

Visible cracks

Which cement makers are failing to address structural issues?

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CDP's sector research for investors provides the most comprehensive climate and water-related data in the market. CDP's team of analysts, voted no. 1 climate change research provider in 2015 by institutional investors, takes an in-depth look at high-emitting industries one by one, starting with the automotive industry, electric utilities, diversified chemicals, metals & mining and now cement. Forthcoming industries include oil & gas and steel.

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. 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

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

Linking emissions to earnings for cement companies

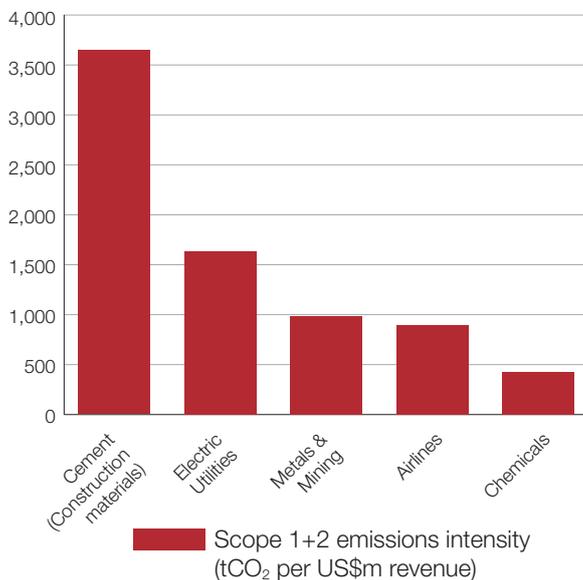
- ▼ CDP's cement League Table ranks companies in an industry that accounts for 5% of global emissions and highlights earnings risk for some companies.
- ▼ Highest ranked companies are: Holcim, Shree Cement and Lafarge.
- ▼ Lowest ranked companies are: Italcementi, Cementir and Taiheiyo Cement.

Overview

This report, covering cement companies, is the latest in a series of investor-focused reports covering high-emitting sectors. CDP has previously published on auto manufacturers (February 2015 and March 2016), European electric utilities (May 2015), chemicals companies (August 2015) and diversified miners (November 2015). Each report features a CDP League Table that ranks companies in an industry grouping on a number of emissions and water-related metrics relevant to that industry. When taken in aggregate, we believe these metrics could have a material impact on company earnings and investment decision-making.

In this report, we launch a cement CDP League Table that ranks 12 of the largest (by market capitalization) and highest-emitting cement companies. The cement industry is amongst the most emissions intensive (accounting for 5% of global carbon emissions) and in its current form is not compatible with the binding global agreement signed at COP21 in Paris. Despite eight of the 12 companies being covered by the EU ETS there are significant differences in emissions intensities across the companies and tightening emissions regulations are an expected feature of the industry's future. This report assesses which companies are preparing for a transition to a low carbon economy.

Sector emissions intensities



Scope of the report:

There are five key areas in our League Table:

- ▼ **Emissions performance:** using emissions profiles as an efficiency proxy for cement production, we assess each company's historical emissions-reduction performance and forward-looking targets in managing their carbon emissions exposure.
- ▼ **Energy and material management:** we assess the extent to which companies exploit existing opportunities to manage their energy cost base (representing around 30% of production costs) including deploying best available kiln technology to optimize thermal energy use, utilizing alternative fuel sources and using material substitution.
- ▼ **Carbon cost exposure:** examines the carbon emissions-related cost exposure of the cement companies in our study and the potential impact on earnings under different carbon pricing scenarios.
- ▼ **Water resilience:** we analyse cement companies' exposure to water risk and their respective water consumption levels and trends. We undertake facility-level analysis to assess which companies are at greater risk of business interruption due to water stress both now and in the future.
- ▼ **Carbon regulation supportiveness:** we use InfluenceMap's¹ proprietary analysis to assess each company's actions in supporting or opposing meaningful carbon regulation. We believe that firms that are supportive of a transition to a low-carbon economy are most likely to benefit from tightening regulatory measures.

1. A UK-based not-for-profit whose remit is to map, analyse and score the extent to which corporations are influencing climate policy and legislation. <http://influencemap.org/>

The summary League Table below initiates CDP investor coverage on the cement sector. It is based on detailed analysis across 15 metrics embedded in the table, which are aggregated to assign an A to E-grade to each company across each key area.

Condensed summary of the League Table for cement companies

League Table rank	Company	Country	Market cap 2015 (US\$m)	2015 cement production (m tonnes)	League Table score	Emissions performance	Energy & material management	Carbon cost exposure	Water resilience	Carbon regulation supportiveness	CDP Performance Band (i)
1	Holcim	Switzerland	21,400	140 (iii)	3.9	A	B	A	B	B	B
	LafargeHolcim	Switzerland	28,861(ii)	256	4.1						
2	Shree Cement	India	6,002	16	4.5	A	B	B	D	A	C
3	Lafarge	France	19,675	116 (iii)	4.7	B	B	A	B	B	C
4	CRH	Ireland	22,615	20	5.0	C	B	A	A	C	C
5	Cementos Argos	Colombia	4,608	13	5.5	C	D	B	A	B	B
6	HeidelbergCement	Germany	14,519	82	6.0	D	C	B	B	D	A
7	CEMEX	Mexico	10,846	68	6.6	D	C	C	C	B	B
8	Ultratech Cement	India	12,526	44	7.0	D	C	D	E	A	C
9	Buzzi Unicem	Italy	2,986	25	7.7	D	D	D	C	D	B
10	Taiheiyo Cement	Japan	3,874	18	8.2	D	C	D	E	E	D
11	Cementir	Italy	1,029	10	8.4	E	C	E	D	E	D
12	Italcementi	Italy	3,078	43	8.7	E	D	E	D	E	B

Weighting for each area

30% 25% 20% 10% 10% 5%

(i) 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 is awarded relative to 2,233 companies that responded to CDP in 2015.

(ii) Calculated over the period from 1 January 2016 to 23 May 2016.

(iii) 2014 production figures.

We highlight the following companies, who collectively represent over US\$60bn in market capitalization, as non-responders to CDP's 2015 climate change questionnaire and therefore not included in this report. We encourage investors to raise this lack of transparency over carbon and water reporting practices in discussions with company management.

Non-responders to CDP

Company	Country	Market Cap 2015 (US\$m)	First year approached by CDP	Reason for not responding	Public disclosure of carbon emissions	Business activities
Anhui Conch Cement	China	17,476	2008	No response.	Partially.	Produces and sells ordinary Portland cement, Portland blast furnace slag cement, compound cement and commercial clinker.
Siam Cement	Thailand	17,427	2006 (i)	No response.	Yes.	Diversified industrial company with operations in cement manufacturing, petrochemicals manufacturing, paper manufacturing, building product manufacturing and distribution.
Dangote Cement	Nigeria	14,380	2010	Company policy not to disclose.	No.	Cement manufacturer operating in Nigeria, Benin, Ghana, Senegal, South Africa and Zambia.
Vulcan Materials	USA	11,783	2006(ii)	They plan to disclose.	Partially.	Principal product lines are aggregates, asphalt mix and concrete, and cement.

(i) Siam Cement last responded to CDP in 2007 .

(ii) Vulcan Materials last responded to CDP in 2010.

Source: CDP

Key findings

- ▼ Emissions performance: there are large differences between cement production emissions intensities across the companies. The best performers have been reducing their emissions intensities over time and currently operate in line with a 2-degree transition, whilst others significantly lag behind and have increased their intensities in recent years. We note that all companies will be required to take further abatement action to align themselves with the industry decarbonization trajectory which tightens significantly post-2025.
- ▼ Emissions-reduction targets: only three companies in the study have targets aligned with global carbon budgets which are deemed as science-based. The vast majority of forward-looking targets for cement companies expire within the coming four years and many existing company targets do not align with a transition to a low-carbon economy. Companies should provide transparency that forthcoming reduction targets are both long-term (i.e. beyond 2025) and sufficiently ambitious, and explain how they intend to achieve them.
- ▼ Carbon pricing: the cement industry has significant potential carbon cost exposure. The most carbon intensive companies could have up to 114% of their EBIT at risk from a US\$10 carbon price (assuming no cost pass-through). More carbon efficient companies show greater resilience and as low as 10% of EBIT at risk from the same carbon price. Proposed revisions to the EU ETS, a system which covers eight of the cement companies in this report, are currently being submitted to policy makers. These include price support measures and changes to generous free allowance allocations which currently undermine incentives for cement companies to reduce emissions cost-effectively.
- ▼ Industry transition: to deliver deep decarbonisation in coming years, cement companies need to seek longer-term solutions such as carbon capture and storage (CCS) and develop less carbon-intensive cement products. Company disclosure on R&D spending and product development is currently inadequate to assess the extent to which companies are allocating their capital to benefit from a low-carbon transition.
- ▼ Consolidation: Lafarge and Holcim, who are strong performers in our analysis, merged in 2015. HeidelbergCement (sixth place) is due to acquire Italcementi (12th place) during 2016; the combined entity would benefit from HeidelbergCement's more efficient practices.
- ▼ Carbon regulation supportiveness: the three poorest performing companies in this key area, who are deemed as obstructive to progressive carbon

regulation, ranked at the bottom of the overall League Table, indicating that they are not preparing for a transition to a low-carbon economy.

- ▼ Fuel use: four companies source 20% or more of their thermal energy requirements from alternative fuels such as municipal waste and biomass. Such fuel sources can be more economical than traditional fossil fuels but are currently under-utilized by companies based in emerging markets, representing an opportunity for companies.
- ▼ Energy efficiency: energy represents around 30% of cement production costs and the most efficient company uses 25% less thermal energy per tonne of clinker produced than the least efficient.
- ▼ Water resilience: across the companies, more than 50% of facilities are currently located in areas of water stress, with 11% of facilities currently in 'high' or 'extremely high' water-stressed areas. This latter figure is projected to rise to 34% of facilities by 2030.

Company findings

- ▼ Holcim is ranked first and is one of only two companies that received an A-grade in the most important key area, emissions performance. It merged with Lafarge (ranked third) in 2015, the only other company to receive A and B-grades in all key areas. Lafarge and Holcim have amongst the lowest emissions intensities and set the most robust reduction targets. Individually the two companies were the largest cement producers by volume in the study and together they produce over three times as much as the next biggest producer of the League Table companies. Aggregating the two companies would result in a League Table score of 4.12 and the joint company ranking first.
- ▼ Shree Cement is ranked second and received an A-grade in emissions performance (it has the lowest cement production emissions intensity) and carbon regulation supportiveness. However it received a D-grade in water resilience due to its high exposure to water stress in India.
- ▼ Italcementi is ranked in last place and is the only company to receive D and E-grades across all key areas. It has the highest potential carbon pricing cost exposure, is deemed to be obstructive of carbon regulations and is significantly off-track to meet its own emissions-reduction target.
- ▼ Cementir is ranked second bottom and the company deemed as most obstructive to carbon regulation; it receives an E-grade in the carbon regulation supportiveness key area. Its cement production emission intensity has increased the most in recent years and it has amongst the highest proportion of EBIT at risk from carbon pricing.

- ▼ Japanese Taiheiyo Cement is ranked tenth. It has the highest emissions intensity of the companies and has the weakest emissions-reduction target. It has significant water stress risk in its operations (one of only two companies to receive an E-grade in water resilience) but discloses to CDP that it is not exposed to substantive water risks. It is also deemed to be obstructive to progressive carbon regulation.
- ▼ Cementos Argos (ranked fifth) received its only D-grade in energy and material management, partly due to its lack of historical information disclosure. It is also the only company not to independently verify its Scope 1+2 emissions. Better transparency and disclosure will aid the company's League Table position going forward.
- ▼ CRH, the company with the smallest proportion of revenue from cement production, is ranked fourth and receives no D or E-grades. It has one of the lowest proportions of EBIT at risk from carbon pricing, low water stress exposure and has been increasing its use of alternative fuel to meet its thermal energy requirements.
- ▼ HeidelbergCement is ranked mid-table and received B-grades in carbon cost exposure and water resilience, and is also one of only three companies to disclose use of an internal carbon price. However its lack of progress against its own emissions-reduction target partly explains its D-grade in emissions performance. We note that HeidelbergCement is due to acquire Italcementi during 2016.
- ▼ CEMEX also ranks mid-table and receives one D-grade, in its emissions performance. Its C-grade in energy and material management masks a contrasting performance in the key area – it has the highest utilization rate of alternative fuel but one of the highest thermal energy intensities. It is also deemed supportive of some carbon regulation measures and receives a B-grade in the key area.
- ▼ Buzzi Unicem is the best performer of the three Italian companies featured in the study but is ranked ninth overall. It received D-grades across all key areas except for water resilience (C-grade) and consistently under-performed relative to its peers in carbon-related metrics.
- ▼ Ultratech Cement is ranked eighth and received a D-grade in emissions performance, the key area which carries the greatest weight in the League Table. Similar to the other Indian company assessed, Shree Cement, it achieved an A-grade for carbon regulation supportiveness but it has the highest exposure to water stress amongst the companies.

Scope of report: Company selection

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

- ▼ Started with the 27 construction materials companies that responded to CDP's 2015 climate change questionnaire.
- ▼ Excluded subsidiaries and privately owned companies.
- ▼ Ranked the companies by market capitalization and Scope 1+2 emissions and selected the top 19. This equates to companies with a total market capitalization of US\$143bn.
- ▼ Reviewed the business activities and shareholdings of the 19 companies which resulted in the exclusion of:
 - ▼ Asia Cement due to its shareholder base.
 - ▼ Marshalls due to its relative size.
 - ▼ Boral, Imerys, Fletcher Building and CSR due to their significantly diverse operations (which include cement production to lesser degrees).
 - ▼ PPC due to lack of disclosure quality.

The chosen 12 companies represent approximately US\$123bn in market capitalization and account for 87% of the combined emissions (Scope 1+2) of the 27 relevant companies that responded to CDP. The primary business activities of the 12 companies are production of cement, aggregates, ready-mix concrete and asphalt.

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 League Table is not intended to identify definitive winners and losers for investment purposes, but more as a proxy for business-readiness in an industry likely to be impacted by more stringent carbon regulations needed to meet long-term carbon objectives and worsening water security.

We would flag that companies towards the bottom of our League Table are possibly higher risk investments from a regulatory perspective than those towards the top.

Methodology

We score each cement company based on a number of different metrics which are ranked and then weighted within each key area (see table below for metric weightings within each key area). We then grade each area from A to E based on these weighted ranks. We calculate the overall League Table score by collating the weighted ranks for each key area.

Each of the key areas has a separate chapter within this report in which we disclose the precise methodology for how we rank each metric.

In addition to the five key areas, we also include CDP's climate change performance band for 2015 in the League Table. It scores the 2,233 companies that responded 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 and implies a well-run business and forward-looking management.

For further study

Areas of interest to investigate further include:

- ▼ Advanced carbon pricing modelling to analyse carbon prices at which certain abatement actions (such as material substitution or CCS) become economical for companies.
- ▼ Analysis of cement companies' electricity costs, which typically account for half of company energy expenditure despite only representing approximately 15% of energy consumption in cement production.
- ▼ Enhanced analysis of company R&D expenditures (e.g. on CCS pilot schemes) and sales exposure to low-carbon cement products.

A summary of key areas, associated metrics and relative weighting with the League Table

Key area in League Table	Link to company earnings	Metrics	Metric weighting within each key area	Key area weighting in overall League Table
Emissions performance	Carbon intensity of production is taken as a proxy for wider company output efficiency as measures taken to reduce emissions can deliver cost benefits. Future reduction targets are indicative of company emissions management intentions.	i) Reduction in cement production emissions intensity (2008-2014). ii) Current cement production emissions intensity (2012-2014). iii) Quality of emissions-reduction target. iv) Performance against target. v) Emission data transparency.	12% 18% 30% 20% 20%	30%
Energy and material management	Energy can represent up to 30% of cement production costs. Thermal energy efficiency measures can reduce energy usage, whilst switching to alternative fuels can deliver both cost and emissions savings relative to fossil fuels. Greater material blending to reduce cement clinker content can reduce thermal energy requirements, costs and emissions.	i) Thermal energy intensity of clinker production. ii) Alternative fuel use. iii) Clinker-to-cement ratio.	30% 40% 30%	25%
Carbon cost exposure	This is the financial exposure of meeting potential emissions costs of carbon pricing schemes across two scenarios. This is a direct financial cost to companies and thus impacts net earnings.	i) Carbon cost exposure under intensity benchmarking. ii) Carbon cost exposure under auctioning. iii) Company use of internal CO ₂ price.	50% 30% 20%	20%
Water resilience	Localized water issues at cement production sites can pose risks to operational continuity at locations experiencing water stress.	i) Water stress risk exposure. ii) Water consumption intensity (2008-2014).	70% 30%	10%
Carbon regulation supportiveness	Companies that are supportive of regulation which facilitates a low-carbon transition are likely to be better placed to benefit from it.	i) InfluenceMap organizational score.	100%	10%
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 performance band.	100%	5%

Source: CDP

Emissions performance

- ▼ Shree Cement is a leader. It has aggressively decreased its cement production emissions year-on-year since 2008 and has a strong forward-looking emissions-reduction target.
- ▼ Italcementi and Cementir are the poorest performers. Italcementi significantly underperforms against its own target that is inconsistent with a 2-degree transition and Cementir increased its emissions intensity the most since 2008.
- ▼ Cementos Argos performs well against its own forward reduction target but is the only company that does not undertake external verification of its Scope 1+2 emissions.

Overview

The cement industry is amongst the most emissions-intensive and accounts for approximately 5%² of global man-made CO₂ emissions. Against the backdrop of a binding agreement at COP21 in Paris, emissions regulations are one of the highest stakeholder concerns raised by companies in annual reporting to investors.

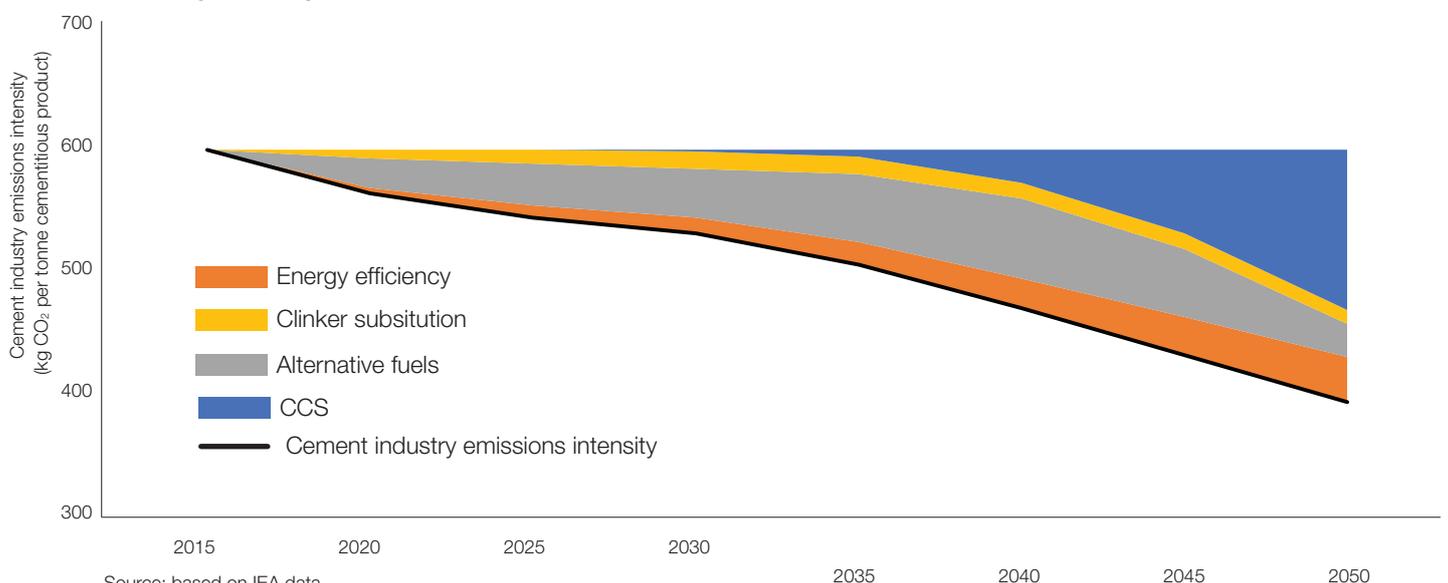
Emissions from cement production originate from the calcination of limestone (50% of emissions) and through fossil fuel burning to heat kilns (40% of emissions) to produce clinker, an intermediate product which is ground into cement. Emissions-reduction efforts can be achieved in the clinker manufacturing process by increasing the use of alternative fuels and improving kiln thermal energy efficiency – both of which can deliver cost benefits. Furthermore, the overall cement production process can become less emissions-intensive through reducing the clinker content of cement by blending in substitute materials. The degree to which companies exploit these emission-reduction levers is explored in the second chapter.

The industry will need to undertake considerable further measures post-2025 in order to remain consistent with a transition to a low-carbon economy as per the roadmap below.

The current industry decarbonisation pathway tightens over time from an emissions intensity level of 590kg CO₂ per tonne cement in 2014 to 380kg CO₂ per tonne cement by 2050. Companies will be required to take increasingly aggressive abatement action over time to be consistent with the trajectory, including deploying CCS and fully exploiting fuel switching, energy efficiency and material substitution opportunities.

In this chapter we assess companies' emissions performance by analyzing cement production emissions, as these account for the overriding majority of company emissions. We identify five key metrics across three different areas to assess cement companies' past and current emissions performance as well as forward-looking emissions-reduction ambition by using science-based target trajectories from the Sectoral Decarbonization Approach (SDA)³.

Cement industry roadmap



Emissions intensity performance

We analyze the historic trends in gross direct (Scope 1) cement production emissions from 2008-2014. Due to the emissions-intensive nature of cement production, these account for the overriding majority of total company emissions (up to 90%).

We use emissions-intensity metrics (normalized by tonne of cementitious material as per the CSI's⁴ recommended industry reporting) rather than absolute emission levels to avoid penalizing companies that grow faster than others.

▼ **Metric 1) Reduction in cement production emissions intensity:** This metric identifies the extent to which companies have reduced their emissions intensity over the period 2008-2014. As cumulative carbon emissions matter from a global warming perspective, instead of using a compound annual growth rate (CAGR) calculation, which only looks at the first and final year's data points, we apply a proprietary function which accounts for a company's emissions-intensity profile over each of the years 2008-14 and adjusts for anomalies.

▼ **Metric 2) Current cement production emissions intensity:** This metric identifies the companies with the lowest current emissions intensity of cement production. We acknowledge that it is difficult to compare a set of cement companies with varying degrees of exposure to other construction products such as aggregates and asphalt, which is why we assess companies' cement production efficiency, the primary source of their emissions.

Our proprietary analysis assesses the quality of each company's emissions-reduction target as well as each company's performance against its target. Our model assesses company emissions performance annually to recognize the cumulative nature of a global carbon budget.

▼ **Metric 3) Quality of emissions-reduction target:** This metric determines whether each company target is weaker or stronger than the science-based decarbonisation pathway for the cement industry which is 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 partner, and analyse both the target rate of emissions-reduction and emissions-intensity target level.

▼ **Metric 4) Performance against target:** This metric judges 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 reduced carbon risk.

Future targets

We assess companies' emissions-reduction targets using two forward-looking metrics: quality of emissions-reduction target and performance against target. We believe they can be used as a proxy for a company's intentions towards future emissions management measures.

All companies in our sample have at least one emissions-intensity reduction target for their own cement production. The majority of companies' forward-looking targets expire within the next four years, representing an opportunity for companies to set forthcoming targets that are both long-term and sufficiently ambitious, as well as outlining how they intend to achieve such reductions.

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 this transparency to reduce 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 or uncertainties relative to the reporting boundary.

3. 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".

4. CSI is the Cement Sustainability Initiative. It is a global effort by 25 major cement producers with operations in more than 100 countries who believe there is a strong business case for the pursuit of sustainable development. This falls under the authority of the World Business Council for Sustainable Development. For more details please visit www.wbcsdcement.org.

Highlights

- Shree Cement is ranked first. It has the lowest current cement production emissions intensity and has significantly reduced this since 2008. The company has a science-based forward-looking target and has made significant progress towards achieving it.
- Holcim and Lafarge ranked second and third respectively and have the most robust emissions-reduction targets.
- Cementos Argos is ranked fourth. It has reduced its cement production emissions intensity the most since 2008 and performs well against its own target. However, it performs poorly in emissions data transparency, as its Scope 1+2 emissions are not verified.
- Many existing company targets do not align with a transition towards a low-carbon economy and only three companies - Holcim, Lafarge and Shree Cement - have 2015 intensity target levels stronger than the industry science-based trajectory.
- Buzzi Unicem, Cementir, CEMEX and Ultratech Cement have on average increased their cement production emissions intensities from 2008-2014.

Emissions intensity performance

- Eight companies have reduced their cement production emissions intensity since 2008. The remaining four have increased emissions per tonne of cement annually over the same period.
- Cementos Argos has reduced its direct cement emissions intensity by the most (7% annually) and Shree Cement is the only other company to reduce its emissions intensity by more than 5% per year.
- Shree Cement has the lowest current cement production emissions intensity (585 kg of CO₂ per tonne of cementitious material), closely followed by Lafarge and Holcim.
- Cementir has one of the highest cement production emissions intensities, which has also increased the most since 2008.
- Taiheiyō Cement is also a laggard despite reducing its emissions intensity by over 1% a year from 2008-2014.
- Cementir and Buzzi Unicem do not disclose emissions per tonne of cementitious material. Instead, they report emissions per tonne of cement equivalent which is inconsistent with their peers.

Emissions performance summary

Company	Emissions intensity performance	Future targets	Data transparency	Overall weighted rank	Emissions performance rank	Emissions performance grade
Shree Cement	1	2	2	3.0	1	A
Holcim	3	2	2	3.7	2	A
Lafarge	4	1	11	4.8	3	B
Cementos Argos	2	4	12	5.5	4	C
CRH	5	7	1	5.7	5	C
HeidelbergCement	7	8	8	7.3	6	D
Buzzi Unicem	8	10	5	7.4	7	D
Ultratech Cement	5	11	5	7.4	7	D
Taiheiyō Cement	9	9	4	7.4	9	D
CEMEX	10	6	9	7.7	10	D
Cementir	12	5	10	8.2	11	E
Italcementi	11	12	5	9.0	12	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

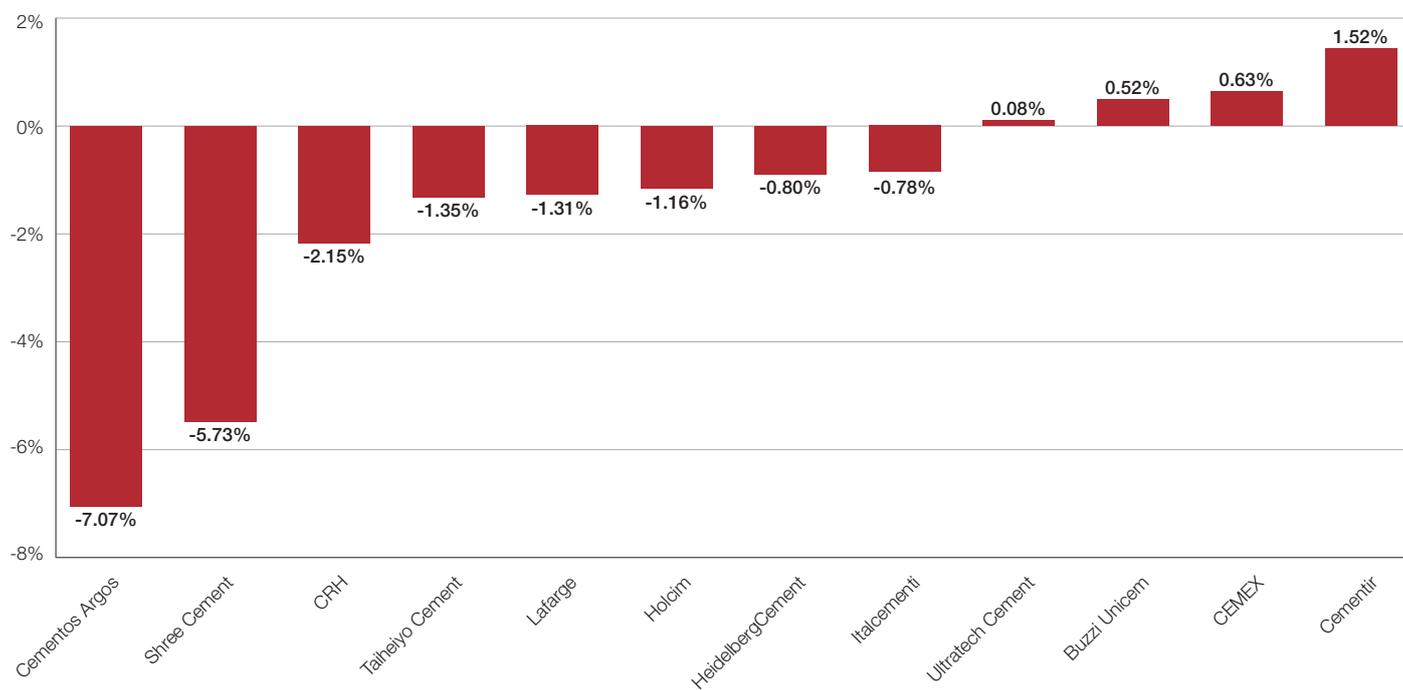
Emissions intensity performance summary

Company	Reduction in emissions intensity 2008-2014	Current emissions intensity	Overall weighted rank	Emissions intensity rank
Shree Cement	2	1	1.4	1
Cementos Argos	1	4	2.8	2
Holcim	6	2	3.6	3
Lafarge	5	3	3.8	4
CRH	3	9	6.6	5
Ultratech Cement	9	5	6.6	5
HeidelbergCement	7	7	7.0	7
Buzzi Unicem	10	6	7.6	8
Taiheiyu Cement	4	12	8.8	9
CEMEX	11	8	9.2	10
Italcementi	8	11	9.8	11
Cementir	12	10	10.8	12

Weighting **40%** **60%**

Source: CDP

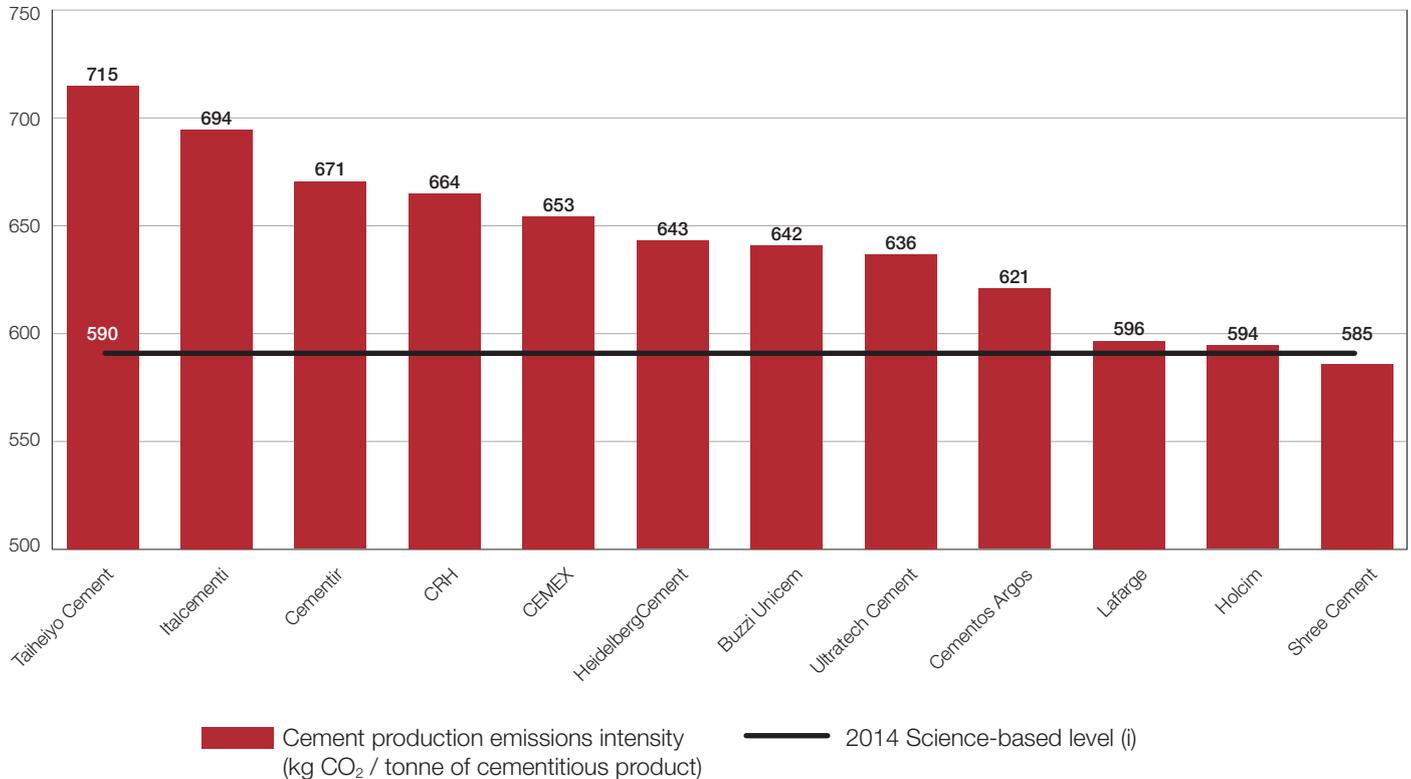
Metric 1) Reduction in cement production emissions intensity (2008-2014)



■ Emissions intensity reduction rate per annum

Source: CDP, company data

Metric 2) Current emissions intensity (2012-2014)



(i) This is the 2014 intensity level in line with the science-based decarbonization trajectory. Source: CDP, company data

Carbon capture and storage (CCS)

Methods to capture cement process carbon emissions are being developed by companies as a necessary way of decarbonizing the industry. CCS is particularly important for the cement industry to drive deep abatement by capturing 'irreducible' emissions originating from the calcination of limestone rather than from fossil fuel burning. Examples of company involvement in CCS projects include:

- ▼ Norcem (a HeidelbergCement subsidiary) leads a CCS pilot project⁵ in Brevik⁶, Norway, which uses excess heat from cement production to capture CO₂ using four techniques. The project, which runs from 2013-2017, cost €12.5m and is expected to capture up to 250,000 tonnes of CO₂ (30% of total plant emissions).
- ▼ CEMCAP⁷ is another CCS project designed to prepare the ground for large-scale deployment in the European cement industry through developing cost-efficient retrofitted carbon capture technologies. The project, which started in 2015, is expected to last three years and cost €10 million.

5. www.globalccsinstitute.com/insights/authors/dennisvanpuylvelde/2013/09/20/capturing-co2-norwegian-cement-industry.

6. Plant capacity: 1.1 tonnes of clinker and 1.3 million tonnes of cement.

7. CEMCAP is a project funded by Horizon 2020 addressing CO₂ capture from cement production

Future targets

- ▼ Almost half of the company reduction targets reported to CDP expired in 2015 and all but one mature by 2020. Cementos Argos has the longest-dated target which extends to 2025.
- ▼ Holcim and Lafarge are the leaders in the ambition of their targets. Both outperform the other companies on their target intensity levels and the aggressiveness of the intensity reductions required to meet their targets⁸.
- ▼ Buzzi Unicem, Ultratech Cement and Italcementi are ranked bottom. Their targets are inconsistent with science-based levels and Italcementi is set to miss its own target.
- ▼ Only three of the 12 companies have a reduction target consistent with science-based intensity levels in 2015.
- ▼ Five of the 12 companies are significantly off-track to meet their own emissions-reduction target. Only Cementir, Cementos Argos and Taiheiyo Cement are on track to meet their target. However, we note that Taiheiyo Cement has the weakest target.
- ▼ We note that the industry decarbonization pathway does not dictate aggressive abatement until 2025 which explains why all company intensity targets analyzed are steeper in their reduction than science-based trends in the years until 2025. To account for this we have complemented the analysis of target reduction rate with the intensity level required to be consistent with a 2-degree transition.

Metric 3) Quality of emissions-reduction target

Companies	% beat/(miss) 2015 science based intensity level	Rank	% beat/(miss) science-based slope	Rank	Weighted rank	Overall rank
Lafarge	2%	2	3%	2	2.0	1
Holcim	5%	1	2%	4	2.2	2
CEMEX	-1%	4	2%	5	4.4	3
Shree Cement	2%	3	1%	8	5.0	4
CRH	-2%	5	2%	7	5.8	5
HeidelbergCement	-2%	6	2%	6	6.0	6
Cementos Argos	-14%	11	5%	1	7.0	7
Cementir	-11%	10	3%	3	7.2	8
Italcementi	-5%	7	1%	9	7.8	9
Ultratech Cement	-6%	8	1%	11	9.2	10
Buzzi Unicem	-6%	9	1%	10	9.4	11
Taiheiyo Cement	-24%	12	0%	12	12.0	12

Weighting

60%

40%

Source: CDP, company data

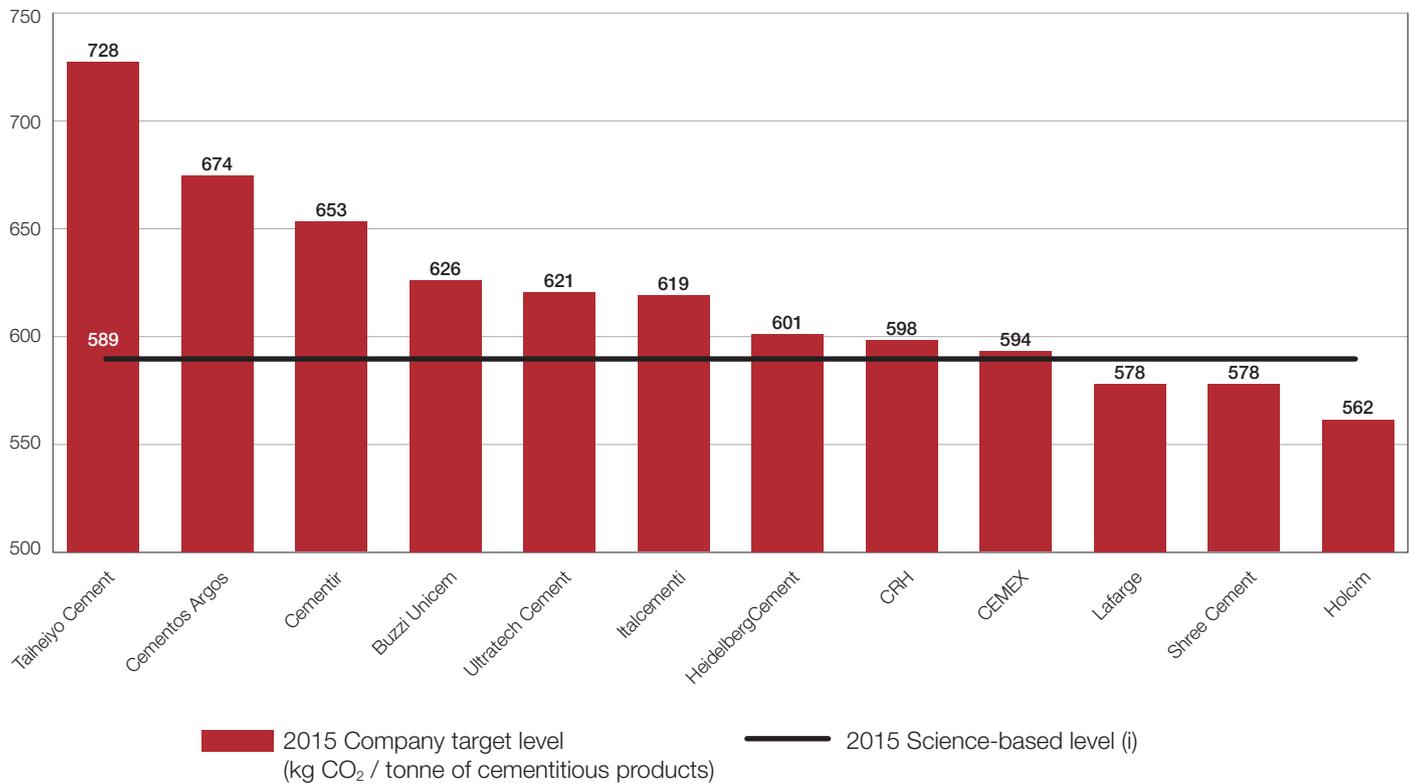
Metric 4) Performance against target

Companies	% beat/(miss) company's target	Performance against target rank
Cementos Argos	4.0%	1
Taiheiyo Cement	1.5%	2
Cementir	1.2%	3
Buzzi Unicem	-0.1%	4
Shree Cement	-0.2%	5
Lafarge	-0.4%	6
Ultratech Cement	-1.3%	7
Holcim	-3.2%	8
HeidelbergCement	-4.4%	9
CRH	-5.9%	10
CEMEX	-6.2%	11
Italcementi	-11.9%	12

Source: CDP, company data

8. LafargeHolcim recently announced an intensity reduction target of 37% on 1990 levels which appears to be consistent with the industry science-based pathway. However we cannot fully analyze this target as we lack historical emissions data for the merged entity. We expect this to be forthcoming from the company in future disclosure reporting.

Component of metric 3) company intensity target levels in 2015



(i) This is the required intensity level for cement companies' targets to be consistent with a 2-degree transition (science-based industry decarbonization pathway).
Source: CDP, company data

Data transparency

▼ CRH is ranked first as it verifies 100% of its Scope 1+2 emissions with reasonable assurance.

▼ Cementos Argos is the only company not to verify their CO₂ emissions.

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
CRH	1	17.6	OC	Complete	Reasonable	100%	0%<X<2%	Complete	Reasonable	100%	0%<X<2%
Holcim	2	13.7	OC	Complete	Limited	100%	0%<X<2%	Complete	Limited	100%	0%<X<2%
Shree Cement	2	13.7	OC	Complete	Limited	100%	0%<X<2%	Complete	Limited	100%	0%<X<2%
Taiheiyō Cement	4	13.5	OC	Complete	Limited	100%	2%<X<5%	Complete	Limited	100%	0%<X<2%
Italcementi	5	13.3	OC	Complete	Limited	100%	2%<X<5%	Complete	Limited	100%	2%<X<5%
Buzzi Unicem	5	13.3	OC	Complete	Limited	100%	2%<X<5%	Complete	Limited	100%	2%<X<5%
Ultratech Cement	5	13.3	OC	Complete	Limited	100%	2%<X<5%	Complete	Limited	100%	2%<X<5%
HeidelbergCement	8	10.0	FC	Complete	Limited	99%	0%<X<2%	Complete	Limited	99%	2%<X<5%
CEMEX	9	9.2	FC	Complete	Limited	99%	2%<X<5%	Complete	Limited	87%	2%<X<5%
Cementir	10	5.0	OC	Complete	Limited	74%	0%<X<2%	None	NR	NR	2%<X<5%
Lafarge	11	4.9	OC	Complete	Limited	41%	0%<X<2%	Complete	Limited	41%	5%<X<10%
Cementos Argos	12	0.0	OC	None	NR	NR	NR	None	NR	NR	NR

(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

GHG emissions analysis for cement companies is not as challenging as for other sectors because companies are broadly consistent in their reporting of direct cement production emissions-intensity levels. Nearly all companies follow the Cement Sustainability Initiative's (CSI) CO₂ and energy accounting and reporting standard for the cement industry⁹. The framework provides a comparable emissions-intensity figure of cement production which companies report for 2008-2014. Using cementitious material as a normalization factor allows us to meaningfully compare companies as well as focus on cement process emissions performance, which accounts for the large majority of company emissions. All the companies, apart from Cementir and Buzzi Unicem, report their cement production emissions per tonne of cementitious material¹⁰.

The overall emissions performance rank and grades are determined as follow:

- ▼ We combine the weighted ranks of the three areas using the following weightings: emissions intensity performance 30%, future targets 50%, data transparency 20%. This determines the overall weighted rank for emissions performance.
- ▼ The emissions performance grade is awarded according to the overall weighted rank.

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

Emissions intensity performance

Data collation:

We apply the following steps to ensure the data is as consistent and credible as possible for our intensity analysis:

- ▼ Collate direct gross cement production emissions intensities for 2008-14.
- ▼ Replace this with restated emissions data where available.

We urge companies to provide improved transparency on direct cement emissions data as follows:

- ▼ Firstly, making restated emissions data 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 intensities by each relevant normalization factor (including per cementitious material) are available for all years back to a target's base year.

We combine the weighted ranks of the two below metrics in the area using the following weightings: metric 1) 40%, and metric 2) 60%.

Metric 1) Reduction in cement production emissions intensity:

- ▼ We collate direct cement production emissions per tonne of cementitious material for the seven-year period 2008-2014 from company sources.
- ▼ For Cementir and Buzzi Unicem we convert the emissions intensity from cement equivalent to cementitious material using a 7% reduction factor. This is the median ratio computed from companies who report cement production emissions intensity both per tonne of cementitious material and per tonne of cement equivalent.

Once we have a complete dataset for direct cement production emissions per tonne of cementitious material we apply the following steps:

- ▼ We use our proprietary function to assess the companies' emissions-reduction performance for each of the following periods: 2008-2014, 2009-2014 and 2010-2014.
- ▼ Our function takes into account 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 intensity over a period and calculates the implied constant reduction rate per annum required to create the same aggregate emission profile (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 reduction 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 constant reduction rate with the companies who have reduced their emissions more aggressively favoured.

9. http://www.wbcsdcement.org/pdf/tf1_co2%20protocol%20v3.pdf

10. Cementitious material = all clinker produced + gypsum + limestone + all clinker substitutes + all cement substitutes.

Metric 2) Current cement production emissions intensity:

- ▼ We collate direct cement production emissions per tonne of cementitious material for the three-year period 2012-2014 from company sources.
- ▼ We calculate the median emissions intensity over the three-year period of 2012-2014.

Future targets

We combine the weighted ranks of the two metrics in the area using the following weights: metric 3) 60%, and metric 4) 40%.

Note:

- ▼ Where companies have more than one target, we select the strongest target for inclusion in both metrics 3) and 4).
- ▼ Three companies disclose absolute emissions-reduction targets; however, we assess intensity targets in order to make the analysis comparable.
- ▼ Cement production emissions intensity is measured using tonne of cementitious material as a normalization factor. For Cementir and Buzzi Unicem we use emissions intensity converted from per tonne of cement equivalent to per tonne of cementitious material as described above.

Metric 3) Quality of emissions-reduction target:

- ▼ We assess whether the companies' emissions-reduction targets are stronger or weaker than science-based targets for cement production.
- ▼ We adopt the methodology of the Sectoral Decarbonization Approach (SDA), published by the Science-Based Targets collaboration¹¹.
- ▼ We compare the intensity level and reduction slope of company targets against the associated cement industry science-based target based on emissions pathways using IEA data.

Target level:

- ▼ We start by modelling companies' emissions for 2015 using their emissions-reduction target. We assume a compound annual growth rate (CAGR) over the life of the companies' targets which allows us to work backwards from the target year to 2015.

- ▼ The CAGR is derived from the base year, target year, base year emissions intensity and % reduction targeted by the company.
- ▼ We calculate the percentage by which the 2015 company intensity target beats or misses the emissions intensity level required by the SDA pathway in 2015 (589 kg of CO₂ per tonne of cementitious material). We chose 2015 because almost half of the reported targets ended in the year.

Target reduction slope:

- ▼ We start by modelling companies' emissions from 2010-2015 using their emissions-reduction target. We assume a constant CAGR over the life of the companies' targets which allows us to work backwards from the target year to 2010.
- ▼ The CAGR is derived from the base year, target year, base year emissions intensity and % reduction targeted by the company.
- ▼ We apply the cement SDA industry pathway for direct emissions (Scope 1) from 2010-2015, using the same 2010 starting point as in the previous step.
- ▼ We compare the modelled emissions of each company with the SDA intensity pathway over the period 2010-2015 (annual science-based emissions).
- ▼ We apply the following formula for each year assessed: annual science-based emissions less modelled target emissions = beat (positive value) or miss (negative value) annual science-based emissions (for the year).
- ▼ We sum the annual beats or misses from 2010-2015.
- ▼ We divide this aggregate value by the aggregate value of the annual science-based emissions over the same period.
- ▼ This gives the % beat or miss used to determine our science-based slope rankings.

11. 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".

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 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 intensity targets (i.e. those with sufficient scope and degree of ambition).
- ▼ We apply the following steps:
 - ▼ We assume that the level required to meet the target follows a CAGR from the base year emissions over the period to the target¹².
 - ▼ 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 modelled target hurdle).
 - ▼ We apply the following formula for each year assessed: modelled target hurdle less actual emissions = beat (positive value) or miss (negative value) the modelled target hurdle (for the year).
 - ▼ We sum the annual beats or misses from the 2010-2014 and divide this aggregate value by the aggregate value of the annual modelled figure over the same period.
 - ▼ This gives the % beat or miss used to determine our metric 4) rankings.
- ▼ The % beat or miss is 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'.

Transparency on emissions

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) 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.

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

Energy and material management

- ▼ No single company outperforms across all the three aspects of energy and material management and no company is awarded an 'A' grade.
- ▼ Buzzi Unicem is ranked second bottom. It has highest thermal energy intensity as well as using a high proportion of clinker in its cement production.

Overview

Energy represents around 30% of cement production costs and contributes approximately 40% of total industry emissions. Managing the sourcing and efficient use of energy is an opportunity to deliver cost savings for companies, which have been largely reliant on fossil fuels (coal and petcoke) to date. Cement companies have three existing levers to manage their energy and material use and reduce process costs (and emissions):

- ▼ Thermal energy efficiency measures that can reduce fuel consumption through using dry kilns with pre-heating and pre-calcination. Such measures can be retrofitted to existing assets and decrease energy requirements by up to 40%¹³ depending on the original technology. The most efficient companies in this report use 25% less thermal energy per tonne of clinker produced than the least efficient, and by implementing thermal energy efficiency measures, companies can reduce a sizeable proportion of their cost base.
- ▼ Switching kiln feedstock energy sources from fossil fuels to using alternative fuels such as burning waste materials or carbon-neutral biomass. Regulatory incentives mean some waste fuels (municipal waste which is otherwise burned in incinerators or sent to landfills) carry a negative price, meaning companies are paid to use them in cement kilns. As well as delivering potential economic upside opportunities for companies, alternative fuel use can also enhance energy security. As there is no technical limitation to alternative fuels use in cement kilns, there is significant scope to utilize waste fuels to a greater degree.
- ▼ Reducing the clinker content of cement products by using decarbonated substitute materials with cementitious properties, such as coal plant fly ash or steel blast furnace slag. This can decrease the amount of energy (and emissions) intensive clinker used per tonne of cement product.

In this chapter we assess the extent to which companies have exploited these levers using three key metrics:

- ▼ **Metric 1) Thermal energy intensity of clinker production:** We assess the extent to which companies deploy kiln efficiency measures to reduce clinker production thermal energy intensity over time and deliver energy use savings.
- ▼ **Metric 2) Alternative fuel use:** This metric identifies which companies have been increasing their alternative fuel use (as a proportion of total energy consumed) to meet their thermal energy needs in recent years.
- ▼ **Metric 3) Clinker-to-cement ratio:** This ranks companies on the extent to which they use clinker substitutes in their cement and how this has changed over time.

Overview of company energy and material management data

League Table companies	Thermal energy intensity (MJ/tonne clinker)	Alternative fuel use (%)	Clinker-to-cement ratio
Minimum	3,002	2%	69%
Median	3,613	14%	77%
Maximum	4,009	28%	81%

Source: CDP, company data

13. <https://www.epa.gov/sites/production/files/2015-12/documents/cement.pdf>

Highlights

- ▼ CRH is ranked first. It has rapidly increased its alternative fuel use and reduced its thermal energy consumption intensity in recent years. However as its clinker-to-cement ratio remains high it is not awarded an 'A' grade.
- ▼ Holcim is ranked second. It tops the clinker-to-cement ratio ranking and has decreased the average clinker content of its cement from 2010-2014 by almost 1 percentage point a year.
- ▼ Four companies source 20% or more of their energy requirements from alternative fuels, with CEMEX utilizing the highest proportion (28%). Alternative fuel use amongst emerging market companies remains very low but growing in India, representing an opportunity for companies with operations in the country.
- ▼ Buzzi Unicem is ranked second bottom despite using alternative fuels for 20% of its thermal energy needs. It has the least energy efficient clinker production and its cement has one of the highest clinker contents.
- ▼ Cementir is ranked fifth and has the strongest performance in thermal energy intensity of clinker production; it decreased its intensity by over 2% annually from 2010-2014. However, it has the lowest use of alternative fuel amongst European companies and a high clinker-to-cement ratio.
- ▼ Cementos Argos' low ranking is driven by lack of disclosure of historical energy and clinker data.

Energy and material management summary

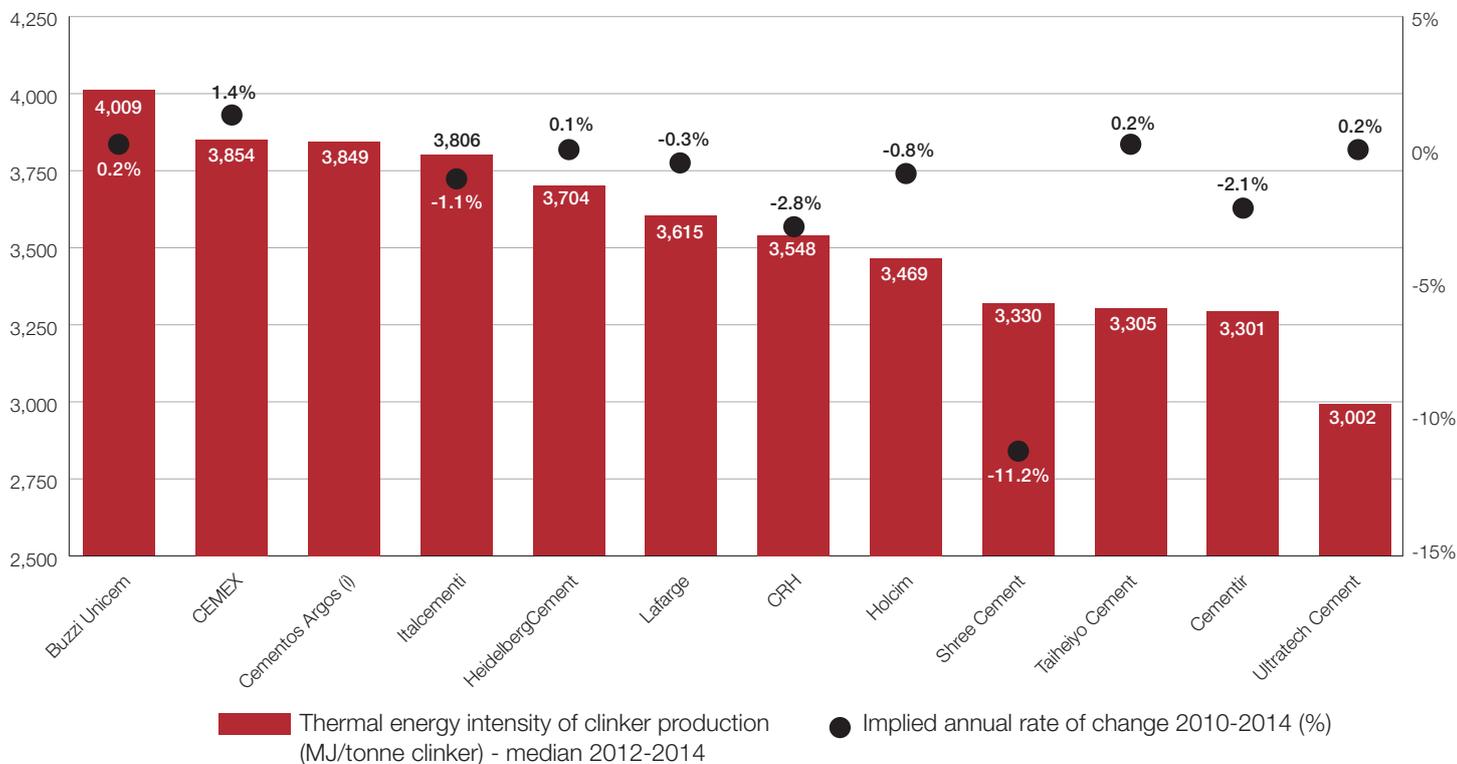
Company	Thermal energy intensity of clinker production	Alternative fuel use	Clinker-to-cement ratio	Overall weighted rank	Energy and material management rank	Energy and material management grade
CRH	4	2	8	4.8	1	B
Holcim	5	8	1	5.0	2	B
Shree Cement	2	11	2	5.1	3	B
Lafarge	7	4	3	5.2	4	B
Cementir	1	9	7	6.2	5	C
HeidelbergCement	9	3	5	6.3	6	C
CEMEX	11	1	6	6.3	7	C
Ultratech Cement	2	10	9	6.7	8	C
Taiheiyō Cement	6	6	11	6.8	9	C
Italcementi	8	7	12	7.8	10	D
Buzzi Unicem	12	5	10	8.4	11	D
Cementos Argos	10	12	4	9.1	12	D

Weighting **30%** **40%** **30%**

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.

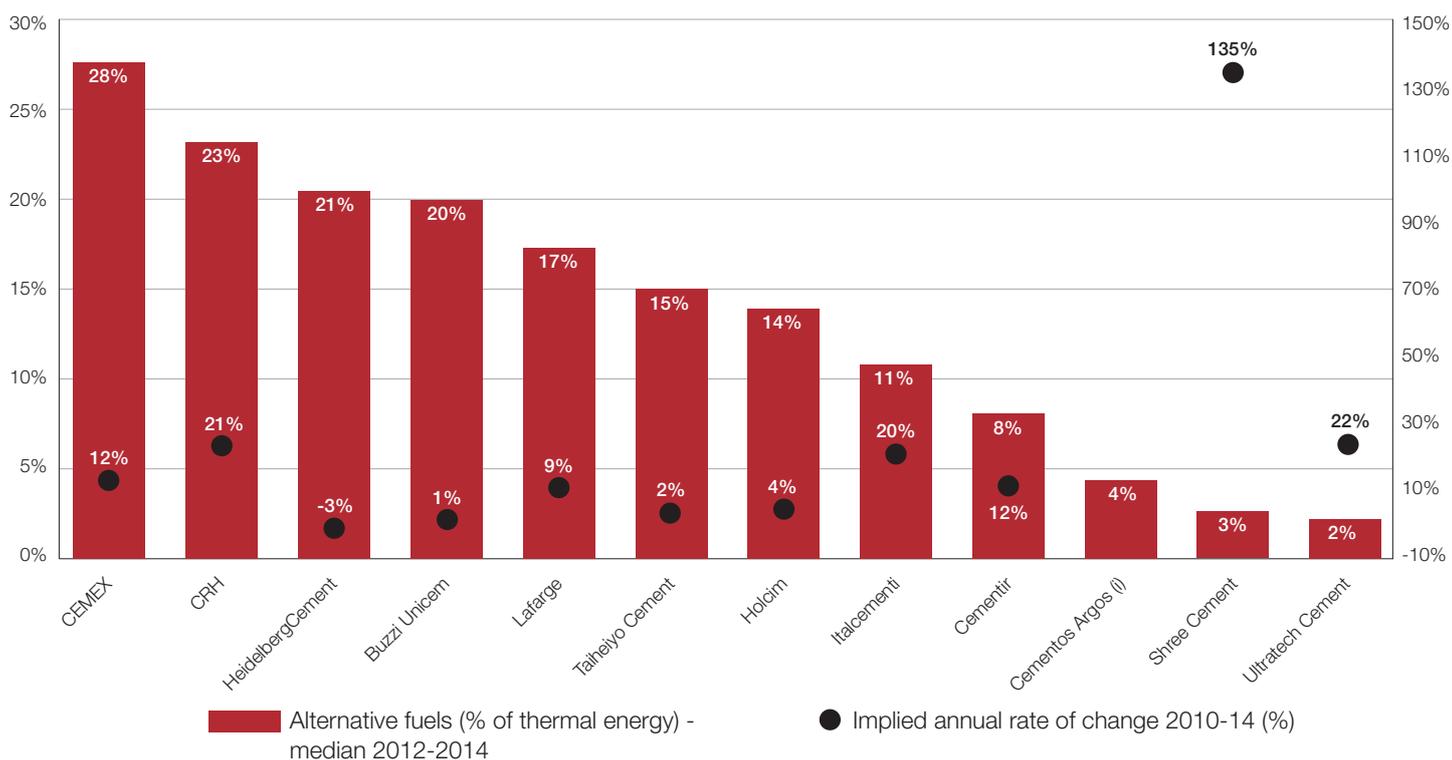
Source: CDP

Metric 1) Thermal energy intensity of clinker production (LHS) and rate of change (RHS)



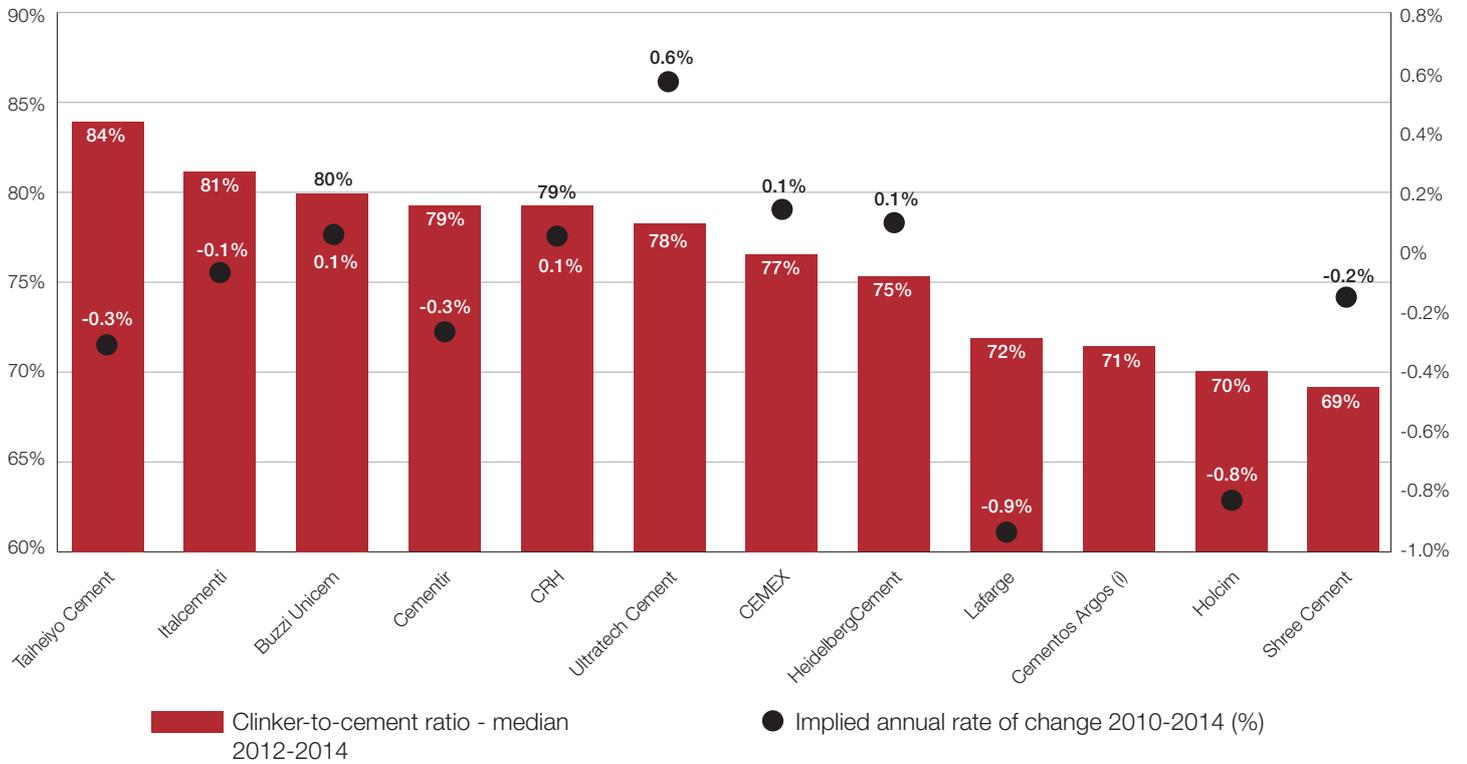
(i) We were unable to calculate the implied annual rate of change for Cementos Argos due to insufficient historical data disclosure.
Source: CDP

Metric 2) Alternative fuel use in cement production (LHS) and rate of change (RHS)



(i) We were unable to calculate the implied annual rate of change for Cementos Argos due to insufficient historical data disclosure.
Source: CDP, IEA, company data

Metric 3) Clinker-to-cement ratio in production (LHS) and rate of change (RHS)



(i) We were unable to calculate the implied annual rate of change for Cementos Argos due to insufficient historical data disclosure.
Source: CDP, company data

Methodology and limitations

The overall energy and material management rank and grades are determined as follows:

- ▼ We combine the weighted ranks of the three metrics using the following weightings: metric 1) 30%, metric 2) 40% and metric 3) 30%. This determines the overall weighted rank for energy and material management.
- ▼ The energy and material management grade is awarded according to the overall weighted rank.

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

Metric 1) Thermal energy intensity of clinker production:

- ▼ We collate thermal energy intensity data (MJ/tonne of clinker) for 2010-2014 from companies' annual reports.
- ▼ We use our proprietary function to calculate the implied annual rate of change of companies' thermal energy intensity for the period 2010-2014¹⁴.
- ▼ The function measures the total energy intensity over 2010-2014 and calculates the implied constant reduction rate per annum required to create the same final energy intensity starting from 2010.
- ▼ The weight rank for the metric is calculated by applying a 30% weight to the trend rate and 70% weight to the level.

Metric 2) Alternative fuel use:

- ▼ We collate alternative fuel use data (% of total cement production fuel consumption) for 2010-2014 from companies' annual reports.
- ▼ We use our proprietary function to assess the companies' change in % alternative fuel use for the period 2010-2014¹⁵.
- ▼ The function measures the total alternative fuel use over 2010-2014 and calculates the implied constant growth rate per annum required to create the same final alternative fuel use starting from 2010.
- ▼ The weight rank for the metric is calculated by applying a 30% weight to the trend rate and 70% weight to the level.

Metric 3) Clinker-to-cement ratio:

- ▼ We collate clinker-to-cement ratio (%) data for 2010-2014 from companies' annual reports.
- ▼ We use our proprietary function to assess the companies' intensity change for the period 2010-2014.
- ▼ The function measures the total clinker content of cement over 2010-2014 and calculates the implied constant reduction rate per annum required to create the same final clinker content of cement starting from 2010.
- ▼ The weight rank for the metric is calculated by applying a 30% weight to the trend rate and 70% weight to the level.

Other limitations

- ▼ Certain alternative fuels (such as waste sludge) have a lower calorific value than traditional fossil fuels such as coal or petcoke and therefore greater volumes need to be combusted to generate the same amount of thermal energy. This can create trade-offs for companies around maintaining an efficient balance between energy use, emissions and costs.
- ▼ Product standard regulations can limit the scope for companies to decrease the clinker content of the cement they produce, depending on its final use (e.g. certain construction standards require a high clinker content of cement for structural purposes).
- ▼ The economics of alternative fuel use alter according to local regulations around waste disposal and pricing (e.g. EU waste directive) and local waste collection networks.
- ▼ As the wider economy decarbonises, the availability of clinker substitutes such as fly ash from coal plants or steel blast furnace slag may reduce over time.

14. For Taiheiyō Cement the analysis was undertaken for 2009-2013 and 2011-2014 for Cementos Argos.

15. For Taiheiyō Cement the analysis was undertaken for 2009-2013.

Carbon cost exposure

- ▼ Italcementi, Cementir and Buzzi Unicem are ranked in the last three. They have significant proportions of EBIT at risk under intensity benchmarking and auctioning carbon regulation pricing scenarios.
- ▼ Holcim is ranked first, while CRH and Lafarge are second and third respectively. They have amongst the lowest EBIT risk exposures in carbon regulation pricing scenarios.
- ▼ Only three companies in our study disclose use of an internal carbon price, ranging from US\$23-\$32 per tonne of carbon-equivalent.

Overview

The companies in our studies operate in 103 countries, of which 41 have current or planned carbon pricing schemes in various forms such as direct CO₂ taxes, emissions trading systems (ETSs) and fossil fuel purchase taxes. Approximately a third of companies' direct emissions are covered by existing or announced carbon pricing schemes; however there is significant variation between companies. This ranges from Shree Cement and Ultratech Cement who almost exclusively operate in India with minimal current carbon pricing regulation, to HeidelbergCement that operates in 18 countries covered by current and incoming carbon pricing schemes or CRH which has approximately 80% of its current emissions covered by the EU ETS.

There is a growing regulatory trend of putting a price on carbon and revisions of existing schemes¹⁶ are expected in the coming years to increase the effectiveness with which carbon emissions are priced. We note that currently free allowances or tax credits exist for cement companies in many schemes in order to prevent carbon leakage¹⁷. However, we believe that the cement industry is less trade exposed¹⁸ than other high-emitting industries such as steel and therefore it is not economically viable to systematically shift cement production away from end markets to avoid carbon pricing¹⁹.

In this chapter, we assess companies' potential cost exposure to different carbon pricing regulatory schemes, intensity benchmarking and full-auctioning, as well as their use of an internal carbon price.

We use three key metrics in our assessment of carbon cost exposure:

- ▼ **Metric 1) Carbon cost exposure under intensity benchmarking:** This is calculated according to the difference between a company's emissions intensity and the level consistent with the industry science-based decarbonization trajectory which acts a benchmark. We calculate each company's carbon cost using a carbon price of US\$32 per tonne of carbon-equivalent²⁰ applied to emissions in excess of the science-based benchmark. We then divide this by recurring company EBIT to determine the carbon cost exposure. This is an approach applied in existing ETS schemes and favours companies with the most carbon-efficient cement production.
- ▼ **Metric 2) Carbon cost exposure under auctioning:** In this scenario, companies are required to pay for all direct emissions. We apply a price of US\$1 per tonne of carbon-equivalent to total company global Scope 1 emissions and divide this by recurring EBIT to determine the financial impact per dollar in carbon price under a full auctioning scenario.
- ▼ **Metric 3) Company use of internal CO₂ price:** This metric assesses whether companies use an internal carbon price and incorporate this into capital planning and investment decision-making.

In our carbon cost exposure assessment we consider direct company emissions (Scope 1) which account for approximately 90% of total company emissions. We do not use real options analysis, which would assess companies' ability to pass on carbon costs to consumers or other ways to reduce emissions.

16. We are starting to see free allowances removed for some industries (e.g. electric utilities) in certain ETSs and we expect this trend to continue, particularly in the EU ETS post-2020, with a greater degree of allowance auctioning.

17. This occurs when companies shift operations to jurisdictions with laxer carbon regulations to avoid associated emissions costs.

18. This is due to the high cost of transportation relative to price for cement.

19. Recent data suggests that carbon leakage in EU has reversed in recent years (Sandbag, 2016).

Highlights

- ▼ Holcim ranks top. Only 1% of its EBIT would be at risk under an intensity benchmark scenario and sets an internal carbon price.
- ▼ Italcementi is ranked bottom and has the highest potential EBIT at risk from comprehensive carbon pricing: 57% of EBIT under intensity benchmarking and 11% of EBIT per US\$1 carbon price under full auctioning.
- ▼ The two other Italian companies, Cementir and Buzzi Unicem, rank in the bottom three due to their high emissions intensities of cement production relative to EBIT levels.
- ▼ CRH has the lowest carbon cost exposure under allowance auctioning (1% EBIT per US\$1 carbon price) partly due to its higher focus on less emissions-intensive products such as aggregates and asphalt.
- ▼ Shree Cement ranks joint fifth and is the only company who would not incur any carbon cost in a benchmarking scenario as its current cement production emission-intensity level is lower than that of the science-based levels in 2014. However we note that such a benchmark would need to tighten over time (and therefore company emissions intensities too) in order to remain consistent with decarbonization.
- ▼ On average, 5% of company EBIT is at risk under full emissions allowance auctioning per US\$1 in carbon price and this ranges from 1% (CRH) to 11% (Italcementi).
- ▼ Three companies currently disclose use of an internal carbon price, with a further four expecting to do so within two years. Of the companies who do not disclose use of an internal price, two (CEMEX and Cementir) currently operate in locations with active carbon pricing schemes.

Carbon cost exposure summary

Company	Intensity based carbon cost rank	Auctioning carbon cost rank	Internal carbon price rank	Overall weighted rank	Carbon cost exposure rank	Carbon cost exposure grade
Holcim	2	5	1	2.7	1	A
CRH	5	1	4	3.6	2	A
Lafarge	3	6	4	4.1	3	A
Cementos Argos	4	2	8	4.2	4	B
Shree Cement	1	10	4	4.3	5	B
HeidelbergCement	6	3	2	4.3	5	B
CEMEX	7	4	8	6.3	7	C
Ultratech Cement	8	9	8	8.3	8	D
Taiheiyu Cement	9	8	8	8.5	9	D
Buzzi Unicem	10	11	3	8.9	10	D
Cementir	11	7	8	9.2	11	E
Italcementi	12	12	4	10.4	12	E

Weighting 50% 30% 20%

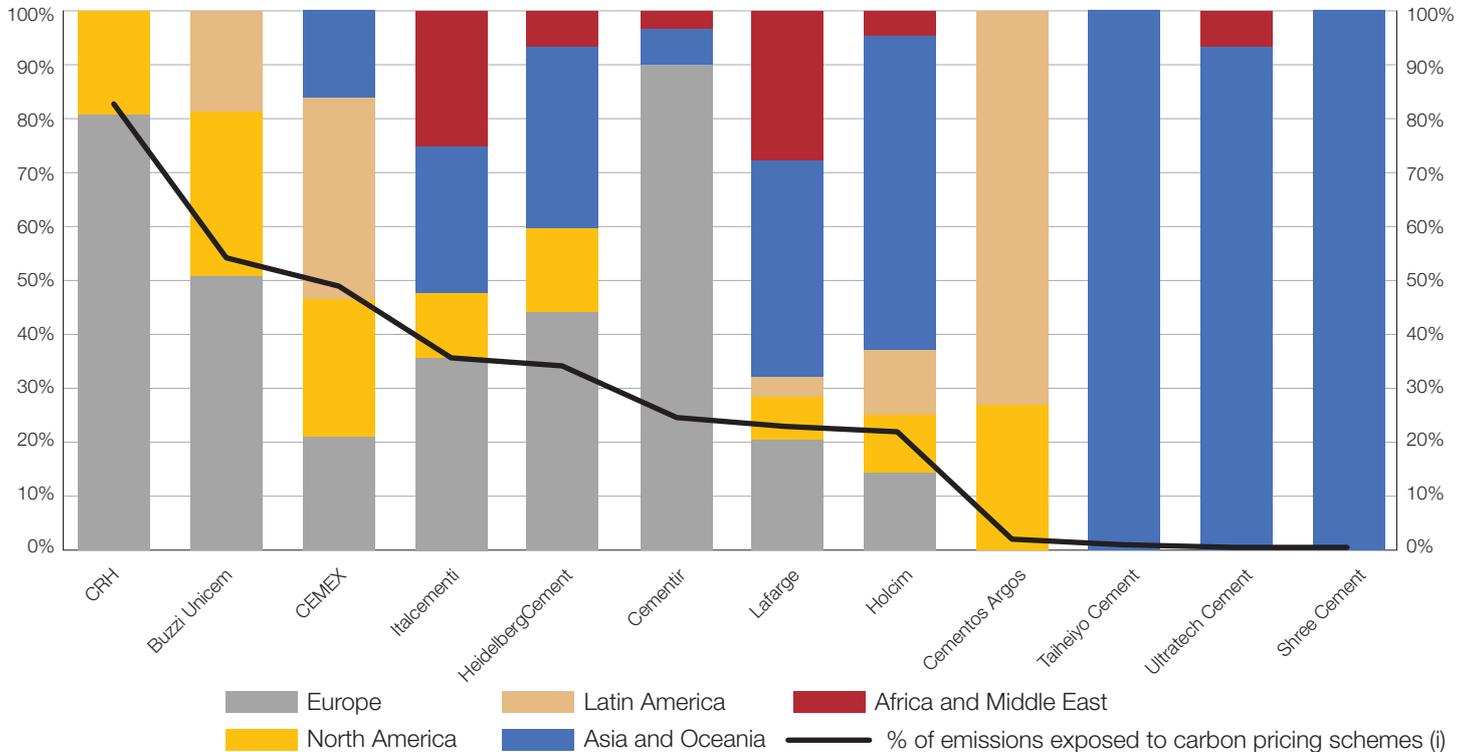
Source: CDP

Full auctioning price scenarios

	US\$5	US\$10	US\$15
Maximum	57%	114%	171%
Minimum	5%	10%	14%
Average	25%	49%	73%
Total companies carbon cost	US\$2,250m	US\$4,500m	US\$6,750m

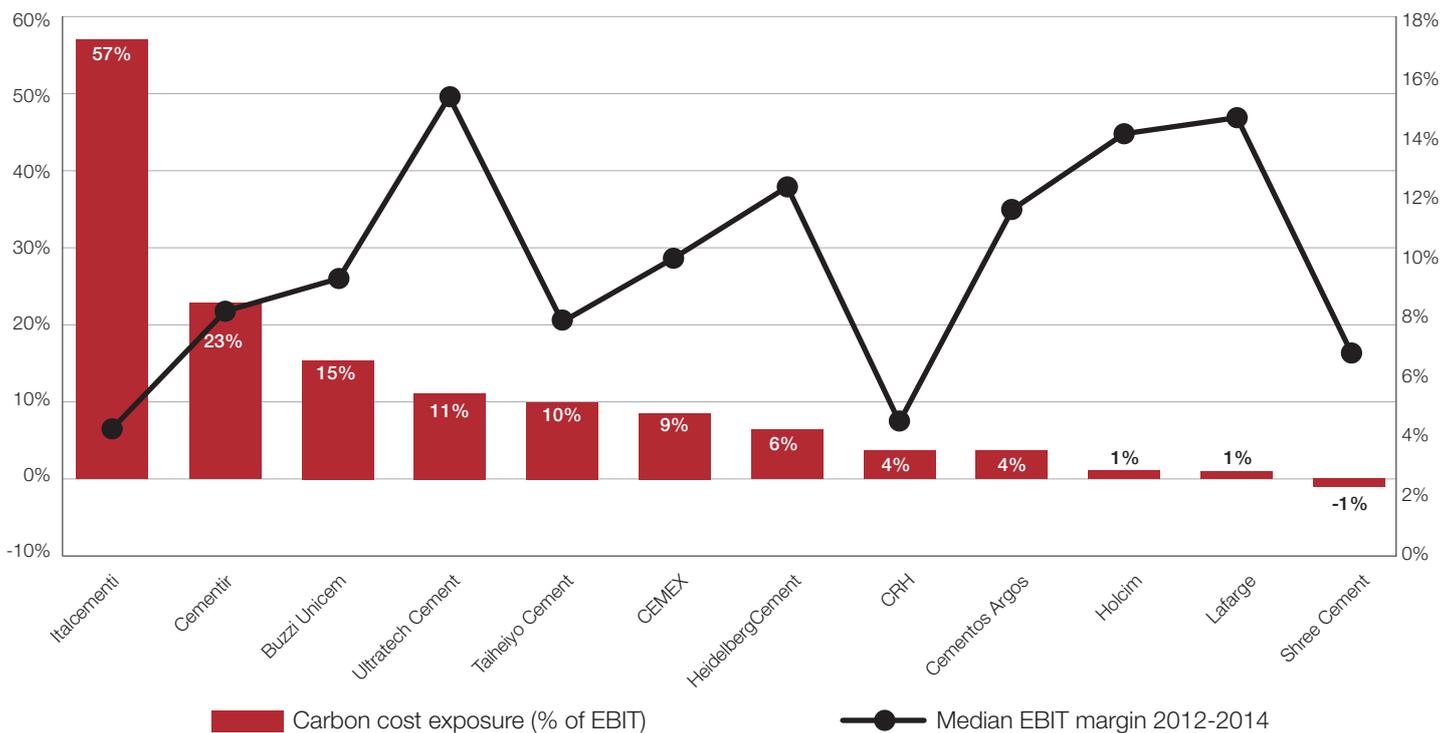
Source: CDP, company data

Company emissions split by region



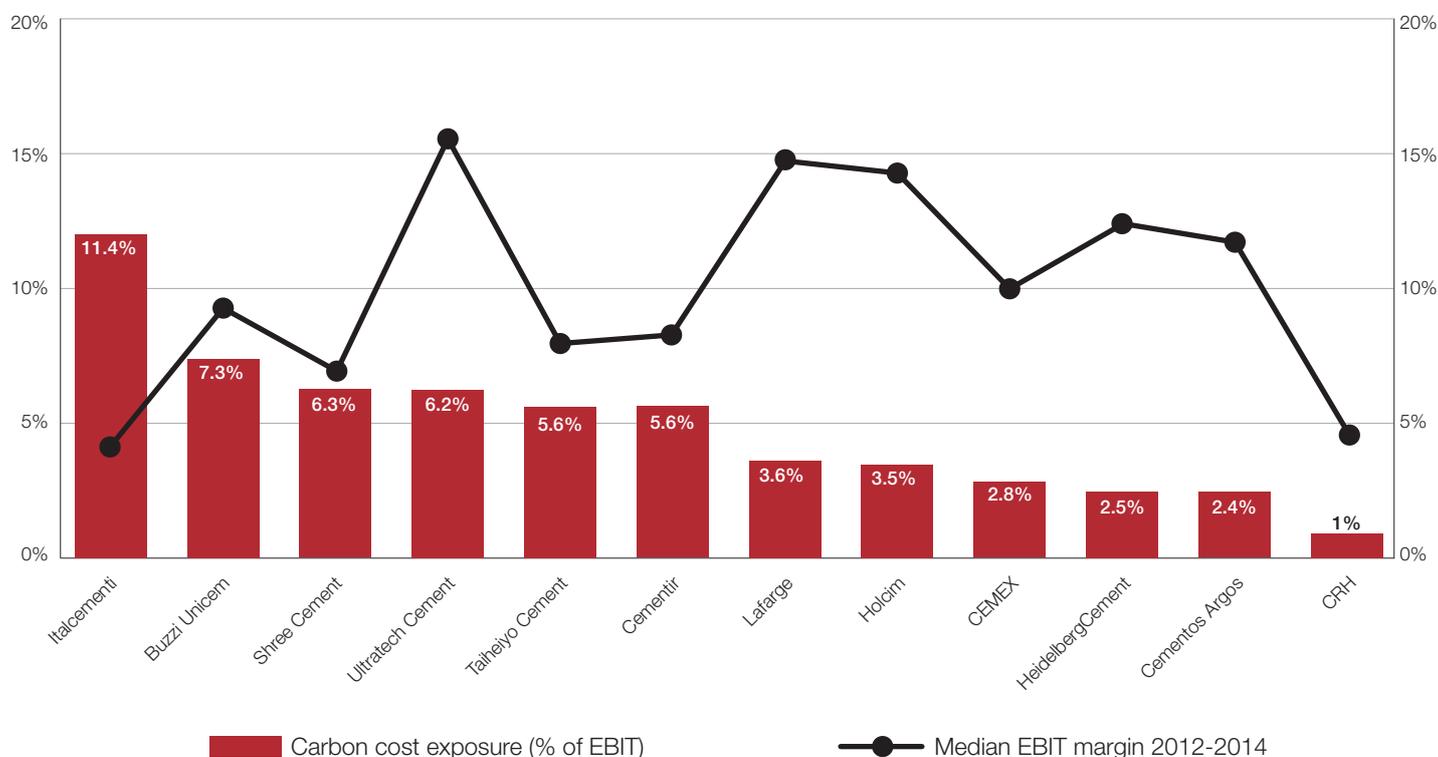
(i) % emissions exposed assumes 100% of emissions in Europe, South Africa, Chile and Kazakhstan are exposed to carbon pricing schemes; it assumes 52% of emissions for Canada, 40% for Mexico, 7% for the USA, 6% for China and 1% for Japan.
Source: CDP

Metric 1) Carbon cost exposure under intensity benchmarking as % of EBIT (LHS) and EBIT margin (RHS)



Source: CDP, company data

Metric 2) Carbon cost exposure under auctioning per US\$1 carbon price as % of EBIT (LHS) and EBIT margin (RHS)



Source: CDP, company data

Metric 3) Company use of internal CO₂ price

Company	Internal carbon price rank	Current use of internal carbon price	Internal carbon price disclosed	Price level (US\$ / tonne of carbon-equivalent)
Holcim	1	Yes	Yes	32
HeidelbergCement	2	Yes	Yes	23
Buzzi Unicem	3	Yes	No	
CRH	4	Not currently but expected within 2 years		
Italcementi	4	Not currently but expected within 2 years		
Lafarge	4	Not currently but expected within 2 years		
Shree Cement	4	Not currently but expected within 2 years		
Cementir	8	Not expected within 2 years		
Cementos Argos	8	Not expected within 2 years		
CEMEX	8	Not expected within 2 years		
Taiheiyō Cement	8	Not expected within 2 years		
Ultratech Cement	8	Not expected within 2 years		

Source: CDP

Latest developments in key carbon pricing schemes

▼ China

China is set to introduce a national trading scheme in 2017 to price greenhouse gas emissions which will cover approximately 4bn tonnes of CO₂, making it the largest carbon market globally. China's current pilot carbon trading system covers five cities and two provinces and the cement industry is included in the scheme. Carbon allowances are expected to trade at around RMB39 (US\$6) in 2017 and RMB56 (US\$8.5) per tonne of carbon-equivalent in 2020²¹. China currently produces approximately 50-60% of the world's cement and is suffering from chronic overcapacity.

▼ EU ETS

Eight of the companies in our study have cement operations covered by the EU ETS which is set to reduce its emissions cap by 2.2% annually post-2020. Just over half of allowances are currently auctioned and the system has an uneven distribution of free allowances across industries covered that has favoured cement producers. This has partly led to incentives for companies to continue to operate inefficient plants in order to maintain allowance allocations and has resulted in the net export of clinker from Europe in recent years (i.e. the opposite of carbon leakage). Proposed reforms to the system are currently being submitted and intend to introduce price support measures such as auction 'back-loading' and the Market Stability Reserve to manage both the carbon price and the number of allowances in the market to avoid supply-demand imbalances.

▼ North America

In 2015 the Canadian province of Alberta announced a carbon tax of CA\$20 (US\$15.5) per tonne of carbon equivalent effective from 2017, rising to CA\$30 (US\$23) per tonne of carbon equivalent in 2018. Large industrial manufacturers are set to join the scheme in 2018. The province of British Columbia already has a revenue-neutral carbon tax on fossil fuel purchases and Quebec has an existing ETS (which is linked to that of California). The province of Ontario plans to introduce an ETS in 2017.

▼ Mexico

Mexico introduced a fossil fuels sales tax in 2014 which covers the additional carbon emissions of a fuel in excess of those generated from natural gas. The tax is capped at 3% of the fuel sales price.

▼ India

India is set to shortly double its tax on coal consumption to INR400 (US\$6) per tonne of coal. This tax has already played a part in many Indian cement companies moving away from coal as a kiln fuel feedstock to petcoke.

Methodology and limitations

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

- ▼ We combine the ranks of the three metrics using the following weightings: metric 1) 50%, metric 2) 30%, and metric 3) 20%. This calculates the overall weighted rank for the carbon cost 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:

Data collation:

- ▼ 2012-2014 company cement production direct emissions intensity from annual reports (kg CO₂ per tonne of cementitious material).
- ▼ 2014 Scope 1 emissions from responses to CDP's 2015 climate change questionnaire question CC9.2.
- ▼ 2012-2014 cement production (volumes sold when production unavailable) from companies' annual reports.
- ▼ 2012-2014 (recurring) EBIT from annual reports which are converted from local currency into US\$ using the relevant annual average foreign exchange rate.

Metric 1) Carbon cost exposure under intensity benchmarking:

- ▼ Using the sectoral decarbonisation approach (SDA) cement intensity benchmark for 2014 (590 kg CO₂ / tonne of cementitious materials²²) we calculate each company's carbon credit (deficit) per tonne of cement produced.
- ▼ We use median 2012-14 production to calculate the total carbon cost by multiplying the production by the carbon deficit and a carbon price of US\$32 per tonne of carbon-equivalent.
- ▼ We calculate the current carbon cost exposure by dividing the carbon cost by the company's 2012-14 median recurring EBIT (in US\$).

Metric 2) Carbon cost exposure under auctioning:

- ▼ We calculate the carbon cost by multiplying all company 2014 Scope 1 emissions by a CO₂ price of US\$1 per tonne of carbon-equivalent.
- ▼ We then divide this carbon cost by the company's 2012-14 median recurring EBIT (in US\$) to determine the carbon cost exposure per US\$1 of full auctioned carbon pricing.

Metric 3) Company use of internal CO₂ price:

- ▼ We collect qualitative and quantitative data on the use of internal carbon prices from responses to question CC2.2c from the 2015 CDP climate change questionnaire.
- ▼ We adopt a scorecard approach to assess companies based on their application of an internal price of carbon.
- ▼ We then combine the two metrics' scores into a weighted score. We use the following weightings: use of carbon price 50%, level of the price 50%.
- ▼ Companies that use an internal carbon price are favoured over those that do not. Companies are also scored on the internal carbon price level, with a higher price favoured.

Other limitations

- ▼ We acknowledge that applying a uniform carbon price to emissions originating in various jurisdictions has its limitations. Greater company disclosure of emissions data at country and facility level would allow a more accurate measurement of carbon cost exposure.
- ▼ The SDA benchmark is not part of any current regulations which use an industry intensity benchmark to allocate free CO₂ allowances. Some schemes allocate allowances linked to a 'best available technology' practices or top emission-intensity performers.
- ▼ We recognise that, as carbon pricing is more effectively enforced, companies are likely to take abatement action which will alter their emission profiles (and thus carbon cost) in a non-linear manner and potentially pass on some of the costs in the form of price rises. However such analysis is not undertaken in this study due to lack of data.

22. <http://sciencebasedtargets.org/wp-content/uploads/2015/05/Sectoral-Decarbonization-Approach-Report.pdf>

Water resilience

- ▼ Cementos Argos is ranked first. It has the lowest exposure to water stress areas in its operations both currently and projected in 2030.
- ▼ Shree Cement and Ultratech Cement have the highest exposure to water-stressed areas, particularly in India, but partly mitigate this risk with lower water consumption intensity relative to peers.
- ▼ Across the companies, more than 50% of facilities are located in water-stressed areas with 11% of facilities currently in 'high' or 'extremely high' water-stressed areas. This latter figure is projected to rise to 34% by 2030.

Overview

There is growing pressure on water resources from population growth, agriculture and businesses, with global water demand expected to exceed supply by 40% by 2030²³. As a result, business is facing a new normal - a stable supply of good quality fresh water can no longer be guaranteed in many regions. This situation is anticipated to be a source of challenge and opportunity for companies in the cement sector, which, by its nature, is tied to long-term assets in particular geographies.

Cement production requires large volumes of water for cooling heavy equipment and exhaust gases in emission control systems, as well as for material preparation in wet kilns. Whilst plant upgrades over time have replaced wet kilns with more energy and water-efficient dry process kilns, the requirement for water in cement production remains significant.

Furthermore, as countries begin to respond to worsening water security, increased regulation of water withdrawal and discharge in both quantity and quality is leading to higher compliance costs and potential reputational risks for the sector. For example, Lafarge disclosed to CDP 50 instances of increased monitoring requirements concerning water use in its US operations in 2014.

Substantive water risks are on the horizon; however, of the five cement companies targeted by the 2015 CDP water questionnaire, only Lafarge identified risks relating to higher operating costs due to water scarcity and resulting increase in water price. A wider lack of disclosure on water risk management and strategy is evident from cement companies.

Water considerations are also critical for two of the cement industry's long term decarbonisation options. CCS infrastructure requires significant volumes of water to capture process CO₂ emissions and the use of biomass as a kiln fuel source also carries a large water footprint. Localized water scarcity issues pose a threat to the potential development of both of these carbon abatement measures.

In this chapter we assess companies' water resilience using publicly available sources and rank companies based on their water stress exposure and consumption intensity. The two key metrics are as follows:

- ▼ **Metric 1) Water stress exposure:** We assess this on a facility-by-facility basis using the Aqueduct global water stress risk mapping tool developed by the World Resources Institute (WRI) which evaluates localized water stress using construction materials industry indicators (water quantity, water quality and regulatory and reputational risks). We analyze both current water stress exposure (2015) and projected water stress exposure (2030) per company and produce a water stress index value.
- ▼ **Metric 2) Water consumption intensity:** We examine companies' current water consumption intensity for cement production and how this has changed over time (2010-2014).

Company water stress exposure overview

	Medium to high	High	Extremely high
2015 water stress exposure (% League Table company facilities)	46%	10%	1%
2030 water stress exposure (% League Table company facilities)	24%	17%	18%

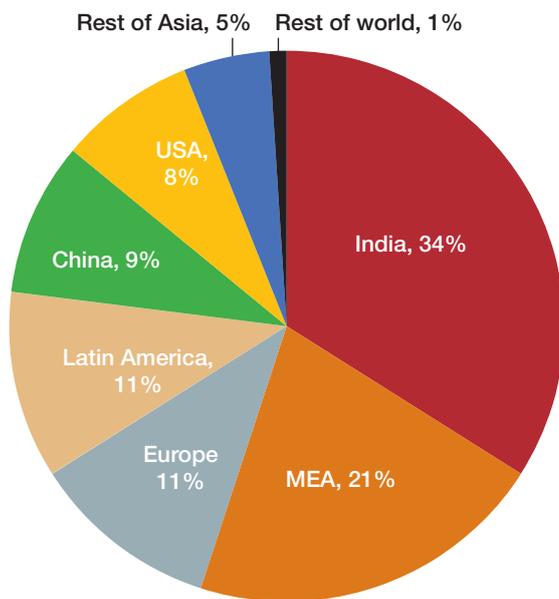
Source: CDP, WRI, company data

23. Allianz Global Investors White Paper Series – Water: A key 21st-Century Growth Opportunity

Highlights

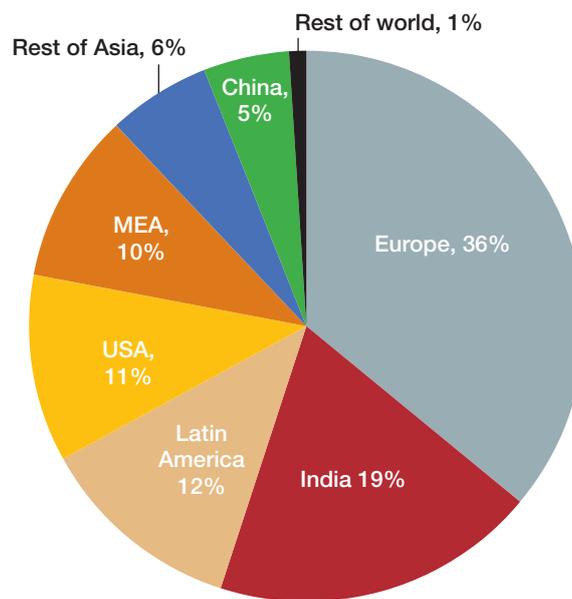
- More than 50% of companies' cement plants and grinding facilities are currently located in water-stressed areas, with the proportion in high-stress regions projected to increase by 2030.
- Cementos Argos is ranked first and is the only company to operate in regions where water stress risks are projected to be lower in 2030 than currently and the only company not projected to have some exposure to extremely high-risk water stress areas in the future.
- Shree Cement and Ultratech Cement rank bottom for water stress exposure as both have a significant proportion of their operations in India. However, Shree Cement has the lowest water consumption intensity, which has been decreasing since 2010.
- Taiheiyo Cement is ranked bottom overall. It operates in water-stressed regions and its water consumption intensity is one of the highest and has been increasing.
- CRH ranks second with one of the lowest water stress exposures and consumption intensity per tonne of cement, which has been falling in recent years.
- Amongst our companies' facilities, current water stress is most prevalent in India; however by 2030 a noticeable shift in European water stress is projected to occur.

2015 geographical split of company facilities in high and extremely high water-stressed areas



Source: CDP, WRI

2030 geographical split of company facilities in high and extremely high water-stressed areas



Source: CDP, WRI

Water risk mitigation

LafargeHolcim's Tula plant in Mexico implemented new water saving technologies to collect rainwater and recycle the treated water in 2012. The Tula plant is situated in the Panuco basin, which has high water scarcity risk (according to the Water Risk Filter) as the company competes with the population of Mexico City for its water resources. The rain recycling measures decreased the plant's water intensity by more than 15%, reaching 75 litres per tonne of cement, ranking it amongst Lafarge's top 10 cement production sites by water performance.

Water resilience summary

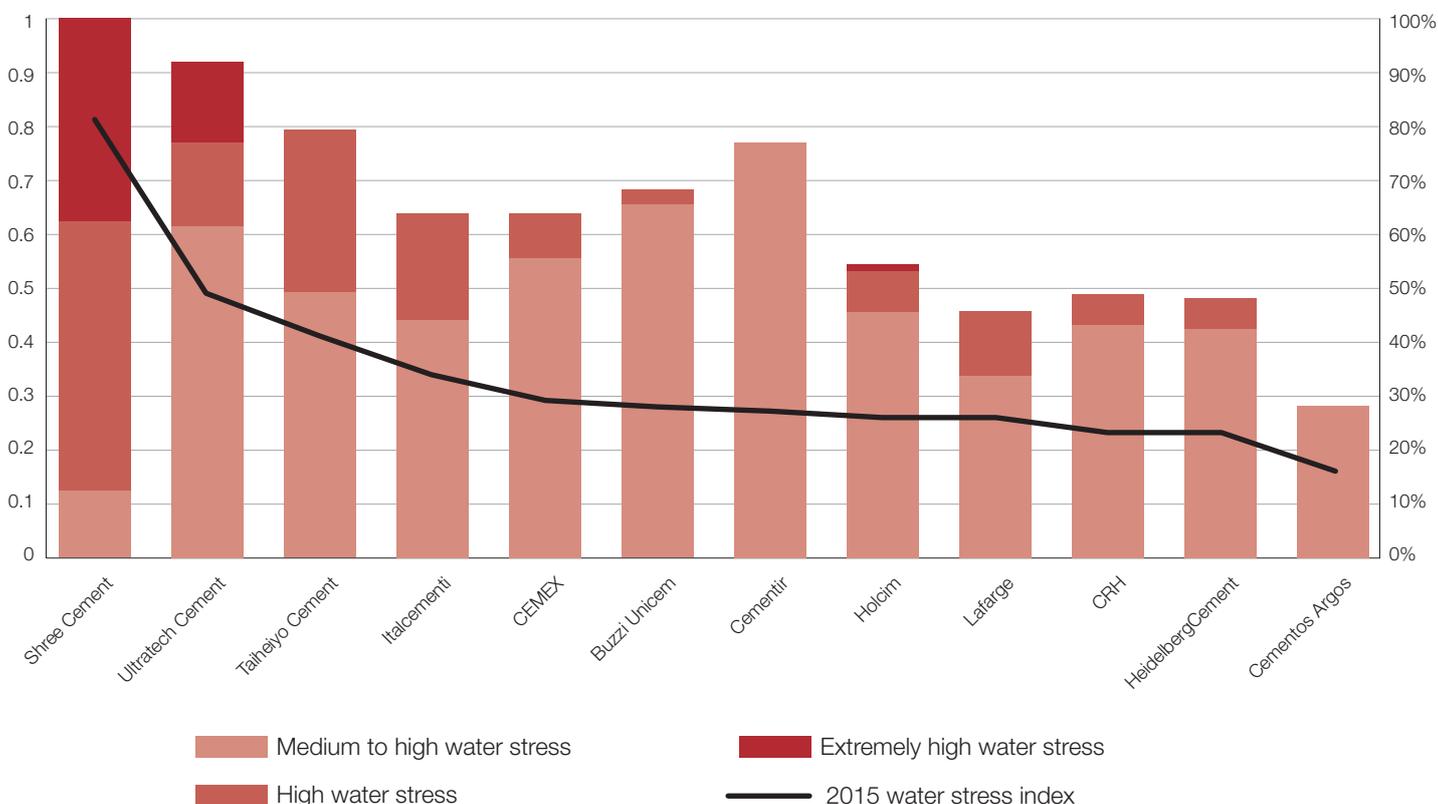
Company	Water stress exposure	Water consumption intensity	Overall weighted rank	Water resilience rank	Water resilience grade
Cementos Argos	1	5	2.7	1	A
CRH	3	2	3.3	2	A
Lafarge	4	4	3.7	3	A
HeidelbergCement	2	8	4.0	4	A
Holcim	5	2	4.4	5	B
Buzzi Unicem	6	5	6.9	6	C
CEMEX	7	8	7.6	7	C
Cementir	8	10	8.1	8	D
Italcementi	9	10	8.9	9	D
Shree Cement	12	1	9.0	10	D
Ultratech Cement	11	5	9.7	11	E
Taiheyo Cement	10	12	9.9	12	E

Weighting **70%** **30%**

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.

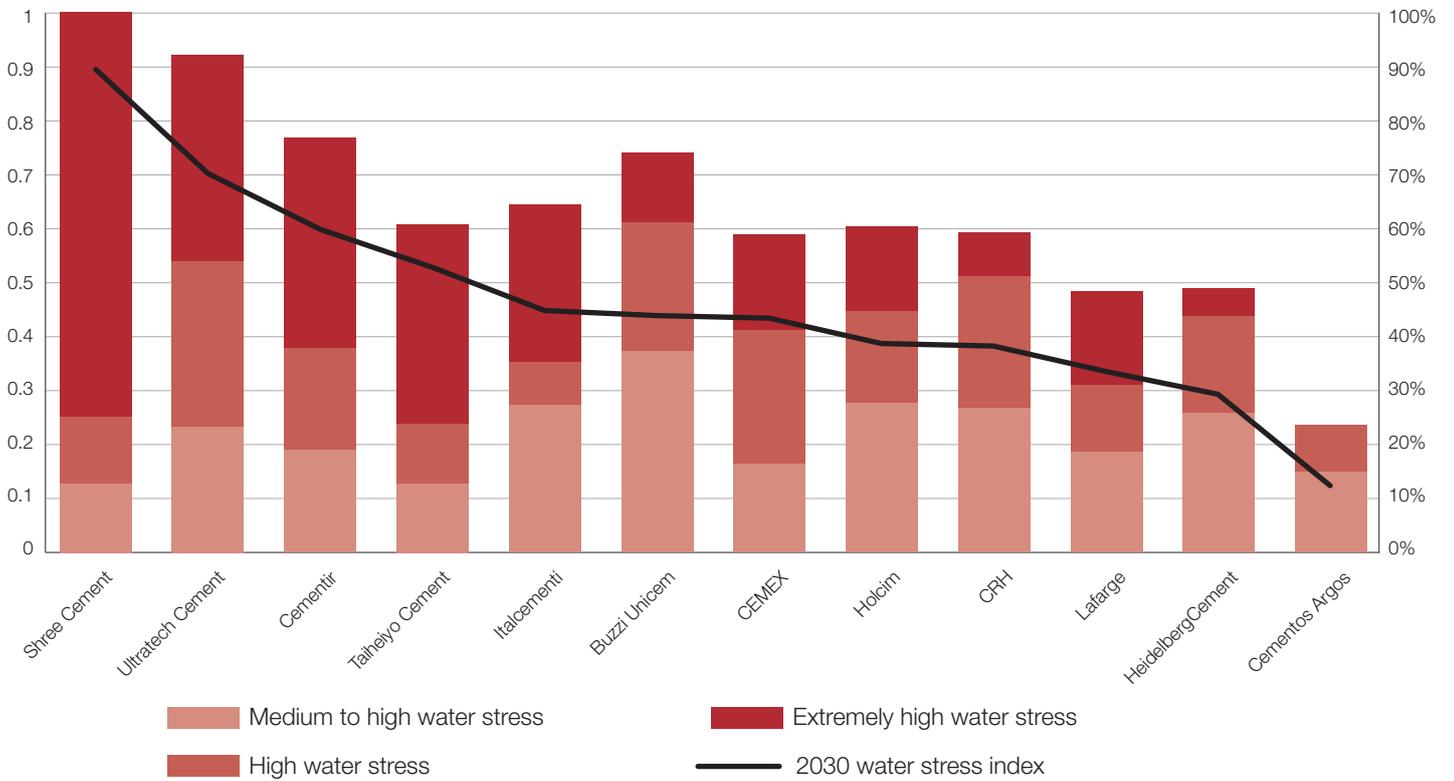
Source: CDP

Component of metric 1) 2015 water stress index (LHS) and water stress exposure by risk category (RHS)



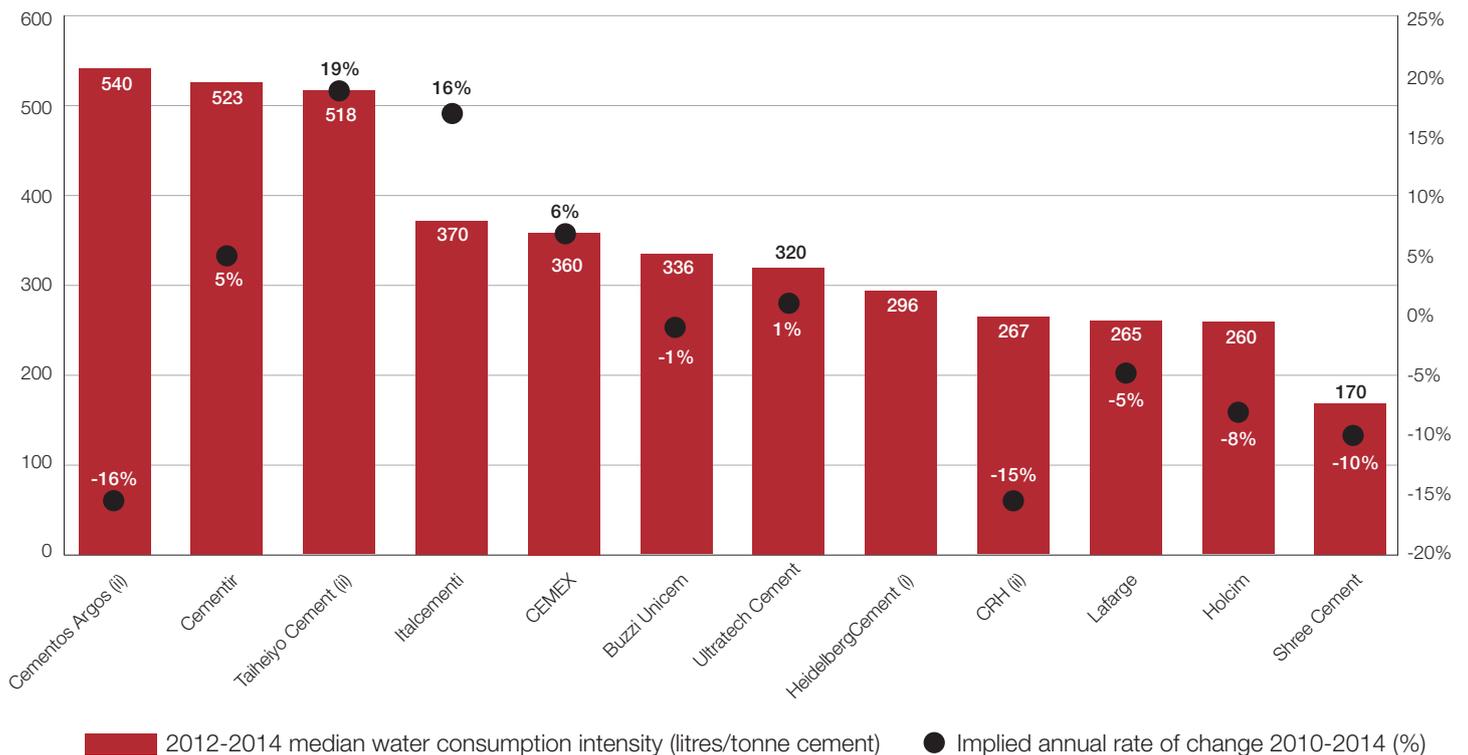
Source: CDP, WRI, company data

Component of metric 1) 2030 water stress index (LHS) and water stress exposure by risk category (RHS)



Source: CDP, WRI, company data

Metric 2) Water consumption intensity (LHS) and rate of change (RHS)



(i) HeidelbergCement's current intensity is based on 2015 data. Due to lack of historical disclosure we are unable to calculate the rate of change since 2010.
 (ii) Cementos Argos, CRH and Taiheiyu Cement do not publicly disclose their water consumption per tonne of cement and therefore these figures have been estimated.

Methodology and limitations

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

- ▼ We combine the weighted ranks of the two metrics using the following weightings: metric 1) 70% and metric 2) 30%. This determines the overall weighted rank for water resilience.
- ▼ 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 risk exposure:

We combine the ranks of both components using the following weightings: Current (2015) water stress exposure 60% and projected (2030) water stress exposure 40%.

We apply the following steps:

- ▼ We collate information on geographical coordinates and equity stakes, for more than 600 cement production and grinding facilities across 103 countries.
- ▼ We exclude facilities that are inactive and scale ownership by equity stakes held.
- ▼ We apply WRI Aqueduct's water stress risk classifications to the remaining facilities according to their geographical location using five categories: low, low to medium, medium to high, high and extremely high. These are based on three risk areas weighted for the construction industry: water quantity (77.9%), water quality (10.2%) and regulatory and reputational risks (11.9%).

Current water stress

- ▼ At the facility level, we identify the level of water stress risk exposure using the WRI overall water risk indicator score.
- ▼ We calculate the number of each company's facilities (weighted by the equity share) in each WRI risk category. Then we scale this number according to the following weights 0:5:15:35:45 (low: low to medium: medium to high: high: extremely high) and divide by the total number of facilities. This approach assigns greater weight to facilities facing higher water stress risks.
- ▼ Finally we normalize this number to produce a water stress exposure index ranging from 0 (all facilities exposed to low water stress risk) to 1 (all facilities exposed to extremely high water stress risk). Therefore the higher the index value the more exposed a company is to water stress risk.

Projected water stress (2030)

- ▼ At the facility level we identify the level of water stress risk exposure, weighting the three scenarios: 25:50:25 (optimistic: business as usual: pessimistic) as defined by WRI.
- ▼ We calculate the number of each company's facilities (weighted by the equity share) in each WRI risk category. Then we scale this number according to the following weights 0:5:15:35:45 (low: low to medium: medium to high: high: extremely high) and divide by the total number of facilities. This approach assigns greater weight to facilities facing higher water stress risks.
- ▼ Finally we normalize this number to produce a water stress exposure index ranging from 0 (all facilities exposed to low water stress risk) to 1 (all facilities exposed to extremely high water stress risk). Therefore the higher the index value, the more exposed a company is to water stress risk.

24. For Shree Cement we use the water withdrawal data and for Taiheiyō Cement total water consumption (both due to data availability).

Metric 2) Water consumption intensity:

We combine the ranks of the two components using the following weightings: change in water consumption intensity 2010-2014 50% and median water consumption intensity 2012-2014 50%.

We apply the following steps:

- ▼ We collect water consumption intensity figures from 2010-2014 from company annual reports when available in the following format: litres per tonne of cement. When this is not available we calculate the intensity figure using total company water consumption and cement production²⁴.

Reduction in water consumption intensity (2010-2014)

- ▼ We calculate the implied reduction rate in water consumption intensity from 2010-2014 using the proprietary function described in the emissions performance key area.
- ▼ We rank companies accordingly, with those displaying a higher reduction rate in water intensity per cement production ranking higher.

Current water consumption intensity

- ▼ To complement the above trend in intensity we rank companies based on their average water consumption intensity (2012-2014), with lower water intensity values favoured.

Other limitations

- ▼ Weighting company facility water stress exposure by equity share can be a limitation. However, due to the lack of facility level production or revenue data, we are unable to undertake a more detailed analysis.
- ▼ Water accounting practices differ across companies and data is not consistently reported or verified, making it challenging to benchmark and compare water consumption.
- ▼ Wider industry disclosure practices around water risks, management and opportunities remains behind others' despite the apparent risks.

Carbon regulation supportiveness

- Shree Cement, Ultratech Cement and Cementos Argos rank top and are supportive of carbon regulation in the emerging markets of India and Columbia.
- Cementir, Italcementi and Taiheiyo Cement appear to be the most obstructive to progressive carbon regulation.
- Lafarge, Holcim, HeidelbergCement and CEMEX are deemed as the most active companies in engagement with policymakers on carbon regulation.

Overview

The cement industry is having to adapt in the face of significant challenges, including the requirement for the industry to decarbonize amid ever more assertive climate commitments following COP21 in Paris. It is therefore increasingly important to understand how cement companies 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 carbon 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. InfluenceMap analyses the behavior of cement

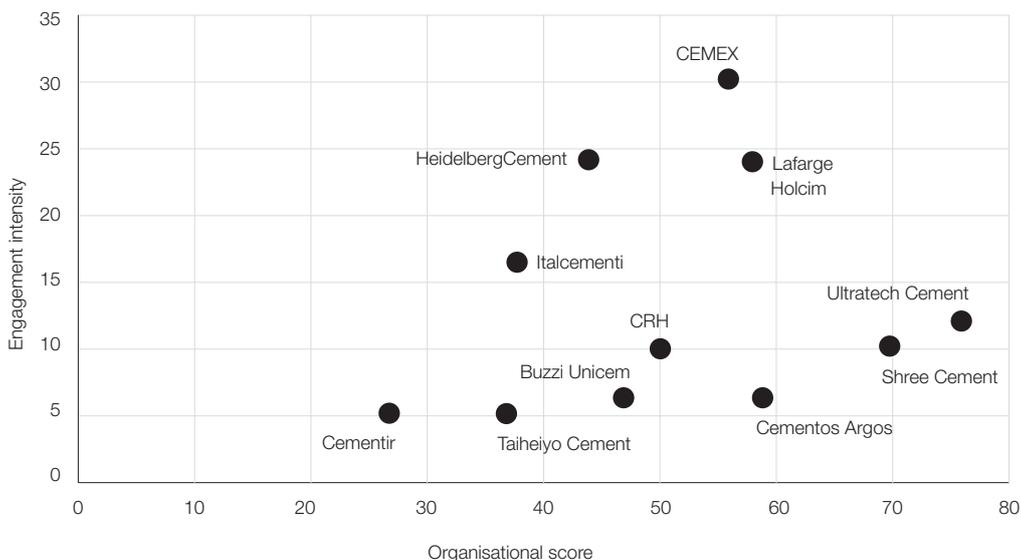
companies concerning key regulatory items affecting their business, including the carbon cap and trade schemes, clean energy targets and energy efficiency measures.

Each company's carbon regulation supportiveness is assessed using the following score:

- InfluenceMap Organizational score:** this represents the stance a company takes on climate policy and legislation as well as its transparency on such positions on key carbon issues. It ranges from 0 (complete opposition to carbon regulation) to 100 (fully supportive of carbon regulation) with 50 representing a relatively neutral stance.

The Organizational score is overlaid with a company 'Engagement intensity'²⁷ value below to display how active each company is in their climate policy engagement alongside their position on such issues.

Organizational score and engagement intensity



Source: CDP, InfluenceMap

25. We recognize that some companies may be lobbying against climate regulation for short-term gain but 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. Engagement intensity is a metric of the extent to which the company is engaging on climate change policy matters, whether positively or negatively. It is a number from 0 (no engagement at all) to 100 (full engagement on all data points). Each organizational score should be looked at in conjunction with this metric to gauge the amount of evidence used in each case as a basis for scoring.

Highlights

- ▼ There is disparity between companies in their approach to climate regulatory policies and some misalignment between company public statements and consultations with policy makers (either direct or via trade associations).
- ▼ Buzzi Unicem has stated to its investors that it expects to continue to retain its free emissions allowance allocations under the EU ETS (approximately a third of the company's emissions are covered by the scheme) and it can be argued that the company is not sufficiently preparing for regulatory tightening in Europe.
- ▼ Cementir ranks bottom and has stated its opposition to energy efficiency laws in Denmark. It has also confirmed its alignment on EU policy matters with the CEMBUREAU trade association which is deemed to negatively engage on European climate matters.
- ▼ Indian companies Shree Cement and Ultratech Cement are ranked top and have limited but positive engagement on climate policies (however, we note there is less immediately forthcoming climate change legislation in India). Shree Cement has pledged to reduce its company emissions beyond Indian national reduction targets and Ultratech Cement has stated its support for the PAT²⁸ energy efficiency mechanism in India.
- ▼ Taiheiyo Cement has stated it is opposed to cap and trade schemes as a method of driving change in the industry. The company also occupies the vice chairman position of the Japan Cement Association which promotes greater use of coal as a cement kiln feedstock.
- ▼ Italcementi ranked tenth and has advocated for the cement industry to receive preferential treatment within the EU ETS, including a continued supply of free allowances. It has also lobbied to block ETS reform measures and the implementation of EU Energy Efficiency and Industrial Emissions Directives.
- ▼ CEMEX appears to have mixed engagement on climate issues with policy makers in different jurisdictions. It is noted as a supporter of Mexico's 'green package' energy transition law but it opposes meaningful EU ETS reform, European energy efficiency measures and emissions-reduction targets linked to the EU Industrial Emissions Directive.
- ▼ HeidelbergCement is ranked ninth and deemed active in climate policy engagement. Its senior management has stated that they expect to avoid ambitious climate regulations and reference carbon leakage threats as key to the continued issuing of free EU ETS allowances. It is an influential member of the CEMBUREAU trade association.
- ▼ LafargeHolcim (analyzed as a single company) has significant but mixed engagement on various strands of climate policy. On the one hand it clearly stated support for action to advance the transition to a low carbon economy ahead of COP21 in Paris. On the other it continues to stress issues of carbon leakage to oppose meaningful EU ETS reform. One of its senior management held the president position at CEMBUREAU during a period where it campaigned against ambitious reforms of the EU ETS.

Carbon regulation supportiveness summary

Company	InfluenceMap Organisation score	Carbon regulation supportiveness rank	Carbon regulation supportiveness grade
Ultratech Cement	76	1	A
Shree Cement	70	2	A
Cementos Argos	59	3	B
Holcim	58	4	B
Lafarge	58	4	B
CEMEX	56	6	B
CRH	50	7	C
Buzzi Unicem	47	8	D
HeidelbergCement	44	9	D
Italcementi	38	10	E
Taiheiyo Cement	37	11	E
Cementir	27	12	E

Weighting 100%

28. Performance, Achieve & Trade scheme.

Policies affecting cement companies

- ▼ **Carbon pricing:** CEMEX, Italcementi, LafargeHolcim and HeidelbergCement have lobbied the EU commission to block progressive reforms to the EU ETS, including the Market Stability Reserve and Cross Sector Correctional Factor. Many of the cement companies in this study receive significant amounts of emission allowances under current EU ETS rules, usually in excess of their emissions levels. Taiheiyo Cement has stated its opposition to the Japanese cap and trade scheme in the Saitama region, whilst the Portland Cement Association, the leadership of which features representatives of several of the companies²⁹, takes a strong negative stance on the possibility of extensive carbon pricing in the USA.
- ▼ **Clean energy:** The Portland Cement Association is also taking legal action against the American EPA over the Clean Power Act. In Europe and Mexico, companies appear supportive of renewable energy targets in the power sector - however we note that the industry remains largely powered by fossil fuels. Concerning the industry use of coal, cement trade associations including the Japanese Cement Association and Indian based Cement Manufacturers Association have called for increased access to the fuel for cement production. On the other hand, the Cement Manufacturers Ireland trade association has a target for 50% of Irish cement production energy requirements to be met by alternative fuels by 2017.
- ▼ **Energy efficiency:** Shree Cement and Ultratech Cement have been advocates of an energy efficiency scheme in India which creates a trading market for energy efficiency certificates earned by firms who undertake certain measures. Within Europe, companies such as HeidelbergCement, Italcementi, CEMEX and LafargeHolcim have used EU ETS consultations to argue that energy efficiency measures are a duplicate policy and an extra burden on business.

Methodology

Our CDP carbon regulation readiness metric uses InfluenceMap's company organization score and 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 a very supportive influence on climate policy.

29. LafargeHolcim, CEMEX, Cementos Argos, Buzzi Unicem.

Appendix: investor engagement themes for cement companies

Sector engagement themes:

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

CDP is actively supporting institutional investors in their discussion with cement companies and will provide additional information, support and coordination as needed

A) Emissions performance

- Set clear, strong, long-term emissions-reduction targets in line with the methodology of the Sector-based Decarbonization Approach (SDA) and perform against them. The SDA targets are industry-specific emissions-reduction pathways to 2050 which are consistent with a transition to a 2-degree world (science-based). It is important that cement companies set targets post-2025 when more aggressive abatement action is required for the industry to decarbonize.
- Use the Cement Sustainability Initiative framework to report CO₂ emissions and provide transparency on carbon intensity of cement production reporting, specifically a consistent measure of direct emissions per tonne of cementitious material.
- Companies can disclose their emissions intensities and reduction targets in CDP's 2016 climate change questionnaire questions CC12.3 and CC3.1. Companies can also disclose information on their R&D spend in and revenue from low carbon products in question CC3.2.

B) Energy and material management

- Fully exploit currently available CO₂ abatement levers including clinker substitution, alternative fuel use and thermal energy efficiency measures.
- Companies can disclose information on their energy use and fuel choices in CDP's 2016 climate change questionnaire question CC11.

C) Carbon cost exposure

- Provide more detailed emissions information at a country or facility level so that investors can make an accurate assessment of companies' financial exposure to local carbon regulations.
- Set and disclose an internal carbon price and

describe how it is used in company planning and capital project decisions.

- Companies can disclose their use of an internal carbon price and facility level emissions in CDP's 2016 climate change questionnaire questions CC2.2c, CC9.2 and CC10.2.

D) Water resilience

- Improve the granularity of water data reporting at facility level and use a consistent reporting framework. Information on production levels for each facility will allow investors to more accurately assess the materiality of water risks at a company level.
- Provide data on water consumption per unit of production (i.e. litres per tonne of cement), including historical data and reduction targets according to the CSI framework.
- Companies can disclose their facility level water information in 2016 CDP Water questionnaire questions W3.2 and W5. They can also disclose their water reduction targets and goals in question W8 and their risk assessment and mitigation strategies in question W3.

E) Carbon regulation supportiveness

- Provide a clear and supportive stance on climate policy consistent with actions and provide greater disclosure on engagement with policy makers.
- Companies can disclose their climate policy position in CDP's 2016 climate change questionnaire question CC2.3.

Company engagement analysis

We use a traffic light system for each metric to highlight areas of engagement focus for each cement 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 colours according to the underlying values for each metric.

Engagement area:		Emissions performance			Energy and materials management			Carbon cost exposure			Water resilience			Carbon regulation supportiveness			Total										
League Table Rank	Companies	Country	Emissions performance rank	Reduction in emissions intensity (2008-2014)	Emissions intensity (2012-2014)	Quality of emissions-reduction target	Performance against target	Data transparency	Energy and materials management rank	Thermal energy intensity of clinker production	Alternative fuel use	Clinker to cement ratio	Carbon cost exposure rank	Carbon cost exposure under benchmarking	Carbon cost exposure under auctioning framework	Company use of internal CO ₂ price	Water resilience rank	Water stress exposure	Water consumption intensity	Climate change supportiveness rank	Climate change supportiveness	Green	Amber	Red			
1	Holcim	Switzerland	2	6	2	2	8	2	2	5	8	1	1	2	5	1	5	2	2	4	4	7	5	1			
2	Shree Cement	India	1	2	1	4	5	2	3	2	11	2	5	1	10	4	10	12	1	2	2	9	2	3			
3	Lafarge	France	3	5	3	1	6	11	4	7	4	3	3	3	6	4	3	4	4	4	4	5	8	1			
4	CRH	Ireland	5	3	9	5	10	1	1	4	2	8	2	5	1	4	2	3	2	7	7	6	5	3			
5	Cementos Argos	Colombia	4	1	4	7	1	12	12	10	12	4	4	4	2	8	1	5	2	3	3	4	5	5			
6	HeidelbergCement	Germany	6	7	7	6	9	8	6	9	3	5	5	6	3	2	4	2	8	9	9	4	6	4			
7	CEMEX	Mexico	10	11	8	3	11	9	7	11	1	6	7	7	4	8	7	7	8	6	6	3	5	6			
8	Ultratech Cement	India	7	9	5	10	7	5	8	2	10	9	8	8	9	8	11	11	5	1	1	3	3	8			
9	Buzzi Unicem	Italy	7	10	6	11	4	5	11	12	5	10	10	10	11	3	6	6	5	8	8	3	5	6			
10	Taiheiyo Cement	Japan	9	4	12	12	2	4	9	6	6	11	9	9	8	8	12	10	12	11	11	2	3	9			
11	Cementir	Italy	11	12	10	8	3	10	5	1	9	7	11	11	7	8	8	8	10	12	12	2	3	9			
12	Italcementi	Italy	12	8	11	9	12	4	10	8	7	12	12	12	12	4	9	9	10	10	10	1	5	8			
			Weighting:	12%	18%	30%	20%	20%	25%	30%	40%	30%	20%	50%	30%	20%	70%	30%	100%	30%	10%	10%	10%				
			Metric Area(i)																								

Notes:
 (i) Does not equal 100% as we have excluded the CDP performance band (5%) from our engagement topics
 Source: CDP

Emissions performance

League Table rank	Companies	Country	Emissions performance rank	Reduction in emissions intensity 2008-2014	Emissions intensity 2012-2014	Quality of target	Performance against target	Data transparency
2	Shree Cement	India	1	2	1	4	5	2
1	Holcim	Switzerland	2	6	2	2	8	2
3	Lafarge	France	3	5	3	1	6	11
5	Cementos Argos	Colombia	4	1	4	7	1	12
4	CRH	Ireland	5	3	9	5	10	1
6	HeidelbergCement	Germany	6	7	7	6	9	8
8	Ultratech Cement	India	7	9	5	10	7	5
9	Buzzi Unicem	Italy	7	10	6	11	4	5
10	Taiheiyo Cement	Japan	9	4	12	12	2	4
7	CEMEX	Mexico	10	11	8	3	11	9
11	Cementir	Italy	11	12	10	8	3	10
12	Italcementi	Italy	12	8	11	9	12	5

Weighting	Metric:	12%	18%	30%	20%	20%
	Area:	30%				

Source: CDP

Energy and materials management

League Table rank	Companies	Country	Energy and materials management rank	Thermal energy intensity of clinker production	Alternative fuel use	Clinker to cement ratio
4	CRH	Ireland	1	4	2	8
1	Holcim	Switzerland	2	5	8	1
2	Shree Cement	India	3	2	11	2
3	Lafarge	France	4	7	4	3
11	Cementir	Italy	5	1	9	7
6	HeidelbergCement	Germany	6	9	3	5
7	CEMEX	Mexico	7	11	1	6
8	Ultratech Cement	India	8	2	10	9
10	Taiheiyo Cement	Japan	9	6	6	11
12	Italcementi	Italy	10	8	7	12
9	Buzzi Unicem	Italy	11	12	5	10
5	Cementos Argos	Colombia	12	10	12	4

Weighting	Metric:	30%	40%	30%
	Area:	25%		

Source: CDP

Carbon cost exposure

League Table rank	Companies	Country	Carbon cost exposure rank	Carbon cost exposure under intensity benchmarking	Carbon cost exposure under auctioning framework	Company use of internal CO ₂ price
1	Holcim	Switzerland	1	2	5	1
4	CRH	Ireland	2	5	1	4
3	Lafarge	France	3	3	6	4
5	Cementos Argos	Colombia	4	4	2	8
2	Shree Cement	India	5	1	10	4
6	HeidelbergCement	Germany	5	6	3	2
7	CEMEX	Mexico	7	7	4	8
8	Ultratech Cement	India	8	8	9	8
10	Taiheiyo Cement	Japan	9	9	8	8
9	Buzzi Unicem	Italy	10	10	11	3
11	Cementir	Italy	11	11	7	8
12	Italcementi	Italy	12	12	12	4

Weighting	Metric:	50%	30%	20%
	Area:	20%		

Source: CDP

Water resilience

League Table rank	Companies	Country	Water resilience rank	Water stress exposure	Water consumption intensity
5	Cementos Argos	Colombia	1	1	5
4	CRH	Ireland	2	3	2
3	Lafarge	France	3	4	4
6	HeidelbergCement	Germany	4	2	8
1	Holcim	Switzerland	5	5	2
9	Buzzi Unicem	Italy	6	6	5
7	CEMEX	Mexico	7	7	8
11	Cementir	Italy	8	8	10
12	Italcementi	Italy	9	9	10
2	Shree Cement	India	10	12	1
8	Ultratech Cement	India	11	11	5
10	Taiheiyo Cement	Japan	12	10	12

Weighting	Metric:	70%	30%
	Area:	10%	

Source: CDP

Carbon regulation supportiveness

League Table rank	Companies	Country	Carbon regulation supportiveness
8	Ultratech Cement	India	1
2	Shree Cement	India	2
5	Cementos Argos	Colombia	3
1	Holcim	Switzerland	4
3	Lafarge	France	4
7	CEMEX	Mexico	6
4	CRH	Ireland	7
9	Buzzi Unicem	Italy	8
6	HeidelbergCement	Germany	9
12	Italcementi	Italy	10
10	Taiheiyo Cement	Japan	11
11	Cementir	Italy	12

Weighting	Metric:	100%
	Area:	10%

Source: CDP

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