, World Resources Institute and WWF. This initiative adopts a scientific approach to help companies establish meaningful and ambitious carbon emissions reduction targets that are in line with the emissions scenarios suggested by the Intergovernmental Panel on Climate Change (IPCC)'s latest report in order to decarbonize the economy. The methodology was published in May 2015 in the report: "Sectoral Decarbonization Approach".

Highlights

- ▼ BHP Billiton is ranked first. It has reduced emissions the most since 2008 and performs well against its emissions reduction target; the target itself is more or less in line with science-based targets. This bodes well for future energy efficiency savings.
- ▼ Anglo American is ranked second. It performs well in emissions data transparency and has the most robust emissions reduction target.
- ▼ Antofagasta, Vedanta Resources, Freeport-McMoRan, Glencore and First Quantum Minerals do not currently have any meaningful future emissions reduction targets.
- ▼ First Quantum Minerals and Glencore are ranked at the bottom. Emissions intensity for both companies has increased significantly since 2008.
- ▼ First Quantum Minerals is ranked bottom in emissions performance despite its low emissions intensity. Its emissions intensity has increased the most across both normalization factors (40% by value-added and 21% by revenue).
- ▼ Glencore is also a laggard in this area. Its emissions intensity increased over the period and its emissions intensity normalized by value-added is the second lowest despite the fact that around 80% of its revenue is derived from low-emitting marketing activities.
- ▼ Antofagasta's emissions intensity remained broadly flat over 2008-14 and it has the second lowest intensity. However the lack of a reduction target means it ranks mid-table overall (seventh place) in emissions performance.

Emissions performance

- ▼ BHP Billiton has reduced its emissions intensity the most across both normalization factors (15% by value-added and 12% by revenue).
- ▼ Rio Tinto is the only other company to reduce emissions normalized by both value-added and revenue, although its operations remain emissions intensive as shown by its third from bottom position in metric 2).
- ▼ Teck and Freeport-McMoRan are both in the bottom third due to lackluster emissions reduction performances.
- ▼ Vedanta has the highest emissions intensity normalized by both revenue and value-added, which is possibly due to its high captive coal use and energy-intensive zinc subsidiary.

Energy efficiency grade summary

Company	Emissions performance	Future targets	Data transparency	Overall weighted rank	Energy efficiency rank	Energy efficiency grade
BHP Billiton	1	1	2	2.0	1	A
Anglo American	7	2	1	3.8	2	A
Vale	2	2	8	4.5	3	B
Rio Tinto	3	4	6	4.5	4	B
Sumitomo Metal Mining	5	4	10	5.7	5	C
Teck	8	4	9	5.9	6	C
Antofagasta	6	11	3	7.9	7	D
Vedanta Resources	4	11	5	8.1	8	D
Freeport-McMoRan	9	11	4	8.4	9	D
Glencore	10	11	7	9.6	10	E
First Quantum Minerals	11	11	11	10.5	11	E

Weighting **30%** **50%** **20%**

Note: In calculating the weighted rank in this table, we use the weighted ranks for each area (where relevant). We display non-weighted ranks in this summary for simplicity only.

Source: CDP

Emissions performance summary

Company	Reduction in emissions intensity 2008-2014	Emissions intensity 2012-14	Overall weighted rank	Emissions performance rank
BHP Billiton	1	7	2.1	1
Vale	3	2	3.9	2
Rio Tinto	2	9	4.4	3
Vedanta Resources	3	11	5.4	4
Sumitomo Metal Mining	6	5	5.8	5
Antofagasta	7	2	5.9	6
Anglo American	5	10	6.1	7
Teck	9	4	6.9	8
Freeport-McMoRan	8	8	7.0	9
Glencore	10	6	9.1	10
First Quantum Minerals	11	1	9.4	11

Weighting **80%** **20%**

Source: CDP

Metric 1) Reduction in emissions intensity 2008-2014 summary

Company	normalized by both value-added (US\$m)	Rank	Normalised by revenue (US\$m)	Rank	Weighted rank	Overall rank
BHP Billiton	-15%	1	-12%	1	1.0	1
Rio Tinto	-7%	2	-4%	5	3.5	2
Vale	2%	6	-10%	2	4.0	3
Vedanta Resources	0%	4	-6%	4	4.0	3
Anglo American	9%	8	-6%	3	5.5	5
Sumitomo Metal Mining	-4%	3	5%	9	6.0	6
Antofagasta	1%	5	1%	8	6.5	7
Freeport-McMoRan	5%	7	1%	7	7.0	8
Teck	16%	9	-1%	6	7.5	9
Glencore	18%	10	13%	10	10.0	10
First Quantum Minerals	40%	11	21%	11	11.0	11

Weighting **50%** **50%**

Source: CDP, company data

Metric 2) Emissions intensity averaged over 2012-2014 (tCO₂ per normalization factor)

Company	Normalised by value-added (US\$m)	Rank	Normalised by revenue (US\$m)	Rank	Weighted rank	Overall rank
First Quantum Minerals	1,043	3	333	3	3.0	1
Antofagasta	750	1	391	6	3.5	2
Vale	775	2	352	5	3.5	2
Teck	1,312	5	339	4	4.5	4
Sumitomo Metal Mining	1,740	8	278	2	5.0	5
Glencore	5,434	10	165	1	5.5	6
BHP Billiton	1,222	4	669	9	6.5	7
Freeport-McMoRan	1,425	7	556	7	7.0	8
Rio Tinto	1,314	6	743	10	8.0	9
Anglo American	2,428	9	622	8	8.5	10
Vedanta Resources	6,252	11	1,402	11	11.0	11

Weighting **50%** **50%**

Source: CDP, company data

Future targets summary

Companies	Quality of target	Performance against target	Overall weighted rank	Future targets rank
BHP Billiton	2	2	2.0	1
Anglo American	1	6	3.5	2
Vale	6	1	3.5	2
Rio Tinto	4	4	4.0	4
Sumitomo Metal Mining	5	3	4.0	4
Teck	3	5	4.0	4
Antofagasta	11	11	11.0	11
First Quantum Minerals	11	11	11.0	11
Freeport-McMoRan	11	11	11.0	11
Glencore	11	11	11.0	11
Vedanta Resources	11	11	11.0	11
Weighting	50%	50%		

Source: CDP

Future targets

- Disappointingly, only six of the 11 companies have set meaningful emissions reduction targets. The remaining five companies are ranked jointly 11th to reflect this shortfall. None of the companies have both an absolute emissions reduction target or an intensity target.
- BHP Billiton is the only company to set an almost science-based target (misses by under 1%) and perform well against it (beats by 8%).
- Anglo American is the only company to set a science-based target (beats by 20%) but is not quite on track to meet it (misses by 5%).
- Rio Tinto sets an intensity target which it is on track to beat, however, it is not science-based.
- Sumitomo Metal Mining's target only covers 48% of its emissions. It is marked down in metric 3) to reflect this shortfall.
- Vale set a company-wide absolute emissions reduction target of 5% reduction on projected "business-as-usual" levels in 2020. In fact, adherence to this target would notably increase absolute emissions over time; it is 50% weaker than the level required for a 2-degree pathway.
- Glencore, First Quantum Minerals and Vedanta reported emissions reduction targets to CDP; however, these were not considered meaningful due to only a low scope of emissions (under 30%) being represented by the targets or target end dates being in the past.

Metric 3) Quality of target

Company	Absolute target % beat/(miss) science-based target	Intensity target % beat/(miss) science-based target	Type of target	% beat/(miss) science-based target	Scope of target	Adjusted result	Quality of target rank
Anglo American	20%		Absolute	20%	100%	20%	1
BHP Billiton	-1%		Absolute	-1%	100%	-1%	2
Teck	-3%		Absolute	-3%	100%	-3%	3
Rio Tinto		-12%	Intensity	-12%	95%	-13%	4
Sumitomo Metal Mining		-25%	Intensity	-25%	48%	-38%	5
Vale	-48%		Absolute	-48%	99%	-49%	6
Antofagasta							11
First Quantum Minerals							11
Freeport-McMoRan							11
Glencore							11
Vedanta Resources							11

Source: CDP, company data

Metric 4) Performance against target

Company	Absolute target % beat/(miss) company's target	Intensity target % beat/(miss) company target	Type of target	% beat/(miss) company's target	Performance against target rank
Vale	10%		Absolute	10%	1
BHP Billiton	8%		Absolute	8%	2
Sumitomo Metal Mining		4%	Intensity	4%	3
Rio Tinto		4%	Intensity	4%	4
Teck	-4%		Absolute	-4%	5
Anglo American	-5%		Absolute	-5%	6
Antofagasta					11
First Quantum Minerals					11
Freeport-McMoRan					11
Glencore					11
Vedanta Resources					11

Source: CDP, company data

Data transparency

- Anglo American and BHP Billiton are ranked first and second. They are the only two companies receiving a reasonable level of assurance for 100% of their Scope 1+2 emissions.
- First Quantum Minerals, is rock bottom. It is the only company that does not receive third party verification on its Scope 1 and Scope 2 emissions data.

Metric 5) Data transparency summary

Company	Rank	Total score (i)	Boundaries (ii)	Scope 1 verification	Scope 1 assurance type	Proportion of scope 1 verified	Uncertainty scope 1 verified	Scope 2 verification	Scope 2 assurance type	Proportion of scope 2 verified	Uncertainty scope 2 verified
Anglo American	1	17.37	OC	Complete	Reasonable	100%	5%	Complete	Reasonable	100%	2%
BHP Billiton	2	17.10	OC	Complete	Reasonable	100%	5%	Complete	Reasonable	100%	5%
Antofagasta	3	16.20	OC	Complete	Reasonable	86%	2%	Complete	Reasonable	98%	2%
Freeport-McMoRan	4	15.84	OC	Complete	Reasonable	90%	2%	Complete	Reasonable	90%	2%
Vedanta Resources	5	14.80	OC	Complete	Moderate	100%	10%	Complete	Moderate	100%	5%
Rio Tinto	6	13.72	OC	Complete	Limited	100%	2%	Complete	Limited	100%	2%
Glencore	7	13.30	OC	Complete	Limited	100%	5%	Complete	Limited	100%	5%
Vale	8	12.95	OC	Complete	Limited	100%	10%	Complete	Limited	100%	5%
Teck	9	12.46	OC	Complete	Limited	100%	20%	Complete	Limited	100%	2%
Sumitomo Metal Mining	10	7.72	FC	Underway	Limited	100%	2%	Underway	Limited	100%	2%
First Quantum Minerals	11	0.00	FC	None			2%	None			2%

(i) Refer to methodology section for steps used to calculate the total score.

(ii) OC = Operational control; FC = Financial control.

Source: CDP

Methodology and limitations

Greenhouse gas emissions analysis across a collection of diversified miners is complex and not without significant pitfalls. These include data availability and consistency in company reporting methodology over time, significant M&A activity as well as unconventional business models (such as the trading activities of Glencore).

Furthermore, the business activities and conditions of each company varies according to their commodity mix and geographical spread. Such differences emphasize the focus on trends in intensity of operations within the companies themselves.

Global commodity prices are notoriously volatile and sensitive to both global GDP movements and macro supply-demand factors. We therefore use both revenue and value-added (revenue minus cost of goods sold) as normalization factors in the absence of a consistent volume of production-linked measurement method with which to compare companies.

The overall energy efficiency rank and grades are determined as follows:

- We combine the weighted ranks of the three areas using the following weightings: emissions performance 30%, future targets 50%, data transparency 20%. This determines the overall weighted rank for energy efficiency.

- The energy efficiency grade is awarded according to the overall weighted rank.

We apply the following methodologies to determine the weighted rank for each area:

Emissions performance

We combine the weighted ranks of the two metrics in the area using the following weightings: metric 1) 80%, and metric 2) 20%.

Data collation:

- We apply the following steps to ensure the data is as consistent and credible as possible for our intensity calculations:
 - Collate emissions, revenue and value-added data for each year.
 - Replace this with restated emissions data, where available (for instance, after an acquisition or divestment), subject to equivalent restated revenue and value-added data being available.

- In the absence of restated normalization factors (i.e. revenue and value-added) over the entire period of restatement, we are unable to calculate the restated emissions intensity and thus reflect the most accurate position of the companies' emissions reductions (as per the GHG Protocol). That said, as we are calculating emissions intensity (and not absolute emissions), this limitation is mitigated somewhat as long as any acquisitions or divestments are not significantly different in emissions intensity.

- We urge companies to provide better transparency on emissions data as follows: firstly, make data for any restated emissions publicly available (we require the emissions data to go at least as far back as the base year of the company target); secondly, ensure that relevant normalization factors including (at least) revenue, value-added and production are also available for all the restated years.

Metric 1) Reduction in Scope 1+2 emissions intensity:

- We collate emissions and financial data for the seven year period of 2008-2014 from CDP's database and company sources.
- We calculate the emissions intensity over the period for each company, using two different normalization factors; revenue and value-added.

We apply the following steps for each measure of intensity:

- We use our proprietary function to assess the companies' emissions performance for each of the following periods: 2008-2014, 2009-2014 and 2010-2014.
- Our function takes account of the full emissions profile of each of the three periods, i.e. seven years of data for 2008-2014, six years of data for 2009-2014, and five years for the remaining period.
- The function measures the total emissions (or intensity) over a period and calculates the implied constant growth rate per annum required to create the same aggregate emissions (over the same period) starting from the base year for the period.
- The function is therefore independent of end date for the period (i.e. 2014) but dependent on start date. This is why we apply the function to three periods with differing start dates.
- We calculate the implied constant growth rate for each of the three periods.

- ▼ We take the median of the results in order to exclude any anomalies (e.g. a material acquisition with a significantly different emissions intensity).
- ▼ We rank the companies based on the median implied growth rate.
- ▼ We apply the above methodology for each of the two normalization factors, revenue and value-added, and combine the ranks in a ratio of 50:50. This determines the weighted rank for this metric.

Metric 2) Scope 1+2 emissions intensity:

- ▼ We collate emissions and financial data for the three year period 2012-2014 from CDP's database and company sources.
- ▼ We calculate the emissions intensity over the period for each company, using two different normalization factors; revenue and value-added.
- ▼ We converted revenue in local currency to US\$ using the average daily foreign exchange rate during 2010. We peg the US\$ exchange rate at this level for all years to avoid distortion in the intensity metric due to foreign exchange movements.
- ▼ For each normalization factor, we calculate the median emissions intensity over the three year period of 2012-2014.
- ▼ We combine the ranks for each normalization factor in a ratio of 50:50, which determines the weighted rank for this metric.

Future targets

We combine the weighted ranks of the two metrics in the area using the following weightings: metric 3) 50%, and metric 4) 50%.

Metric 3) Quality of target:

- ▼ We assess whether the companies' targets are stronger or weaker than science-based targets.
- ▼ We adopt the methodology of the Sectoral Decarbonization Approach (SDA), published by the Science-Based Targets collaboration⁴.
- ▼ We assess both absolute and intensity targets belonging to the company out to 2050, with an associated science-based target based on emissions pathways using IEA data.

- ▼ We start by modelling future company emissions from a 2010 base.
- ▼ We apply the relevant SDA industry pathway according to the source of emissions which varies across companies. We recognize, in particular, that all mining companies generate a portion of their power internally.
- ▼ As such, we apply the SDA power generators emissions pathway to model both company Scope 2 emissions and the proportion of Scope 1 emissions that relates to in-house power generation. We use CDP and company data to estimate this proportion on a company-by-company basis.
- ▼ We take this approach as we recognize that under SDA emissions pathways, power generation has a particularly aggressive decarbonization profile.
- ▼ For the remainder of Scope 1 emissions, we apply two SDA emissions pathways (aluminum industry and 'other industries'⁵) according to each company's activities.
- ▼ Specifically, we apply the SDA aluminum industry emissions pathway for the proportion of company emissions related to aluminum production and, as a proxy, for company emissions related to copper production. We take this approach due to the similar emissions intensities of both copper and aluminum production.
- ▼ We apply the SDA 'other industries' emissions pathway for the remainder of Scope 1 emissions.
- ▼ We combine the relevant SDA emissions pathways based on the company's activities to get a total Scope 1+2 emissions pathways.

- ▼ For Vale (which only sets a Scope 1 emissions target), we apply the SDA emissions pathway only to power generators for the proportion of Scope 1 emissions that relates to in-house power generation.
- ▼ A limitation to this approach is that perhaps mining companies should not be expected to decarbonize their internal power generation portfolio as quickly as utilities.
- ▼ We apply slightly different approaches for absolute targets as opposed to intensity targets (see next page).

5. Science Based Targets is a joint collaboration between CDP, the United Nations Global Compact, World Resources Institute and WWF. This initiative adopts a scientific approach to help companies establish meaningful and ambitious carbon emissions reduction targets that are in line with the emissions scenarios suggested by the Intergovernmental Panel on Climate Change (IPCC)'s latest report in order to decarbonize the economy. The methodology was published in May 2015 in the report: "Sectoral Decarbonization Approach".

6. 'Other industries' aggregates various sectors including, but not limited to, non-ferrous metals, transport equipment, machinery and, mining and quarrying

7. 2010 is used due to constraints in the IEA's forecasts.

8. We acknowledge that there is not always such a CAGR relationship over the life of the target.

For absolute targets:

- ▼ We compare the Scope 1+2 emissions pathways, which are from a 2010 base, with the companies' targets⁷.
- ▼ In order to compare like with like, we rebase the company targets to 2010 and we assume a constant CAGR over the life of the companies' targets.
- ▼ We calculate the percentage by which the company target beats or misses the level of emissions required by the pathway in 2015. We chose 2015 as two out of the four companies' targets expire in this year.

For intensity targets:

- ▼ We normalize the Scope 1+2 emissions pathway by value-added in order to calculate the Scope 1+2 emissions intensity pathway. We forecast value-added from a 2010 base using the IEA's activity forecast for 'Other industries' (basically, long-term global GDP).
- ▼ We compare the Scope 1+2 emissions intensity pathways, which are from a 2010 base, with the companies' intensity targets.
- ▼ In order to compare like with like, we rebase the company targets to 2010 and we assume a constant CAGR over the life of the companies' targets.
- ▼ We calculate the percentage by which the company target beats or misses the level of emissions required by the emissions pathway in 2015. We chose 2015 for consistency reasons with the absolute target methodology (one of the two companies' targets analyzed expires in this year).

Adjusting targets for scope of emissions covered:

- ▼ In assessing the quality of each target, we adjust for the scope of emissions that the target covers, such that a target that covers 100% of Scope 1+2 emissions is considered better than one that has a reduced scope. As such, we apply the following adjustment:
 - ▼ For targets that are stronger than science-based targets: multiply (% beat) by (% scope)
 - ▼ For targets that are weaker than science-based targets: multiply (% miss) by (2 - % scope)
- ▼ These formulae have the effect of reducing a % beat by up to 100% or increasing a % miss by up to 100%.
- ▼ We rank the adjusted % beat or miss as the results for metric 3).

Companies with neither an absolute nor intensity target:

- ▼ Companies without any sort of target are jointly ranked 11th.

Metric 4) Performance against target:

- ▼ In assessing companies' targets, we reward those companies who have created a carbon surplus relative to their target pathway (over the entire forecast period), rather than simply comparing their latest reported emissions against the target.
- ▼ Moreover, if a company is consistently off track to meet its target over the entire target period, its carbon exposure will be higher than a company that consistently outperforms the level required to meet its target.
- ▼ We assess all relevant and meaningful absolute and intensity targets (i.e. those with sufficient scope and with a significant degree of ambition).
- ▼ For both absolute and intensity targets we apply the following steps:
 - ▼ We assume that the level required to meet the target follows a constant annual growth rate (CAGR) from the base year emissions over the period to the target⁸.
 - ▼ The CAGR is derived from the base year, target year, base year emissions and % reduction targeted by the company.
 - ▼ We compare the actual emissions of each company with the level required to meet the target for each year of the forecast period (the annual hurdle).
 - ▼ We apply the following formula for each year assessed: annual hurdle less actual emissions = beat (positive value) or miss (negative value) the annual hurdle (for the year).
 - ▼ We sum the annual beats or misses from the base year to 2014 and divide this aggregate value by the aggregate value of the annual hurdle over the same period.
 - ▼ This gives the % beat or miss used to determine our metric 4) rankings.
- ▼ We adjust the formula for Vale to account for the fact that its emissions in the target year are higher than those in the base year (i.e. the target is a reduction on business-as-usual emissions which are growing). We calculate its carbon surplus by taking the difference between its actual emissions and base year level of emissions.

- ▼ The % beat or miss is essentially a measure of the carbon surplus (credit) or deficit created by the company relative to its target. We believe that analyzing targets in terms of a carbon surplus or deficit is particularly important in relation to science-based targets, which are based on a global 'carbon budget'.

Note:

- For absolute emissions targets, we use an adapted data set relative to that used in metrics 1) and 2) (which analyzed intensity). Wherever a company restated its emissions, we used restated numbers as far as we could go back towards the base year for the target.
- Some companies were better than others for providing transparent restated emissions data. Four of the six companies with emissions targets restated their emissions on an annual basis back to the base year of the target. BHP Billiton and Sumitomo Metal Mining did not restate their emissions on an annual basis back to the target base year.
- For emissions intensity targets, we use the normalization factor chosen by the company.
- In order to compare like with like, we rebase the company targets to 2010; and we assume a constant CAGR over the life of the companies' targets.

Data transparency

We adopt a scorecard approach to analyze companies in terms of their emissions data transparency on a scale of 0-20 (10 for transparency on Scope 1, and 10 for transparency on Scope 2). We rank companies according to their score.

Metric 5) Emissions data transparency:

- We use the following approach to score companies according to their Scope 1 data transparency. The procedure is exactly the same for Scope 2.
 - The start point in the analysis is the proportion of emissions verified by a third party. We score this out of 10. If 100% are verified, this achieves 10 points. Then, points are awarded according to the proportion verified, i.e. a company with 86% of emissions verification is awarded 8.6 points.
 - We then adjust the score (max 10) according to the uncertainty of the scope verified. If the uncertainty is 5%, we deduct 0.5 points, if the uncertainty is 2%, we deduct 0.2 points, and so on.
 - We multiply the remaining score according to the level of assurance as follows: high assurance = 100%; reasonable = 90%; moderate = 80%; limited = 70%; don't know yet = 50%; none = 0%.
 - We then multiply the remaining score (still max 10) according to the status of the verification: complete = 100%; underway = 75%; none = 0%.

- We apply the above steps to transparency on both Scope 1 emissions and Scope 2 emissions. We then combine the score (max 10 each).
- Finally, we multiply the combined score (out of 20) according to the boundary of the emissions reported as follows: operational control = 100%; financial control = 75%.
- Operational control is the most comprehensive boundary. It reflects accounting consolidation, i.e. 100% of emissions for all subsidiaries controlled by the group regardless of ownership share and % owned (or controlled) of JVs and associated companies.
- Financial control requires consolidation of 100% of emissions for subsidiaries controlled by the group (regardless of ownership share) but does not require emissions from JVs or associated companies to be included.

Other limitations

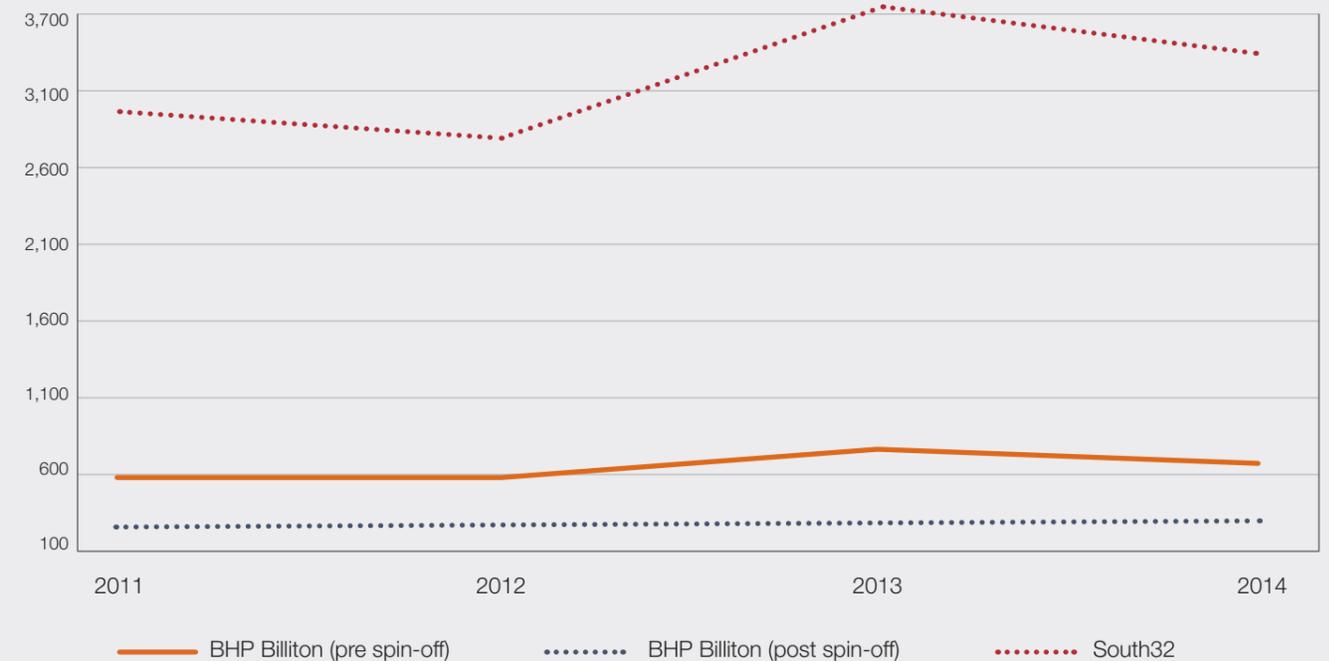
- We would like to include a metric related to renewables in this chapter, however are unable to comprehensively assess the companies on renewables due to data limitations. Although we have collated data on company ownership of and plans to develop captive renewable plants, it is unfair to assess company performance on number of plants or capacity of plants alone; a comprehensive analysis requires an assessment of the economics of the plants compared to other options. This is complex and subjective, and is something we would like to consider further in future, data permitting.
- The use of a monetary unit to normalize emissions is an imperfect indicator of energy efficiency. The use of aggregated production data (such as copper equivalent output⁹) would enhance such analysis. However, this is complex for diversified miners given the array of commodities produced, their inconsistent ore qualities and volatile relative prices. As a result a production-linked normalization factor was not used in our analysis.
- The use of the IEA 'other industries' pathway does not fully reflect mining activities. In future work we seek to develop a more precise pathway consistent with the mining industry's operations.
- Whilst the industry is characterized by significant M&A activity, companies tend to only restate their greenhouse gas emissions for a few years prior to the new acquisition or divestment. This makes comparisons across companies in certain years challenging.

9. Some companies report the use of a copper-equivalent production unit to aggregate production levels across different assets. However, methodological approaches and assumptions are not disclosed and differ across companies.

BHP Billiton: South32 demerger

In May 2015, BHP Billiton spun-off a collection of emissions intensive business assets to create a new mining entity - South32. The transaction means that BHP Billiton's emissions levels going forward are expected to significantly reduce (around 60% of Scope 1+2 emissions) relative to the loss in revenue (12% decrease in revenue), reducing its emissions intensity. In addition, BHP Billiton has scaled down its exposure to thermal coal by circa 47%. This report considers BHP Billiton data compiled from its 2015 CDP climate change questionnaire response which does not account for the spin-off.

BHP Billiton emissions intensity⁽ⁱ⁾ (per US\$m revenue)



(i) Dotted lines are estimated using historical revenue and emissions splits of the business areas which now form South32.

Source: CDP

Water resilience

- ▼ Vale is ranked first in the water resilience area, followed by BHP Billiton and Teck.
- ▼ Vedanta Resources has the highest water stress exposure. Antofagasta faces water issues in its Chilean activities. These companies rank lowest.
- ▼ Five companies have more than 50% of their mining facilities exposed to significant water stress.

Overview

Against a backdrop of population growth and increasing climatic impacts, a stable supply of good quality freshwater - an assumption on which the mining industry currently operates - can no longer be guaranteed. The result is greater competition for a finite resource. Accordingly, there is increasing pressure on companies to consider the implications of worsening water security at a strategic level, with the World Economic Forum having recently ranked water as the most serious threat to business and society¹⁰.

Water is used in the mining industry across a broad range of activities and is a fundamental resource to the continuity of operations. The industry ranks amongst the most water intensive and almost 50% of facilities for the companies in our study are located in areas with medium or higher water stress (as defined by WRI Aqueduct)¹¹. Water regulation and prices are tightening in some of these areas; as recognised by the companies themselves.

Water spending in the mining industry almost tripled over 2009-2013, outstripping growth in mining output for major commodities over the same period. Examples of financial implications of water stress are as follows:

- ▼ Forced production interruption: Anglo American lost 30,000 tonnes of copper production at their Los Bronces mine in Chile due to drought, equating to 4% of the company-wide 2014 copper output, and circa US\$170m in lost revenue.
- ▼ Capital expenditure on new water supply infrastructure: BHP Billiton and Rio Tinto are jointly investing a total of US\$3bn in desalination infrastructure to supply their Escondida copper mine in Chile, representing around 13% of their respective total 2014 capital expenditure.

CDP's water programme further highlights that water management costs are likely to keep rising¹².

In this chapter, we assess companies targeted by investors via CDP's 2015 water questionnaire. Vedanta Resources was not sent a questionnaire, thus we only assess it on those metrics (or components of metrics) which are determined using publicly-available sources. We adopt three key metrics:

▼ **Metric 1) Water stress exposure:** we assess this on a mine-by-mine basis using the Aqueduct global water risk mapping tool developed by the World Resources Institute (WRI) which evaluates localised water stress using industry-specific indicators (water quantity, water quality and regulatory & reputational risks). We cross-reference this with CDP questionnaire responses to assess how well this is recognised by responding companies. We also examine company water data verification at facility-level.

▼ **Metric 2) Water governance and strategy:** identifies companies that have established comprehensive water risk assessment procedures, that have a track record of water regulatory compliance and that recognise opportunities. We adopt a scorecard approach to evaluate companies' responses to CDP's 2015 water questionnaire.

▼ **Metric 3) Water performance:** examines companies' water withdrawal intensity using value-added as a normalisation factor. In particular, companies are evaluated based on both their water withdrawal intensity both in 2014 and how this has changed between 2010 and 2014.

Highlights

- ▼ Vale is ranked first. Its mining facilities are least exposed to water stressed areas and it has the most transparent water data.
- ▼ Vedanta Resources is ranked bottom with the highest proportion of mining facilities in high water stress areas (18%). The company was only assessed on publicly-available data, thus we couldn't evaluate the level of its awareness of such risks.
- ▼ Antofagasta is ranked second from bottom. Three-quarters of its mines are located in 'medium to high risk' areas and to compensate, over half of its water withdrawals are from the sea. However, this results in increased infrastructure and energy costs.
- ▼ Anglo American is the only company that reports an absolute water consumption reduction target (relative to business-as-usual levels). In particular, the company requires all individual, active facilities to forecast their water demand.
- ▼ Six companies have been subject to water penalties and fines, including US\$10m for Anglo American in Chile and US\$8m for Teck in Alaska.
- ▼ Rio Tinto and BHP Billiton have the lowest water withdrawal intensity levels and growth amongst the companies. Improving water management practices is an increasingly important issue for miners in Australia.

Water resilience summary

Company	Water stress exposure	Water governance and strategy	Water performance	Overall weighted rank	Water resilience rank	Water resilience grade
Vale	1	5	6	2.92	1	A
BHP Billiton	4	1	2	3.98	2	B
Teck	2	10	10	4.65	3	B
Anglo American	5	3	8	5.11	4	C
Rio Tinto	6	6	1	5.23	5	C
Sumitomo Metal Mining	3	9	3	5.53	6	C
First Quantum Minerals	8	2	9	5.99	7	D
Glencore	7	7	11	6.46	8	D
Freeport-McMoRan	9	4	4	6.56	9	D
Antofagasta	10	8	7	7.38	10	E
Vedanta Resources	11	n/a	4	9.70	11	E

Weighting **60%** **30%** **10%**

Adjusted weightings for Vedanta Resources **78%** **n/a** **22%**

n/a : Vedanta Resources was not target by CDP's 2015 water questionnaire

Note: In calculating the weighted rank in this table, we use the weighted ranks for each area (where relevant). We display non-weighted ranks in this summary for simplicity only.

Source: CDP, company data

10. World Economic Forum. 2015. Global Risks 2015 – 10th Edition.

11. For more information about the Aqueduct framework: <http://www.wri.org/our-work/project/aqueduct>.

12. Cate Lamb. Forthcoming. Drying and drowning assets – how worsening water security is stranding assets.

Metric 1) Water stress exposure:

- Freeport-McMoRan has 71% of its facilities in 'medium to high risk' stress areas, however it is not fully aware of these risks.
- Anglo American and Teck are the most aware of their water stress exposure according to data reported to CDP. Anglo American has 65% of its facilities in 'medium to high risk' or 'high risk' stress areas, and it recognizes risks in its CDP response.
- Sumitomo Metal Mining has the lowest water stress risk awareness, although its water stress risk is one of the lowest; thus it ranks third place overall for water stress exposure.
- Only six companies report that their water data is verified by a third party at the facility-level.
- Five companies report that they evaluate water risks over a 10 year period, and how these risks could impact the organization's growth strategy.
- Rio Tinto is the only company that reports that water does not present a strategic, operational or market opportunities that substantively benefit the organization.
- Vale, Anglo American, Glencore and Freeport-McMoRan rank top of the companies that recognize linkages and trade-offs between water and other areas (such as energy).
- Antofagasta is ranked bottom in water governance and strategy, it is the only company which does not systematically assess water risk at facility-level.

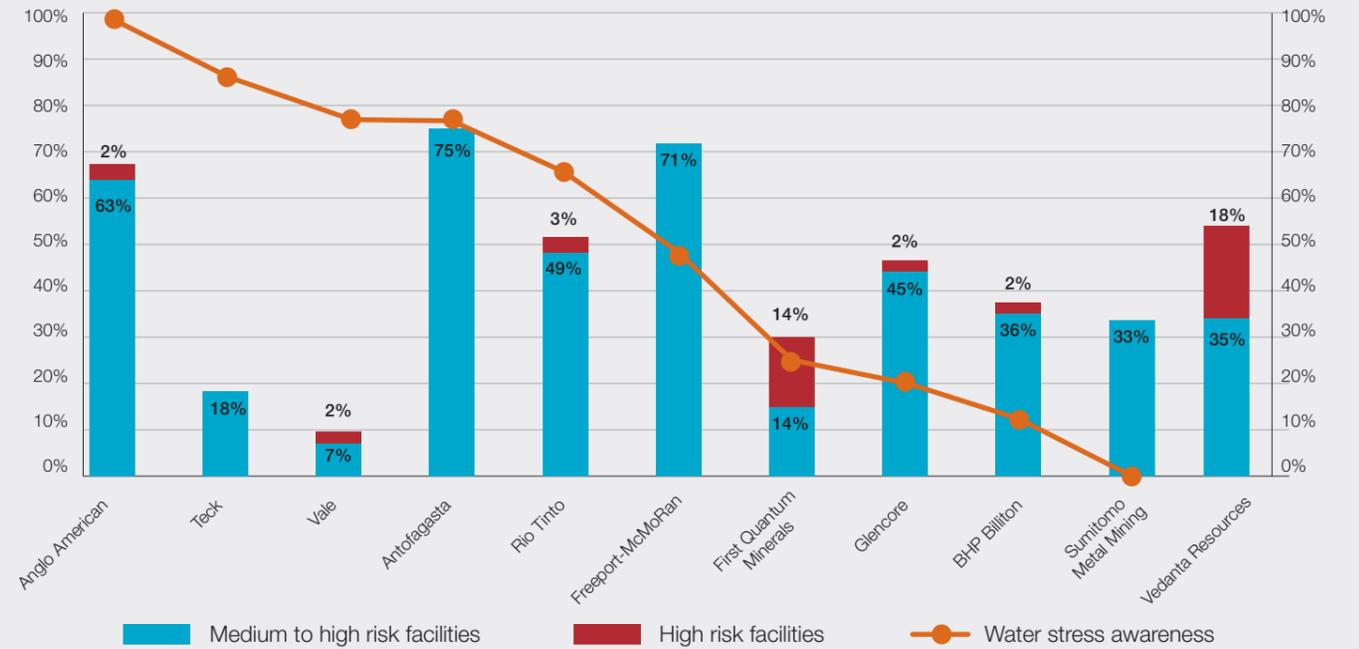
Metric 2) Water governance and strategy:

- BHP Billiton ranks first in this metric. It is comprehensive in its stakeholder engagement and evaluates water risks on a 10 year timeframe. It also recognizes water opportunities which represent cost savings and has the joint strongest water policy framework.

Metric 3) Water performance:

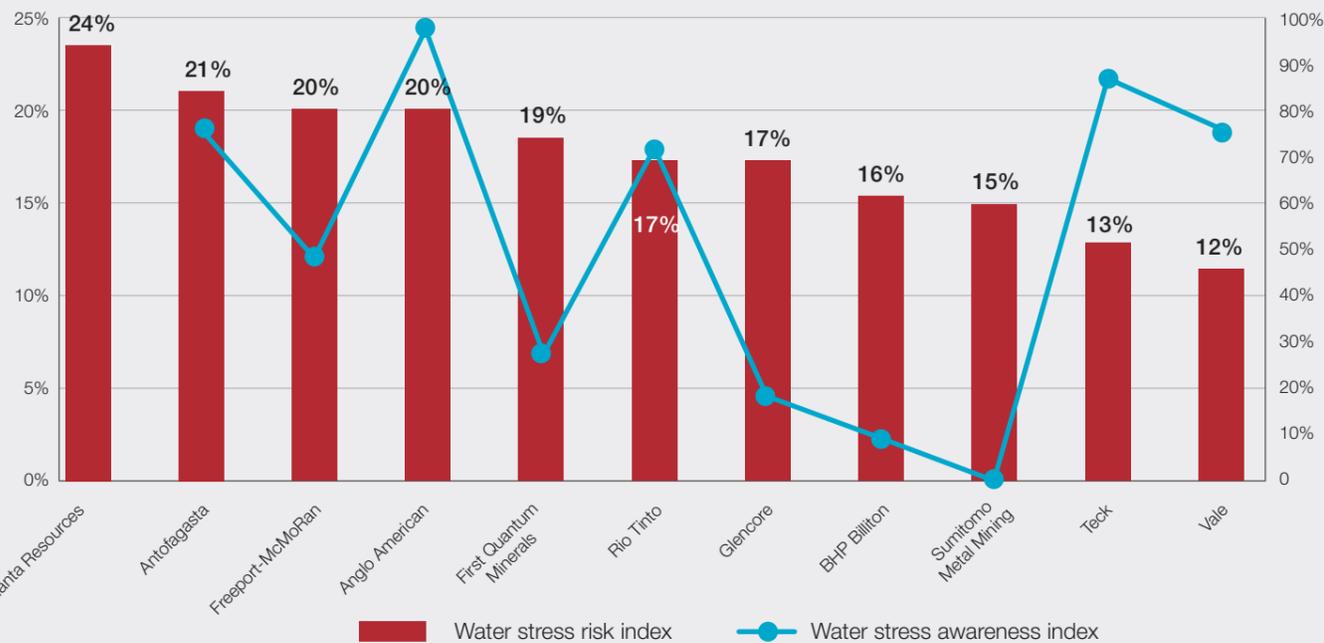
- Glencore only reports water withdrawal data for facilities it considers at risk, making it impossible to assess water performance at a company-level.
- The two Canadian companies, First Quantum Minerals and Teck, are not ranked on intensity changes over time due to data availability. In the case of Teck this is due to a change in its reporting framework.

Components of metric 1) water stress awareness index (LHS) and water stress risk (RHS)



Source: CDP, company data, World Resources Institute

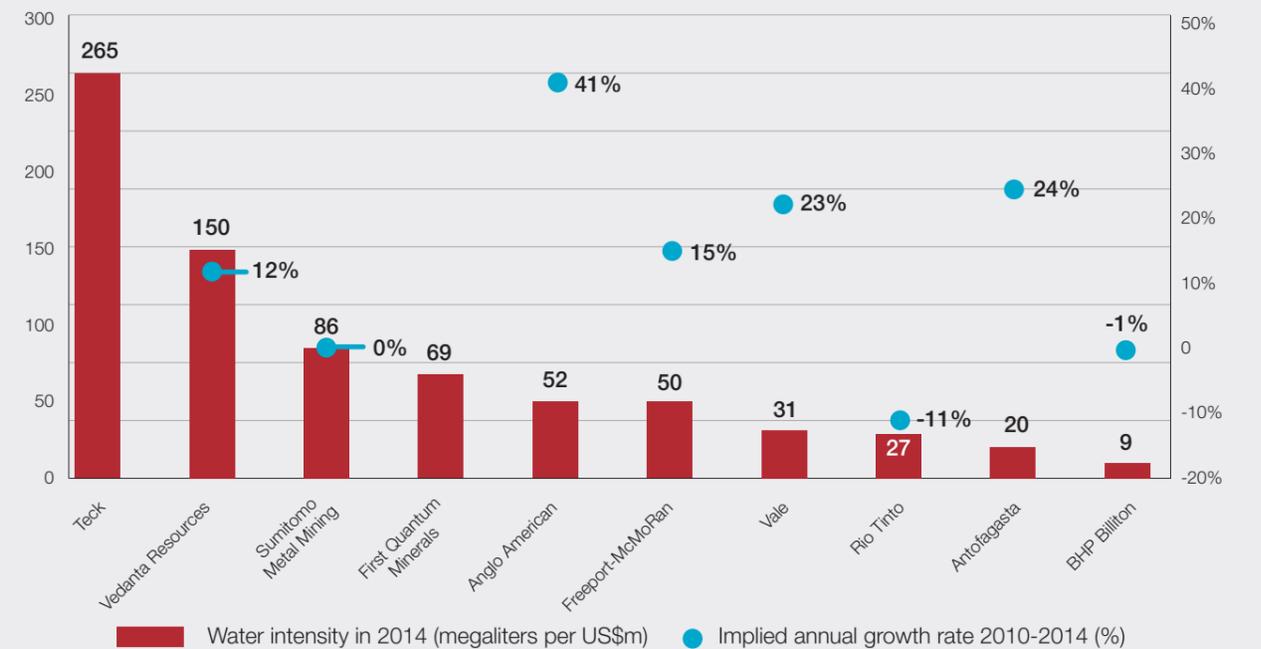
Components of metric 1) water stress risk index (LHS) and water stress awareness index (RHS)



Note: the water stress risk index ranges from no facilities in water stress risk areas (0%), to all facilities in high water stress risk areas (100%).

Source: CDP, company data, World Resources Institute

Metric 3) Water withdrawal intensity in 2014 (LHS) and % change 2010-2014 (RHS)



Note: We were unable to calculate implied annual growth rates for Teck, First Quantum Minerals and Glencore. In addition, there was insufficient data to calculate Glencore's water intensity in 2014.

Source: CDP, company data

Methodology and limitations

The overall water resilience rank and grades are determined as follows:

- ▼ We combine the weighted ranks of the three metrics using the following weightings: metric 1) 60%, metric 2) 30%, and metric 3) 10%. This determines the overall weighted rank for water resilience.
- ▼ In the case of Vedanta Resources, we use the following weightings: metric 1) 78%, metric 2) 0%, and metric 3) 22%. This reflects the components of the analysis for which we are able to assess the company using publicly-available data.
- ▼ The water resilience grade is awarded according to the overall weighted rank.

We apply the following methodologies to determine the weighted rank for each metric:

Metric 1) Water stress exposure:

We combine the weighted ranks of the three components using the following weightings: water stress risk 60%, water stress awareness 30%, and data verification at facility-level 10%.

We apply the following steps:

- ▼ **Water stress risk**
 - ▼ We collate information on geographical coordinates, type of facility and equity shareholding on over 480 facilities, including mining, processing and oil & gas production plants, across 46 countries.
- ▼ We filter the data as follows:
 - ▼ Exclude processing facilities as these have lower water usage.
 - ▼ Exclude facilities in which companies hold a less than 30% stake due to the perceived lack of operational influence.
 - ▼ Exclude facilities that are inactive.
- ▼ We apply WRI Aqueduct's risk classifications to the remaining facilities (mining and oil & gas production plants). WRI Aqueduct classifies the water stress risk in geographical locations using five categories (low, low-medium, medium-high, high and extremely high), which are based on three risk areas (physical water quantity, physical water quality and regulatory and reputational risks). We note that the relative importance of the three risk areas are different for mining as opposed to oil & gas.

- ▼ We calculate the proportion of each company's facilities in each WRI risk category and scale these according to the following weights 0:10:25:65 (low: low-medium: medium-high: high). We note that no company facilities were classified as extremely high risk). This approach assigns greater importance to high risk facilities.
- ▼ For each company, we sum the weighted values across each WRI risk category, and divide by the total facilities to produce a water stress risk index from 0 to 1, ranging from no facilities in water stress risk areas to 100% of facilities in high water stress risk areas. Therefore, companies with a lower index value are favored.

Water stress awareness

- ▼ We map the proportion of companies' facilities in each WRI risk category with information reported as part of the 2015 CDP water questionnaire concerning facilities they consider to be exposed to water risks (questions W3.2a and W5.1).
- ▼ We evaluate the extent to which companies recognize water risks at the individual facilities identified in each WRI risk category and scale these according to the previous weightings of 0:10:25:65 to produce a water stress awareness index from 0 to 1, ranging from no water stress exposure awareness to full awareness. Therefore, companies with a higher index value are favored.

Data verification at facility-level

- ▼ We compile companies' responses to CDP's 2015 water questionnaire (W5.1 and W5.4) and examine responses on verification of water data at a facility-level across a number of categories including water withdrawals and discharges. We assess companies based on the proportion of facilities which verify data at a facility-level across the categories.
- ▼ Vedanta Resources is not assessed due to the lack of comparable data from public sources and in the absence of a CDP water questionnaire response.

Metric 2) Water governance and strategy:

We adopt a scorecard approach to evaluate companies based on their frameworks to address water concerns according to responses to CDP's 2015 water questionnaire (Vedanta Resources is not assessed in this metric).

- ▼ We combine the weighted ranks of the four components using the following weightings: stakeholder engagement and compliance 20%, water risks 35%, water opportunities 35%, and water linkages and trade-offs 10%.

Stakeholder engagement and compliance

- ▼ This area rewards companies that engage with local communities, river basin management authorities and other water users at a local-level. We also score companies based on their track record in complying with local regulations, including whether they have been subject to any regulatory action.
- ▼ Data is sourced from CDP's 2015 water questionnaire (W2.7 and W7.1).

Water risks

- ▼ We score companies based on the comprehensiveness of their water risk assessment procedures and recognition of regulatory and tariff changes at a local-level which may pose material future risks.
- ▼ Data is sourced from CDP's 2015 water questionnaire (W2.2-2.4, W2.6 and W3.2c).

Water opportunities

- ▼ We reward forward-looking companies that have water targets and strategies as well as those that are exploring technological opportunities to address water risks.
- ▼ Data is sourced from CDP's 2015 water questionnaire (W4.1a, W6.2a, W6.3a, W8.1 and W8.1a).

Water linkages and trade-offs

- ▼ We assesses companies based on their consideration of linkages and trade-offs between water and other areas of environmental and economic concern (e.g. water-energy relationship).
- ▼ Data is sourced from CDP's 2015 water questionnaire (W9.1 and W9.1a).

Metric 3) Water performance:

We combine the weighted ranks of the two components using the following weightings: changes in water withdrawal intensity 2010-2014 80%, and water withdrawal intensity in 2014 20%.

We apply the following steps:

- ▼ We collect water withdrawal¹³ data for each company from 2010-2014 and normalize by the accompanying value-added (gross profit) figure for each year.
- ▼ Data is sourced from CDP's 2015 water questionnaire (W1.2a¹⁴) and from companies annual and sustainability reports.
- ▼ Metric 3) accounts for just 10% of water resilience as we recognise the limitations in judging a company on an aggregate basis.

Changes in water withdrawal intensity 2010-2014

- ▼ We calculate the implied growth rate in water withdrawal intensity between 2010 and 2014 using the proprietary function described in the energy efficiency key area.
- ▼ We rank companies accordingly, with those displaying a lower growth in water intensity per unit value-added ranking higher.

Water withdrawal intensity in 2014

- ▼ To compliment the above trend in intensity, we rank companies based on their water withdrawal intensity level in 2014, with lower water intensity values favored.

Other limitations

- ▼ We acknowledge that the lack of granular data on water quality, recycling and withdrawal limits our ability to fully assess which companies are improving their water impact¹⁵, and identify those that are at risk of having their assets stranded.
- ▼ We note that assessing the water stress exposure of different mining operations using a single indicator (i.e. WRI), may have limitations. For example, water risk can vary significantly across both the type of commodity and the nature of the process¹⁶.
- ▼ A wider limitation is that water accounting practices differ across companies and water data is not consistently reported or verified making it challenging to benchmark and compare water usage.

13. We note that a few companies choose different reporting boundaries to report water data, in comparison to those used to report greenhouse gas emissions data. This is the case for Glencore and Freeport-McMoRan.31. This does not apply for Vedanta Resources.

14. This does not apply for Vedanta Resources.

15. For example, companies that source their water needs from wastewater from nearby industries or from seawater are more resilient than those with similar water needs but take from non-renewable water sources.

16. For example, pyro-metallurgy and hydro-metallurgy are the two processing routes used for copper extraction. The former is, on average, six times more water intensive than the latter.

Coal exposure

- Glencore and Anglo American rank lowest, both have significant thermal coal exposure.
- Vale ranks highest amongst companies with coal exposure. Only 2% of its revenue is from coal production.
- Five companies have no coal exposure.

Overview

Coal is responsible for 44% of total global CO₂ emissions¹⁷ and faces increasing competition from cleaner energy alternatives as well as regulatory action specifically targeting its use in power generation in the USA and China (the world's two largest coal consumers), as well as the EU, due to emissions reduction targets and pollution concerns.

Six of the companies in our study have coal exposure, ranging from 2% to 44% of revenue (average is 20%), and combined they produced 433 million tons of coal in 2014. This accounts for 27% and 40% of the global thermal and coking coal export markets respectively. Declining demand has impacted the economics of coal production with the average EBITDA margins for the six companies falling from 37% to 20% since 2010.

In this chapter, we differentiate between the six companies with coal exposure using four key metrics:

▼ **Metric 1) Share of revenue from coal:** this attracts scrutiny from financial institutions that have tightened lending policies to companies with coal activities on the back of greater perceived risk.

▼ **Metric 2) Percent thermal coal production:** this rewards companies less exposed to riskier thermal (energy) coal, in favor of coking coal (see box below).

▼ **Metric 3) Emissions intensity of coal activities:** we assess total emissions (Scope 1+2+3)¹⁸ from coal production normalized by coal revenue. We favor companies that have lower total emissions per unit revenue from coal.

▼ **Metric 4) Life of reserves:** this estimates the production life of companies' coal reserves (measured by total emissions). Longer-life reserves are at greater risk of stranding within a global carbon budget.

Coking coal and thermal coal

The two broad types of coal have different demand dynamics and environment regulatory pressures. Thermal (energy) coal is used for electricity generation whilst coking (metallurgical) coal has a distinct industrial purpose, providing the necessary energy and chemical requirements for the blast furnace method of steel and iron production.

Low-carbon substitutes for thermal coal's use in electricity generation are plentiful, including wind and solar which are cost competitive on a levelized cost basis. Furthermore, regulatory measures on coal-fired power generation are tightening, including World Bank financing restrictions and the removal of subsidies.

Coking coal use is dependent on the balance between continued industrial steel demand and greater material recycling, as well as R&D developments on alternative feedstock fuels such as natural gas or renewable sources. These may influence demand for coking coal over the medium-term.

Coal exposure summary

Company	Share of revenue from coal	Percent thermal coal production	Emissions intensity of coal activities	Life of reserves	Overall weighted rank	Coal exposure rank	Coal exposure grade
Antofagasta	1	1	1	1	1	1	A
First Quantum Minerals	1	1	1	1	1	1	A
Freeport-McMoRan	1	1	1	1	1	1	A
Sumitomo Metal Mining	1	1	1	1	1	1	A
Vedanta Resources	1	1	1	1	1	1	A
Vale	6	7	8	11	7.2	6	C
Rio Tinto	7	8	7	8	7.4	7	C
Teck	11	6	6	7	8.1	8	D
BHP Billiton	8	9	9	9	8.6	9	D
Anglo American	9	10	11	10	9.8	10	E
Glencore	10	11	10	6	9.9	11	E

Weighting **40%** **30%** **20%** **10%**

Note: In calculating the weighted rank in this table, we use the weighted ranks for each area (where relevant). We display non-weighted ranks in this summary for simplicity only.

Source: CDP, company data

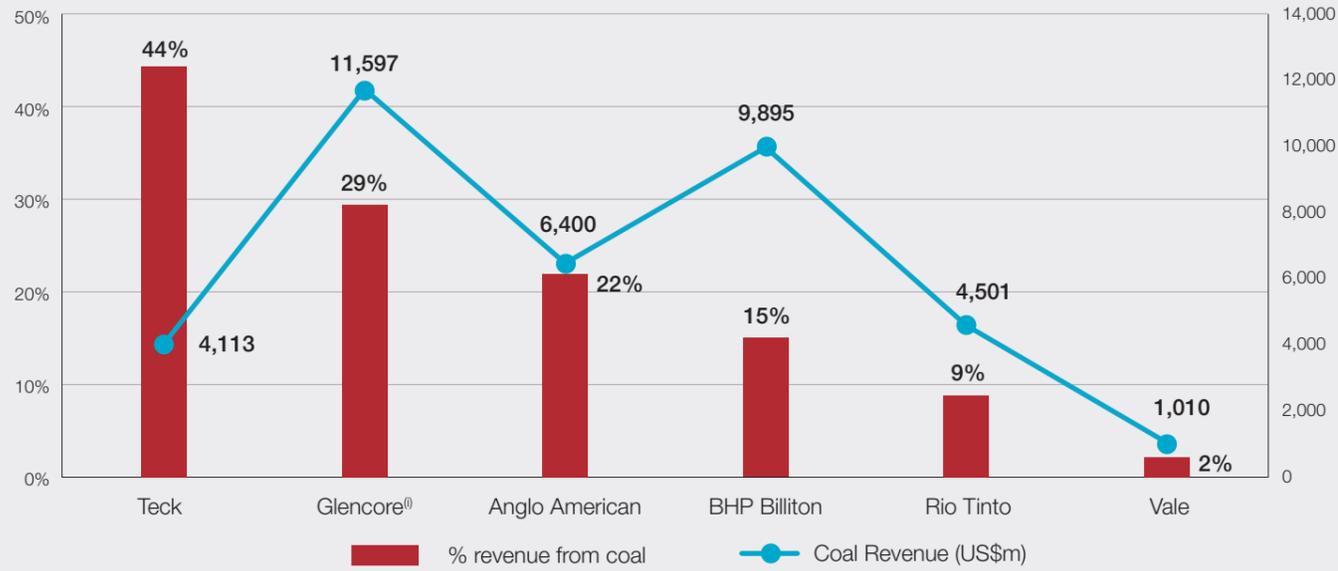
Highlights

- Antofagasta, First Quantum Minerals, Freeport-McMoRan, Sumitomo Metal Mining and Vedanta Resources have not had coal activities in recent years.
- Glencore is ranked bottom. It is the largest producer of coal, 92% of which is thermal. It also has the highest absolute coal revenue and is the largest exporter of thermal coal.
- Anglo American is ranked second from bottom. More than a fifth of its revenue comes from coal, with a focus on thermal coal production (79% of coal production). It also has the highest absolute level of total emissions in reserves from coal.
- BHP Billiton has the third highest emissions intensity from coal (and second highest total emissions). It is ranked third from bottom.
- Teck generates over 40% of its revenue from coking coal and has the lowest emissions intensity of coal activities. It is ranked eighth (or third out of the six coal producers).
- Rio Tinto generates less than 10% from coal activities, having divested from some of its coal activities in recent years. It is ranked seventh (or second out of the six coal producers).
- Vale ranks highest amongst companies with coal exposure. Only 2% of its revenue is from coal production, and three-quarters of this production is from coking coal.
- Four out of the six companies hold less than 50 years' worth of production in reserves. Vale holds the greatest at 138 years, and Glencore the fewest at 28.

17. IEA, 2013.

18. This captures the total emissions from extraction to combustion.

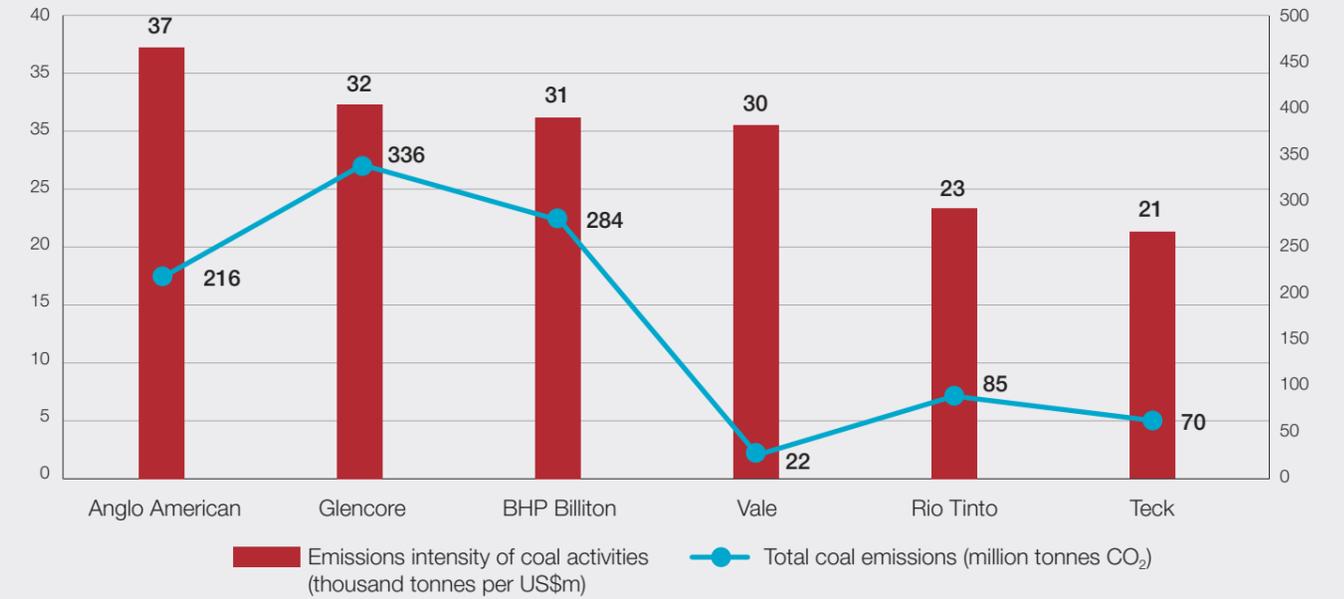
Metric 1) Share of revenue from coal (LHS) and coal revenue (RHS)



(i) Glencore revenue excludes its marketing business.

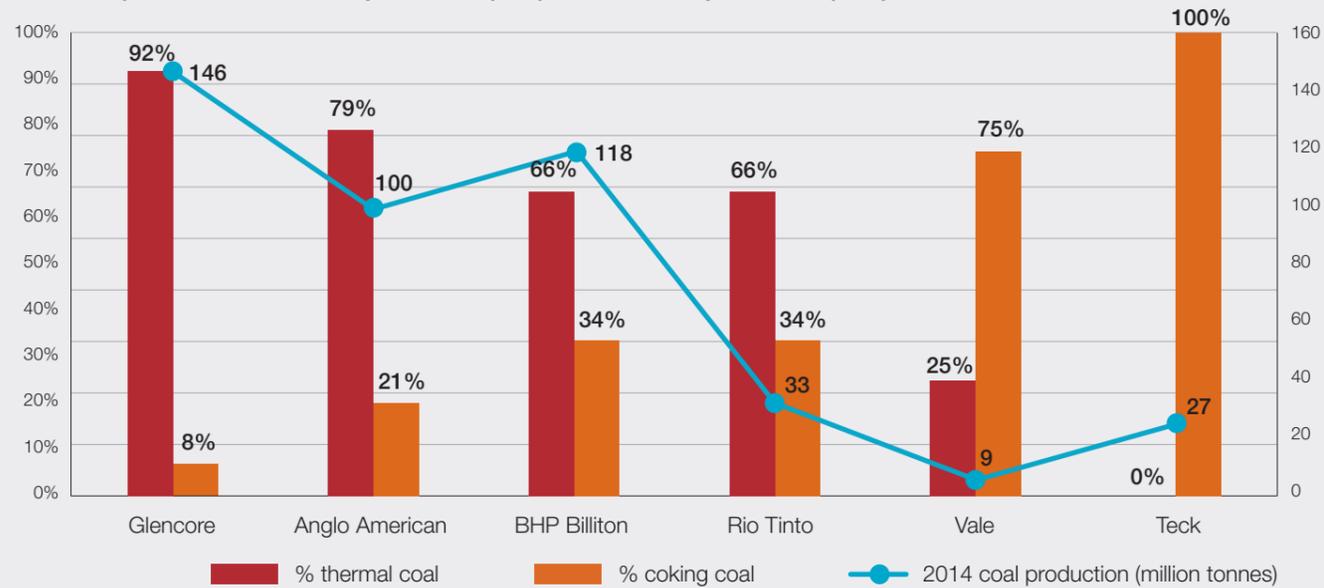
Source: CDP, company data

Metric 3) Emissions intensity of coal activities (LHS) and total coal emissions (RHS)



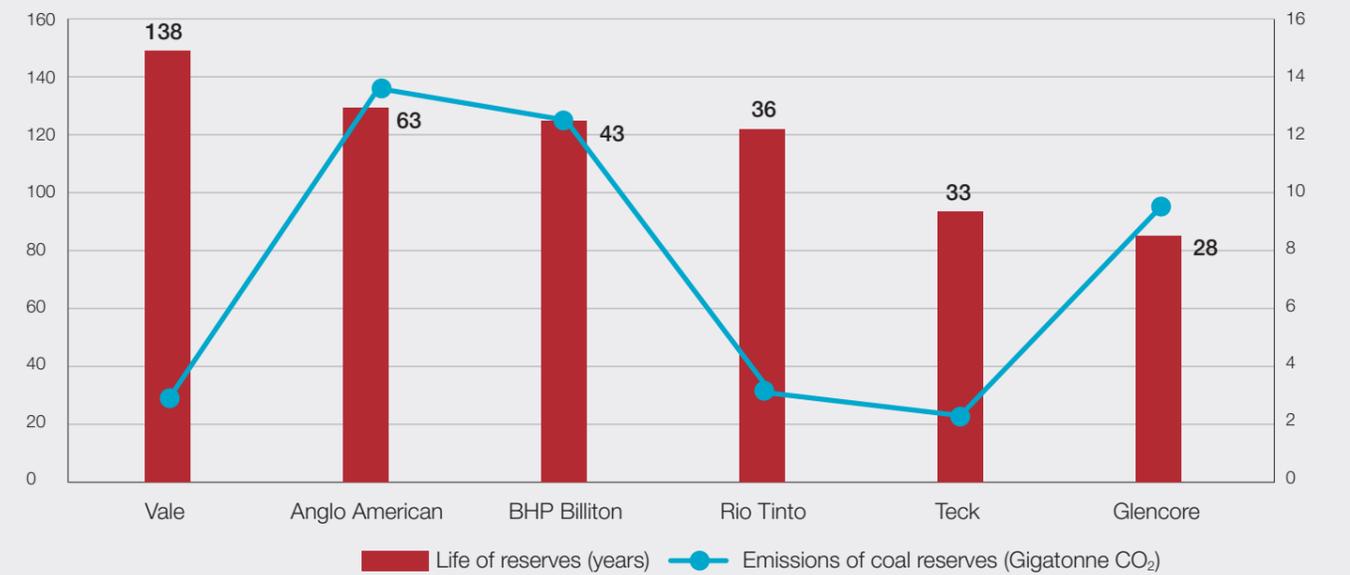
Source: CDP, company data

Metric 2) Percent thermal coal production (LHS) and 2014 coal production (RHS)



Source: CDP, company data

Metric 4) Life of reserves (LHS) and emissions of coal reserves (RHS)



Source: CDP, company data and Fossil Free Indexes.

Methodology and limitations

The overall coal exposure rank and grades are determined as follows:

- ▼ We combine the weighted ranks of the four metrics using the following weightings: metric 1) 40%, metric 2) 30%, metric 3) 20% and metric 4) 10%. This determines the overall weighted rank for coal exposure.
- ▼ The coal exposure grade is awarded according to the overall weighted rank.

We apply the following methodologies to determine the weighted rank for each metric:

Metric 1) Share of revenue from coal:

- ▼ We collate financial information on coal revenue from company annual reports.
- ▼ We divide coal revenue by total revenue for each company and calculate the median over the three years 2012-14.

Metric 2) Percent thermal coal production:

- ▼ We calculate thermal coal production as a percentage of total coal production (in volume terms in both cases).
- ▼ We calculate the median over the three years 2012-14.

Metric 3) Emissions intensity coal activities:

- ▼ We estimate total emissions from each company's 2014 coal activities, including emissions from extraction and third party energy generation (Scope 1+2) and downstream emissions from combustion (Scope 3 category 11 – use of sold products¹⁹). This information is compiled across the companies in our study using proprietary analysis on a mine-by-mine basis as coal energy content and emission factors vary at this level.
- ▼ The approach identifies production according to the respective types of coal in each mine (anthracite, bituminous, sub-bituminous and lignite) which are not uniform in their carbon emissions intensity at combustion. As approximately 90% of the total

emissions from coal occur on combustion, such analysis is crucial in determining the total emissions from companies' coal production which is less evident when only considering Scope 1+2 emissions.

- ▼ The methodology accounts for location-specific characteristics which impact Scope 1+2 emissions at each mine. For example, whether a mine is surface or underground influences the extraction energy requirement. The level of fugitive methane emissions will also vary according to mine characteristics.
- ▼ Scope 3 category 11 emission factors are calculated from the relationship between carbon content and calorific value of the different types of coal detailed above. Tier 1 and Tier 2 emission factors for the respective coal types are taken from IPCC guidelines and national inventory submissions to the UNFCCC²⁰.
- ▼ Emissions are scaled by the equity share each company holds in a respective mine.
- ▼ These total emissions are normalized by each company's coal revenue in 2014.

Metric 4) Life of reserves:

- ▼ We adopt the total emissions content of each company's coal reserves from Fossil Free Indexes²¹. This ranks the top 100 investable companies according to the estimated emissions content of their disclosed coal reserves (reserves are defined as resources which have a probability of extraction based on cost and price). Fossil Fuel Indexes' full methodology is available online²².
- ▼ We divide the total emissions from each company's coal reserves by the total emissions from its 2014 coal activities (metric 3). This gives an estimate for life of reserves.

Other limitations

- ▼ Scope 1 emissions estimates are dependent on the intensity of fugitive methane emissions, which varies between mines. Scope 2 emissions estimation assumes national average grid electricity emission factors which masks intra-national variation. Uncertainty in Scope 3 emissions estimation primarily derives from the use of Tier 1 or 2 carbon emissions factors.
- ▼ Estimates for coal reserves are subjective and depend on a number of factors, including the volume of coal that can be economically extracted.

19. As per GHG Protocol.

20. United Nations Framework Convention on Climate Change.

21. The Carbon Underground 2015 Edition. "The World's Top 200 Public Companies, Ranked by the Carbon Content of their Fossil Fuel Reserves." February 2015

22. <http://fossilfreeindexes.com/research/the-carbon-underground/>.

Carbon cost exposure

- ▼ Glencore and Teck are ranked bottom. They both have relatively high exposure to current and potential future carbon costs.
- ▼ Five companies could have over 15% of EBIT at risk under a US\$50 per tonne of carbon-equivalent price scenario.
- ▼ Over 60% of the companies in our study use an internal carbon price ranging from US\$12 to US\$80 per tonne of carbon-equivalent.

Overview

With over 60 national and sub-national jurisdictions having implemented carbon pricing schemes (both emissions trading schemes (ETSs) and carbon tax regimes), the growing global trend of putting a price on carbon is gaining momentum. Collectively, these carbon pricing schemes cover around 12% of global greenhouse gas emissions, whereas the companies in our study have, on average, 31% of emissions exposed to existing or announced carbon pricing schemes. There is significant variation between the companies, ranging from Antofagasta, with all of its emissions in Chile which is due to implement a carbon tax in 2017, to Vedanta Resources with no imminent carbon pricing exposure to its solely Indian mining activities. For the mining industry, the announcement of a carbon tax in Chile and South Africa is particularly relevant given the importance of these countries to global copper, iron ore, precious metals and coal production.

In this chapter, we assess the cost exposure of companies to carbon pricing schemes and their internal use of a carbon price. We note that currently free allowances or tax credits exist for metals and mining companies in most schemes in order to prevent carbon leakage²³. However, we believe companies cannot economically shift production to avoid carbon pricing in a sustainable manner and we are starting to see free allowances removed for some industries in certain ETSs²⁴. We expect this trend to continue, especially if global warming is to be limited to within 2-degrees. We differentiate between the companies using three key metrics:

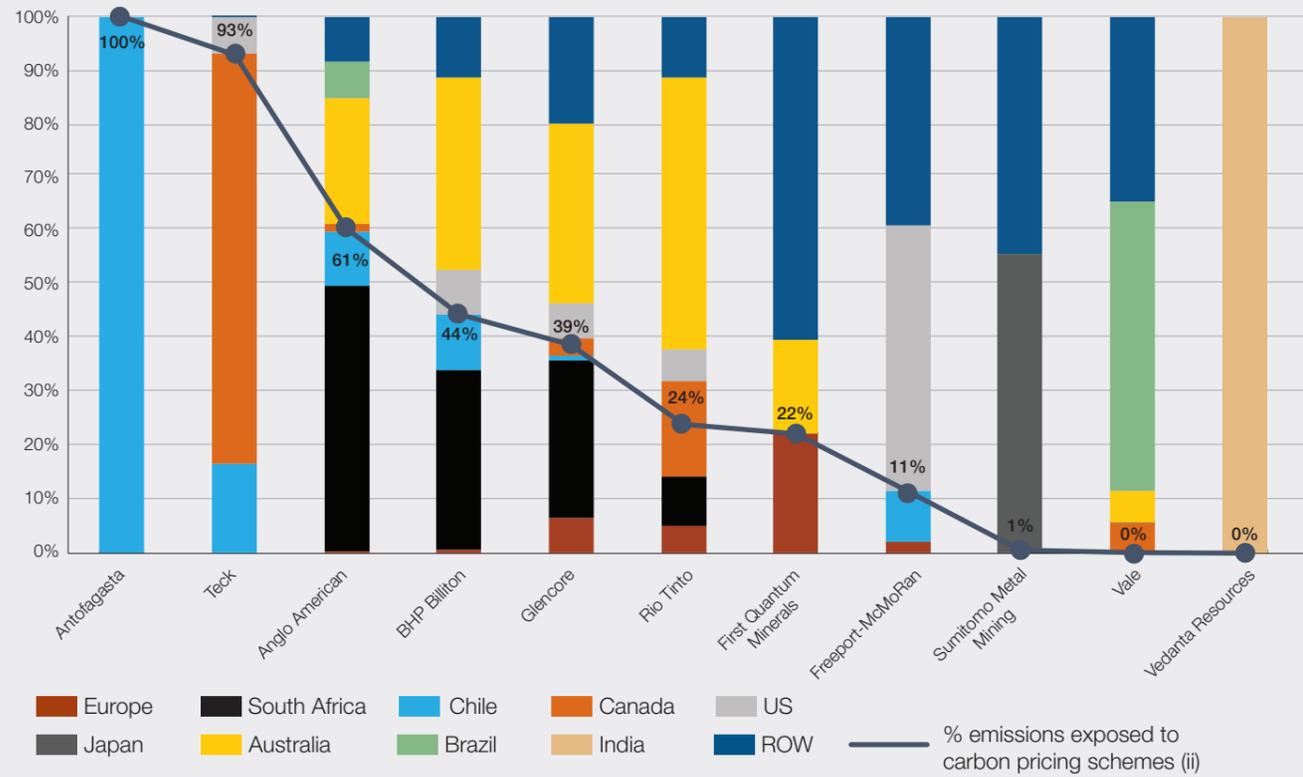
- ▼ **Metric 1) Current carbon cost exposure:** is determined by current exposure of the companies to existing or planned carbon pricing schemes. We calculate a carbon cost for the companies based on actual YTD carbon prices (or planned tax rates) multiplied by the companies' emissions in the respective jurisdictions. We then divide it by recurring EBIT to determine the carbon cost exposure.
- ▼ **Metric 2) Potential future carbon cost exposure:** applies a single price to companies' total global emissions. We use US\$50 per tonne of carbon-equivalent as this is the internal carbon price most frequently used by companies within our study.
- ▼ **Metric 3) Internal carbon price:** assesses whether companies themselves put a price on carbon and incorporate this into their capital planning and investment decision-making. This metric assesses companies based on information provided on their use of internal carbon prices, the scope of emissions covered by them and the range of prices used.

In our carbon cost exposure assessment, we consider both direct emissions from facilities which companies operate (Scope 1 emissions) and indirect emissions from the consumption of purchased power (Scope 2 emissions). We assume that utilities fully pass on their carbon costs through electricity prices. We do not include real option analysis which would consider companies' ability to pass on the carbon cost to their customers or other ways to reduce emissions.

23. Carbon leakage occurs when companies shift their production to jurisdictions that have laxer carbon regulation to avoid associated emissions costs.

24. EU ETS will phase out free allocation from 80% in 2013 to 30% in 2020 for all manufacturing industries, including metals and mining. The California ETS currently give free allowances to industrial, refinery and electric utilities sectors at various level and plans to reduce the amount of free allowance by 2020.

Emissions split by geography and % exposure to key carbon pricing schemes



(i) % emissions exposed assumes 100% of emissions in Europe, South Africa and Chile exposed to carbon pricing schemes; when facility locations in Canada, US and Japan are unknown, we assume 52%, 7% and 1% of the emissions in the respective jurisdictions are exposed to carbon pricing schemes based on geographical coverage of the scheme in the country.

Source: CDP, company data

Carbon cost exposure summary

Company	Current carbon cost exposure rank	Potential future carbon cost exposure rank	Internal carbon price rank	Overall weighted rank	Carbon cost exposure rank	Carbon cost exposure grade
Vale	1	4	3	2.6	1	A
First Quantum	4	2	8	4.0	2	B
Freeport-McMoRan	3	6	3	4.2	3	B
Antofagasta	6	1	8	4.4	4	B
Sumitomo Metal Mining	5	3	8	4.8	5	B
BHP Billiton	7	5	1	5.0	6	B
Vedanta Resources	2	11	8	6.8	7	C
Rio Tinto	8	7	5	7.0	8	C
Anglo American	9	8	7	8.2	9	D
Teck	11	9	2	8.4	10	D
Glencore	10	10	6	9.2	11	E

Weighting **40%** **40%** **20%**

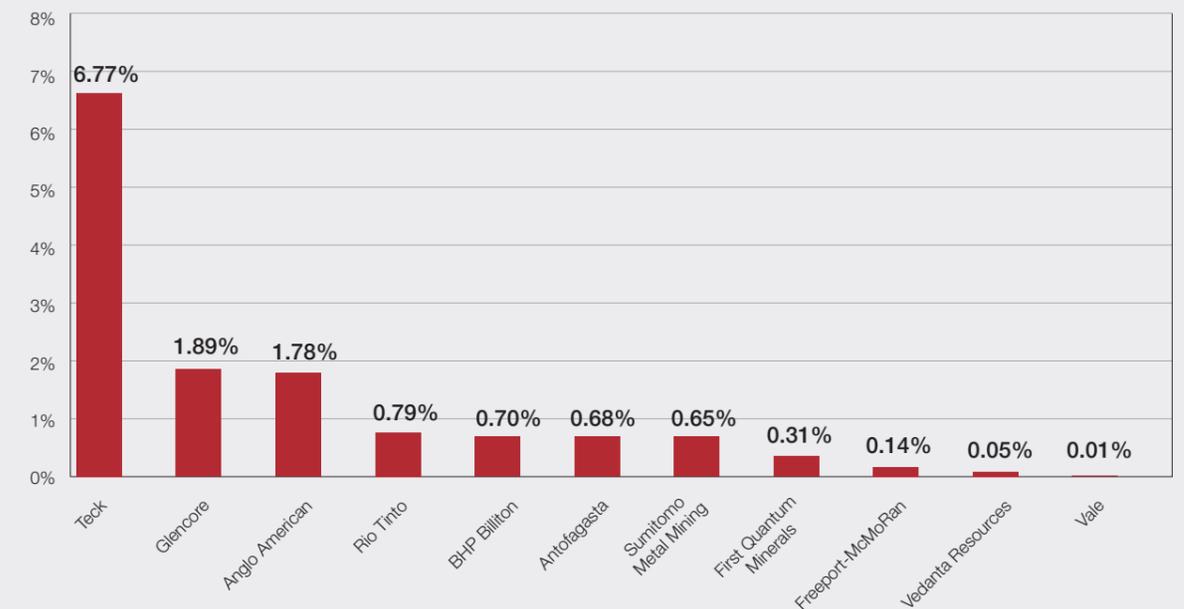
Note: In calculating the weighted rank in this table, we use the weighted ranks for each area (where relevant). We display non-weighted ranks in this summary for simplicity only.

Source: CDP

Highlights

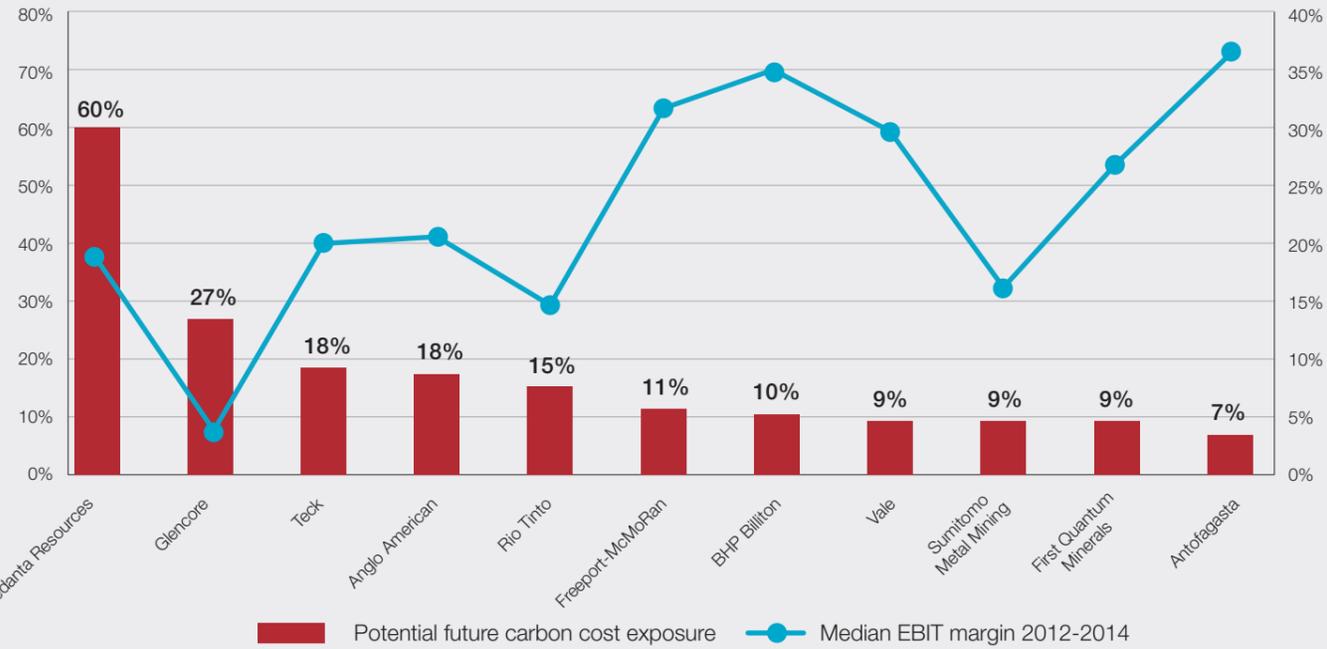
- Glencore is ranked in the bottom-three in both current and potential future carbon cost exposure. We note that it performed poorly on emissions intensity (normalized by value-added) in the energy efficiency key area.
- Teck is ranked second from bottom. It has current carbon cost exposure of over 6% of EBIT, rising to 18% using a price of US\$50 per tonne of carbon-equivalent.
- Antofagasta is ranked joint second due to its low current and potential carbon cost exposure. This is in spite of its exposure to Chile, which is due to implement a carbon tax in 2017, and likely due to its high EBIT margin and relatively low emissions intensity (normalized by value-added). That said, its lack of use of internal carbon price is concerning.
- Vedanta Resources has the highest potential future carbon cost exposure of 60% of EBIT due to the emissions intensive nature of its activities. It is ranked seventh overall mainly due to its low current carbon cost exposure due to the concentration of its mining activities in India, which does not currently have plans to implement an ETS.
- Using a price of US\$50 per tonne of carbon-equivalent; Vedanta Resources, Glencore, Teck, Anglo American and Rio Tinto all have more than 15% of EBIT at risk.
- Seven companies use an internal carbon price, ranging from US\$12 to US\$80 per tonne of carbon-equivalent. Three use a fixed global price rather than differing it by jurisdiction and the companies apply their internal prices to between 36-100% of their emissions.
- Antofagasta, First Quantum Minerals, Sumitomo Metal Mining and Vedanta Resources do not use an internal carbon price and do not foresee doing so in the next two years.

Metric 1) Current carbon cost exposure (as % of EBIT)



Source: CDP

Metric 2) Potential future carbon cost exposure (as % of EBIT) (LHS) and EBIT margin (RHS)



Source: CDP

Latest development of key carbon pricing schemes

South Africa

South Africa has been developing its own pricing scheme since 2010 and the current planned tax has faced strong resistance from the country's carbon intensive sectors. It is due to be implemented in 2016 (following two delays) at ZAR 120 (US\$8.8) per tonne of carbon-equivalent.

China

Following the success of the seven city and provincial-level ETSs initiated from 2013, China has recently announced it will implement a national ETS in 2017. It will overtake the EU ETS to become the largest trading scheme in the world in terms of emissions covered.

Chile

In 2014 the Chilean government passed legislation to introduce a carbon tax in 2017, making it the second country in Latin America – after Mexico – to put a price on carbon. The tax will be US\$5 per tonne of carbon-equivalent. Chile is the largest copper-producing country in the world.

Metric 3) Internal carbon price

Company	Internal carbon price rank	Use of internal carbon price	Internal carbon price disclosed	Fixed or variable price	Pricing scenarios	% of emissions covered by internal carbon price	Emissions scope coverage	Price level
BHP Billiton	1	Yes	Yes	Fixed price	Yes	100%	No disclosure	US\$24, 50, 80
Teck	2	Yes	Yes	By jurisdictions	Yes	77%	No disclosure	US\$12-32
Freeport-McMoRan	3	Yes	Yes	Fixed price	Yes	No disclosure	Scope 1+2	US\$50
Vale	3	Yes	Yes	Fixed price	No disclosure	60%	Scope 1	US\$50
Rio Tinto	5	Yes	No	By jurisdictions	No disclosure	100%	No disclosure	No disclosure
Glencore	6	Yes	No	No disclosure	Yes	36%	Scope 1+2	No disclosure
Anglo American	7	Yes	No	No disclosure	No disclosure	73%	No disclosure	No disclosure
Antofagasta	8	No						
First Quantum Minerals	8	No						
Sumitomo Metal Mining	8	No						
Vedanta Resources	8	No						

Source: CDP, company data

Methodology and limitations

The overall carbon exposure rank and grades are determined as follows:

- ▼ We combine the weighted ranks of the three metrics using the following weightings: metric 1) 40%, metric 2) 40%, and metric 3) 20%. This determines the overall weighted rank for carbon exposure.
- ▼ The carbon exposure grade is awarded according to the overall weighted rank.

We apply the following methodologies to determine the weighted rank for each metric:

Metric 1) Current carbon cost exposure

We collate the following information:

- ▼ 2014 emissions data mainly from responses to CDP's 2015 climate change questionnaire and also publicly available sources.
- ▼ EBIT figures from annual reports adjusted for non-recurring items
- ▼ YTD 2015 carbon prices from various sources, including Bloomberg, World Bank and emissions registries
- ▼ For each of the existing carbon pricing schemes, we calculate the YTD 2015 carbon prices by averaging over daily carbon prices (if trade/auctioned daily), otherwise from 1 January to 30 September. For scheduled carbon pricing schemes, i.e. Chile and South Africa, we take the tax rates announced by the governments. We then convert the price from local currency to US\$ by using an annual average exchange rate.
- ▼ We only assign a cost to emissions in Europe, US, Canada, Japan, Chile and South Africa because they are the jurisdictions which have implemented or announced carbon pricing schemes and where the companies have significant activities. We note that there are jurisdictions with carbon pricing schemes in which some of the companies have activities, e.g. Rio Tinto in New Zealand and Glencore in Kazakhstan, but are not included in our study as they represent a low proportion of company activities.
- ▼ We calculate each company's current carbon cost (assuming no free allowances or tax credits) in Europe, Chile and South Africa (which have full geographical coverage) by multiplying their emissions in each jurisdiction with the corresponding carbon prices.

- ▼ Carbon pricing schemes in US, Canada and Japan do not cover the whole country and thus instead of taking 100% of companies' emissions in these countries, we seek to map emissions at a facility level with prevalent carbon price of the corresponding state, provincial or city-level scheme. For companies that do not disclose their emissions at facility level, we take 7%, 52% and 1% of their emissions in US, Canada and Japan respectively, as these percentages correspond to the percentage of emissions covered by existing schemes in the three countries.

- ▼ We calculate the current carbon cost exposure by combining the carbon costs for the six countries/regions and dividing it by the company's 2014 recurring EBIT.

Metric 2) Potential future carbon cost exposure

- ▼ We calculate each company's potential future carbon cost exposure by multiplying their total global emissions in 2014 by a carbon price of US\$50 per tonne of carbon-equivalent.
- ▼ We then divide this carbon cost by the company's 2014 recurring EBIT.

Metric 3) Internal carbon price

- ▼ We collect qualitative and quantitative data on the use of internal carbon prices from responses to the 2015 CDP climate change questionnaire (CC2.2) as well as publicly-available sources including annual reports, CSR reports and company websites.
- ▼ We adopt a scorecard approach to assess companies based on their application of an internal carbon price.
- ▼ We combine the weighted ranks of the seven components using the following weightings: if they use an internal carbon price 10%, internal carbon price disclosure 10%, fixed or variable price 10%, number of carbon price scenarios 10%, proportion of total emissions to which prices applies 20%, whether Scope 1 only or both Scope 1+2 emissions are covered 20%, and the level of the price 20%.

Other limitations

- ▼ We note that all carbon pricing schemes have differing levels of coverage of mining activities (e.g. fugitive emissions, emissions from on-site power generation and transportation, etc.). Such schemes further offer varying levels of free allowances or tax credits to mining companies and thus not all emissions considered as at risk of carbon cost exposure in this exercise are fully at risk. If companies provide emissions data at facility level and by activity type then this assessment would be more accurate.

Carbon regulation readiness

- ▼ Antofagasta and Vale are ranked first and second. They are both supportive of progressive low-carbon regulation.
- ▼ Glencore is the clear laggard due to its opposition to carbon pricing and dismissal of the concept of stranded assets.
- ▼ BHP Billiton and Rio Tinto were the most active companies in opposing the Australian carbon tax before its repeal.

Overview

The mining industry is having to adapt in the face of significant challenges including higher competition for natural resource deposits and greater environmental regulatory scrutiny. It is therefore increasingly important to understand how miners are preparing themselves for a transition towards a low-carbon regulatory regime. We believe that companies that are supportive of low-carbon regulatory measures, and are strategically aligning themselves accordingly, are more likely to be better placed should regulation tighten. Conversely, companies engaged in overt or covert obstruction of climate change policies may be less likely to be strategically shifting their activities and thus could be at a higher risk from regulatory shocks²⁵.

In this chapter, we adopt InfluenceMap's²⁶ proprietary analysis to assess companies' readiness for a shift towards a low-carbon regulatory framework. We believe supportive companies are best placed to benefit from a regulatory shift in their favor. InfluenceMap analyses the behavior of the diversified miners regarding key

regulatory items affecting their business, including the EU Emissions Trading System, carbon taxes in Australia, South Africa and Chile, as well as the US Clean Air Act.

InfluenceMap scores companies in two ways:

- ▼ Organizational score: represents the stance a company takes on climate policy and legislation as well as its transparency on such positions on key climate issues.
- ▼ Relationship score: represents the strength of a company's relationships with trade bodies or other entities and its ability to influence climate policy and legislation.

The two scores for each company are combined²⁷ along with other factors in InfluenceMap's algorithmic calculation to produce a total score (InfluenceMap score). This score determines our carbon regulation readiness rank.

Carbon regulation readiness summary

Companies	InfluenceMap score	Carbon regulation readiness rank	Carbon regulation readiness grade (i)
Antofagasta	58.8	1	A
Vale	52.6	2	A
Teck	46.5	3	B
First Quantum Minerals	46.2	4	B
Vedanta Resources	46.1	5	B
Sumitomo Metal Mining	43.8	6	C
Freeport-McMoRan	42.9	7	C
BHP Billiton	41.7	8	C
Rio Tinto	36.7	9	D
Anglo American	35.4	10	D
Glencore	24.3	11	E

(i) This is the CDP Carbon regulation readiness grade which is relative to the companies involved in our study only. It is connected to InfluenceMap's own grades which are relative to a wider, cross-sector, sample.

Source: CDP

25. We recognize that some companies may be lobbying against climate regulation for short-term gain yet simultaneously preparing for a longer-term shift towards a low-carbon economy.

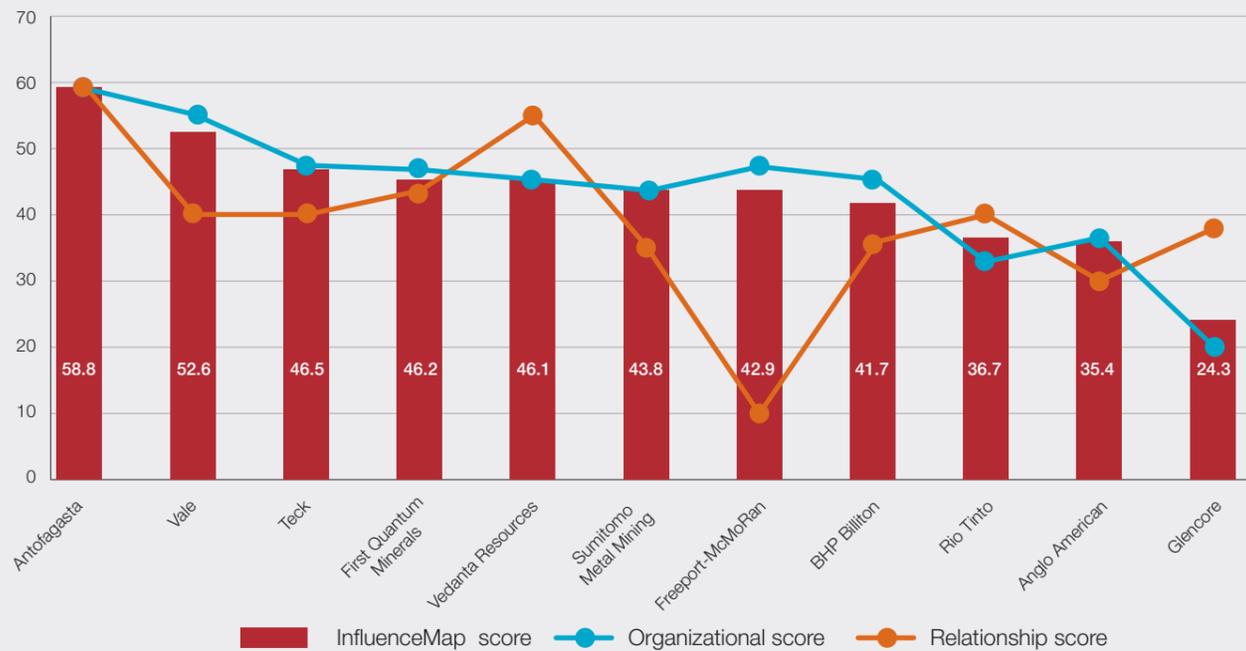
26. A UK-based non-for profit whose remit is to map, analyze and score the extent to which corporations are influencing climate policy and legislation. <http://www.influencemap.org/>

27. The scores are combined in varying proportions on a company by company basis.

Highlights

- Antofagasta is ranked top due to its non-opposition to the incoming Chilean carbon tax. Vale is ranked second place and has been an active supporter of progressive EU ETS reform such the 'back-loading' of auction volumes. These are the only two companies to score greater than 50; an InfluenceMap score of more than 50 indicates that a company is supportive of climate regulation
- Glencore is rock bottom. It has by far the lowest InfluenceMap score, mostly due to its very poor organizational score, which is due to its stated opposition to carbon price regulation in South Africa and advocacy of greater coal use.
- Rio Tinto and BHP Billiton are ranked in the bottom half. They heavily opposed the Australian carbon tax and are both influential members of the Minerals Council of Australia (MCA) which has an obstructive position on climate change legislation. Rio Tinto is deemed the most active of the companies in its opposition to climate regulation, particularly in Australia.
- Canadian miners Teck and First Quantum Minerals are ranked third and fourth. Both have organizational scores just below 50 and have little direct engagement on climate legislation.
- Anglo American is ranked second from last. It opposes EU renewable energy targets and actively advocates wider use of coal.
- Freeport-McMoRan ranks mid-table. It has by far the lowest relationship score due to its board membership of the National Mining Association which is taking legal action against the American EPA over its Clean Air Act. Its overall InfluenceMap score is pushed up as it has the fourth highest organizational score as the majority of its lobbying activities are through its association membership rather than direct engagement.
- Vedanta Resources and Sumitomo Metal Mining are also ranked mid-table. They have little direct climate policy engagement, however, are active through associations.

Carbon regulation readiness



Source: InfluenceMap

Australia

- The repealing of the Australian carbon tax in 2014 was the most actively engaged item of climate regulation for the mining industry in recent years. Several companies in this report were negatively involved in lobbying for its repeal and BHP Billiton and Rio Tinto were particularly influential.
- BHP Billiton and Rio Tinto are both active board members of the MCA which opposes other strands of Australian climate change policies including renewable energy targets and country emissions reduction targets. It also lobbies the World Bank to lift funding restriction to coal fired power plants.
- BHP Billiton states that it supports Australia's climate policies yet caveats its position by arguing that regulation should not impact competitiveness. In its annual disclosure to CDP, BHP Billiton indicates that its climate change position is consistent with that of the MCA.
- Rio Tinto has opposed energy efficiency measures in Australia and publicly advocates continued coal use, inconsistent with a transition to a low-carbon economy.

Methodology

Our CDP carbon regulation readiness metric uses InfluenceMap's total score which combines the company organization score and relationship score according to their proprietary algorithm. From this, we determine the carbon regulation readiness rank and grade.

A full description of InfluenceMap's detailed methodology can be found on its website. Its methodology comprises three stages: (a) aggregation of suitable data sources (SEC disclosures, legislative consultations, CDP responses etc.); (b) assessment (via raw scores) of those data sources using suitable queries; and (c) input of the raw scores and other factors into its algorithm to arrive at comparable metrics of regulatory readiness for corporations. It analyzes these data sources with a series of 12 queries relating to various aspects of climate change policy and legislation (e.g. carbon tax, emissions trading, greenhouse gas emissions regulations, renewable energy legislation etc.). It then scores each data source/query intersection (or cell) on a 5-point scale, with clearly consistent evidence and guidelines.

Organizational score: is computed over 96 scoring cells by InfluenceMap's proprietary algorithm that accounts for weightings and irrelevant data sources/queries. The organizational score is expressed as a percentage, with 100% representing very supportive influence on climate policy.

Relationship score: is a reflection of a corporation's climate influencing activities through its influencers (i.e. trade association etc.). The relationship score is also expressed as a percentage, with 100% representing very supportive influence over climate policy.

Appendix: investor engagement themes for diversified miners

Sector engagement themes:

In order to ensure robust and resilient business strategies as well as encouraging a smooth transition to a low-carbon economy, we are recommending some areas of engagement for investors to raise in their discussions with mining company management. These are intended as proxies under which to 'stress test' a company's business strategy to prepare for the medium and long-term.

CDP is actively supporting institutional investors in their discussions with mining companies and will provide additional information, support and coordination where needed.

A) Energy efficiency

Set clear, strong and long-term emissions reduction targets, both by absolute levels and intensity, which are in line with the methodology of Science Based Targets' Sector-based Decarbonization Approach (SDA), and perform against these. The SDA targets are emissions reduction pathways to 2050 which are consistent with a 2-degree world.

Provide transparency on carbon intensity of production reporting, specifically a consistent measure of emissions per volume produced.

B) Water resilience

Improve awareness of potential risks of water stress at mining facilities and disclose what actions are being taken to avoid disruption to operations.

Improve granularity of water data reporting at facility level and using a consistent reporting framework.

C) Coal exposure

Provide a strategy on how coal exposure is being managed within the company's commodity portfolio and how this is expected to change over time.

Examine the extent to which a company's ongoing earnings are dependent on thermal coal production in particular.

D) Carbon cost exposure

Provide more detailed emissions information at a facility or country level so that investors can make an accurate assessment of a company's financial exposure to carbon regulations across various jurisdictions.

Disclose the extent to which an internal carbon price is used company planning, its level and whether it is used in capital project decisions.

E) Carbon regulation readiness

Provide a clear stance on climate policy consistent with actions and disclosure on policymaker engagement.

Company engagement: traffic light system

We use a traffic light system for each metric to highlight areas of engagement focus for each diversified mining company:

Green = good performance

Amber = monitor performance, possible concern

Red = area of concern, engage with company

We have not assigned a uniform number of green, amber and red across the metrics according to rank. Instead, we have reviewed the results of each metric in detail and assigned the above colors according to the underlying quantities for each metric.

SLT

SLT rank	Companies	Country	Engagement area:											Number of RGA							
			Energy efficiency			Water resilience			Coal exposure			Carbon cost exposure			Carbon regulation readiness						
1	Vale	Brazil	3	3	2	6	1	8	1	1	6	6	1	1	4	3	2	7	Green		
2	BHP Billiton	UK	1	7	2	2	2	2	2	9	9	8	7	6	5	1	8	7	7	Amber	
3	Sumitomo Metal Mining	Japan	6	5	5	3	10	9	3	1	1	1	5	5	3	8	6	6	7	Amber	
4	Rio Tinto	UK	4	2	9	4	4	6	5	7	8	7	8	8	7	5	9	3	10	Amber	
5	Teck	Canada	6	9	4	3	5	9	3	11	6	10	11	10	9	2	3	2	8	Amber	
6	Antofagasta	UK	7	7	2	11	11	3	10	1	1	1	4	6	1	8	1	8	3	Amber	
7	Anglo American	UK	2	5	10	1	6	1	4	10	10	11	9	9	8	7	10	2	7	Amber	
8	Freeport-McMoRan	USA	8	8	8	11	11	4	9	1	1	1	3	6	3	7	7	6	6	Amber	
9	Vedanta Resources	UK	8	3	11	11	11	5	11	11	n/a	4	7	11	8	11	5	5	4	Amber	
10	First Quantum Minerals	Canada	11	11	1	11	11	11	7	8	2	9	1	2	4	8	4	7	2	Amber	
11	Glencore	Switzerland	10	6	6	11	11	7	8	7	11	10	11	10	10	6	11	0	6	10	Green

Weighting:	Metric	Area (i)	Area (ii)	Adjusted area (ii)
24%	Energy efficiency rank	20%	9%	45%
6%	Reduction in emissions intensity 2008-2014	25%	25%	25%
25%	Quality of target	25%	25%	25%
25%	Performance against target	20%	20%	20%
60%	Water stress exposure	30%	30%	30%
30%	Water governance and strategy	10%	15%	17%
40%	Coal exposure rank	40%	15%	17%
40%	Share of revenue from coal	30%	40%	30%
30%	Percent thermal coal production	20%	30%	20%
10%	Emission intensity of coal-activities	10%	10%	10%
40%	Life of reserves	40%	10%	11%
40%	Carbon cost exposure rank	40%	10%	11%
20%	Current exposure	20%	20%	20%
40%	Potential exposure	40%	40%	40%
20%	Internal carbon price	20%	20%	20%
10%	Carbon regulation readiness rank	10%	10%	11%

Notes:
 (i) Adjusted weights apply to Vedanta Resources
 Source: CDP

Energy efficiency: engagement areas through traffic light

SLT rank	Company	Country	Energy efficiency rank	Reduction in emissions intensity 2008-2014	Emissions intensity 2012-2014	Quality of target	Performance against target	Data transparency
2	BHP Billiton	UK	1	1	7	2	2	2
7	Anglo American	UK	2	5	10	1	6	1
1	Vale	Brazil	3	3	2	6	1	8
4	Rio Tinto	UK	4	2	9	4	4	6
3	Sumitomo Metal Mining	Japan	5	6	5	5	3	10
5	Teck	Canada	6	9	4	3	5	9
6	Antofagasta	UK	7	7	2	11	11	3
9	Vedanta Resources	UK	8	3	11	11	11	5
8	Freeport-McMoRan	USA	9	8	8	11	11	4
11	Glencore	Switzerland	10	10	6	11	11	7
10	First Quantum Minerals	Canada	11	11	1	11	11	11

Weighting	Metric:	24%	6%	25%	25%	20%
	Area:	40%				
	Adjusted area (i)	45%				

Notes:
(i) Adjusted weights apply to Vedanta Resources

Source: CDP

Water resilience: engagement areas through traffic light

SLT rank	Company	Country	Water resilience rank	Water stress exposure	Water governance and strategy	Water performance
1	Vale	Brazil	1	1	5	6
2	BHP Billiton	UK	2	4	1	2
5	Teck	Canada	3	2	10	10
7	Anglo American	UK	4	5	3	8
4	Rio Tinto	UK	5	6	6	1
3	Sumitomo Metal Mining	Japan	6	3	9	3
10	First Quantum Minerals	Canada	7	8	2	9
11	Glencore	Switzerland	8	7	7	11
8	Freeport-McMoRan	USA	9	9	4	4
6	Antofagasta	UK	10	10	8	7
9	Vedanta Resources	UK	11	11	n/a	4

Weighting	Metric:	60%	30%	10%
	Area:	20%		
	Adjusted area (i)	9%	78%	22%

Notes:
(i) Adjusted weights apply to Vedanta Resources

Source: CDP

Coal exposure: engagement areas through traffic light

SLT rank	Company	Country	Coal exposure rank	Share of revenue from coal	Percent thermal coal production	Emission intensity of coal-activities	Life of reserves
6	Antofagasta	UK	1	1	1	1	1
10	First Quantum Minerals	Canada	1	1	1	1	1
8	Freeport-McMoRan	USA	1	1	1	1	1
3	Sumitomo Metal Mining	Japan	1	1	1	1	1
9	Vedanta Resources	UK	1	1	1	1	1
1	Vale	Brazil	6	6	7	8	11
4	Rio Tinto	UK	7	7	8	7	8
5	Teck	Canada	8	11	6	6	7
2	BHP Billiton	UK	9	8	9	9	9
7	Anglo American	UK	10	9	10	11	10
11	Glencore	Switzerland	11	10	11	10	6

Weighting	Metric:	40%	30%	20%	10%
	Area:	15%			
	Adjusted area (i)	17%			

Notes:
(i) Adjusted weights apply to Vedanta Resources

Source: CDP

Carbon cost exposure: engagement areas through traffic light

SLT rank	Company	Country	Carbon cost exposure rank	Current exposure	Potential exposure	Internal carbon price
1	Vale	Brazil	1	1	4	3
10	First Quantum Minerals	Canada	2	4	2	8
8	Freeport-McMoRan	USA	3	3	6	3
6	Antofagasta	UK	4	6	1	8
3	Sumitomo Metal Mining	Japan	5	5	3	8
2	BHP Billiton	UK	6	7	5	1
9	Vedanta Resources	UK	7	2	11	8
4	Rio Tinto	UK	8	8	7	5
7	Anglo American	UK	9	9	8	7
5	Teck	Canada	10	11	9	2
11	Glencore	Switzerland	11	10	10	6

Weighting	Metric:	40%	40%	20%
	Area:	10%		
	Adjusted area (i)	11%		

Notes:
(i) Adjusted weights apply to Vedanta Resources

Source: CDP

Appendix II: tailings dams

Carbon regulation readiness: engagement areas through traffic light

SLT rank	Company	Country	Carbon regulation readiness rank
6	Antofagasta	UK	1
1	Vale	Brazil	2
5	Teck	Canada	3
10	First Quantum Minerals	Canada	4
9	Vedanta Resources	UK	5
3	Sumitomo Metal Mining	Japan	6
8	Freeport-McMoRan	USA	7
2	BHP Billiton	UK	8
4	Rio Tinto	UK	9
7	Anglo American	UK	10
11	Glencore	Switzerland	11

Weighting	Metric:	100%
	Area:	10%
	Adjusted area (i)	11%

Notes:

(i) Adjusted weights apply to Vedanta Resources

Source: CDP

We investigate potential exposure of the companies in our study to tailings dam incidents. We present our findings in this appendix and note that there are limitations due to data availability. This analysis does not contribute to our Super-League Table, which assesses the climate readiness of companies.

There have been 47 major²⁸ tailings dam failures across 18 countries in the last 25 years²⁹. Five of these incidents relate to companies in our study. In this appendix, we focus on nine of the countries, which account for nearly 80% of the companies' mines, and more than half of the major incidents.

We assessed the impact on earnings for four recent tailings dam incidents (involving five companies), occurring since 2014. The average potential impact on earnings for four companies was 6% of EBIT, whereas for one small company (under USD0.5bn market cap), the impact was over 250%.

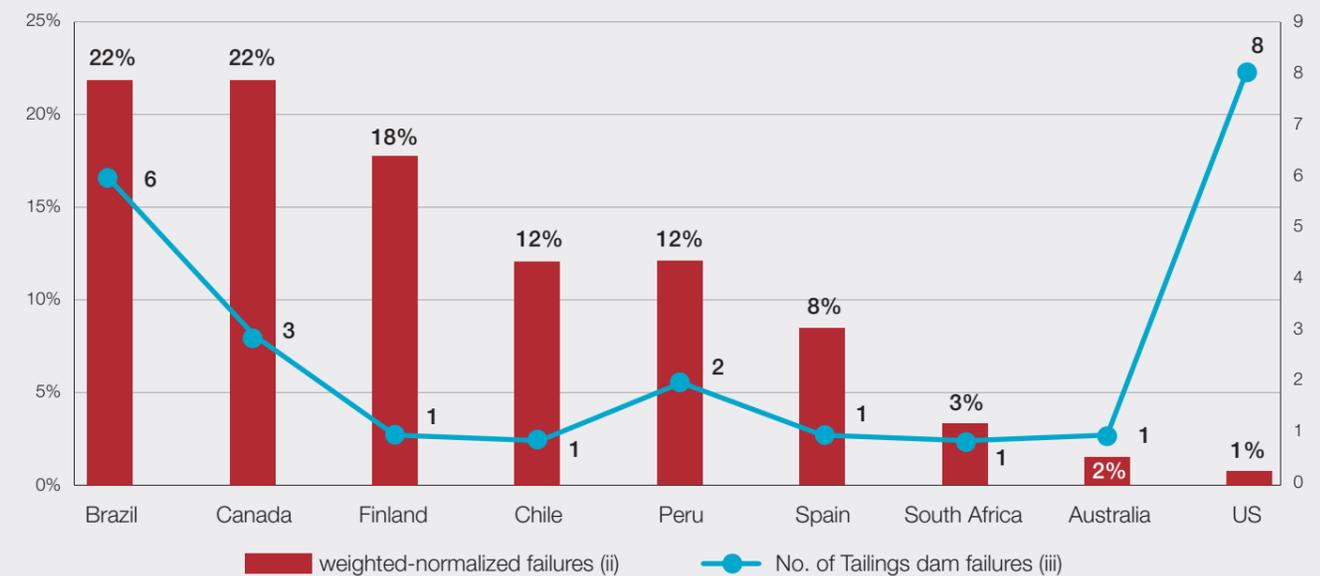
We consider three metrics:

▼ **Metric 1) Exposure index:** calculates the proportion of each company's mines in countries that have had major tailings dam failures since 1990. These proportions are weighted according to the normalised³⁰ frequency of failures in each country to produce an index, with exposure to countries where failures (normalised for the number of mines in that country) have occurred more often carrying a higher weight.

▼ **Metric 2) Absorption factor:** assesses the impact of an individual mine incident on a company's wider operations. Those companies with a higher number of sites are less at risk of significant company-level earning impact (from both lost output and regulatory action), in the event of a dam failure.

▼ **Metric 3) Previous incidents:** examines whether companies have been involved in previous dam failure incidents in the last 25 years.

Major tailing dam failures by country (i)



(i) We select nine of the 18 countries that are material to the companies
 (i) Normalised by the no of dams in each country and weighted across the nine countries
 (ii) Major tailings dam failures since 1990

28. Defined as those involving the release of more than 100,000 m of material or loss of life or run-out greater than 5km.

29. Based on data from CSP² (<http://www.csp2.org/>).

30. Normalised frequency of failures = no. of major incidents in each country divided by no. of mines in that country.

Summary of tailing dam incident exposure rank

Company	Exposure index	Rank	Absorption factor	Rank	Previous incidents	Rank	Overall weighted rank	Tailing dams rank
Freeport-McMoRan	12%	2	14	6		1	2.8	1
Glencore	17%	5	68	1		1	3.0	2
Vedanta Resources	2%	1	14	6	2006	7	3.8	3
Anglo American	23%	7	58	2		1	4.3	4
Rio Tinto	15%	3	37	4	1996	7	4.3	4
Sumitomo Metal Mining	20%	6	3	11		1	6.0	6
BHP Billiton	17%	4	31	5	2015, 1997	11	6.0	6
First Quantum Minerals	30%	8	7	9		1	6.5	8
Antofagasta	55%	9	4	10		1	7.25	9
Vale	85%	11	42	3	2015	7	8.0	10
Teck	74%	10	11	8	2004	7	8.8	11

Weightings	50%	25%	25%
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Source: CDP, company data

Highlights

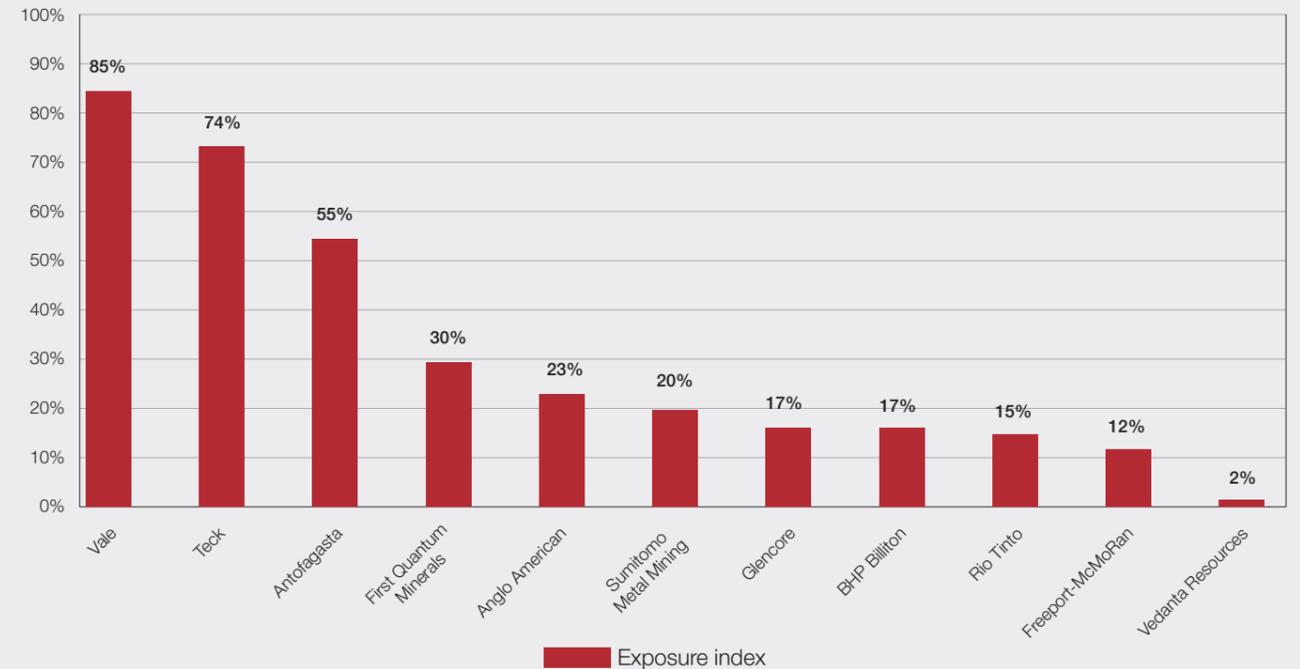
- ▼ BHP Billiton and Vale are in the lower half of the table. BHP Billiton is the only company which has been involved in more than one tailings dam failure in the last 25 years.
- ▼ Vale has the highest exposure index level owing to its high proportion of mines in Brazil. Brazil has the highest level of normalized failures of the nine countries.
- ▼ Antofagasta and First Quantum Minerals have amongst the highest exposure to countries with a high normalized level of major dam failures. In addition, they have a relatively small number of mines and may therefore be less able to absorb the costs of a major incident. That said, neither company have been involved in a tailings dam failure in the last 25 years.
- ▼ Glencore and Anglo American have the highest number of mines and are potentially better able to absorb the costs of a tailings dam incident.
- ▼ One of the largest diversified miners who did not respond to CDP, Grupo Mexico, incurred a US\$135m (8% of EBIT) fine for a dam failure at a site in Mexico in 2014 due to leakage of toxic material into rivers.
- ▼ Freeport has one of the lowest exposure index levels due to concentration of operations in the US, which has the lowest normalised number of tailings dam incidents (despite having the highest absolute number).
- ▼ Sumitomo Metal Mining has the fewest number of mines (three) and thus ranks lowest in the absorption factor metric. It ranks mid-table on our exposure index.
- ▼ Vedanta Resources has the lowest exposure index level due to its concentration of operations in India, which has not had any recent major tailings dam failures. It did, however, have a major failure at one of its Zambian mines in 2006.

Limitations

We acknowledge that a more detailed assessment of tailings dam risk requires an analysis of the dam failure risks and potential impacts on a mine by mine basis, including examining data on individual tailings dams' characteristics. However, significant data limitations exist in key mining geographies such as Australia and Chile, particularly concerning the number of dams at each mine and their associated risk and potential impact profiles.

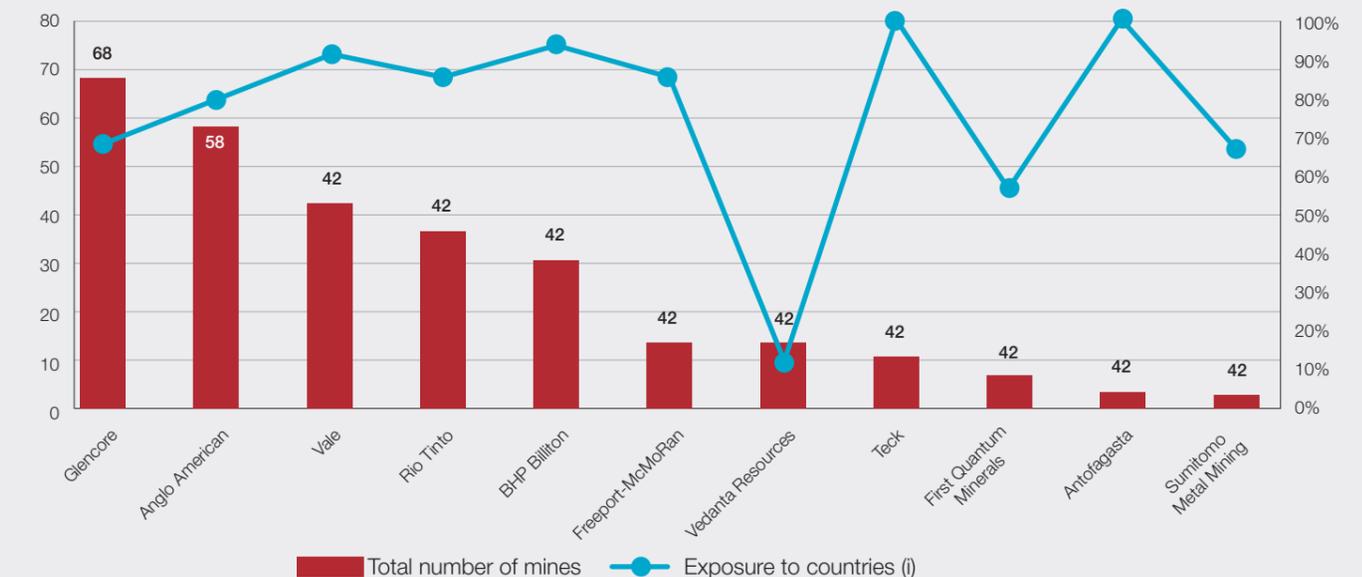
Disclosure on tailings dams is not part of the mining industry's regular reporting practices and environmental impact assessment reports addressing tailing dam risks are not always made available. Recommended metrics to disclose are provided by the Sustainability Accounting Standards Board (SASB) including on the total weight of tailings waste and the number of tailings impoundments.

Metric 1) Major tailings dam incident exposure index



(i) % exposure of each company's mines to countries where there has been a major tailings dam incident

Metric 2) Number of mines (LHS) and % exposure to countries with major tailings dam incidents (RHS)



(i) % exposure of each company's mines to countries where there has been a major tailings dam incident since 1990

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