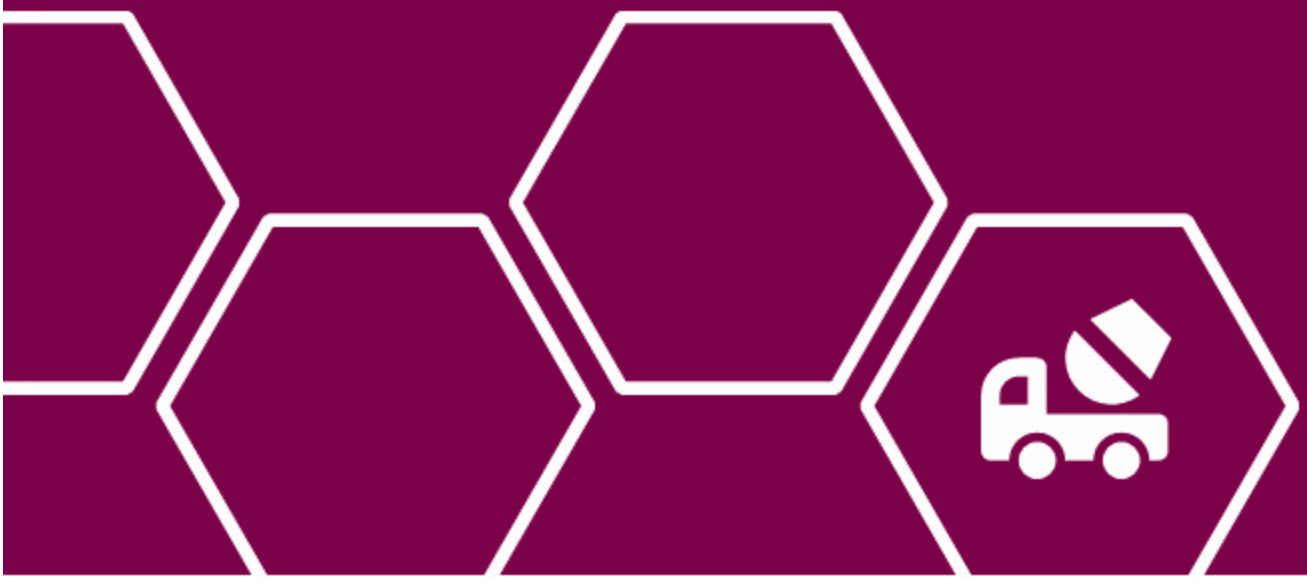
ACT

SECTOR METHODOLOGY

Assessing low-Carbon Transition

Cement



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1. Introduction

The 2015 United Nations Climate Change Conference (COP21) in Paris further strengthened the global recognition of limiting dangerous climate change. Political agreement was reached on limiting warming to well below “2 degrees” and pursuing efforts to limit temperature rise to “1.5 degree” above pre-industrial levels. The ‘Assessing low-Carbon Transition’ (ACT) Initiative measures how a company is ready to transition to a low-carbon economy. The ACT initiative aims at helping businesses to drive their climate strategy, their business model(s), their investments and operations and set targets compatible with a low-carbon pathway. The general approach of ACT is based on the Sectoral Decarbonization Approach (SDA) developed by the Science-Based Targets Initiative (SBTi) in order to compare a company’s alignment with a “low-carbon world” (compatible with 2°C - or beyond - climate change scenarios), the application of which is described in the ACT Framework [1]. The ACT Cement methodology aligns with other reporting frameworks where applicable (e.g. CDP, TCFD, EU Taxonomy).

Why do we need to develop a methodology for cement?

The cement industry is the second largest industrial carbon emitter and the third largest industrial energy consumer. The cement sector currently emits 7 percent of global CO2 emissions [2]. The global population is expected to grow an additional 30 percent by 2050, increasing the need for buildings and transport infrastructure (e.g. roads, bridges, tunnels…), and in turn increasing global demand for cement. A low-carbon world is therefore impossible without a transformative change in the cement sector, which is why the sector is crucial to achieving this transition and needs an ACT assessment methodology to hold it accountable.

The cement sector has a well-defined primary activity (clinker production) with accessible emissions intensity data, as confirmed by the Cement Technical Working Group which was involved in the development of this methodology. The ACT Cement methodology considers scenarios that include predictions such as increased demand for cement, improved efficiency of the assets (factories) and growth of new business models and the operation of new decarbonization technologies over time.

For the cement sector, the methodology focuses on the cement production capacity and the existing and planned production technologies. The Sectoral Decarbonisation Approach (SDA) was developed mainly for integrated cement companies which have direct access to their production data (e.g. clinker intensity). However, the emergence of blenders and grinding operators manufacturing cement from bought or imported clinker, or without clinker at all, means that these new types of business models shall be considered in the methodology. The methodology considers several factors such as: current production assets (factories), locked-in emissions from these assets, production technology changes such as the deployment of renewables and/or carbon capture and storage CCS, future investments and partnerships in low-carbon technologies. Such data feed simplified assessment models that quantify the effects of, for example, technology choices for future emissions. Qualitative topics will also be considered as relevant, including new business models, customer behaviour influence and policy engagement, and the overall stated strategy.

It is important to note that the choice of low-carbon scenario might differ between each ACT sectoral methodology, so it is not always possible to compare assessment results across sectors.

1.1. CEMENT DESCRIPTION

There are 27 types of common cement products described in the EN 197-1 cement standard (*Cement Composition, specifications and conformity criteria for common cements*) that could be described based on their:

- Composition (ex: Portland cement, composite cement, ...)
- Performance based on (ASTM C-1157) or strength classes

The EN 197-1 European standard contains the following nomenclature:

- CEM I Portland cement (>95% clinker)
- CEM II Portland-composite cement (65-94% clinker)
- CEM III Blast furnace cement (5-64% clinker)
- CEM IV Pozzolanic cement (45-89% clinker)
- CEM V Composite cement (20-64% clinker)

A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produces concrete.

Cement is a material mainly known for its strength. Its other properties are its fineness, its soundness, its consistency, its setting time, its heat of hydration, its loss of ignition, its bulk density, and its specific gravity (Relative density).

1.2. MAIN SOURCES OF EMISSIONS FROM CEMENT PRODUCTION

The cement-manufacturing process can be divided into two basic steps:

1. Clinker (the main constituent of cement) is first made in a kiln with fuel (gas, solid fuel – such as coal, petcoke, alternative fuels… - or liquid fuel) up to 2000°C, which heats raw materials such as limestone (calcium carbonate) with small quantities of other materials (e.g. clay) to 1,450°C. During this process, known as calcination, the calcium carbonate (limestone) is transformed into calcium oxide (lime), which then reacts with the other constituents from the raw material to form new minerals, collectively called clinker. This near-molten material is rapidly cooled to a temperature of 100 - 200°C.

2. Clinker is then ground with gypsum and other materials to produce the grey powder known as cement.

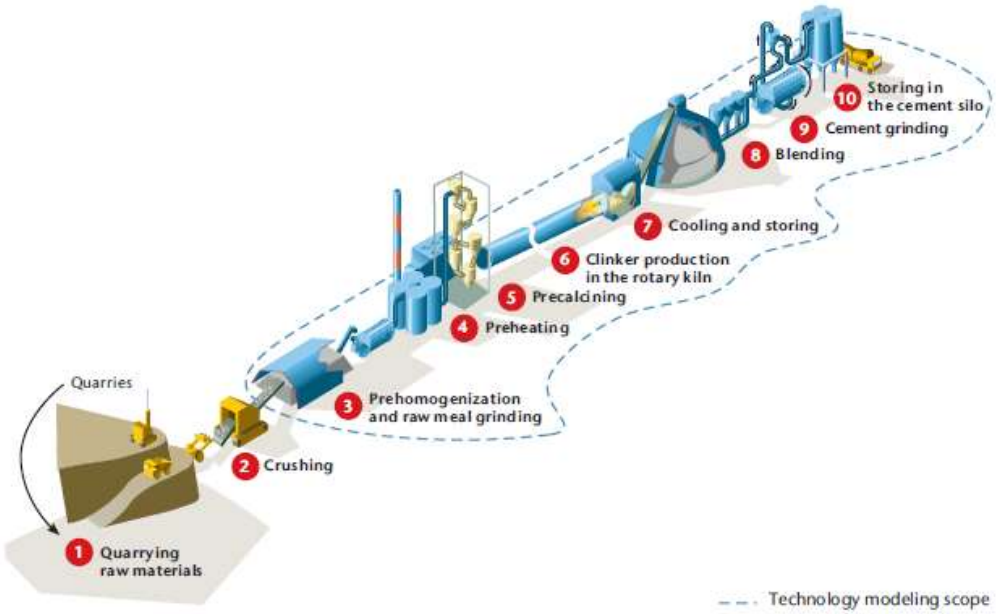


FIGURE 1: CEMENT PRODUCTION PROCESS [2]

The carbon footprint of cement is directly linked to the amount of clinker in the cement (clinker rate). Clinker is also the main ingredient for material resistance and therefore the strength of infrastructures and buildings.

Cement production involves several chemical reactions, with the main reaction being the decomposition of limestone into lime and carbon dioxide. Half of the CO2 emissions associated with the production of cement is released from this reaction – another 40 percent are emitted from burning fuel to power the process and the final 10% are emitted from quarrying and transportation. There are several ways to reduce cement energy inputs and emissions, including (i) substituting clinker for other materials, (ii) substituting the fuel used in the process for less carbon intensive fuel, and (iii) capturing the carbon generated during the process to prevent its release to the atmosphere.

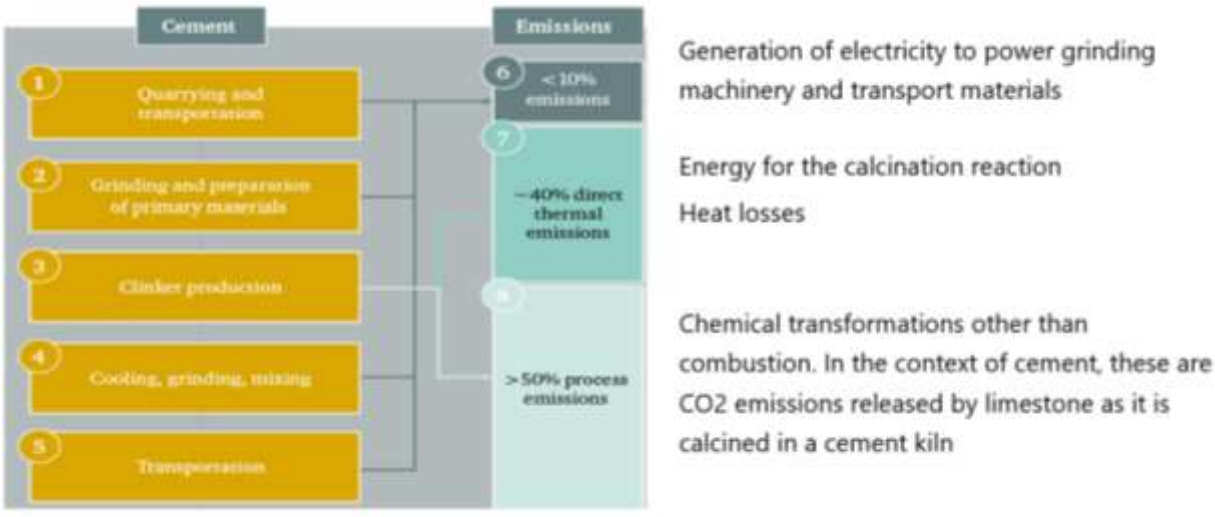


FIGURE 2: CO2 EMISSIONS LINKED WITH THE MANUFACTURING STEPS OF CEMENT [3]

Finding a Life Cycle Assessment (LCA) focused on cement is not easy as most LCA studies (including Environmental Product Declarations – EPD) currently cover concrete products or buildings. However, LCA of concrete do confirm that cement production emits most of the GHG emissions, and more precisely during the cement manufacturing stage of production.

1.3. COMPANIES SEGMENTATION IN CEMENT INDUSTRY

There are three segments of companies in the cement industry.

1. **Blenders**: supply cement and substitutes from imported or bought cement / materials.
    - Main emissions sources are due to transport (scope 1) and electricity consumption (scope 2).

2. **Grinding plant operators**: manufacture cement from imported or bought clinker or, for vertically integrated companies, transferred from other sites.
    - Main emissions sources are due to energy consumption for clinker grinding (scope 2), drying material and transport (scope 1).

3. **Vertically integrated manufacturers**: manufacture cement from clinker they produce themselves.
    - Main emissions sources will include calcination of raw materials in addition to kiln and non-kiln fuels (and transport) (scope 1).

During the development phase, the Cement Technical Working Group also looked at clinker operators (clinker operators are clinker manufacturers that do not produce their own cement), but no quantitative information was found nor provided regarding how much of the cement market the clinker operators represent. Nevertheless, clinker operators are considered in the scope of the methodology but are not assessed by themselves but through the blenders and grinding operators.

To be sure to address the right issues foreach type of company, the methodology has been differentiated for integrated companies (referred to as company A in the assessment) and blenders and grinding operators (referred to as company B in the assessment).

1.4. SCOPE 1, 2, 3 – ACCOUNTING CO2 FOR CEMENT INDUSTRY

The World Business Council for Sustainable Development (WBCSD) Working Group Cement: Toward a Sustainable Cement Industry has developed the Cement CO2 Protocol [4], which includes guidelines and tools to calculate GHG emissions from the cement sector.

This document defines the scopes for CO2 emissions accounting in the cement industry.

Table 1: Emissions from scope 1, 2 & 3 **[4]**

	Scope 1	Scope 2	Scope 3
Cement and Lime	• Process emissions (calcination of limestone) • Stationary combustion (clinker kiln, drying of raw materials, production of electricity)	• Stationary combustion (consumption of purchased electricity, heat or steam)	• Stationary combustion (production of purchased materials, waste combustion) • Process emissions (production of purchased clinker and lime)

	Scope 1	Scope 2	Scope 3
	• Mobile combustion (quarry operations, on site transportation)		• Mobile combustion (transportation of raw materials/ products/ waste, employee business travel, commuting) • Fugitive emissions (mining and landfill CH4 and CO2, outsources process emissions)

NOTE RELATIVE TO EMISSIONS FROM WASTE FUEL OR HEAT TO COMPLY TO THE GHG PROTOCOL CORPORATE STANDARD

The cement manufacturers might use waste fuels to reduce their overall emissions. It is important here to clarify the way these emissions are accounted:

- If the cement producer burns directly waste to produce heat or energy on its own site, these emissions are accounted in Scope 1
- If the cement producer purchases heat or electricity from waste incineration from another operator (waste management service done by a third party), these emissions are accounted in Scope 2

NOTE RELATIVE TO EMISSIONS FROM CLINKER PRODUCTION

As clinker production is the most emissions intensive step in traditional cement manufacturing, it is important to clarify how these emissions shall be accounted for in the methodology:

- If the cement producer does not produce the clinker that enters the process, the clinker emissions are in its scope 3, and the company shall collect the specific factor from the supplier(s).
- If the cement producer produces its own clinker, the clinker emissions are in its scope 1.

For the rest of the document, we will reference to "inclusive scope 1 + 2". It includes the emissions relative to clinker production, be the clinker produced by the company or by a supplier.

2. Principles

The selection of principles to be used for the methodology development and implementation are explained in the general ACT Framework. Table 2 recaps the principles that were adhered to when developing the methodology.

TABLE 2: PRINCIPLES FOR IMPLEMENTATION

RELEVANCE - Select the most relevant information (core business and stakeholders) to assess low-carbon transition.

VERIFIABILITY - The data required for the assessment shall be verified or verifiable.
CONSERVATIVENESS - Whenever the use of assumptions is required, the assumption shall be on the side of achieving a 2° maximum global warming.
CONSISTENCY - Whenever time series data is used, it should be comparable over time.
LONG-TERM ORIENTATION - Enables the evaluation of the long-term performance of a company while simultaneously providing insights into short- and medium-term outcomes in alignment with the long-term.

3. Scope

3.1. SCOPE OF THE DOCUMENT

This document presents the ACT assessment methodology for the cement (CEM) sector. It includes the rationales, definitions, indicators and guidance for the sector-specific aspects of performance, narrative and trend scorings. It was developed in compliance with the ACT Guidelines for the development of sector methodologies [5], which describe the governance and process of this development, as well as the required content for such documents. It is intended to be used in conjunction with the ACT Framework, which describes the aspects of the methodology that are not sector specific.

3.2. SCOPE OF THE CEMENT SECTOR

This section on the scope specifies which type of company the methodology can assess [1].

The CEM sector includes cement manufacturing as categorised in the CDP Activity Classification System (CDP-ACS). The CEM sector comprises all activities necessary to produce cement, from the provision of raw materials to the production of cement (gate). These activities include the use of raw material (e.g. limestone, fly ash, etc.) and/or purchased materials and fuels (e.g. fossil fuels, waste fuels), manufacturing activities (e.g. calcination, grinding, blending, etc.) and services to customer (consultancy...).

The **activities excluded from the scope**, even if some companies in the CEM sector also operate in these segments, are:

- The extraction of lime, which is covered by quarries management
- The distribution and manufacturing activities of refractory mortars, concrete, articles of cement, ready-mixed and dry-mix concrete and mortars
- The manufacture of cements used in dentistry.

The ACT Cement methodology aims at assessing companies on an international level, covering cement manufacturing in various regions. The methodology should be used to assess cement production entities with the NACE code 2351 [6] **or ISIC code 2394** [7]**.**

The NACE and ISIC classifications include manufacturers of clinkers and hydraulic cements, including Portland cement, aluminous cement, slag cement and superphosphate cement. However, both classifications exclude:

- manufacture of refractory mortars, concrete etc., see 2320[1]
- manufacture of articles of cement, see 2369
- manufacture of ready-mixed and dry-mix concrete and mortars, see 2363, 2364
- manufacture of cements used in dentistry, see 3250.

37440 is CDP version 2 code for cement (including Portland, aluminous and slag cement, and similar hydraulic cements, except in the form of clinkers). Some cement production companies are involved in all the activities of cement manufacturing, while others only operate in specific areas.

Companies manufacturing blended cement can either produce their own clinker or they can buy it from their suppliers. If buying clinker from suppliers, the company shall collect the emissions factor for the bought clinker for accurate emissions reporting.

Figure 3 shows the type of companies that can use the ACT Cement methodology to carry out an assessment. Integrated cement companies (A), blenders and grinding operators (B) can be assessed on the full cement production process, except for product transport.

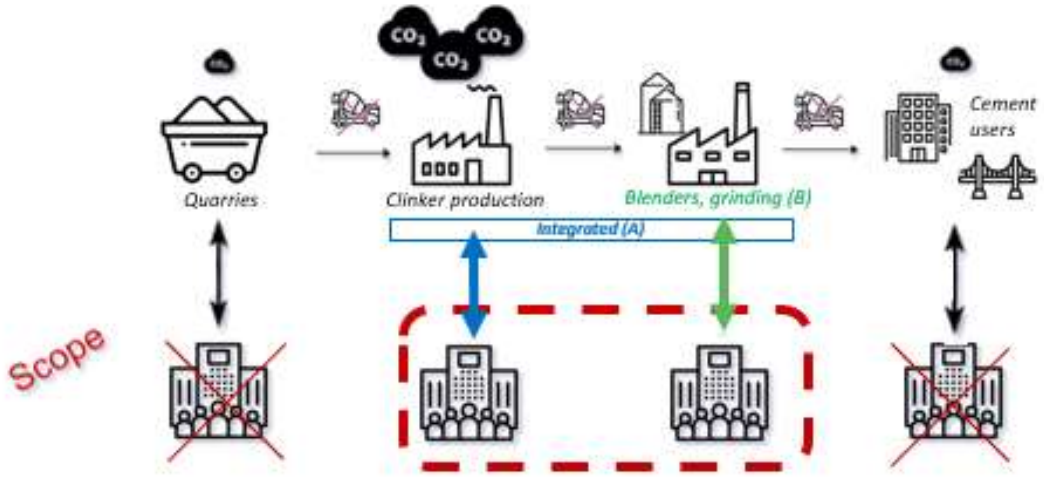


FIGURE 3: SUMMARY OF THE TYPE OF COMPANIES THAT CAN USE THE ACT CEMENT METHODOLOGY TO CARRY OUT AN ASSESSMENT (SCOPE).

RATIONALE FOR SCOPE DEFINITION

Why focus on cement and not on clinker and concrete? Firstly, the end use of clinker is cement production, and encompassing cement activities covers most CO2 emissions sources. Secondly, the sectors

[1] NACE and ISIC classification code – ISIC with a "." After the two first numbers, for example 23.20

considered for developing the ACT methodologies were chosen according to the recommendations from the TCFD (Task Force on Climate-related Financial Disclosures), which consider cement and not clinker or concrete. Thirdly, the benchmark for low-carbon scenarios from the International Energy Agency covers cement production; no benchmark for clinker or concrete was identified. As a result, it was concluded that a cement scope was most relevant for the methodology.

All types of cements are considered (grey or white cement, CEM I, CEM II, CEM III, alternative binders, etc.). The CO2 benchmark from the IEA considers cement as a commodity without differentiation between the different types of cement. Therefore, the ACT Cement methodology considers just cement without differentiating between cement performances or between type of cement (white or grey). The choice of producing white or grey cement, as well as the performance of the product, depends on client requirements. The cement manufacturer shall inform their client of the relative environmental impact (CO2 emissions as a minimum) of the product they buy and advise them on the quantity of cement to use depending on their activity. In addition, white cement represents a relatively small part of global cement production (it represents an amount of about 20 million tons per year2).

4. Boundaries

The Boundaries section specifies which emission sources are included in this methodology [1].

For integrated companies, scope 1 and 2 emissions related to cement and clinker production are included. For blenders and grinding operators, "inclusive scope 1+2" emissions are included, that is, scope 1+2 emissions of cement production, as well as the scope 3 emissions relative to clinker production. The data reported shall be gross emissions to be comparable with the IEA benchmark.

Figure 4 presents the boundaries of the ACT cement methodology

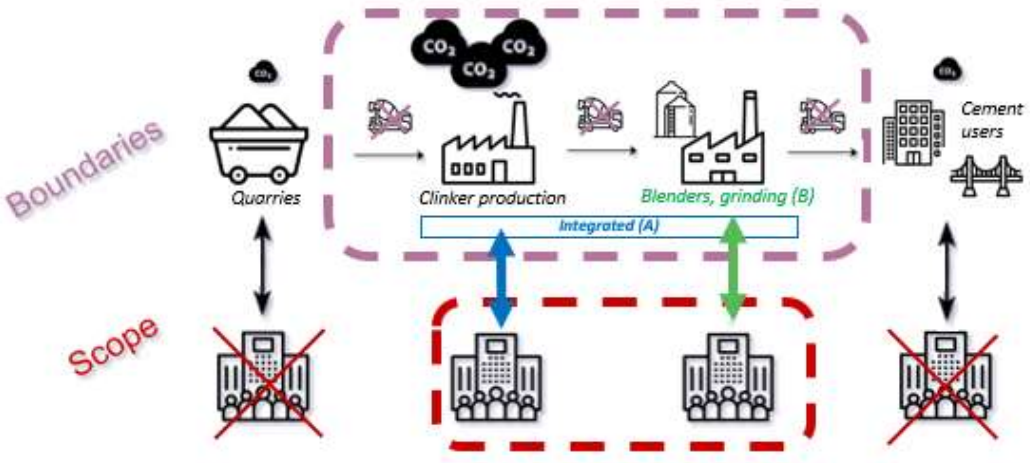


FIGURE 4: BOUNDARIES OF ACT CEMENT METHODOLOGY

[2]Article, written by Peter Edwards, Global Cement Magazine, December 2017
https://www.globalcement.com/magazine/articles/1054-global-cement-top-100-report-2017-2018

RATIONALE FOR BOUNDARY SETTINGS

The focus is on cement manufacture emissions for two main reasons: (1) As shown in Figure 2, it is expected that these will generally represent more than 90 percent of production emissions, including clinker emissions (inclusive scope 1+2) of a cement company [8], and (2) it represents a homogeneous activity indicator that can accurately measure a company's low-carbon transition.

Transport activities

The transport phase (together with quarrying, grinding and preparation of primary materials) represents less than 10 percent of the CO2 emissions, as presented in Figure 2, so it is excluded from the quantitative indicators. Transport activities are included in the qualitative indicators in the Supplier Engagement module and in the Indirect operations module specifically for clinker / material transport.

Use & end of life phases of cement

In most cases, cement is transformed into concrete that has no (or low) emissions in its use phase. If concrete is ground into fine elements at its end of life, it can capture CO2. This phenomenon is called carbonatation and occurs when cement is blended with water. It can begin during the use phase (i.e. when concrete is used to build buildings) but it is accelerated when the exposed surface is higher, so when concrete is ground into fine elements and exposed to the air. The time aspect is thus an important issue. Carbonatation is an opportunity to capture CO2 (e.g. Fastcarb or Recybeton projects). The ground concrete could be recycled or reused to create new concrete and save resources. The disadvantage of carbonatation however, is that it induces steel rebar corrosion.

The carbonatation phenomenon during the use phase and end of life phase of cement will only be included in the qualitative modules of the methodology. If carbonatation is used on the manufacturing site, captured CO2 emissions should not be accounted for in the quantitative calculations because no method currently exists to accurately estimate the quantity of emissions removed.

Figure 5 presents how the life cycle phases of cement are integrated in the ACT methodology for the cement sector.

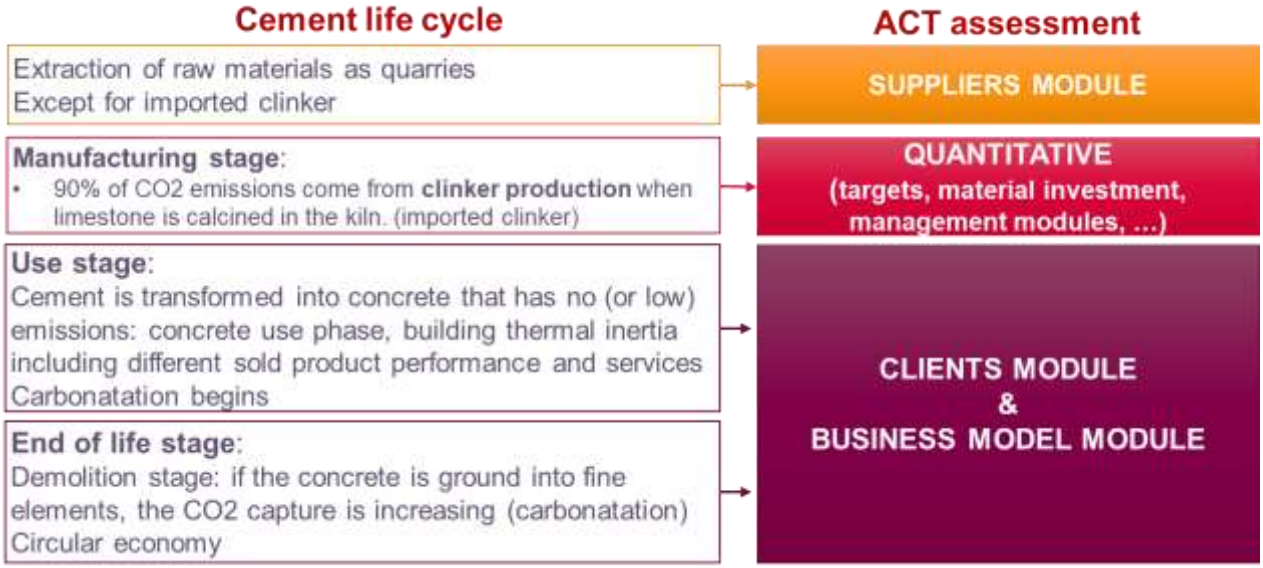


FIGURE 5 : CONSIDERATION OF CEMENT LIFE CYCLE IN THE ACT ASSESSMENT

5. Construction of the data infrastructure

Indicators are built according to the bibliographical work and the other sectors indicators development. Weighting for modules is proposed in accordance to the ACT Framework [1].

5.1. DATA SOURCES

In order to carry out a company level assessment, many data points need to be gathered by sourcing from various locations. Principally, ACT relies on the voluntary provision of data by the participating companies. Besides, external data sources are consulted where this would streamline the process, ensure fairness, and provide additional value for checking, validation and preparation of the assessment narrative.

The ACT assessment uses the following data sources:

TABLE 3: ACT ASSESSMENT DATA SOURCES

Data source	Main use
Company data request	Primary data source for most indicators.
Contextual and financial information database sources (E.g. Online and press news, RepRisk)	Contextual and financial information on company and events related to the company that could impact the ACT assessment
IPCC WG3 Assessment	Emissions factors and related figures ("Mitigation of climate change" IPCC, Contrib. Work. Group III Fifth Assess. Rep. Intergov. Panel Clim. Change, *2014)* Technology level data ("Climate Change", IPCC, 2014)
Asset activity database: GlobalData asset database. Available at: https://www.globaldata.com Cement asset database. Available at www.cemnet.com/global-cement-report/ GNR database: Available at https://www.wbcsdcement.org/GNR-2016/	Additional information used to fill the gaps of company reporting on assets.
Environmental declarations on cement based on ISO 14025 and EN 15804 (for example, Environmental Product Declaration - https://www.environdec.com/	Information about life cycle assessment of product produces by the company (traditional product or low-carbon product).

Roadmap [2]	Give an overview of the strategy of the company and the targets
CDP questionnaire (where cited in this document, the questions refer to the 2019 question numbers)	Data regarding company emissions, targets, management, business model…
GCCA questionnaire	Data regarding company emissions, targets, management, business model…

Where indicators refer to third party data sources as the default option, reporting companies may provide their own data to replace it if they can provide a justification for doing so, and information about its verification status, any assumptions used and the calculation methodology.

5.2. COMPANY DATA REQUEST

In accordance with the approach presented in *1. Introduction,* the data request will be presented to companies in a comprehensive data collection format.

The CDP questionnaire and the GCCA questionnaire can be a source of information for data collection. The ACT data collection form will highlight correspondence between requested data in the ACT cement methodology and the 2019 version of the CDP questionnaire. All data would be collected by the analyst or the company. If the clinker imported by a company is lower than 5%, a cut off rule would be applied on this imported value to simplify the calculation.

In order to address the right issues for each type of company, the methodology has been differentiated for integrated companies (referred to as company A in the assessment) and blenders and grinding operators (referred to as company B in the assessment). Only Modules 2 and 4 are distinctly based on company type – other modules apply to all companies.

If a company has produced **a** quantity of cement in their A assets (integrated) and **b** quantity of cement in their B assets (blenders and grinding operators), the company should answer to the questionnaire with the relative quantity of cement produced for each type of asset. The computation of the score is explained in *6.3 Weightings.*

5.3. PERFORMANCE INDICATORS

Table 4 gives an overview of performance indicators for the cement sector. “A” module (namely 2. Direct operations) is specific for companies A (integrated companies), whereas “B” module (namely 4. Indirect operations) is specific for companies B (blenders and grinding operators). Both modules aim at assessing the direct emissions for companies A and mainly indirect emissions for companies B.

TABLE 4: PERFORMANCE INDICATORS OVERVIEW

		CEMENT		
		Past	Present	Future
Core business performance	1.TARGETS	CEM 1.3 Achievement of previous targets		CEM 1.1 Alignment of inclusive scope 1+2 emissions reduction targets CEM 1.2 Time horizon of targets
Core business performance / Investment	2.A DIRECT OPERATIONS	CEM 2.1 A Trend in past emissions intensity		CEM 2.2 A Locked-in emissions CEM 2.3 A Trend in future emissions intensity CEM 2.4 A Alternative fuels activities
Core business performance / Investment	3. INTANGIBLE INVESTMENT		CEM 3.1 R&D for low-carbon transition	
Core business performance	4 B INDIRECT OPERATIONS	CEM 4.1 B Trend in past emissions intensity		
Core business performance	4 B INDIRECT OPERATIONS		CEM 4.2 B Electricity management CEM 4.3 B Clinker / material-specific interventions	
Core business performance	5. GOVERNANCE		CEM 5.1 Oversight of climate change issues CEM 5.2 Climate change oversight capabilities CEM 5.4 Climate change management incentives	CEM 5.3 Low-carbon transition plan CEM 5.5 Climate change scenario testing
Influence	6. SUPPLIER	CEM 6.1 Strategy to influence suppliers to reduce their GHG emissions CEM 6.2 Activities to influence suppliers to reduce their GHG emissions		
Influence	7. CLIENT	CEM 7.1 Strategy to influence customer behaviour to reduce their GHG emissions CEM 7.2 Activities to influence customer behaviour to reduce their GHG emissions		

	8. POLICY ENGAGEMENT		CEM 8.1 Company policy on engagement with trade associations CEM 8.2 Trade associations supported do not have climate-negative activities or positions CEM 8.3 Position on significant climate policies	
	9. BUSINESS MODEL	CEM 9.1 Business activities that reduce structural barriers to market penetration of low-carbon cement CEM 9.2 Business activities that contribute to low-carbon optimization of construction CEM 9.3 Business activities around the circular economy		

For all maturity matrices except for Business Model module matrices, the score will be 0 for a 'basic' level answer, 0,25 for 'standard', 0,5 for 'advanced', 0,75 for 'next practice', 1 for 'low-carbon aligned'.

MODULE 1: TARGETS (WEIGHTING: 15%)

CEM 1.1 ALIGNMENT OF INCLUSIVE SCOPE 1+2 EMISSIONS REDUCTION TARGETS

DESCRIPTION & REQUIREMENTS	CEM 1.1 ALIGNMENT OF INCLUSIVE SCOPE 1+2 EMISSIONS REDUCTION TARGETS
SHORT DESCRIPTION OF INDICATOR	A measure of the alignment of the company's emissions reduction target with its decarbonization pathway. The indicator will identify the gap between the company's targeted pathway and the decarbonization pathway as a percentage, which is expressed as the company's commitment gap.
DATA REQUIREMENTS	The questions (from CDP questionnaire 2019) covering the information relevant to this indicator are: ♦ CEM0.B (base year) [C0.1] ♦ CEM1.A (company's target) [C4.1a], [C4.1b] ♦ CEM2.A, 4.A (tons of cement produced per plant; emissions factor (metric tonnes CO2e/tonnes of cement) [C-CE9.3b] & [C6.1], [C6.3], [C6.5], or [C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4], [C-CE7.7/C-CH7.7/C-CO7.7/C-MM7.7/C-OG7.7/C-ST7.7/C-TO7.7/C-TS7.7] ; The IEA scenario only allows differentiation between OECD and non-OECD regions. This distinction could be relevant. ♦ CEM2.B (The reporter shall provide production activity and emissions data by plant type) External sources of data used for the analysis of this indicator are: ♦ IEA ETP [9] – background scenario data ♦ SDA [10] – specific benchmark pathway definition The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Cement production emissions, including clinker emissions (inclusive scope 1+2)	CB_{S12}	kgCO2/ton cement	IEA ETP– background scenario data

HOW THE ANALYSIS WILL BE DONE

The analysis has two dimensions.

- Dimension 1 assesses the alignment of the company's near-term targets. Any target where the target year ≤ reporting year + 10 can be included in this dimension.
- Dimension 2 assesses the alignment of a company's long-term targets. Any target for which the target year > reporting year + 10 can be included in this dimension.
- The scoring rationale and calculation are the same for both dimensions.

The analysis is based on a trend ratio between the company's scope 1+2 emissions target and the company benchmark. Trends are computed between base year and the longest time horizon of the target.

The company's target pathway is the decarbonisation over time, defined by the company's scope 1+2 emissions reduction target. To compute it, a straight line is drawn between the starting point of the analysis and the company's target endpoint. The company benchmark pathway is the company specific scope 1+2 emissions low-carbon benchmark pathway. See section 6.1 Benchmarks for details on the computation of this pathway. The company achieves the maximum score if the company's target pathway and the company benchmark pathway are aligned and if the targets are covering most of the company's scope 1+2 emissions at base year.

CALCULATION OF SCORE:

1) Trend ratio

The score is calculated by dividing the company's emissions intensity reduction trend by the specific benchmark emissions intensity reduction trend between the base year and the target year through the trend ratio:

$$Trend\ ratio = \frac{Company's\ commitment\ trend}{Benchmark\ pathway\ trend} = \frac{EI_C(TY) - EI_C(BY)}{EI_B(TY) - EI_B(BY)}$$

Where:

- EIc(TY) is the company scope 1+2 emissions intensity at target year,
- EIc(BY) is the company scope 1+2 emissions intensity at base year,

- EIb(TY) is the company's benchmark scope 1+2 emission intensity at target year
- EIb(BY) is the company's benchmark scope 1+2 emission intensity at base year (equals to EIc (BY))

The commitment gap of the company is equal to (1- trend ratio). Thus, when the company's target pathway is aligned on the company's benchmark, the trend ratio is equal to 1 and the commitment gap is 0 (see Figure 6).

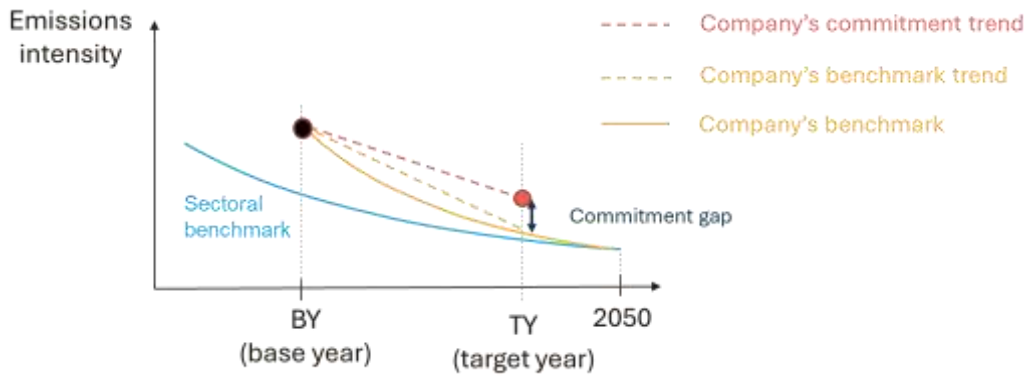


FIGURE 6: TREND RATIO AND COMMITMENT GAP

2) **Final Score**

The final score assigned to the indicator is calculated as follows (see Appendix **Error! Reference source not found.** for a graphic illustration of the different cases):

Conditions	Score
$Company's\ target\ trend > 0$ Increase in company emissions intensity	0%
$Company's\ target\ trend \leq 0$	

$0 \leq trend\ ratio \leq 1$ Decrease in company emissions intensity but company's commitment does not go beyond the company's benchmark ambition	$Trend\ ratio \times 100\%$
$Company's\ target\ trend < 0$ and $EI_C(BY) \geq EI_B(2050)$ $trend\ ratio > 1$ Decrease in company emissions intensity and company's commitment equals or exceeds the company's benchmark ambition	100%
$Company's\ target\ trend \leq 0\ and\ EI_C(BY) \leq EI_B(2050)$ No increase in company emissions intensity and company's emissions intensity is already below the company's benchmark ambition for 2050	100%

Targets that do not cover > 95% of scope 1+2 emissions are not preferred in the calculations. If only such targets are available, then the score will be adjusted downwards in proportion with % coverage. If the target coverage of total company emissions at base year (C_{BY}) represents less than 95%, the final score is equal to:

Final Score = Score x Target coverage of total company emissions (C_{BY}))

- If the company has set several targets for the same emission source, the score will be the average of target scores.
- If the company has set targets on different emissions sources, the consolidation of the scores will be based on the share of emissions covered by the targets.

Aggregate score: Dimension 1: 50%, Dimension 2: 50%

ACA specific case

If the company benchmark pathway is built using the absolute contraction approach (ACA), calculations are the same as above, but using absolute emissions instead of emission intensities.

RATIONALE	CEM 1.1 ALIGNMENT OF INCLUSIVE SCOPE 1+2 EMISSIONS REDUCTION TARGETS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** Targets are included in the ACT CEM assessment for the following reasons: • Targets are an indicator of corporate commitment to reduce emissions and are a meaningful metric of the company's internal planning towards the transition. • As most emissions of the sector are within the sector boundaries of control, targets are a very powerful management tool to reduce these emissions. Most emissions from the cement sector can be captured in targets using existing target-setting frameworks. • Targets are one of the few metrics that can predict a company's long-term plans beyond that which can be projected in the short-term, satisfying ACT's need for indicators that can provide information on the long-term future of a company. **SCORING RATIONALE:** Targets are quantitatively interpreted and directly compared to the low-carbon benchmark for the sector, using the CB_{S12} benchmark. This is done because most of the emissions from the sector are from cement production emissions, which makes the cement production emissions benchmark the most relevant to the company. Targets are compared to the benchmark directly, and the relative gap is calculated compared to the business-as-usual pathway. The gap method was chosen for its relative simplicity in interpretation and powerful message, which aligns with the United Nations Environment Program's (UNEP) narrative of the global commitment gap of the United Nations Framework Convention on Climate Change (UNFCCC) Climate Agreements [6]. The simple percentage score also needs no further computation to become meaningful on its own, as well as be useable for aggregation in the performance score.

CEM 1.2 TIME HORIZON OF TARGETS

DESCRIPTION & REQUIREMENTS	CEM 1.2 TIME HORIZON OF TARGETS
SHORT DESCRIPTION OF INDICATOR	A measure of the time horizons of company targets. The ideal set of targets is forward looking enough to a long-time horizon compatible with sector plant lifetimes (major infrastructures lifetime of the asset as kilns, grinders, storages silos for rocks, powder, clinker, cement or homogenization), but also includes short-term targets that incentivise action in the present.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- CEM0.B (reporting year) [C0.1]
- CEM1.A (target year) [C4.1b]
- CEM2.A, 4.A (tons of cement produced per plant; emissions factor (metric tonnes CO2e/tonnes of cement) [C-CE9.3b] & [C6.1], [C6.3], [C6.5], or [C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4], [C-CE7.7/C-CH7.7/C-CO7.7/C-MM7.7/C-OG7.7/C-ST7.7/C-TO7.7/C-TS7.7] ; The IEA scenario only allows differentiation between OECD and non-OECD regions. This distinction could be relevant.
- CEM2.B (The reporter shall provide production activity and emissions data by plant type)

External sources of data used for the analysis of this indicator are:

- INNOVATION IN THE CEMENT INDUSTRY, CEMBUREAU “cement plants typically have a lifetime of as long as 30-50 years” p.5 [11]
- “Plant lifetime in the order of 15-20 years” p.2 [12]

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Plant average lifetime	Ha	years	30 years is used as a proxy

HOW THE ANALYSIS WILL BE DONE

The analysis has two dimensions:

- A comparison of: (a) the longest time horizon of the company’s targets, and (b) the plant average lifetime (30 years used as a proxy).
- The company has interval targets that ensure both short and long-term targets are in place to incentivise short-term action and communicate long-term commitments.

DIMENSION 1 – TARGET ENDPOINT:

The company's target endpoint (T_e) is compared to the sector plant average lifetime Ha (30 years as a proxy). The company's target endpoint (T_e) is equal to the longest time horizon among the company's targets, minus the reporting year:

$$T_e = Longest\ target\ time\ horizon - reporting\ year$$

The analysis compares the company's target endpoint(T_e) to Ha. This analysis measures the horizon gap:

$$Horizon\ gap = Ha - T_e$$

The company's target endpoint is compared to Ha. A maximum score of 50% is attained if T_e equals or exceed Ha, in which case the horizon gap is zero. A zero score is awarded if the horizon gap is > 2/3 of Ha , and an intermediate percentage score is awarded for any target that is between these two points, proportional to the size of horizon gap.

DIMENSION 2 – INTERMEDIATE HORIZONS:

All company targets and their endpoints are calculated and plotted. The ideal scoring company does not have intervals between target endpoints larger than 5 years from the reporting year.

Measurements are done in five-year intervals between the reporting year and T_e.

The company's targets are compared according the following scoring table:

INTERMEDIATE TARGET GAP	SCORE
No gaps of more than 5 years during T_e	50%
No gaps of more than 5 years during 80% of T_e	40%
No gaps of more than 5 years during 60% of T_e	30%
No gaps of more than 5 years during 40% of T_e	20%
No gaps of more than 5 years during 20% of T_e	10%

There are gaps of more than 5 years before 20% of T_e	0%

An example is illustrated in Figure 7.

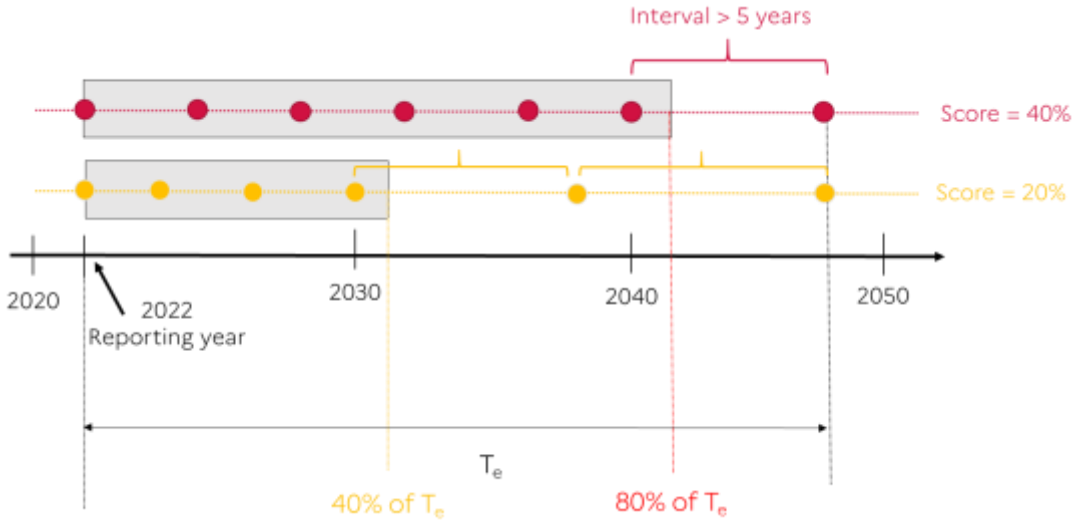


FIGURE 7: EXAMPLES OF HORIZONS OF INTERMEDIATE TARGETS SET BY THE COMPANY AND CORRESPONDING SCORES ON DIMENSION 2 OF THE INDICATOR 1.2

FOR ALL CALCULATIONS:

- If the company enters a 'year target was set' in the data request, then the calculations may be redone using this as the baseline instead of the reporting year. The company can attain up to 80% of the maximum score with this alternate calculation. The baseline that results in the higher score will be used for the final score.
- Targets that do not cover > 95% of inclusive scope 1+2 emissions are not preferred in the calculations. If these types of targets only are available, then the score is adjusted downwards equal to the % coverage that is missing.

Note: Several targets can be assessed, but the analyst shall focus on targets that cover the inclusive scope 1 + 2 defined in the methodology. Target at group or corporate level is preferred than at country or facility level. When several targets are assessed, the aggregation of the scores will be a weighted average of the target scores, based on the share of emissions covered by the targets

AGGREGATE SCORE - DIMENSION 1: 50%, DIMENSION 2: 50%.

RATIONALE	CEM 1.2 TIME HORIZON OF TARGETS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** The time horizon of targets is included in the ACT CEM assessment for the following reasons: ♦ The target endpoint is an indicator of how forward looking the company's transition strategy is. ♦ The long-expected time horizon of production assets means that cement producers 'commit' a large amount of GHG emissions into the future, which requires targets that have time horizons that are aligned with this reality. ♦ Aside from communicating long-term commitments, short-term action needs to be incentivised. Therefore short-time intervals between targets are needed. **SCORING RATIONALE:** The score of this indicator is tied to how the target timeline compares to the lifetime of the company's plants (or the plants on which a blender or grinding operator (company B) depends when subcontracting the production of clinker). The company has a 'horizon gap' if its targets do not go up to this lifetime.

CEM 1.3 ACHIEVEMENT OF PREVIOUS TARGETS

DESCRIPTION & REQUIREMENTS	CEM 1.3 ACHIEVEMENT OF PREVIOUS TARGETS
SHORT DESCRIPTION OF INDICATOR	A measure of the company's historical target achievements and current progress towards active emissions reduction targets. The ambition of the target is qualitatively assessed and is not included in the performance indicators.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- CEM0.B (reporting year) [C0.1]
- CEM1.A (target year) [C4.1b]

HOW THE ANALYSIS WILL BE DONE

For the performance score, this will be assessed on two dimensions.

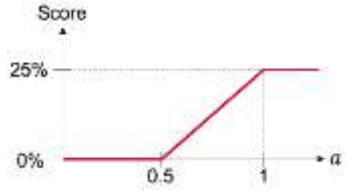
DIMENSION 1: The company has achieved all previous emissions reduction targets with a target year in the past 10 years. If all past targets are indeed achieved, the highest score is obtained. If not, the achievement ratio a is computed as follows:

$$a = \frac{E(t_{ref}) - E(t_{horizon})}{E(t_{ref}) - T(t_{horizon})} \geq 0.5$$

where $E(t_{ref})$ is the level of emissions of the company on the year the target was set, $T(t_{horizon})$ is the target the company set (a given level of emission at a given horizon year, now past), and $E(t_{horizon})$ is the effective level of emission reached by the company on the year of horizon of the target.

A threshold is set for scoring at 0.5: if the company has achieved less than 50% of its own past target, it shall receive a zero score.

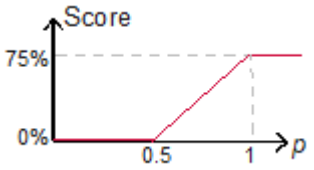
If the company has several past targets over the last 10 years, the ratio a shall be computed for each target, and the average of all a ratio shall be kept for scoring.

Achievement ratio	Score	
$a \geq 1$	25%	
0.5 < a< 1	25%*(2*a-1)	
$a \leq 0.5$	0%	

DIMENSION 2: The company is currently on track to meet an existing emissions reduction target, whereby the ratio between the remaining time period and the level missing to target achievement (Progress Ratio p) is not lower than 0.5:

$$p = \frac{1 - \%time}{1 - \%complete} \geq 0.5$$

The highest score (100%) is attained if p is 1 or higher, and the lowest score (0%) is attained if p is 0.5 or lower. A percentage score is assigned for any value between 0.5 and 1.

Progress ratio	Score	
$p \geq 1$	75%	
$0.5 < p < 1$	$75\% * (2 * p - 1)$	
$p \leq 0.5$	0%	

AGGREGATE SCORE - DIMENSION 1: 25%, DIMENSION 2: 75%.

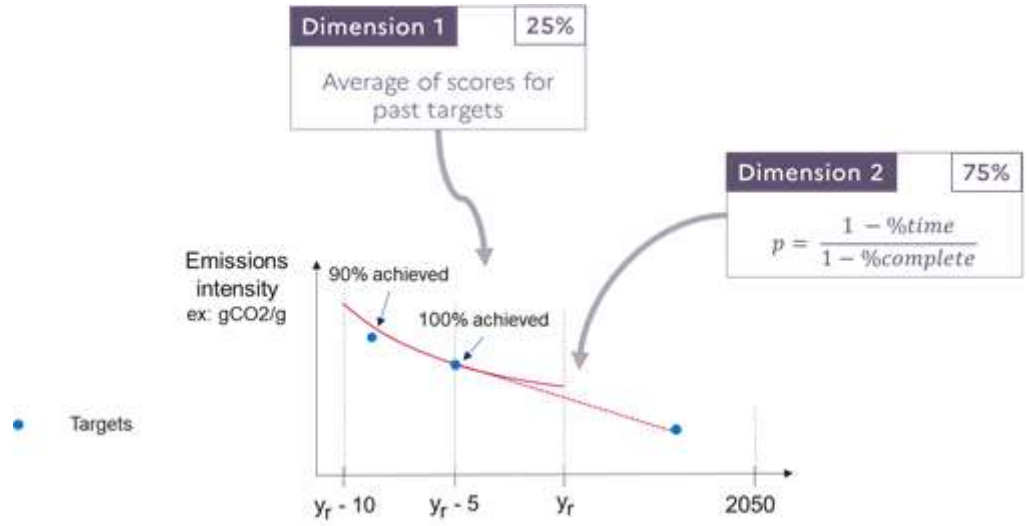


FIGURE 8: CALCULATION OF THE ACHIEVEMENT OF PREVIOUS TARGET INDICATOR

FOR ALL CALCULATIONS:

- Companies whose past targets do not have target years, but which only have target years in the future are not assessed on dimension 1, but only on dimension 2.
- Targets that do not cover >95% of inclusive scope 1+2 emissions are not preferred in the calculation of dimension 2, but will not be penalized, as other indicators already penalize companies for not having a large coverage in the target.
- If the company has several active targets in different scopes that can be assessed according to the above criteria, then the score will be an average score based on the progress ratios of all targets assessed.

The performance score does not assess the ambition level and scope of previous targets, and therefore dimension 1 only has a low weight in the final performance score. This information is assessed in the analysis narrative, which will look at the following dimensions:

- Achievement level: To what degree has the company achieved its previously set emissions reduction targets?
- Progress level: To what degree is the company on track to meet its current emissions reduction targets?
- Ambition level: What level of ambition do the previously achieved emissions reduction targets represent?

RATIONALE	CEM 1.3 ACHIEVEMENT OF PREVIOUS TARGETS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** ♦ The ACT assessment only looks to the past to the extent that it can inform on the future. This indicator is future-relevant by providing information on the company's organizational ability to set and meet emissions reduction targets. Dimension 1 of this indicator adds credibility to any company claiming to commit to a science-based reduction pathway. ♦ Indicators 1.1 and 1.2 look at targets in an undefined, theoretical future. Dimension 2 of this indicator adds value and grounds the assessment to the analysis of a comparison to the company's historical performance with respect to its targets in the reporting year. **SCORING RATIONALE:** Quantitative interpretation of previous target achievement is not straightforward. The performance score thus makes no judgement of previous target ambition and leaves it to the analysis narrative to make a meaningful judgement on the ambition level of past targets. ♦ Dimension 1 of the performance score will penalize companies who have not met previous targets in the past 10 years, as this means the company has lower credibility when setting ambitious science-based targets. ♦ Dimension 2 uses a simple ratio sourced from existing CDP data points (CC 3.1e) in order to compare targets. The threshold 0.5 was chosen as it allows companies some flexibility with respect to the implementation of the target, but it does have the ability to flag companies that are not on track towards achievement. When p is lower than 0.5, the company needs to achieve more than twice the reduction per unit of time than the target originally envisioned.

MODULE 2: DIRECT OPERATIONS (A) (WEIGHTING: 0 - 33%)

This module shall be calculated and assessed only integrated companies (companies called A). Only the CO2 emissions for the cement sales should be reported (Emissions considered = clinker production + blenders & grinding – clinker sold). The CO2 emissions for the clinker sales could be reported as a comment in the assessment for each facility or at corporate level.

CEM 2.1A TREND IN PAST SCOPE 1+2 EMISSIONS

DESCRIPTION & REQUIREMENT	CEM 2.1A TREND IN PAST SCOPE 1+2 EMISSIONS

SHORT DESCRIPTION OF INDICATOR

A measure of the alignment of the company's recent emissions trend with that of its decarbonization pathway. The indicator will compare the gradient of this trend over a 5-year period to the reporting year (reporting year minus 5 years) with the decarbonization pathway trend over a 5-year period after the reporting year.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- CEM 0.B: The start and end date for which data is reported for the most recent year – CDP0.2
- CEM 2.A: For all existing and planned assets : Asset name, Geographic Location (country level), Plant type, Technology, Fuel mix , Status, Total capacity (ton), Active capacity (ton), Emissions factor (metric tonnes CO2e/t cement), Year of commissioning, Expected lifetime (years), Decommissioning or modernization year, if planned, Ownership stake (%), Attributable to reporting boundary (%)
- CEM 2.B: The reporter shall provide plant activity and emissions data by plant type for the last five years

External sources of data used for the analysis of this indicator are:

- The Global Cement Report - Online Database of Cement Plants for plant listing (www.cemnet.com/global-cement-report/)
- IEA ETP [9]– background scenario data
- SDA [10] – specific benchmark pathway definition
- IPCC (2006) [13] – Fuel emissions factors

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC
Cement production emissions, including clinker emissions (inclusive scope 1+2)	CB_{S12}	kgCO2/ton cement

HOW THE ANALYSIS WILL BE DONE

The analysis is based on the comparison between the company's recent (reporting year minus 5 years) emissions intensity trend gradient (CR'_{S12}) and the company's decarbonization pathway trend gradient (CB'_{S12}) in the short-term (reporting year plus 5 years). The emissions intensity of the company at the reporting year (CEI_Y) and the sectoral benchmark value of emissions intensity in 2050 (SB_{2050}) are also considered to calculate the company's score.

CR'_{S12} is the gradient of the linear trend-line of the company's recent inclusive scope 1+2 emissions intensity ($kgCO_2$/ton cement) over time (CR_{S12}).

CB'_{S12} is the gradient of the linear trend-line of the company benchmark pathway for emissions intensity ($kgCO_2$/ton cement) (CB_{S12}). See section 6.2. Quantitative benchmarks used for the indicators for details on the computation of the company specific decarbonization pathway.

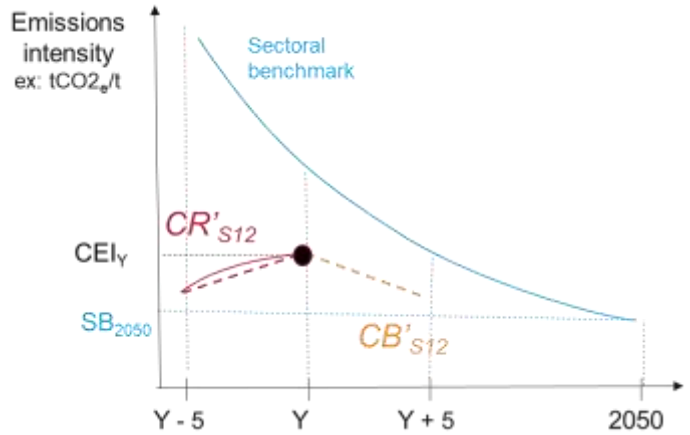
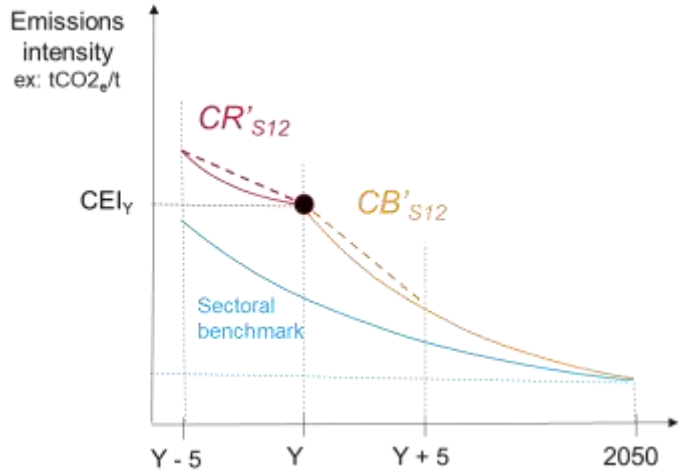
The difference between CR'_{S12} and CB'_{S12} will be measured by their ratio (r_{S12}). This is the inclusive scope 1+2 emissions Transition ratio, which is calculated by the following equation, with the symbol ' used to denote gradients:

$$R_{S12} = \frac{CR'_{S12}}{CB'_{S12}}$$

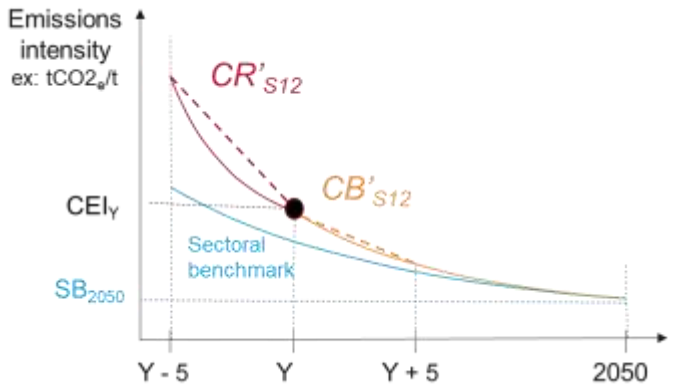
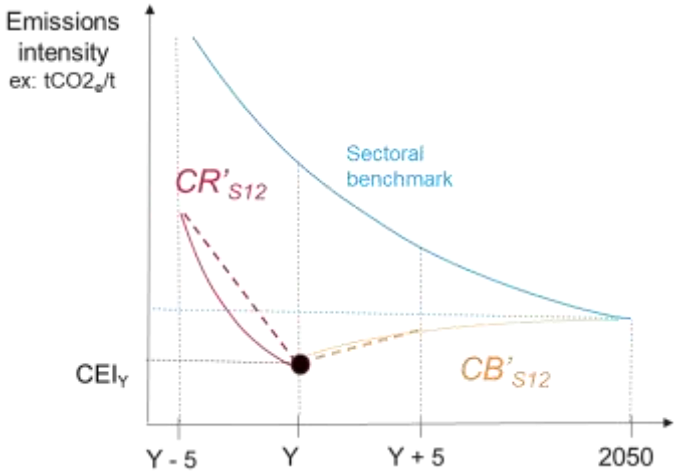
Four different cases are to be taken into consideration:

- Case #1: CR'_{SC1+2} is positive → Score = 0 (whatever the r_{SC1+2} and CEI_Y values)
- Case #2: CR'_{SC1+2} is negative and $0 < r_{SC1+2} < 1$ and CEI_Y is higher than SB_{2050} → Score = r_{SC1+2} (expressed as a percentage)
- Case #3: CR'_{SC1+2} is negative and $r_{SC1+2} \geq 1$ and CEI_Y is higher than SB_{2050} → Score = 100 %
- Case #4: CR'_{SC1+2} is negative and CEI_Y is lower than SB_{2050} → Score = 100 % (whatever the r_{SC1+2} value)

Case #1	Case #2

	
$CR'_{S12} > 0$ Whatever the r_{S12} value Whatever the CEI_Y value	$CR'_{S12} < 0$ $0 < r_{S12} < 1$ $CEI_Y > SB_{2050}$
Score = 0	**Score = r_{S12} (%)**

Case #3	Case #4

		
	$CR'_{S12} < 0$ $r_{S12} \geq 1$ $CEI_Y > SB_{2050}$	$CR'_{S12} < 0$ $CEI_Y < SB_{2050}$ whatever the r_{S12} value
	Score = 100 %	**Score = 100 %**

RATIONALE

CEM 2.1A TREND IN PAST SCOPE 1+2 EMISSIONS

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Trend in past emissions intensity is included in the ACT CEM assessment for the following reasons:

- The trend shows the speed at which the company has been reducing its emissions intensity over the recent past. Comparing this to the decarbonization pathway gives an indication of the scale of the change that needs to be made within the company to bring it onto a low-carbon pathway.
- While ACT aims to be as future-oriented, it nevertheless does not want to solely rely on projections of the future, in a way that would make the analysis too vulnerable to the uncertainty of those projections. Therefore, this measure, along with projected emissions intensity and absolute emissions, forms part of a holistic view of company emissions performance in the past, present, and future.

SCORING RATIONALE:

While 'gap' type scoring is preferred where possible for any indicator, this indicator only looks at past emissions and would therefore require a different baseline in order to generate a gap analysis. Thus, instead of a gap analysis, a trend analysis is conducted to compare current data of the company to the past data and improvements that have been made since the past data. An advantage of the trend analysis is that it does not require the use of a business-as-usual pathway to anchor the data points and aid interpretation; trends can be compared directly and a score can be directly correlated to the resulting ratio.

CEM 2.2A LOCKED-IN EMISSIONS

DESCRIPTION & REQUIREMENT	CEM 2.2A LOCKED-IN EMISSIONS
SHORT DESCRIPTION OF INDICATOR	A measure of the company's cumulative emissions from the reporting year to the reporting year + 15 years from installed and announced plants. The indicator will compare this to the emissions budget entailed by the company's intensity decarbonization pathway and projected trends in the sector at the country/regional level.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 0.B: The start and end date for which data is reported for the most recent year – CDP0.2 ♦ CEM 2.A, 4.A: For all existing and planned assets: Asset name, Geographic Location (country level), Plant type, Technology, Fuel mix, Status, Total capacity (ton), Active capacity (ton), Emissions factor (metric tonnes CO2e/t cement), Year of commissioning, Expected lifetime (years), Decommissioning or modernization year, if planned, Ownership stake (%), Attributable to reporting boundary (%) ♦ CEM 2.B, 4.B: The reporter shall provide plant activity and emissions data by plant type for the last five years ♦ CEM 2.C: Anticipated gross production (t cement) for RY+15 External sources of data used for the analysis of this indicator are: ♦ IEA ETP [9] – background scenario data

- SDA [10] – specific benchmark pathway definition
- IPCC (2006) [13] – Fuel emissions factors
- Cemnet – lifetime of assets

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Cement production emissions, including clinker emissions (inclusive scope 1+2)	CA_G	kgCO2/ton cement	• IEA ETP – background scenario data • SDA – specific benchmark pathway definition

HOW THE ANALYSIS WILL BE DONE

The analysis is based on the ratio between the company's installed and planned emissions for the 15 years after the reporting year [$LE_F(t)$], and the emissions budget entailed by the company's carbon budget [B(t)] over the same period of time.

$LE_F(t)$ is calculated as the total cumulative emissions implied by the lifetimes of currently active and confirmed planned assets that are going to be commissioned soon. If unknown, the commissioning year of projects is estimated from the project status (e.g. bidding process, construction, etc.) and data on typical project periods by plant type. An average historical capacity factor over a 5-year period to the reporting year is applied to cement plant capacities to estimate future production.

$LE_F(t)$ is calculated as the company's locked-in carbon emissions, up until the chosen time period t, which is derived by taking the area under the company's future locked-in emissions curve. This curve in turn is derived from the company's intensity pathway CA_G, multiplied by activity A_G:

$$LE_F(t) = \int_{from\ the\ reporting\ year}^{y_T+15} A_G * CA_G$$

Figure 9 illustrates locked-in emissions of one facility and of the whole company.

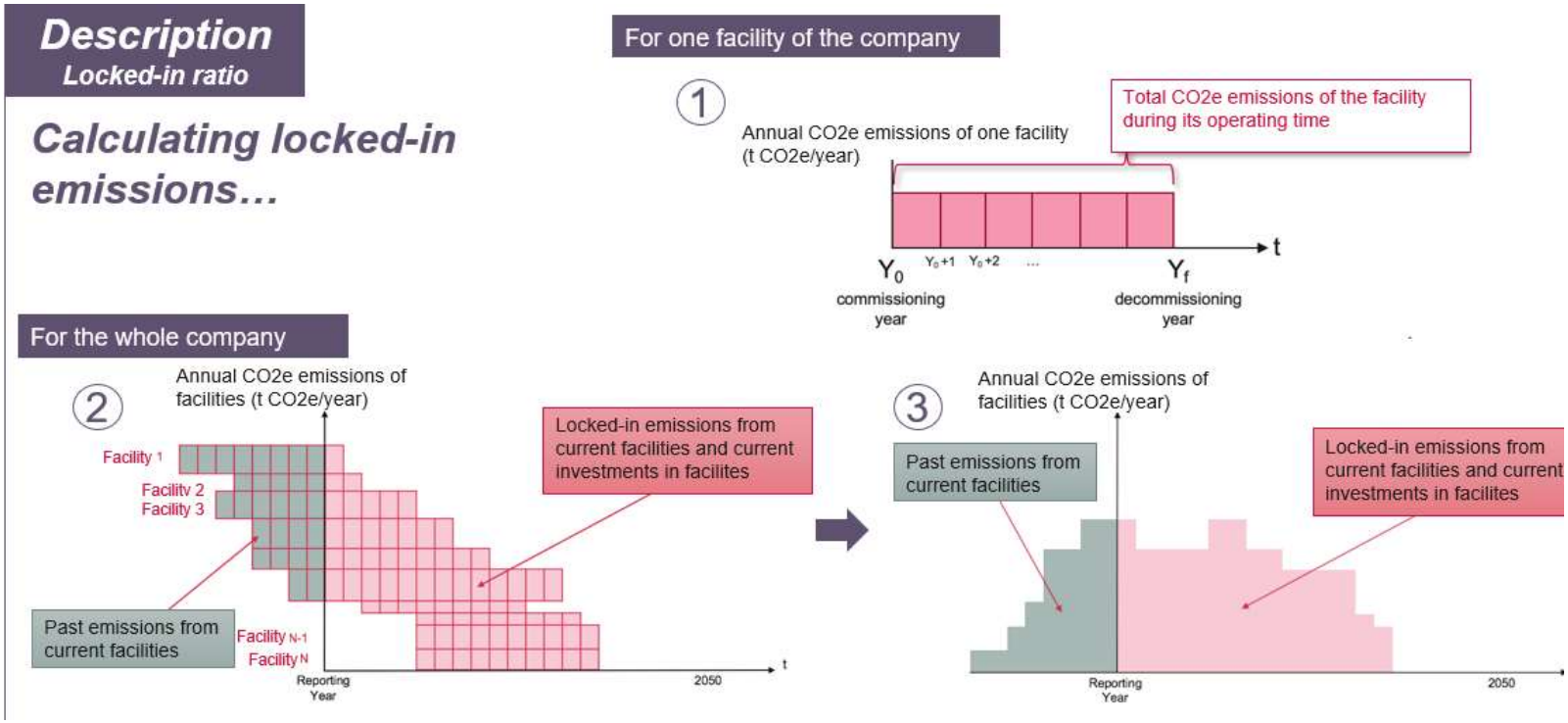


FIGURE 9 : COMPUTING LOCKED-IN EMISSIONS FROM FACILITY

$B(y_r + 15)$ is calculated as the company's carbon budget up to reporting year + 15 years, which is derived by taking the area under the absolute emissions reduction curve. This curve is derived from the company benchmark pathway ($CB_{Scopes12}$) by multiplying it by the projected cement activity A_P for the company:

$$B(t) = \int_{the\ reporting\ year}^{y_r+15} A_P * CB_{Scope12}$$

The company’s benchmark is computed from the company’s current emissions at reporting year and the level of carbon intensity defined by the sectoral benchmark presented in section 6. The carbon budget is illustrated in Figure 10 below.

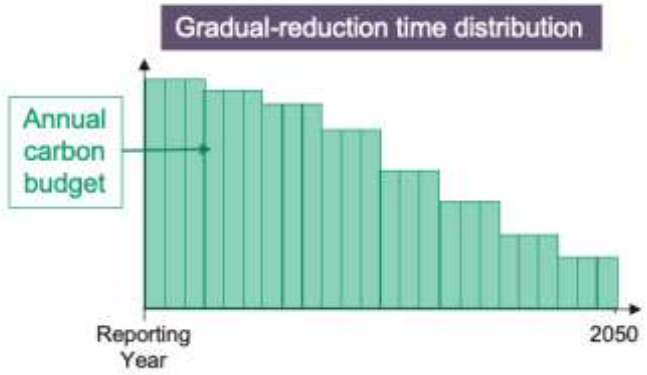


FIGURE 10 : CARBON BUDGET DERIVED FROM THE COMPANY'S BENCHMARK

Depending on the data availability, the computation of these areas may not be as straightforward as the equations shown and will be done by approximation, but the principles will hold.

The locked-in ratio (r_{LB}) is illustrated in Figure 11, and calculated as follows:

$$r_{LB}(t) = \frac{LE_F(t)}{B(t)}$$

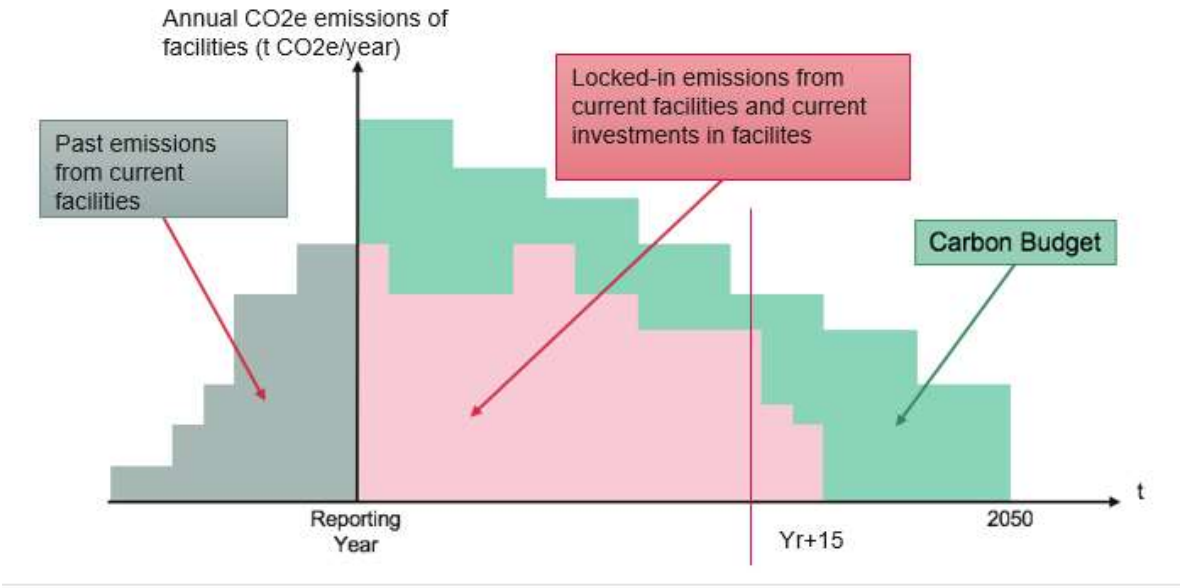


FIGURE 11 : ILLUSTRATION OF THE LOCKED-IN RATIO

TO BE ABLE TO GIVE A SCORE REGARDING THE AMOUNT OF CARBON BUDGET CONSUMED, THE LEVEL OF ACTIVITY PERFORMED WITH THE EXISTING AND PLANNED ASSETS NEEDS TO BE TAKEN INTO ACCOUNT. THEREFORE, IN A SIMILAR WAY TO LOCKED-IN EMISSIONS, THE LEVEL OF ACTIVITY THAT THE COMPANY IS ABLE TO

PERFORM THANKS TO THE EXISTING AND PLANNED ASSETS, PER YEAR. IT IS CALLED THE SECURED ACTIVITY AND IS ILLUSTRATED IN

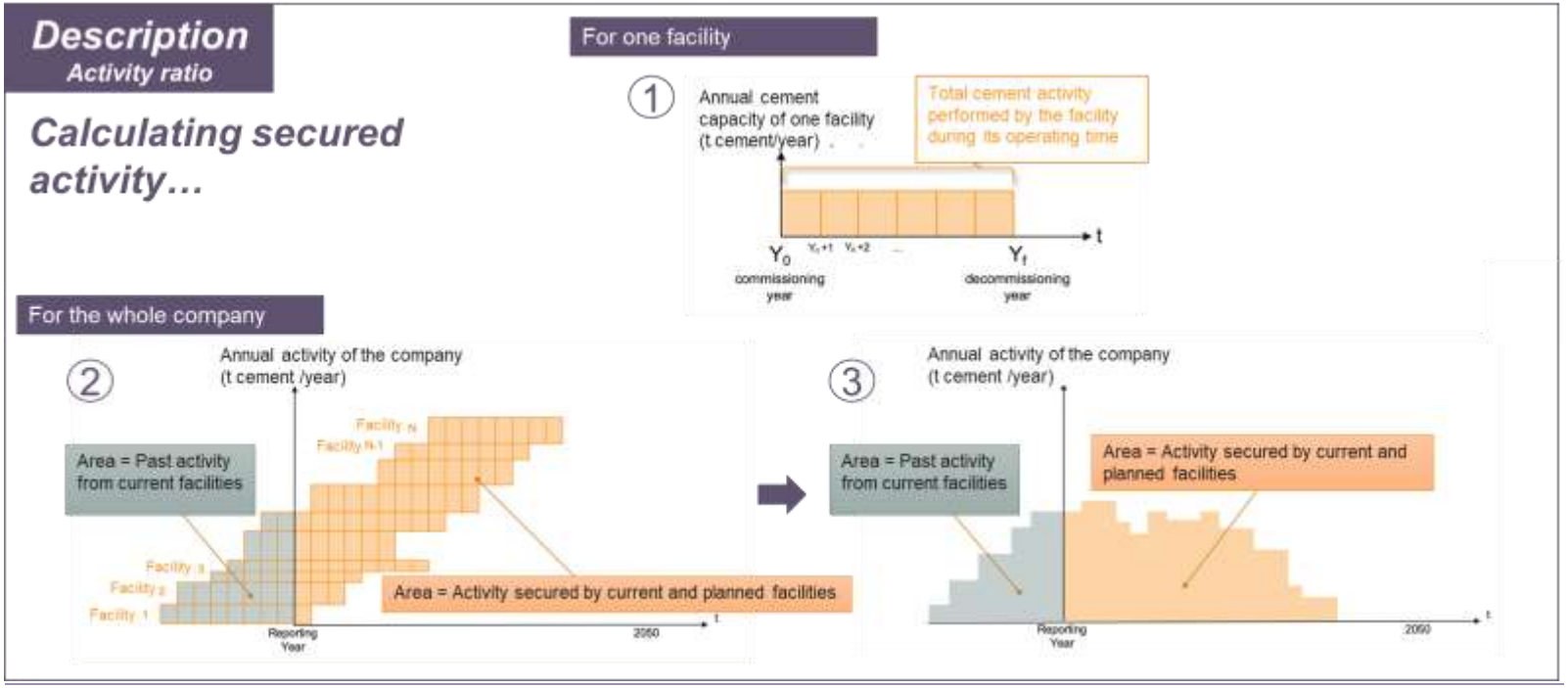


Figure 12.

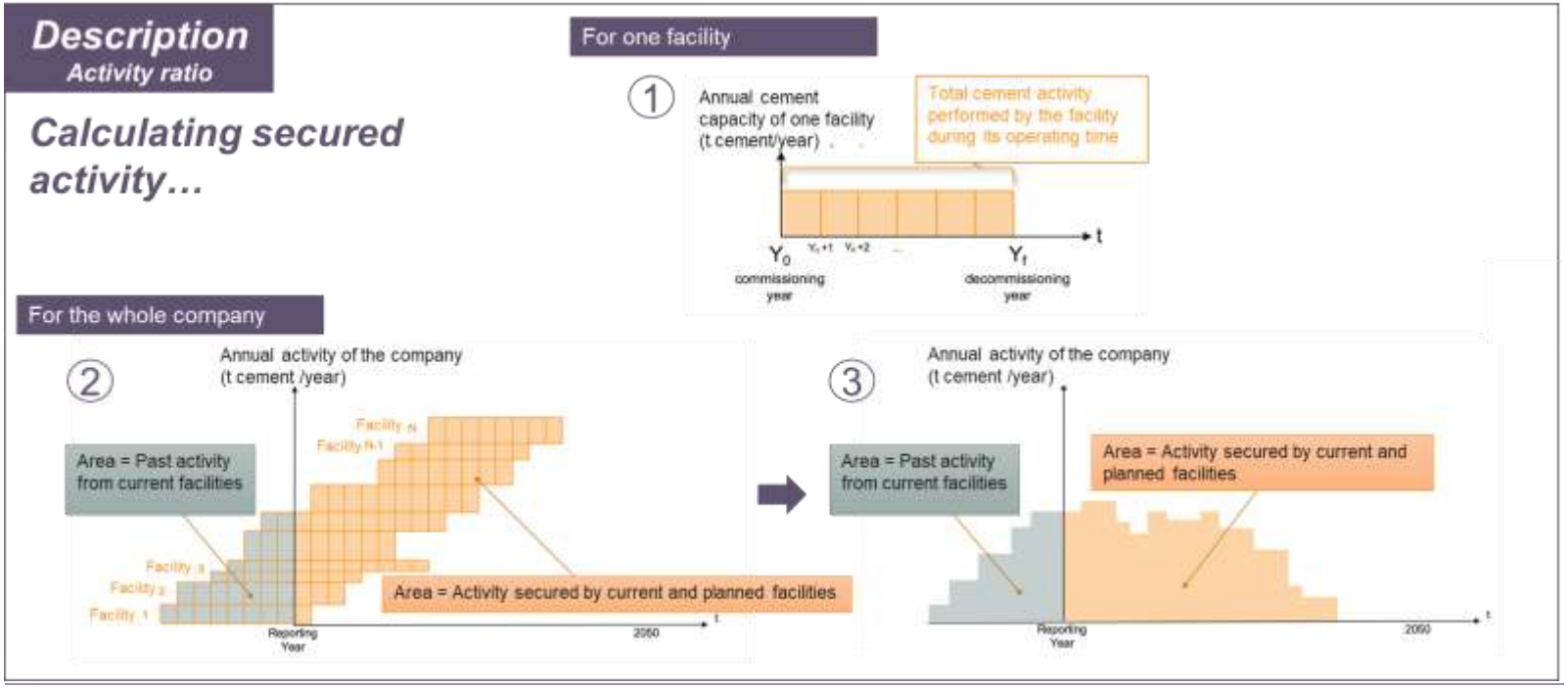
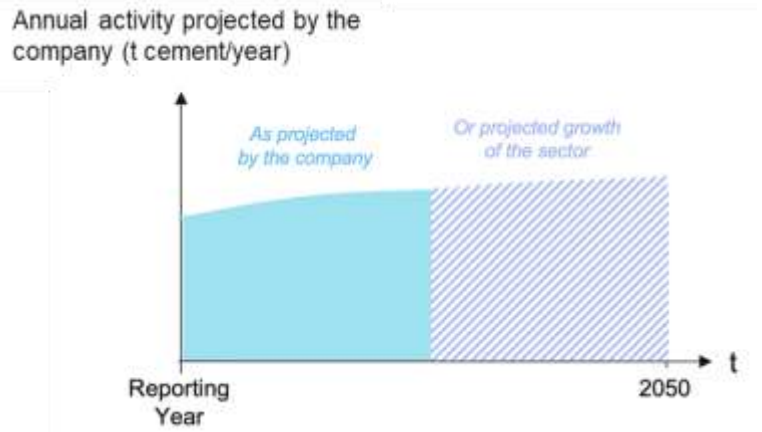


FIGURE 12 : SECURED ACTIVITY BY THE COMPANY

THE SECURED ACTIVITY IS COMPARED TO THE LEVEL OF ACTIVITY PROJECTED BY THE COMPANY UP TO REPORTING YEAR + 15 YEARS. IF THE COMPANY DOES NOT HAVE ANY PROJECTIONS OR NOT UP TO REPORTING YEAR + 15 YEARS, IT WILL BE CONSIDERED THAT ITS MARKET SHARE WILL REMAIN CONSTANT AND ITS ACTIVITY

WILL EVOLVE AT THE SAME RATE AS THE SECTOR AND SECTORAL PROJECTION OF ACTIVITY ARE USED (SEE SECTION 6). THE COMPANY'S PROJECTED ACTIVITY IS



ILLUSTRATED IN

Figure 13.

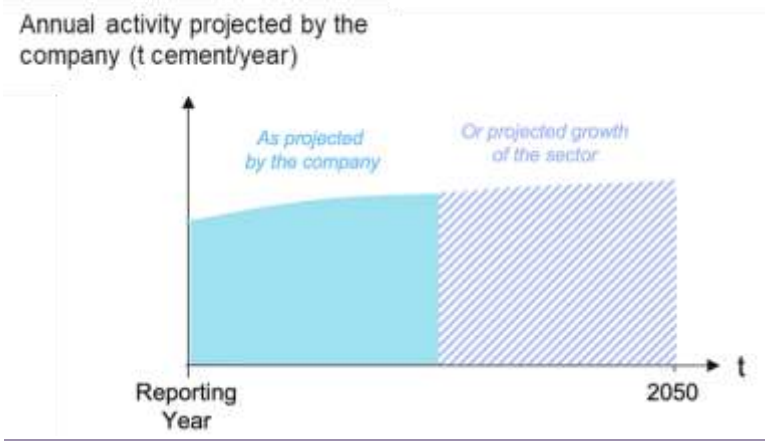


FIGURE 13 : PROJECTED ACTIVITY

The secured activity ratio $r_{SA}(y_r + 15)$ compares the secured activity up to $(y_r + 15)$ with the projected activity up to $(y_r + 15)$. It is illustrated in Figure 14.

$$r_{SA}(y_r + 15) = \frac{A_S(y_r + 15)}{A_P(y_r + 15)}$$

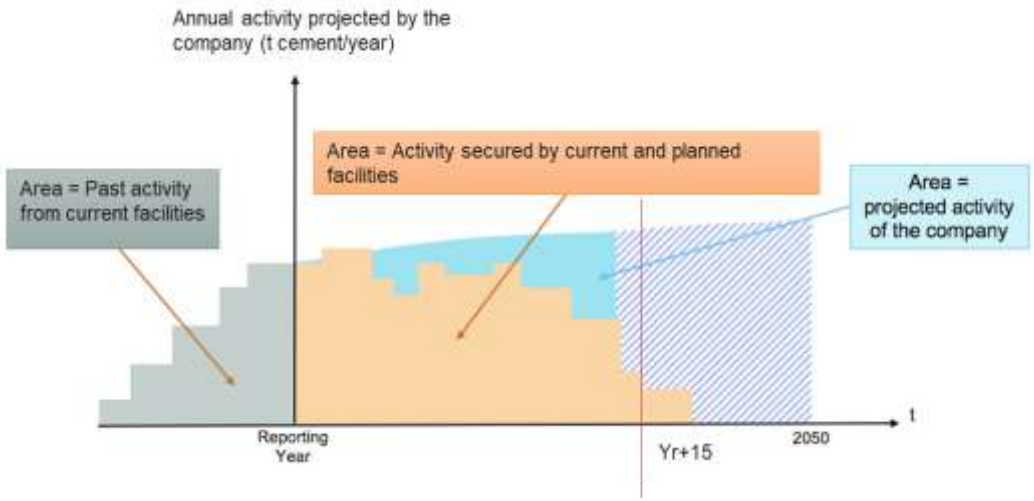


FIGURE 14 : SECURED ACTIVITY RATIO

CALCULATION OF THE SCORE:

r_{SA} is used as a threshold value for the scoring:

$r_{SA} < 1$: More investments will be needed	
Value of r_{LB}	**Score**
$r_{LB} \leq r_{SA}$	100%

$r_{SA}<r_{LB}<1.5$	$\frac{r_{LB}-1.5}{r_{SA}-1.5}$
$r_{LB}\geq 1.5$	0%

This means that if the company has planned its activity and its locked-in emissions are lower than the carbon budget, it gets 100%, but if the locked-in emissions exceed by more than 50% its carbon budget, it gets 0%.

The case $\boldsymbol{r_{SA} > 1}$ is unlikely to happen as the company is unlikely to have existing or planned assets able to meet the projection of activity until $(y_r + 15)$.

RATIONALE	CEM 2.2A LOCKED-IN EMISSIONS

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Locked-in emissions are included in the ACT CEM assessment for the following reasons:

- Absolute GHG emissions over time are the most relevant measure of emissions performance for assessing a company's contribution to global warming. While the indicator CEM 2.3A has a short-term measurement point on reporting year plus 5 years, the concept of locked-in emissions allows a judgement to be made about the company's outlook in more distant time periods.
- Analysing a company's locked-in emissions alongside science-based budgets also introduces the means to scrutinise the potential cost of inaction, including the probability of stranded assets.
- Examining absolute emissions, along with recent and short-term emissions intensity trends, forms part of a holistic view of a company's emissions performance in the past, present, and future.

The approach using the secured-activity ratio is new to ACT methodology. It is a coherence check between the company's ambition for emissions reduction, and its investments (and the inevitable emissions associated). It allows showing the leeway for future investments and alerts for the cost of inaction and the risk of stranded assets.

SCORING RATIONALE:

The only data coming in is provided by the asset dataset: currently active plants, new plants and modernization / retrofit plans that are 'in the pipeline' (which can be estimated to become active in the short-term).

When a plant reaches the end of its estimated lifetime, no replacement is assumed because those decisions have not been made yet. In fact, cement plants are not often decommissioned but more modernized with new important equipment, so the lifetime of the asset is assumed to be the average lifetime of the process equipment (kiln, storage, mills, mixers, buildings…), which is between 30 and 50 years.

Hence, the locked-in emissions calculated are the locked-in emissions of committed (existing and pipeline) plants only. The indicator describes the proportion of their budget (computed from the reporting year for 15 years ahead) that will be used up by committed activity.

Unlike the 'gap' and 'trend' comparisons done in all other quantitative indicators, this indicator compares two areas: that of the carbon budget until t and the locked-in emissions until t. It is expected that companies will exceed their budget when t is in the short-term future but will not when it is in the long-term future. However, any short-term exceedance will have to be compensated for in later time periods. This is called carbon budget displacement, which makes the company's actual decarbonization pathway steeper than the original benchmark. There is a dimension of risk from inaction here.

When the company exceeds its full carbon budget up to $(y_r + 15)$, it will not be able to displace enough carbon from later time periods to nearer ones and will be faced with stranded assets when the current lifetime estimates are held up. This is a major problem, and this situation will certainly result in a zero score.

When companies are closer to their carbon budget than others, they will be less flexible in their future strategy as there is more pressure to change their equipment on a plant (modernization of a kiln for example). There is also less room for refurbishment to extend the lifetimes of existing assets as this carries the risk of exceeding the carbon budget. Therefore, there is rationale for intermediate scoring levels that magnify this level of risk due of future flexibility in the future.

NOTE ON CALCULATING LE_F AND B:

Where data on plant emissions intensity is unavailable at the asset level (requested in CEM 2A), default factors are applied and are the median of the range of values published in annex A.III. 4.2.1 of IPCC. Data on typical project periods by plant type is also obtained from this source. Where plant lifetime information is unavailable (requested in CEM 2A), the median of known lifetimes in Cemnet will be applied. The rationale for using these sources is that the medians are built on comprehensive samples of data.

CEM 2.3A TREND IN FUTURE EMISSIONS INTENSITY FOR CEMENT PRODUCTION

DESCRIPTION & **CEM 2.3A TREND IN FUTURE EMISSIONS INTENSITY FOR CEMENT PRODUCTION**

REQUIREMENT	
SHORT DESCRIPTION OF INDICATOR	A measure of the alignment of the company's projected emissions intensity with its decarbonization pathway. The indicator will identify the gap in 5 years after the reporting year between the company's performance and the decarbonization pathway as a percentage, which is expressed as the company's 'action gap'.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: • CEM 0.B: The start and end date for which data is reported for the most recent year – CDP0.2 • CEM 1.A: Declaration of the company targets. Variation of [CDP C4.1] + [CDP C4.1a] + [CDP C4.1b] ♦ CEM 2.A, 4.A: For all existing and planned assets : Asset name, Geographic Location (country level), Plant type, Technology, Fuel mix , Status, Total capacity (ton), Active capacity (ton), Emissions factor (metric tonnes CO2e/t cement), Year of commissioning, Expected lifetime (years), Decommissioning or modernization year, if planned, Ownership stake (%), Attributable to reporting boundary (%) ♦ CEM 2.B, 4.B: The reporter shall provide plant activity and emissions data by plant type for the last five years. External sources of data used for the analysis of this indicator are: • IEA ETP [10]– background scenario data • SDA [11] – specific benchmark pathway definition • IPCC (2006) [13] – Fuel emissions factors • Cemnet – lifetime of assets The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Cement production emissions, including clinker emissions (inclusive scope 1+2)	CB_G	kgCO2/ton cement	• IEA ETP – background scenario data • SDA – specific benchmark pathway definition

HOW THE ANALYSIS WILL BE DONE	The analysis is based on the difference between the company's action pathway (CA_G) and the company's benchmark (CB_G) developing from the reporting year to 5 years after.

The company's action pathway (CA_G) is the weighted average plant emissions intensity over time, assuming the continuation of active plants until anticipated decommissioning and the completion of known plant/retrofit projects. If unknown, the commissioning year of projects is estimated from the project status (e.g. bidding process, construction, etc.) and data on typical project periods by plant type.

The company's benchmark (CB_G) pathway is the 'company specific decarbonization pathway'. See section 6.1 for details on the computation of this pathway.

The analysis compares CA_G to CB_G, by examining the difference between these pathways in 5 years after the reporting year. The pathways are expressed in grams of CO2 per unit of activity (intensity measure). The unit of activity for the cement sector is ton of cement. The result of the comparison is the action gap.

CALCULATION OF THE SCORE:

To assign a score to this indicator, the size of the action gap will be compared to the maximum action gap, which is defined by the business as usual pathway (BAU_G). $BAUG$ is defined as an unchanging (horizontal) intensity pathway, whereby the emissions intensity is not reduced at all over a period after the reporting year.

$$Future\ emissions\ action\ gap = \frac{CA_G - CB_G}{BAU_G - CB_G}$$

$$Score = 1 - Future\ emissions\ action\ gap$$

The score assigned to the indicator is equal to 1 minus the action gap and is expressed as a percentage (1 = 100%). Therefore, if CA_G- CB_G is equal to zero, the company's target is aligned with the sectoral benchmark, and the maximum score is achieved

RATIONALE	CEM 2.3A TREND IN FUTURE EMISSIONS INTENSITY FOR CEMENT PRODUCTION
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** The trend in future emissions intensity is included in the ACT assessment because this particular measure, along with recent emissions intensity and absolute emissions, forms part of a holistic view of company emissions performance in the past, present, and future. **SCORING RATIONALE:**

The scoring rationale follows the same narrative as indicator CEM 1.1. Please refer to the rationale of this indicator to understand the choices made.

NOTE ON CALCULATING CA_G:

Where data on plant emissions intensity is unavailable at the asset level (requested in CEM 2A), default factors are applied and are the median of the range of values published in annex A.III. 4.2.1 of IPCC. Data on typical project periods by plant type is also obtained from this source. Where plant lifetime information is unavailable (requested in CEM 2A), the median of known lifetimes in cement will be applied. The rationale for using these sources is that the medians are built on comprehensive samples of data.

CEM 2.4A ALTERNATIVE FUELS ACTIVITIES

DESCRIPTION & REQUIREMENT	CEM 2.4A ALTERNATIVE FUELS ACTIVITIES
SHORT DESCRIPTION OF INDICATOR	This indicator is looking at the share of alternative fuels used at reporting year and helps to valorise the difference between gross and net emissions.

DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are:
	• CEM 0.B: The start and end date for which data is reported for the most recent year – CDP0.2
	♦ CEM 2.C: % of alternative fuels (biomass included) used (CCS/CCU excluded)
	
	The benchmark indicators involved are:
	• ETP 2017, B2DS scenario
	  ○ OCDE zone: 19% for 2014, 24% for 2030 and 30% for 2050
	  ○ Non-OCDE zone: 2% for 2014, 10% for 2030 and 22% for 2050
	  ○ World level: 5% for 2014, 11% for 2030 and 23% for 2050

HOW THE ANALYSIS WILL BE DONE	**CALCULATION OF THE SCORE:** The maturity matrix used for the assessment is the following:

	Question	Basic	Standard	Advanced	Next practice	Low-carbon aligned
	Share of alternative fuels used	Less than 5%	Between 5% and 10%	Between 11% and 20%	Between 21% and 30%	Over 30%

RATIONALE	**CEM 2.4A ALTERNATIVE FUELS ACTIVITIES**
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** This indicator rewards the alternative fuels switching path. Report in net emissions valorise the fact that the cements actors are part of a territorial cohesion. The treatment of waste as the biomass use, if supervised by the policy, with applying the best practices, is one step in circular economy.

MODULE 3: INTANGIBLE INVESTMENT (WEIGHTING: 10%)

CEM 3.1 R&D spending on low-carbon activities

DESCRIPTION & REQUIREMENTS	**CEM 3.1 R&D SPENDING ON LOW-CARBON TECHNOLOGIES**
SHORT DESCRIPTION OF INDICATOR	A measure of the ratio of R&D investments in mitigation-relevant technologies. The indicator will identify the ratio between the company's R&D investment and the required investment as set by a scientific benchmark of R&D requirements.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM3. A Provide Capital Expenditure and total R&D Expenditure - Variation of [CDP C-CO9.6/C-CE9.6/C-OG9.6] for the three last years ♦ CEM 3.A: R&D costs/investments in mature and non-mature climate change mitigation technologies of the company for the three last years External sources of data used for the analysis of this indicator are: Mitigation technology: ♦ Ecofys-WWF Energy model [14] – benchmark data 5% ♦ IEA Technology Roadmap Low-Carbon Transition in the Cement Industry report, 2018 [2] Maturity of technology – Technology Readiness Levels (TRLs): ♦ https://www.iea.org/tracking/tcep2018/industry/cement/ ♦ https://www.iea.org/topics/innovation/innovationgaps/#trl

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK

	R&D Benchmark for CEM industry	B_{RD}	M$/M$	Ecofys-WWF Energy model – benchmark data 5%

HOW THE ANALYSIS WILL BE DONE

The analysis is based on the ratio of the company's 'annual R&D expenditure on technologies that mitigate climate change' ($CAPEX'MR\&D$)-average over 3 years - to the company's 'total annual capital expenditure' ($CAPEX$) – average over 3 years. The highest scoring level will compare only 'R&D expenditure on non-mature technologies (see the indicator's rationale) that mitigate climate change' ($CAPEX'MR\&D_{non-mature}$).

The ratios are defined as the 'mitigation R&D intensity' ratios (D) or ($D_{(non-mature)}$):

$$D = \frac{CAPEX'MR\&D}{CAPEX}$$

$$D_{(non-mature)} = \frac{CAPEX'MR\&D_{(non-mature)}}{CAPEX}$$

Expenditures over the 3 last years are used for the indicator to consider that expenditure for major R&D projects may not be linear over years.

DIMENSION 1 - INCLUSIVE R&D INVESTMENT RATIO:

This intensity will be compared to a benchmark for mitigation R&D (B_{RD}) intensity, and a score will be assigned depending on the company's proximity to the benchmark. This benchmark is defined by the IEA Technology Roadmap Low-Carbon Transition in the Cement Industry report [2]. The inclusive R&D investment ratio includes all investment in carbon mitigation technologies (mature and non-mature).

The score is a percentage of the maximum R&D investment ratio. It is calculated by dividing D by B_{RD}.

$$R\&D\ Investment\ ratio_1 = \frac{D}{B_{RD}}$$

The score for Dimension 1 is calculated by multiplying the investment ratio by 50% if the ratio is lower than 1. For values higher than 1, 50% will be assigned as a score.

DIMENSION 2 - NON-MATURE R&D INVESTMENT RATIO :

R&D investment is not as necessary for some technologies as it is for others. The non-mature technology investment ratio $D_{non-mature}$ is compared to the benchmark for Dimension 2:

$$R\&D\ Investment\ ratio_2 = \frac{D_{non-mature}}{B_{RD}}$$

A company with an investment ratio of 1 for Dimension 2 shall achieve 100% of the maximum score. If the ratio is lower than or equal to 1, the score for Dimension 2 is the value of the calculated ratio.

The highest score between dimensions 1 and 2 is chosen as the company's final score.

RATIONALE	CEM 3.1 R&D SPENDING ON LOW-CARBON TECHNOLOGIES

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

R&D for low-carbon transition is included in the ACT assessment for the following reasons:

- To enable the transition, sectors such as the CEM sector rely heavily on R&D to develop: low-carbon technologies replacing their currently high-emitting portfolio of asset, new cement with low-ratio of clinker or no clinker at all and the use of new and low-emitting fuels, carbon capture, storage and use.
- R&D is also one of the principal tools to reduce the costs of a technology in order to increase its market penetration.
- Lastly, the R&D investment of a company into non-mature technologies allows for direct insight into the company's commitment to alternative technologies that may not currently be part of its main business model.

DEFINING R&D:

Research and development (R&D): Refers to the activities companies undertake to innovate and introduce new products and services. It is often the first stage in the development process. Investment in R&D is a type of operating expense associated with the research and development of a company's goods or services (definition from CDP guidance).

Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. The term R&D covers three activities (definitions from OECD website, 2012):

:

- Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any application or use in view.
- Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

R&D covers both formal R&D in R&D units and informal or occasional R&D in other units.

DEFINING THE R&D SCOPE:

The indicator focuses on mature and non-mature technologies or construction and organizational methodologies that mitigate climate change.

Climate mitigation technologies for the cement sector may include:

- Dry kiln (using a preheater for greater thermal efficiency than the wet process)
- Waste heat recovery
- Improving energy efficiency
- Switching to alternative fuels
- Reducing the clinker to cement ratio or low clinker cement
- Using emerging and innovative technologies
- Alternative low-CO_2 cements/binders
- Carbon capture and storage (CCS)
- Carbon capture, utilization and storage (CCUS)

R&D expenditures should cover development of concepts and ideas and development of pilot projects. A first environmental balance should demonstrate that the solution reduces the overall CO_2 emissions on the life cycle and does not make pollution transfers.

DEFINING 'MITIGATION R&D':

The 'mitigation R&D' is defined by the categorization employed by the *IEA Technology Roadmap Low-Carbon Transition in the Cement Industry* report [2].

DEFINING 'NON-MATURE R&D':

A Technology Readiness Level (TRL) should be used to assess the maturity of a technology. Higher scoring levels of this indicator exclude research in technologies that are already considered mature in terms of market penetration, in order to incentivise a focus on those technologies that have a higher need for R&D investment, in order to break through technical barriers and reduce the levelized costs of deploying these technologies

To formalize this distinction in the analysis, the company is asked for a detailed breakdown of R&D expenditure in Section 3 of the data request. Since defining what type of R&D is 'non-mature' is theoretically difficult, the classification is inversed, and done based on the principle of exclusion. This methodology excludes only those low-carbon technologies that are considered mature in terms of market position and levelized cost.

The mature and non-mature technologies are defined in chapter 11.4 Identification of the technologies used to decarbonize the cement sector. This table has been built with IEA website and other sources coming from cement sector (ECRA). The table is not exhaustive and should be update according to the development progress of technologies.

SCORING RATIONALE:

To align with the narrative of ratios that is also used in the other indicators, the indicator is computed as the 'R&D investment ratio'. This investment ratio is only assigned 50% of the maximum score, as the analysis aims to incentivise R&D in non-mature technologies as opposed to mature technologies. Therefore, the achievable score for achieving a high R&D in non-mature technologies ($D_{non-mature}$) is double that of the score when this criterion is not included (D).

MODULE 4: INDIRECT OPERATIONS (B) (WEIGHTING: 0 – 33%)

This module shall be calculated and assessed only for blenders and grinding assets (B Companies). If a plant, type B, purchase clinker from an integrated plant within the same company group, it could assume that different teams should still closely collaborate to reduce emissions and can be assessed on their internal interventions. It might depend on the availability of information on such a strategy, but it is also the most consistent with the other assessments.

CEM 4.1B TREND IN PAST SCOPE 3 EMISSIONS

DESCRIPTION & REQUIREMENT	CEM 4.1B TREND IN PAST SCOPE 3 EMISSIONS
SHORT DESCRIPTION OF INDICATOR	A measure of the alignment of the company's recent emissions intensity trend with that of its decarbonization pathway. The indicator will compare the gradient of this trend over a 5-year period to the reporting year (reporting year minus 5 years) with the decarbonization pathway trend over a 5-year period after the reporting year.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 0.B: The start and end date for which data is reported for the most recent year – CDP0.2 ♦ CEM 1.A: Declaration of the company targets - Variation of [CDP C4.1] + [CDP C4.1a] + [CDP C4.1b] ♦ CEM 4.A: For all existing and planned assets: Asset name, Geographic Location (country level), Plant type, Technology, Fuel mix , Status, Total capacity (ton), Emissions factor (metric tonnes CO2e/t cement), Year of commissioning, Expected lifetime (years), Decommissioning or modernization year, if planned, Ownership stake (%), Attributable to reporting boundary (%), Comment ♦ CEM 4.B: The reporter shall provide plant activity and emissions data by plant type for the last five years External sources of data used for the analysis of this indicator are: • The Global Cement Report - Online Database of Cement Plants for plant listing o www.cemnet.com/global-cement-report/ • IEA ETP [9]– background scenario data • SDA [10] – specific benchmark pathway definition • IPCC (2006) [13] – Fuel emissions factors

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC
Cement production emissions, including clinker emissions (inclusive scope 1+2)	CB_{S12}	kgCO2/ton cement

HOW THE ANALYSIS WILL BE DONE

See indicator 2.1, same computation. **If the data for clinker emissions is not collected, the score 0 is assigned to this indicator.**

RATIONALE

CEM 4.1B TREND IN PAST SCOPE 3 EMISSIONS

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Trend in past emissions intensity is included in the ACT CEM assessment for the following reasons:

- The trend shows the speed at which the company has been reducing its emissions intensity over the recent past. Comparing this to the decarbonization pathway gives an indication of the scale of the change that needs to be made within the company to bring it onto a low-carbon pathway.
- While ACT aims to be as future-oriented, it nevertheless does not want to solely rely on projections of the future, in a way that would make the analysis too vulnerable to the uncertainty of those projections. Therefore, this measure, along with projected emissions intensity and absolute emissions, forms part of a holistic view of company emissions performance in the past, present, and future.

SCORING RATIONALE:

While ‘gap’ type scoring is preferred for any indicator where possible, this indicator only looks at past emissions, and would therefore require a different baseline in order to generate a gap analysis. Thus, instead of a gap analysis, a trend analysis is conducted to compare current data of the company to the past data and improvements that have been made since the past data. An advantage of the trend analysis is that it does not require the use of a business-as-usual pathway to anchor the data points and aid interpretation, as trends can be compared directly and a score can be directly correlated to the resulting ratio.

As clinker production is the main contributor to the GHG emissions of cement production, the blenders & grinding operators shall collect the data from their suppliers if they want to claim that they are engaged in low-carbon transition. That is why the score is 0 if no data is collected.

CEM 4.2B ELECTRICITY MANAGEMENT

DESCRIPTION & REQUIREMENT	CEM 4.2B ELECTRICITY MANAGEMENT
SHORT DESCRIPTION OF INDICATOR	A measure of the company's electricity management actions at the reporting year. The indicator will evaluate the implementation of global recommendations to decarbonize the assets consuming energy.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 0.B: The start and end date for which data is reported for the most recent year – CDP0.2 ♦ CEM 1.A: Declaration of the company targets - Variation of [CDP C4.1] + [CDP C4.1a] + [CDP C4.1b] ♦ CEM 4.A: For all existing and planned assets: Asset name, Geographic Location (country level), Plant type, Technology, Fuel mix, Status, Total capacity (ton), Active capacity (ton), Emissions factor (metric tonnes CO2e/t cement), Year of commissioning, Expected lifetime (years), Decommissioning or modernization year, if planned, Ownership stake (%), Attributable to reporting boundary (%) ♦ CEM 4.C: The reporter shall provide action plans regarding electricity management ♦ CEM 4.D: Details on the electricity, heat, steam, and/or cooling amounts that were accounted for at a low-carbon emissions factor in the market-based Scope 2 figure reported in CDP C6.3 - Variation of [CDP C8.2f] External sources of data used for the analysis of this indicator are: ♦ IEA ETP [9]– background scenario data ♦ EU taxonomy [15] – low-carbon technologies details and thresholds ♦ SDA [10] – specific benchmark pathway definition ♦ IPCC (2006) [13] – Fuel emissions factors ♦ Cemnet – lifetime of assets ♦ Press

The benchmark involved is based on the IEA Technology roadmap [2]: “The use of efficient grinding and milling technologies decreases the global electricity intensity of cement by 14% by 2050 compared to 2014 in the 2DS”. Even though the benchmark is for a scenario 2DS, differences between 2DS and B2DS is focused on CCS deployment.
For low-carbon electricity, the benchmark is based on a combined approach with:

- IEA World Energy Outlook 2019 for Sustainable Development Scenario which gives for low-carbon electricity (renewables and coal / gas with CCUS without nuclear) at global level: 26% for 2018, 50% for 2030 and 72% for 2040;
- IEA Technology roadmap [2]: ‘Various renewable-based options are available for cement manufacturers including wind power, solar photovoltaic power, solar thermal power and small hydropower generation. Potential deployment of these technologies in cement plants is highly dependent on local conditions such as the availability of local renewable sources, electricity prices, cement plant size and policy contexts. The current level of installed renewable-based captive power generation in the global cement sector is minor.”

HOW THE ANALYSIS WILL BE DONE

CALCULATION OF THE SCORE:

To be ready for the transition to a low-carbon economy, cement companies (especially blenders and grinding operators) need to plan and carry out electricity management to reduce GHG emissions of their assets.

The maturity matrix used for the assessment is the following:

Questions	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Sub-score
Does the company take actions to reduce electric consumption for grinding and mixing?	There are no reported actions	Actions have been taken to reduce the annual electric intensity (in kWh or MJ/ton of cement) up to 3% per year	Actions have been taken to reduce the annual electric intensity (in kWh or MJ/ton of cement) up to 6% per year	Actions have been taken to reduce the annual electric intensity (in kWh or MJ/ton of cement) up to 10% per year	Actions have been taken to reduce the annual electric intensity (in kWh or MJ/ton of cement) up to 14% per year	50%

Does the company take actions to use low-carbon electricity?	No knowledge of carbon content of electricity used	25% of electricity consumption used is low-carbon as defined by the EU taxonomy (including on-site generation)	40% of electricity consumption used is low-carbon as defined by the EU taxonomy (including on-site generation)	55% of electricity consumption used is low-carbon as defined by the EU taxonomy (including on-site generation)	75% of electricity consumption used is low-carbon as defined by the EU taxonomy (including on-site generation)	50%

RATIONALE	CEM 4.2B ELECTRICITY MANAGEMENT
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** Locked-in emissions are not well relevant for blenders and grinding operators, as they are not high energy consumers in the cement value chain. It is nevertheless essential to give them strong recommendations to help them to decarbonize. Electricity management is key for these actors. Many companies are beginning by the electricity management to reduce their carbon emissions. This indicator looks at specific renewable energy or energy efficiency pathways, as this information is expected to be reflected in the company's scope 1+2 emissions pathway. It is important to have a double requirement, on energy efficiency and carbon reduction. Switching from a fossil energy source to a decarbonated one (solar, biomass, district heating network fed by renewable energy…) without improving energy efficiency is not considered as satisfactory. It is important to ask the company these questions to be sure that there is no potential cost of inaction.

CEM 4.3B CLINKER / MATERIAL-SPECIFIC INTERVENTIONS

DESCRIPTION & REQUIREMENT	CEM 4.3 B CLINKER / MATERIAL-SPECIFIC INTERVENTIONS
SHORT DESCRIPTION OF INDICATOR	An analysis of the company's reporting of mature interventions to reduce GHG emissions for purchased or imported clinker / material determined as being high GHG impact, relative to the other categories of products relevant to the company. This indicator focused also on the actions taken to low-carbon final products of the company.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: • CEM 4.E: Identify emissions reduction initiatives active in the reporting year [CDP C4.3a + C4.3b + C4.3c]

External sources of data used for the analysis of this indicator are:

- Online and press news
- EU taxonomy [15] – low-carbon vehicles

Clinker value collected could be benchmarked for example with CSI[3] or IPCC[4] values.

HOW THE ANALYSIS WILL BE DONE

To be ready for the transition to a low-carbon economy, cement companies (especially blenders and grinding operators) need to plan and carry out “interventions” within the value chain in order to exercise their market position and influence to reduce GHG emissions.

For all its activity, the company identifies interventions that determine the most ambitious impacts achievable and highlights the GHG hotspots in accordance with best practices.

The analyst compares the interventions reported by the company with this benchmark and against other interventions reported by other reporting companies, whereby the analyst assigns a ‘maturity scoring’ to the reported interventions.

Several measures are combined to assign a score to the intervention. These measures are:

- Extent size of the intervention
- Intervention maturity scoring
- Level of ambition of the intervention
- Future emissions assessment
- Transport of clinker / material

The maturity matrix used for the assessment is the following:

Questions	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Sub-score

[3] GNR (Getting the Numbers Right) Project of GCCA : https://gccassociation.org/gnr/

[4] Emissions factor database of IPCC : https://www.ipcc-nggip.iges.or.jp/EFDB/main.php

Extent size of the intervention	Intervention involves suppliers that together represent a marginal coverage of the hotspot		Intervention involves suppliers that together represent a significant coverage of the hotspot		Intervention involves products that together represent the major coverage of the hotspot	20%
Intervention maturity scoring	Intervention is common practice and not backed with success factors like planning, adequate resources, clear goals, performance tracking and measures of success.		Intervention is an advanced practice and backed with some success factors like planning, adequate resources, clear goals, performance tracking, and measures of success.		Intervention is cutting-edge innovation practice and backed with all relevant success factors like planning, adequate resources, clear goals, performance tracking and measures of success.	20%
The company shall report on the level of ambition of the intervention	Incremental improvement with quantified actions		Improvements to achieve more than 33% of GHG reduction of the purchased clinker		Breakthrough innovation to achieve more than 63% of the GHG reduction of purchased clinker	20%
Is the company able to determine with certainty future CO2 emissions intensity linked to clinker / material purchase?	No knowledge of purchased clinker/material carbon intensity	No robust carbon intensity data on purchased clinker/material (i.e. not certified by a third party)	Robust CO2 data on purchased clinker/material certified by third party	Robust CO2 data on purchased clinker/material certified by third party Future CO2 emissions intensity of suppliers is forecasted but the intensity is not low-carbon aligned	Robust CO2 data on purchased clinker/material certified by third party Future CO2 emissions intensity of suppliers is forecasted, and the intensity is low-carbon aligned	35%

Action to reduce the carbon emissions and increase efficiency linked to clinker / material transport	There are no reported actions	Quantification of carbon emissions and efficiency of transports used	Actions have been taken to reduce of 20% the carbon emissions and increase the use of low-carbon vehicles of 20%	Actions have been taken to reduce of 50% the carbon emissions and increase the use of low-carbon vehicles of 50%	Use of low-carbon transportation and local suppliers only	5%

SIGNIFICANCE AND EXTENT OF THE INTERVENTION:

Whether the intervention is large or small in scale affects its overall level of impact on GHG emissions. Large-scale interventions receive more points (e.g. significant interventions covering a high percentage of clinker / material purchased).

This assesses how advanced the intervention is relative to current practice, and other elements that can ensure its success like clear goals and measures of success, use of supporting technology, use of certification and verification.

INTERVENTION MATURITY SCORING:

This assesses how advanced the intervention is relative to current practice, and other elements that can ensure its success like clear goals and measures of success, use of supporting technology, use of certification and verification.

LEVEL OF AMBITION:

The company shall report on the level of ambition of the intervention. The first level is an incremental improvement (e.g. GHG reduction). The other levels are aligned on absolute-bases approach of SBTi ”This equals to at least a 2.5% absolute reduction per year for well-below 2°C alignment, or a 4.2% absolute reduction per year for 1.5°C alignment.“. This method requires all companies to reduce their own emissions by the same percentage of absolute emission reductions as required for a given scenario (e.g. globally or for a sector). When referring to this method at a global level, the SBTi is currently using the IPCC Special Report on Global Warming of 1.5°C (SR15) for two pathways, a well-below 2°C and a 1.5°C trajectory. (https://sciencebasedtargets.org/methods/).

The second level consists of a new development (e.g. new product development, eco design products or installation of a technology to achieve more than 33% of GHG reduction of the purchased clinker / material). The third level is a breakthrough innovation (e.g. new business model development or installation of a technology to achieve more than 63% of GHG reduction of the purchased clinker / material).

FUTURE EMISSIONS ASSESSMENT:

This indicator assesses the communication between the company and the clinker supplier or material purchased supplier. This indicator is looking at the data reported between them concerning the carbon intensity data and the data collection and the future CO2 emissions intensity of the clinker. Robust and certifiable data are more appreciated.

TRANSPORT OF CLINKER / MATERIAL PURCHASED:

Even if the transport is a low CO_2 hotspot, it is possible to make some actions to improve this step.

RATIONALE	CEM 4.3B CLINKER / MATERIAL-SPECIFIC INTERVENTIONS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR** As 90% of cement emissions come from clinker production, blenders and grinding operators shall interact with their clinker producers in order to reduce the emissions - they shall demonstrate their willingness to drive their clinker suppliers to reduce their emissions. Even if the primary material is not clinker, blenders shall also demonstrate their willingness to drive their material suppliers to reduce their emissions. A key issue with the interventions approach is that if interventions have no measurable impact on GHG emissions, they are effectively "greenwash". However, we recognise that, when attempting to influence GHG emissions outside of direct operations, measurement may be difficult. Barriers to measurement should not be barriers to action; therefore, the analysis will consider interventions where the GHG emissions mitigation has not been measured. Nonetheless, companies should describe the rationale for emissions reduction connected to the intervention so that it is clear this potential exists. The reporting should also include, where possible, enough detail on mitigation potential, and the scale of impact expected, to distinguish between interventions that could be considered greenwash and those with a material, positive climate change mitigation impact.

MODULE 5: GOVERNANCE (WEIGHTING: 10%)

CEM 5.1 OVERSIGHT OF CLIMATE CHANGE ISSUES

DESCRIPTION & REQUIREMENT	**CEM 5.1 OVERSIGHT OF CLIMATE CHANGE ISSUES**
SHORT DESCRIPTION OF INDICATOR	The company discloses that responsibility for climate change within the company lies at the highest level of decision making within the company structure.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 5.A: Details on where is the highest level of direct responsibility for climate change within the organization - Variation of [CDP C1.1] + [CDP C1.2] ♦ CEM 5.B: Position of the individual or name of the committee with this responsibility and outline their expertise regarding climate change and the low-carbon transition - Variation of [CDP C1.1a] + [CDP C1.2a]
HOW THE ANALYSIS WILL BE DONE	The benchmark case is that climate change is managed within the highest decision-making structure within the company. The company situation is compared to the benchmark case; if it is similar then points are awarded. The position at which climate change is managed within the company structure is determined from the company data submission and accompanying evidence. The maturity matrix used for the assessment is the following:

Question	Basic	Standard	Advanced	Next practice	Low-carbon aligned
Position of individual(s)/committee with highest responsibility for climate change	No one in charge of climate change issues	Manager/Officer	Senior Manager/Officer	Senior Manager/Officer closely related to decision-making structure within the company	Board or individual/sub-set of the board or other committee appointed by the board

RATIONALE	CEM 5.1 OVERSIGHT OF CLIMATE CHANGE ISSUES
RATIONALE OF THE INDICATOR	Successful change within companies, such as the transition to a low-carbon economy, requires strategic oversight and buy-in from the highest levels of decision-making within the company. For the cement sector, a change in strategy and potentially business model will be required and this cannot be achieved at lower levels within an organisation. Evidence of how climate change is addressed within the top decision-making structures is a proxy for how seriously the company takes climate change, and how well integrated it is at a strategic level. High-level ownership also increases the likelihood of effective action to address the low-carbon transition. Changes in strategic direction are necessarily future-oriented, which fits with this principle of the ACT inititative. Management oversight of climate change is considered good practice.

CEM 5.2 CLIMATE CHANGE OVERSIGHT CAPABILITY

DESCRIPTION & REQUIREMENT	CEM 5.2 CLIMATE CHANGE OVERSIGHT CAPABILITY
SHORT DESCRIPTION OF INDICATOR	Company board or executive management has expertise on the science and economics of climate change, including an understanding of policy, technology and consumption drivers that can disrupt current business.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 5B: Identify the position of the individual or name of the committee with this responsibility and outline their expertise regarding climate change and the low-carbon transition - Variation of [CDP C1.1a] + [CDP C1.2a]
HOW THE ANALYSIS WILL BE DONE	The presence of expertise on topics relevant to climate change and the low-carbon transition at the level of the individual or committee with overall responsibility for it within the company is assessed. The presence of expertise is the condition that must be fulfilled for points to be awarded in the scoring. The analyst determines if the company has expertise as evidenced through a named expert biography outlining capabilities. The analysis is binary: expertise is evident or not. A check is performed against [CDP 3.1 question] on the highest responsibility for climate change, the expertise should exist at the level identified or the relationship between the structures/experts identified should also be evident.

The maturity matrix used for the assessment is the following:

Question	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Weighting
Associated score	***0%***	***25%***	***50%***	***75%***	***100%***	
Does the individual or committee with oversight of climate change issues (as reported in indicator 5.1) have relevant climate change- and low-carbon transition-related expertise*?	The employee/committee does not meet any of the characteristics of climate change- and low-carbon transition-related expertise*.	The employee/committee meets 1 of the characteristics of climate change- and low-carbon transition-related expertise*.	The employee/committee meets 2 of the characteristics of climate change- and low-carbon transition-related expertise*.	The employee/committee meets 3 or more of the characteristics of climate change- and low-carbon transition-related expertise*.	The employee/committee meets 3 or more of the characteristics of climate change- and low-carbon transition-related expertise*. Expertise systematically informs strategic investment planning/decision-making processes.	***100%***

* "Characteristics of climate change- and low-carbon transition-related expertise" include:
    - Academic/professional qualification related to climate change and the low-carbon transition, including an understanding of the impacts and risks, and the solutions to implement (e.g., Bachelors, Masters, Doctorate, professional certification, diploma, etc.)
        - A purely energy-related background with no relationship to climate change and the low-carbon transition is not enough to qualify as expertise.
    - Recent (i.e., within the last 10 years) professional experience related to climate change and the low-carbon transition (e.g., previous employment in a climate change/low-carbon transition-related role, or with a climate change/low-carbon transition-related organisation, etc.)
    - Recent (i.e., within the last 10 years)/active membership of organization(s) driving corporate knowledge and action on climate change and the low-carbon transition (e.g., World Business Council For Sustainable Development, Solar Energy Industry Association, etc.)

- Technical knowledge related to climate change and the low-carbon transition, evidenced through recently (i.e., within the last 10 years) published outputs written by the individual/committee (e.g., statements, reports, etc.)

RATIONALE	CEM 5.2 CLIMATE CHANGE OVERSIGHT CAPABILITY
RATIONALE OF THE INDICATOR	Effective management of the low-carbon transition requires specific expertise related to climate change and its impacts, and their likely direct and indirect effects on the business. Presence of this capability within or closely related to the decision-making bodies that will implement low-carbon transition both indicates company commitment to that transition and increases the chances of success. Even if companies are managing climate change at the Board level or equivalent, a lack of expertise could be a barrier to successful management of a low-carbon transition. This disclosure is in line with Governance (a) of the TCFD: "a) Describe the board's oversight of climate-related risks and opportunities."

CEM 5.3 LOW-CARBON TRANSITION PLAN

DESCRIPTION & REQUIREMENT	CEM 5.3 LOW-CARBON TRANSITION PLAN
SHORT DESCRIPTION OF INDICATOR	The company has a plan on how to transition the company to a business model compatible with a low-carbon economy.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 5.C: Details on the organization's low-carbon transition plan - Variation of [C-AC3.1b/C-CE3.1b/C-CH3.1b/C-CO3.1b/C-EU3.1b/C-FB3.1b/C-MM3.1b/C-OG3.1b/C-PF3.1b/C-ST3.1b/C-TO3.1b/C-TS3.1b] + [C-AC3.1e/C-CE3.1e/C-CH3.1e/C-CO3.1e/C-EU3.1e/C-FB3.1e/C-MM3.1e/C-OG3.1e/C-PF3.1e/C-ST3.1e/C-TO3.1e/C-TS3.1e]
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence of the low-carbon transition plan for the presence of best practice elements and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points are allocated for elements indicating a higher level of maturity. Among the best practice elements identified to date are: ♦ The plan includes financial projections

- The plan should include cost estimates or other assessment of financial viability as part of its preparation
- The description of the major changes to the business is comprehensive, consistent, aligned with other indicators
- Quantitative estimates of how the business will change in the future are included
- Costs associated with the plan (e.g. write-downs, site remediation, contract penalties, regulatory costs) are included
- Potential “shocks” or stressors (sudden adverse changes) have been taken into consideration
- Relevant region-specific considerations are included
- The plan’s measure of success is SMART - contains targets or commitments with timescales to implement them, is time-constrained or the actions anticipated are time-constrained
- The plan’s measure of success is quantitative
- The description of relevant testing/analysis that influenced the transition plan is included
- The plan is consistent with reporting against other ACT indicators
- Scope – should cover the entire business, and is specific to that business
- The plan should cover the short, medium and long terms. From now or the near future <5 years, until at least 2035 and preferably beyond (2050)
- The plan contains details of actions the company realistically expects to implement (and these actions are relevant and realistic)
- The plan has been approved at the strategic level within the organisation
- Discussions about the potential impacts of a low-carbon transition on the current business have been included
- The company has a publicly acknowledged low-carbon (or beyond) science-based target

The maturity matrix used for the assessment is the following:

Questions	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Sub score
Level of approval within the organisation	Not known	Operational level (CSR level)	Upper management level	Board/strategic level	Matches highest level of responsibility as previously reported	100%/7
Measure of success	No measures of success		Measure of success is mainly qualitative		Measure of success is SMART: specific, measurable, acceptable, realistic, time bound.	100%/7

Financial content in plan	No financial content	Financial projections, cost estimates or other estimates of financial viability are described but not quantified	Financial projections, cost estimates or other estimates of financial viability are laid out OR short-term actions to start implementing plan are quantified in more detail	Quantitative estimations of how the business will change in the future are included Costs associated with the plan (e.g. write-downs, site remediation, contract penalties, regulatory costs) are included	Description of the major changes to the business is comprehensive, consistent, aligned with other indicators	100%/7
Future considerations	Implications to future business noted but not discussed properly	Contains actions the company expects to implement to make the transition a reality without any details	Contains discussion certain current company elements that need to be changed to make the transition a reality	Contains discussion of the potential portfolio of a future, low-carbon ready company	Contains one or more elaborate outlines of how the far-future company could look like in terms of physical assets and business model	100%/7
Current considerations and plans	Short-term considerations and remedial actions can be discussed but are not integrated in the plan	List of short-term considerations and remedial actions integrated in the plan	Contains discussion of the potential impacts of a low-carbon transition on the current business Relevant region-specific considerations are included	Contains details of actions the company realistically expects to implement (and these actions are relevant and realistic)	Consideration of potential short-term “shocks” or stressors (sudden adverse changes) has been made	100%/7
Transition plan scope, consistency, analysis	No clear scope to the plan, no consistency among sections and no analysis presented	The scope covers the entire business	The scope covers the entire business. Plan is consistent with reporting against other ACT indicators Contains a description of relevant testing/analysis	The scope covers the entire business and is specific to it. Plan is consistent with reporting against other ACT indicators. Contains a description of relevant testing/analysis	Transition covers entire business and is specific to it, with proper scoping, consistency and proper analysis	100%/7

	Transition timescale	Covers only short-term (< 3 years)	Covers only medium term (reporting year+ 5 years)	Should cover the short, medium and long term. From now or near future (reporting year + 5 years), until at least (reporting year + 10 years) and preferably beyond (reporting year + 15 years)	Covers the short, medium and long term. From now until at least (RY+20 years)	Covers the short, medium and long term. From now and beyond 2050	100%/7

RATIONALE	CEM 5.3 LOW-CARBON TRANSITION PLAN
RATIONALE OF THE INDICATOR	The cement sector will require substantial changes to its business to align with a low-carbon economy over the short, medium and long term, whether voluntarily following a strategy to do so or if forced to change by regulations (ex: obligations to use waste as alternative fuels) and structural changes to the market (ex: customer demands come from low-carbon solutions). It is better for the success of its business and of its transition that these changes occur in a planned and controlled manner. The *Investor Expectations of Companies in the Construction Materials Sector document* [16] specifically states that companies in the sector should develop such a plan. This disclosure is in line with Strategy a) and b) of the TCFD: "a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term." and "b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning."

CEM 5.4 CLIMATE CHANGE MANAGEMENT INCENTIVES

DESCRIPTION & REQUIREMENT	CEM 5.4 CLIMATE CHANGE MANAGEMENT INCENTIVES
SHORT DESCRIPTION OF INDICATOR	The Board's compensation committee has included metrics for the reduction of GHG emissions in the annual and/or long-term compensation plans of senior executives; the company provides monetary incentives for the management of climate change issues as defined by a series of relevant indicators.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 5.D: Whether the company provides incentives for the management of climate change issues, including the attainment of targets? (Same as [CDP C1.3])

- CEM 5.E: Details on the incentives provided for the management of climate change issues (Same as [CDP C1.3a])

HOW THE ANALYSIS WILL BE DONE

The analyst verifies if the company has compensation incentives set for senior executive compensation and/or bonuses, that directly and routinely reward specific, measurable reductions of tonnes of GHG emitted by the company in the preceding year and/or the future attainment of emissions reduction targets, or other metrics related to the company's low-carbon transition plan.

The maturity matrix used for the assessment is the following:

Questions	Basic	Standard	Advanced	Next practice	Low-carbon aligned	sub score
Who is entitled to benefit?	Any other answer				Board chairman - Board/Executive board - Director on board - Corporate executive team - Chief Executive Officer (CEO) - Chief Operating Officer (COO) - Chief Financial Officer (CFO) - All employees	100%/3
Type of incentives		Recognition (non-monetary)	Other non-monetary reward		Monetary reward	100%/3
Incentivized performance indicator		Behaviour change related indicator or other specification	Efficiency project, Efficiency target, Environmental criteria included in purchases, Supply chain engagement, or other specification		Emissions reduction project, Emissions reduction target, Energy reduction project, Energy reduction target, or other specification	100%/3

RATIONALE

CEM 5.4 CLIMATE CHANGE MANAGEMENT INCENTIVES

RATIONALE OF THE INDICATOR

Executive compensation should be aligned with overall business strategy and priorities. As well as commitments to action the company should ensure that incentives, especially at the executive level, are in place to reward progress towards a low-carbon transition. This will improve the likelihood of a successful low-carbon transition.

Monetary incentives at the executive level are an indication of commitment to successful implementation of a low-carbon transition strategy.

CEM 5.5 CLIMATE CHANGE SCENARIO TESTING

DESCRIPTION & REQUIREMENT	CEM 5.5 CLIMATE CHANGE SCENARIO TESTING
SHORT DESCRIPTION OF INDICATOR	Testing or analysis relevant to determining the impact of the transition to a low-carbon economy on the current and projected business model and/or business strategy has been completed, with the results reported to the Board or C-suite (CEO, CFO, etc.), the business strategy revised where necessary, and the results publicly reported.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 5.F: Details on the organization's climate change scenario testing - Variation of [CDP C3.1a] + [CDP C3.1d] ♦ CEM 5.G: Consideration of risk types in organization's climate-related risk assessments (CDP C2.2c) ♦ CEM 5.H: Details of risks identified with the potential to have a substantive financial or strategic impact on business (CDP C2.3a)
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence of the low-carbon economy scenario testing for the presence of best-practice elements and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points is allocated for elements indicating a higher level of maturity. Best-practice elements to be identified in the test/analysis include: ♦ full coverage of the company's boundaries ♦ timescale from present to long-term (2035-2050) ♦ results are expressed in value-at-risk or other financial terms ♦ multivariate: a range of different changes in conditions are considered together ♦ changes in conditions are specific to a low-carbon climate scenario ♦ climate change conditions are combined with other likely future changes in operating conditions over the timescale chosen The maturity matrix used for the assessment is the following:

Questions	Basic	Standard	Advanced	Next practice	Low-carbon aligned	sub score
Boundary	Large element not included		Small element not included		Covers entire boundary of the company	25%

Timescale	From present to near future	From present to RY+5 years	From present to RY+10 years	From present to RY+20 years	From present to 2050 and beyond	25%
Results	Expressed in qualitative terms	Expressed in qualitative terms	Expressed in financial terms	Expressed in financial terms and results are translated into value-at-risk	Expressed as value-at-risk	25%
Conditions considered	Does not consider any changing conditions	Considers a narrow range of different changes in conditions.	Considers a range of changing conditions together (multivariate)	Considers changing climate conditions in combination with changes in operating conditions	Considers changing conditions specific for a low-carbon decarbonization scenario	25%

RATIONALE — CEM 5.5 CLIMATE CHANGE SCENARIO TESTING

RATIONALE OF THE INDICATOR

Changes predicted to occur due to climate change could have several consequences for the cement sector, including the risk of “stranded assets”, increased costs, a dramatically changed operating environment and major disruptions to the business. There are a variety of ways of analysing the potential impacts of climate-related changes on the business, whether these are slow and gradual developments or one-off “shocks”. Investors are increasingly calling for actions to reduce greenhouse gas emissions across the value chain (see IIGCC investor expectations document for the sector [16]), effective abatement will require a combination of action: improve energy efficiency, use alternative fuels, use clinker substitution, develop new technologies, sell less cement but sell services or advice to use cement in a better way…. These actions should be linked with a strong governance framework to manage physical risks of the sector. The ACT methodology thus provides a broad definition of types of testing and analysis that can be relevant to this information requirement, to identify both current and best practices and consider them in the assessment.

Risk management plan is an important management tool for preparing for the low-carbon transition. For businesses likely to be strongly affected by climate change impacts (both direct and indirect), and businesses with large fixed asset bases and long management horizons, such as the cement sector, it has even greater importance.

This disclosure is in line with Disclosure c) of the TCFD: "c) Describe the resilience of the organization’s strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario".

MODULE 6: SUPPLIER ENGAGEMENT (WEIGHTING: 7%)

The suppliers for the cement industry vary considerably depending on the structure of the company and its activities: quarries, raw materials, secondary raw materials, waste treatment for fuels or heat supply and especially transport. A specific focus should be made on transport when analysing supplier engagement.

Quarries are being considered for assessment of integrated companies in the Suppliers' module. For blenders and grinding operators, engagement with clinker / material producers is not considered in this module assessment because they are already considered in the Indirect operations module. No specific sub-dimensions are given for the two indicators, but a global evaluation should be used to rate the level of the company. The analyst should make sure to identify the most important suppliers in the company's supply chain. This identification is necessary to give recommendations on where emissions could be lowered.

CEM 6.1 STRATEGY TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS

DESCRIPTION & REQUIREMENT	CEM 6.1 STRATEGY TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS
SHORT DESCRIPTION OF INDICATOR	The company has a strategy, ideally governed by policy and integrated into business decision making, to influence, enable, or otherwise shift suppliers' choices and behaviour in order to reduce GHG emissions.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 6.A: Details of the methods of supplier engagement, strategy for prioritizing supplier engagements and measures of success - Part of [CDP C12.1a] ♦ CEM 6.B: Number of suppliers with whom the company is engaging, the proportion of the total spend that they represent, part of the inclusive scope 1+2 carbon emissions. Variation of [CDP C12.1a] ♦ CEM.C: If data on suppliers' GHG emissions and climate change strategies are available, explain how the company makes use of that data- Variation of [CDP C12.1a] OR/AND List of environmental contract clauses in purchasing & suppliers' selection process
HOW THE ANALYSIS WILL BE DONE	The assessment will assign a maturity score based on the company's formalized strategy with their suppliers, expressed in a maturity matrix. The analyst should pay attention to identify the most important suppliers in the company's global carbon emissions. This identification is necessary to give recommendations.

Questions	Subdimension	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Subscore
To what extent GHG emissions reduction issues are integrated in engagement with suppliers?	Consideration of reduction targets	No consideration of reduction targets.	CSR clause included in engagements with suppliers. Means commitment included in contracts.	. CSR clause with GHG emissions reduction included in engagements with suppliers. Results driven commitment in contracts.	CSR clause with quantified GHG emissions reduction included in engagements with suppliers. Results commitment in contracts. Regular reporting.	CSR clause with GHG emissions reduction included as priority in engagements with suppliers. Results driven commitment in contracts. Regular reporting.	20%
What action levers are used by the company to encourage suppliers to develop low carbon offer?	Use of action levers	No actions levers used.	Passive approach (suppliers may offer low-carbon product but no specific requirements from the company).	Use of one action lever (awareness campaign, compensation, purchasing rule, etc.)	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.).	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.). Regular audits of the supplier by the purchaser or a representative.	30%
What is the scope of the action levers used?	Scope	No strategy applied to any suppliers.	Strategy applied to few large suppliers.	Strategy applied to most large suppliers.	Strategy applied to all large suppliers and few small suppliers.	Strategy applied to all of suppliers.	20%

	To what extent carbon issues are integrated in the selection process of suppliers?	Suppliers selection process	No selection of suppliers based on environmental criteria. No change in suppliers' base.	Selection of suppliers based on at least one environmental criterion. No change in suppliers' base.	No change in suppliers' base. Selection of suppliers with low-carbon alternatives.	No change in suppliers' base. Selection of suppliers offering low-carbon alternatives.	Engaging suppliers over low-carbon alternatives.	30%

RATIONALE	**CEM 6.1 STRATEGY TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS**
RATIONALE OF THE INDICATOR	Since the raw material being used is linked to the environmental performance of the final cement product, suppliers have to be involved in the strategy action plan of the company, regardless of whether raw materials are from quarries or from other industries. The choice of sustainable purchased product is an important lever to help the company to apply its low-carbon transition. The transport of raw materials and cement shall also be assessed. Supplier engagement is included in the ACT CEM assessment for the following reasons: • As the cement manufacturing value chain is highly specialized, technologically complex, and could be integrated, cement companies heavily rely on innovations within their supply chain • Decarbonization of the supply chain is also key to achieving ambitious decarbonization goals in both the manufacturing of cement and cement alternatives that serve the same function. Natural conservation of quarries is also an important part of the cement supply chain to keep in mind because CO_2 affects also biodiversity. **SCORING THE INDICATOR:** Because of data availability and complexity, a direct measure of the outcome of such engagement is not very feasible at this time. It is often challenging to quantify the emissions reduction potential and outcome of collaborative activities with the supply chain. Therefore, the approach of a maturity matrix allows the analyst to consider multiple dimensions of supplier engagement and assess them together towards a single score for Supplier Engagement.

CEM 6.2 ACTIVITIES TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS

DESCRIPTION & REQUIREMENT	**CEM 6.2 ACTIVITIES TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS**
SHORT DESCRIPTION OF INDICATOR	This indicator assesses the level of engagement that the company has with its suppliers, based on an assessment of previous initiatives that show whether or not the company engages with suppliers in various ways.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 6.D: List of initiatives implemented to influence suppliers to reduce their GHG emissions, green purchase policy or track record, supplier code of conduct
HOW THE ANALYSIS WILL BE DONE	The maturity matrix used for the assessment is the following:

Questions	Subdimension	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Subscore
How the company encourage suppliers to reduce their GHG emissions?	Suppliers GHG emissions	No activity (no engagement with suppliers with respect to emissions reduction)	Company requires suppliers to sign a code of conduct (or similar) and/or to provide data regarding their environmental performance (for audited suppliers). Means-driven commitment	Company assists suppliers to reduce their GHG emissions	Company partners with large suppliers to define common GHG emissions reduction plan	Company contributes in GHG emissions reduction along its value chain through close partnerships with suppliers	60%
Does the company develop a low-carbon demand?	Low-carbon offer of suppliers	No green purchase		Company purchases low-carbon products /equipment/services.		Company purchases low-carbon products/equipment/ services Company partners with suppliers to develop low-carbon products.	40%

RATIONALE	CEM 6.2 ACTIVITIES TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS

RATIONALE OF THE INDICATOR

Companies that have quarries integrated within plants are a concern for this indicator. It may also go beyond this however: to take into account interesting and sustainable ideas emerging companies are working together, and if companies use their resources to help their suppliers in improving environmental performance.

SCORING THE INDICATOR:

Because of data availability and complexity, a direct measure of the outcome of such engagement is not currently feasible. It is often challenging to quantify the emissions reduction potential and outcome of collaborative activities along the supply chain. Therefore, the approach of a maturity matrix allows the analyst to consider multiple dimensions of supplier engagement and assess them together towards a single score for Supplier Engagement.

MODULE 7: CLIENT ENGAGEMENT (WEIGHTING: 10%)

The clients for the cement industry are mainly companies of the construction sector, including all types of buildings and infrastructure. Concrete producers are also part of clientele.

The phenomenon of carbonatation should be qualitatively assessed in this module as it comes under strategies and activities that encourage and promote reduction of the overall carbon footprint of the final product.

It is important for the analyst to pay attention to the use of cement by clients in certain countries, since it is often mixed with raw materials like mineral admixtures before the final concrete is produced for use.

CEM 7.1 STRATEGY TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE GHG EMISSIONS

DESCRIPTION & REQUIREMENTS	CEM 7.1 STRATEGY TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE GHG EMISSIONS
SHORT DESCRIPTION OF INDICATOR	The company has a strategy, ideally governed by policy and integrated into business decision-making, to influence, enable, or otherwise shift customer choices and behaviour in order to reduce GHG emissions.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 7.A (methods of client engagement) [C12.1b] ♦ CEM 7.B (% of customers) [C12.1b]
HOW THE ANALYSIS WILL BE DONE	The analyst checks if the policy or strategy exists and analyses if it targets customer behaviour through specific actions undertaken by the company. The strategy must mention whether: ♦ GHG emissions reduction are part of the goal. ♦ Customers are engaged either through education or information sharing, or through collaboration & innovation. ♦ Whether it is an active rather than a reactive strategy: a reactive strategy responds only to customer demand for more low-carbon systems and services, whereas an active strategy attempts to change the existing customer demand towards low-carbon alternatives. ♦ If it is widespread: the strategy must apply to most customers. Maturity matrix is built as following:

Questions	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Sub score
Scope	No clients in the scope		Only large clients	Majority of clients	All clients	20%
Consideration of reduction targets	No strategy	GHG emissions reduction included in engagement with clients. Means-driven commitment.		Quantified GHG emissions reduction included in engagement with clients.	Quantified GHG emissions reduction included as priority in engagements with clients.	40%
Influence on clients Providing low-carbon systems and services eg. Additive manufacturing, consultancy	Company only delivers cement that meet regulation requirements.	Passive approach (offers products that go beyond regulation but no incentive for clients to choose low-carbon product rather than standard ones).	Use of one action lever (awareness campaign, compensation, purchasing rule, etc.). Provision of documents and tools by the lessor.	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.). Provision of documents and tools. Multi-party working group with annual meeting at least.	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.). Contribution to shift demand towards low-carbon systems and services using cement	40%

RATIONALE

CEM 7.1 STRATEGY TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE GHG EMISSIONS

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Strategy to influence consumer behaviour to reduce GHG impacts is included in the analysis for the following reasons:

- A significant part of emissions associated with cement production are from clinker, and are hence unavoidable; one of the most efficient ways to reduce its impact is to reduce the amount of clinker in cement (increase the use of alternative cement to CEM1) and to optimize construction to reduce the amount of cement.
- As cement producers are often in direct contact with cement users, they can influence users to diversify their use of cement and optimise the amount used.

SCORING RATIONALE:

The scoring of elements in the way that it is presented is similar to the CDP scoring methodology, whereby a narrative answer that details a certain strategy is checked for whether it includes certain elements that the ACT assessment deems vital for any sound customer engagement strategy.

CEM 7.2 ACTIVITIES TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE GHG EMISSIONS

DESCRIPTION & REQUIREMENTS	CEM 7.2 ACTIVITIES TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE GHG EMISSIONS
SHORT DESCRIPTION OF INDICATOR	The company participates in activities, to influence, enable, or otherwise shift customer choices and behaviour in order to reduce GHG emissions.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 7.C (reported activities or interventions) ♦ CEM 7.D: reported activities specific for use phase and end-of-life phase of their products
HOW THE ANALYSIS WILL BE DONE	The analyst assigns a maturity score based on the company's demonstration of engagement with its customers, expressed in a maturity matrix. This indicator takes a holistic viewpoint on the interventions reported and assesses how together they paint a picture of the company's level of active engagement with their customers. It uses a maturity matrix to cover different types of activities under one score. The level that the company has achieved is determined by the analyst after reviewing all the information provided on the value chain interventions. Successive levels into this matrix represent a more advanced level of engagement that works towards a collaborative effort of decarbonizing the cement sector and assumes that the actions in the previous level are also part of the company's engagement. Maturity matrix is built as following:

Subdimension	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Sub score
Client GHG emissions Development of EPD Consultancy	No engagement with customers with respect to	The company has marketing campaigns that specifically aim to highlight products	Company assists clients to reduce their GHG emissions and to have the right use of the cement.	Company partners with large clients to define common GHG emissions reduction plan. Provision of documents as EPDs	Company contributes in GHG emissions reduction along its value chain through	60%

	Right use of cement	emissions reduction	that have a lower carbon impact.	Provision of documents as EPDs (Environmental Product Declaration) and tools by the lessor	(Environmental Product Declaration) and tools. Multi-party working group with annual meeting at least	close partnerships with clients	
	Users GHG emissions	No action	Passive approach (company implement action in response of specific request of tenants/users)	Company influence infrastructure/building users through awareness campaigns (for example about the lifetime of the product)	Company integrates actions within the construction/renovation of buildings/ infrastructures	Use of several actions levers along the whole life of the building/infrastructure (construction, renovation, management)	20%
	End of life GHG emissions	No action	The company collaborates with buildings and infrastructure end of life actors (associated to the cement/concrete) for example to increase the capture of carbon	The company has several actions on collecting and treating of buildings and infrastructure demolition waste (associated to cement and concrete).	The company has a successful program on collecting and treating of buildings and infrastructure demolition waste (associated to cement and concrete).	Strong pilot development for carbonatation and treatment of end of life of their products for reuse or recycling (in a sustainable way)	20%

RATIONALE

CEM 7.2 ACTIVITIES TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE GHG EMISSIONS

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

While measurement of strategy as in CEM 7.1 is important, measuring activities and their outcome is more insightful with regards to the company's actual emissions reduction activities in the supply chain. Because of the difficulty in measuring this, the ACT assessment uses this maturity matrix approach that has been piloted by several other institutions (see scoring rationale) to fill this gap in indicators CEM 6.2 and CEM 7.2.

SCORING RATIONALE:

Because of data availability and complexity, a direct measure of the outcome of supply chain engagement activities is not very feasible at this time. Therefore, the approach of a maturity matrix allows the analyst to consider multiple dimensions of client engagement and analyse them together towards a single score. This approach has been used before by several institutions that attempt to make measurements of progress in the complex and multidimensional industry sectors.

MODULE 8: POLICY ENGAGEMENT (WEIGHTING: 5%)

MODULE RATIONALE

The cement industry is not regulated in a uniform way due to its structural importance to economies as presented below:

- As noted in the CDP Cement report, Building Pressure [17], "alternative fuels from waste offer another way to decarbonize at a low cost with international companies in countries with robust waste legislation set to benefit compared to their Indian peers",
- US EPA has a specific cement manufacturing enforcement initiative,
- IEA[5]: Nevertheless, "further policy efforts across all countries will be required to achieve necessary cement sector decarbonisation".
- Policy and private sector efforts are facilitating reductions in energy use and emissions in key cement-producing economies, so regulations influencing fuel types used to heat kilns are important to look at.
- As part of its 13th Five-Year Plan (2016-20), China aims to reduce the thermal energy intensity of clinker production to 3.07 GJ/t clinker on average by 2020, which would shrink the gap between the current level and best available technology thermal energy performance by two-thirds.
- Between 2011 and 2015, 85 cement plants in India participated in the first cycle of Perform, Achieve, Trade (PAT), a market-based mechanism to improve energy efficiency. They achieved energy demand reductions equivalent to 9% of India's 2014 cement sector energy consumption, and the cement sector is now involved in the second PAT cycle, with higher targets and coverage.
- In Europe, the mandate to develop cement standards within the European Committee for Standardisation was recently widened to allow possible low-carbon alternatives to OPC clinker that rely on different raw materials or mixes.
- In 2015 in the private sector, 18 key cement companies developed the shared objective to reduce their CO2 emissions by 20-25% from the business-as-usual level by 2030, equivalent to 1 GtCO2.

However, regulation affecting the sector is usually developed in a consultative fashion due to the need for technical inputs. This allows significant opportunity for influence of these regulations, potentially in a way that is negative for the climate. Since the industry is currently a major source of emissions, effective, timely regulation is necessary to ensure that scientific limits are observed and that there is a "level playing field" for businesses in this sector to approach the transition to a low-carbon economy.

[5] https://www.iea.org/tcep/industry/cement/

CEM 8.1 COMPANY POLICY ON ENGAGEMENT WITH TRADE ASSOCIATIONS

DESCRIPTION & REQUIREMENTS	CEM 8.1 COMPANY POLICY ON ENGAGEMENT WITH TRADE ASSOCIATIONS
SHORT DESCRIPTION OF INDICATOR	The company has a constructive policy on what action to take when industry organisations in which it has membership are found to be opposing 'climate-friendly' policies.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 8.A: The company shall disclose if it has a policy to govern action when trade associations supported take positions on legislation that could hinder progress on transition to a low-carbon economy, and if this policy is public ♦ CEM 8.B: If it has a policy as outlined at CEM 8.A, the company shall describe this policy including the following details: Include [CDP C12.3f] ♦ CEM 8.E: The company should attach supporting documentation, if this exists, giving evidence
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence of the policy on trade associations and climate change for the presence of best-practice elements and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points are allocated for elements indicating a higher level of maturity. Best practice elements to be identified in the test/analysis include: ♦ Having a publicly available policy in place ♦ The scope of the policy covers the entire company and its activities, and all group memberships and associations ♦ The policy sets out what action is to be taken in the case of inconsistencies ♦ The action carries the option to terminate membership of the association ♦ The action carries the option of publicly opposing or actively countering the association's position ♦ Responsibility for oversight of the policy lies at the top level of the organisation ♦ Presence of a process to monitor and review trade association positions The maturity matrix used for the assessment is the following:

Question	Subdimension	Basic	Standard	Advanced	Next practice	Low-carbon aligned	Sub-score

What is the scope covered by the engagement policy? Is the policy publicly available?	Transparency and scope	Does not cover entire company or all group memberships. Is not publicly available.	Does not cover entire company or all group memberships. Is publicly available.	Covers the entire company and its activities, and all group memberships and associations, but not publicly available		Covers the entire company and its activities, and all group memberships and associations. Public policy is publicly available	40%
Does the company have a review process of trade associations?	Oversight	No process to review trade associations positions	A process and review trade association positions exists but is not necessarily implemented	A process to monitor and review trade association positions exists and is well implemented	A process to monitor and review trade association positions exists and is well implemented at a high level of the organization	A process to monitor and review trade associations' positions is in place. Responsibility for oversight of the policy lies at top level of the organization	40%
Does the company have an action plan regarding engagement with trade associations?	Action plan	No mention of this element		Sets out what action is to be taken in the case of inconsistencies	Option to terminate membership of the association	Option of publicly opposing or actively countering the association position	20%

RATIONALE

CEM 8.1 COMPANY POLICY ON ENGAGEMENT WITH TRADE ASSOCIATIONS

RATIONALE OF THE INDICATOR

See also the module rationale.

Trade associations are a key method by which companies can influence policy on climate indirectly. Thus, where trade associations take positions that are negative for the climate, companies need to take action to ensure that this negative influence is countered or minimised. Transparency about public policy is a specific request of the Investor Expectations report [16].

CEM 8.2 TRADE ASSOCIATIONS SUPPORTED DO NOT HAVE CLIMATE-NEGATIVE ACTIVITIES OR POSITIONS

DESCRIPTION &

CEM 8.2 TRADE ASSOCIATIONS SUPPORTED DO NOT HAVE CLIMATE-NEGATIVE ACTIVITIES OR POSITIONS

REQUIREMENTS

SHORT DESCRIPTION OF INDICATOR

The company is not on the Board or providing funding beyond membership of any trade associations that have climate-negative activities or positions. It should also be considered if the company is supporting trade associations with climate-negative activities and/or positions.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- CEM 8.C: The company shall disclose if (yes or no) it is on the board of any trade associations or provides funding beyond membership. Same as [CDP C12.3b]
- CEM 8.D "If yes, the reporter shall provide details of those trade associations that are likely to take a position on climate change legislation. Same as [CDP C12.3c]
- CEM 8.E: The company should attach supporting documentation, if this exists, giving evidence

External sources of data shall also be used for the analysis of this indicator:

- RepRisk database,
- Climate Action 100+
- Ellen Macarthur Foundation [18]
- press news
- EP100 – Climate Group www.theclimategroup.org/project/ep100
- Low-carbon Technology Partnerships initiative www.wbcsd.org/Programs/Climate-and-Energy/Climate/Low-Carbon-Technology-Partnerships-initiative

HOW THE ANALYSIS WILL BE DONE

The list of trade associations declared in the CDP data and other external sources entries relating to the company is assessed against a list of associations that have climate-negative activities or positions. The results will be compared to any policy described in CEM 8.1.

If the company is part of trade associations that have climate-negative activities and/or positions, this should be considered for the analysis.

The maturity matrix used for the assessment is the following:

Question	Subdimension	Basic	Standard	Advanced	Next practice	Low-carbon aligned
Does the company support trade associations that	Membership / funding	Company is on the board or provides funding		Company is not on the board or providing funding beyond		Company is not a member of any trade associations

	have climate negative activities/positions?		beyond membership to trade associations that have climate-negative activities or positions.		membership of any trade associations that have climate negative activities or positions. Company can be member.		that have climate negative activities or positions.

RATIONALE	**CEM 8.2 TRADE ASSOCIATIONS SUPPORTED DO NOT HAVE CLIMATE-NEGATIVE ACTIVITIES OR POSITIONS**
RATIONALE OF THE INDICATOR	See also the module rationale. Trade associations are a key instrument by which companies can indirectly influence policy on climate. Thus, participating in trade associations that actively lobby against climate-negative legislation is a negative indicator and likely to obstruct the low-carbon transition.

CEM 8.3 POSITION ON SIGNIFICANT CLIMATE POLICIES

DESCRIPTION & REQUIREMENTS	**CEM 8.3 POSITION ON SIGNIFICANT CLIMATE POLICIES**
SHORT DESCRIPTION OF INDICATOR	The company is not opposed to any significant climate relevant policies and/or supports climate friendly policies.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 8.E: The company should attach supporting documentation, if this exists, giving evidence ♦ CEM 8.F: "The company shall disclose details of the issues on which it has been directly engaging with policy makers and its proposed legislative solution. Same as [CDP C12.3a] External sources of data shall also be used for the analysis of this indicator (e.g. RepRisk database, press news, actions in standard development).
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence on the company's position on relevant climate policies for the presence of best practice elements, negative indicators and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points will be allocated for elements indicating a higher level of maturity.

The maturity matrix used for the assessment is the following:

Question	Subdimension	Basic	Standard	Advanced	Next practice	Low-carbon aligned
What is the position of the company on significant climate policies?	Climate policy support	The company publicises direct opposition to climate policy (e.g. direct statement issued or given by a company representative in a speech or interview) or reported direct opposition to climate policy can be found (third-party claims are found)	Reported indirect opposition to climate policy (e.g. a via trade association or in standards development)	No report of any opposition to climate policy	Reported direct support to relevant significant climate policy can be found	Publicly supports relevant significant climate policy

RATIONALE

CEM 8.3 POSITION ON SIGNIFICANT CLIMATE POLICIES

RATIONALE OF THE INDICATOR

See also the module rationale.

Policy and regulation that acts to promote transition to a low-carbon economy is key to the success of the transition. Companies should not oppose effective and well-designed regulation in these areas but should support it.

MODULE 9: BUSINESS MODEL (WEIGHTING: 10%)

MODULE RATIONALE

In addition to developing low-carbon cement, a company may transition its business model to other areas to remain profitable in a low-carbon economy. The company's future business model should enable it to decouple financial results from GHG emissions, in order to meet the constraints of a low-carbon transition while continuing to generate value. The business model shifts identified do not conflict with the changes that are implied by decarbonizing the company's production and sales.

These indicators aim to identify both relevant current business activities and those still at a burgeoning stage. It is recognized that transition to a low-carbon economy, with the associated change in business models, will take place over several years. The analysis will thus seek to identify and reward projects at an early stage as well as more mature business activities, although the latter (i.e. substantially sized, profitable, and/or expanding) business activities will be better rewarded.

A variety of sources have been consulted to develop a comprehensive review of the challenges facing the cement sector in relation to the low-carbon transition. Several opportunities for the sector have been identified which the ACT initiative has formatted under a taxonomy for reporting the development of business activities connected to them. The main reference sources for building these indicators are extracted from the literature and from exchanges with the experts during the methodology development process.

Climate scenarios can identify shifts in modes of construction and use of the buildings that will foster the transition to a low-carbon economy. Companies committed to adapting their business to these predicted changes will be better positioned to take advantage of associated opportunities and successfully transition to a low-carbon economy.

SCORING

The maturity matrix used for the assessing all indicators in this module is the following:

	Basic	Advanced	2° aligned	
Associated score	0%	50%	100%	**Sub score**
Profitability of business model	Non estimated or in a very early stage of development (research or conception stage)	Mature business model but non profitable or in a development stage (prototype / demonstration or test)	Mature and profitable business model	25%
Size of business model	Non estimated	Limited size of business for the company (few FTE or time dedicated, small turnover, few revenues expected, etc.)	Substantial size of market for the company (significant number or FTE or dedicated hours, great turnover, great anticipated profitability, etc.)	25%
Growth potential of business model	Non estimated or exploration of the business model interrupted	Scheduling next development steps	Scheduling the expansion of the target or size of the business model	25%

Deployment schedule of business model	Non scheduled	Deployment scheduled with a 2 years horizon or less	Deployment scheduled with a 2 years horizon or more	25%

When several business models are implemented, only the advanced one is assessed for the final score calculation.

CEM 9.1 BUSINESS ACTIVITIES THAT REDUCE STRUCTURAL BARRIERS TO MARKET PENETRATION OF LOW-CARBON CEMENT

DESCRIPTION & REQUIREMENTS	CEM 9.1 BUSINESS ACTIVITIES THAT REDUCE STRUCTURAL BARRIERS TO MARKET PENETRATION OF LOW-CARBON CEMENT
SHORT DESCRIPTION OF INDICATOR	The company is actively developing business models for a low-carbon future and participating in business activities that reduce structural barriers to market penetration of low-carbon cement.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 9.A: Business model subcategory, Description of business activity, Stage of development, Activity timeframe, Indicator of business size (over activity timeframe), Business size, What are your future plans for this activity?, What is your deployment timeframe ?, How do you manage this business plan deployment ? for the specific indicator. External sources of data used for the analysis of this indicator are: ♦ Climate-strategies [19] ♦ WBCSD_Cement sustainability initiative [20] ♦ Ellen Macarthur Foundation [18] ♦ EuropeanCement Research Academy (ECRA) ♦ ITRI (Taiwan) ♦ The Portland Cement Association (USA)
HOW THE ANALYSIS WILL BE DONE	The analysis is based on the company's degree of activity in one of the future business model areas used to benchmark. Relevant business activity areas for this indicator are, for example: ♦ New cement type (ex: improve the air quality of building or cities)

- Cement without clinker
- Lower clinker content
- Hazardous & Non-hazardous waste treatment (use as fuel)
- Use of biomass
- Use of hydrogen as an energy carrier or reduction agent
- Electrification of heat production

CALCULATION OF THE SCORE

In order for companies to align with a low-carbon future and meet the future construction needs, it is expected that they pursue at least one of these future business model pathways and integrate them into their strategic plans. The analyst evaluates the description and evidence of the company's degree of activity in one of the future business model areas for the presence of best practice elements and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points are allocated for elements indicating a higher level of maturity.

The minimum requirement for points to be awarded is that some level of exploration of one or more of these relevant business areas has started. This could include participation in collaborations, pilot projects, or research funding.

Best practice elements to be identified in the test/analysis include:

- the company has developed a mature business model that integrates one or many of the above elements
- the business activity is profitable
- the business activity is of a substantial size
- the company is planning to expand the business activity
- expansion will occur on a defined timescale

Maximum points are awarded if all these elements are demonstrated.

RATIONALE	CEM 9.1 BUSINESS ACTIVITIES THAT REDUCE STRUCTURAL BARRIERS TO MARKET PENETRATION OF LOW-CARBON CEMENT
RATIONALE OF THE INDICATOR	See the module rationale.

CEM 9.2 BUSINESS ACTIVITIES THAT CONTRIBUTE TO LOW-CARBON OPTIMIZATION OF CONSTRUCTION

DESCRIPTION & REQUIREMENTS	CEM 9.2 BUSINESS ACTIVITIES THAT CONTRIBUTE TO LOW-CARBON OPTIMIZATION OF CONSTRUCTION
SHORT DESCRIPTION OF INDICATOR	The company is actively developing business models for a low-carbon future, in participating in business activities associated with design and use of buildings or infrastructures that could increase the lifetime or environmental performance of the buildings or infrastructures.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: CEM 9.A: Business model subcategory, Description of business activity, Stage of development, Activity timeframe, Indicator of business size (over activity timeframe), Business size, What are your future plans for this activity?, What is your deployment timeframe ?, How do you manage this business plan deployment? for the specific indicator. External sources of data used for the analysis of this indicator are: • 2018 - Chatham House_making concrete change [8] • Ellen Macarthur Foundation [18] • EU taxonomy on Sustainable Finance - Nearly Zero Energy Building Standard • PCR Cement and Lime EN 16908, PCR Concrete EN 16757 • Standards on product lifetime or infrastructure lifetime (standards from TC59)
HOW THE ANALYSIS WILL BE DONE	The analysis is based on the company's degree of activity in one of the future business model areas used to benchmark. Relevant business activity areas for this indicator are for example: ♦ Increase material efficiency in building or infrastructures ♦ Increase the lifetime of buildings or infrastructures (technically but also with the patrimonial value, for example in increasing the biodiversity development) ♦ Develop of new activities related to low-carbon construction ♦ Products and services around the low-carbon construction ♦ Advanced concrete products ♦ Actions to help our customers to decarbonize their business model (concrete inertia, longer lifetime, active structure...) The calculation of the score is the same as in the CEM 9.1 indicator.

RATIONALE	CEM 9.2 BUSINESS ACTIVITIES THAT CONTRIBUTE TO LOW-CARBON OPTIMIZATION OF CONSTRUCTION
RATIONALE OF THE INDICATOR	See the module rationale.

CEM 9.3 BUSINESS ACTIVITIES AROUND CIRCULAR ECONOMY

DESCRIPTION & REQUIREMENTS	CEM 9.3 BUSINESS ACTIVITIES AROUND CIRCULAR ECONOMY
SHORT DESCRIPTION OF INDICATOR	The company is actively developing business models around circular economy, in participating in business activities associated with reuse and recycling of material.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ CEM 9.C: Business model subcategory, Description of business activity, Stage of development, Activity timeframe, Indicator of business size (over activity timeframe), Business size, What are your future plans for this activity? What is your deployment timeframe? How do you manage this business plan deployment? for the specific indicator. External sources of data used for the analysis of this indicator are: ♦ Ellen Macarthur Foundation [18] ♦ 2018 - Chatham House_making concrete change [8]
HOW THE ANALYSIS WILL BE DONE	Relevant business activity areas for this indicator are for example ♦ Reduce the amount of waste during the manufacture (ex: leveraging digital technology to address structural waste in supply chains, 3D printing and innovation) ♦ Promote reuse and refurbishment of concrete structures rather than destruction ♦ Develop CCS/CCU ♦ Increase the recycling rate of concrete and cement (for example use waste as raw material if authorized) ♦ Increase the amount of waste and secondary material used in cement (ex: the reuse of concrete 'fines' (particles with a small diameter) as a substitute for new cement)

- Application of the principles of industrial ecology to create symbiosis with other industries or organisations (include secondary material in cement, transmitting heat or vapour to another process or organization…)
- Cement plants as key actors of the circular economy in their territory (e.g. sharing the surplus heat from the cement production to supply as district heating to the local citizens)
- Increase carbonation

The calculation of the score is the same as in the CEM 9.1 indicator.

RATIONALE	CEM 9.3 BUSINESS ACTIVITIES AROUND CIRCULAR ECONOMY
RATIONALE OF THE INDICATOR	See the module rationale.

6. Assessment

6.1. SECTOR BENCHMARK

The default sectoral benchmark is taken from the sectoral decarbonization approach (SDA [10]) to science-based targets. For the cement sector the SDA at scope 1 and 2 levels (production emissions, including clinker emissions = inclusive scope 1+2) only considers the CO_2 from cement manufacturing.

Inclusive scope 1 and 2 (production emissions, including clinker emissions) are chosen because the revised WRI / WBCSD Protocol requires that companies shall separately account for and report on scopes 1 and 2 and verification shall also cover scope 1 and 2 emissions. [21]

For grinding plants and blenders, scope 3 could be relevant and is considered in the inclusive scope 1+2.

According to the last report of IPCC from October 2018, and with the IEA annual report from 2019[6], industry and energy sectors should be more ambitious than the 2°C scenario. With this commitment to be under 2°C, the suitable scenario is the beyond 2°C scenario (B2DS) from IEA. This scenario will be used as the default benchmark as presented in Figure 15. The benchmark presented is reported in gross direct emissions. CSI reporting is consistent with the benchmark so it could be used for ACT reporting.

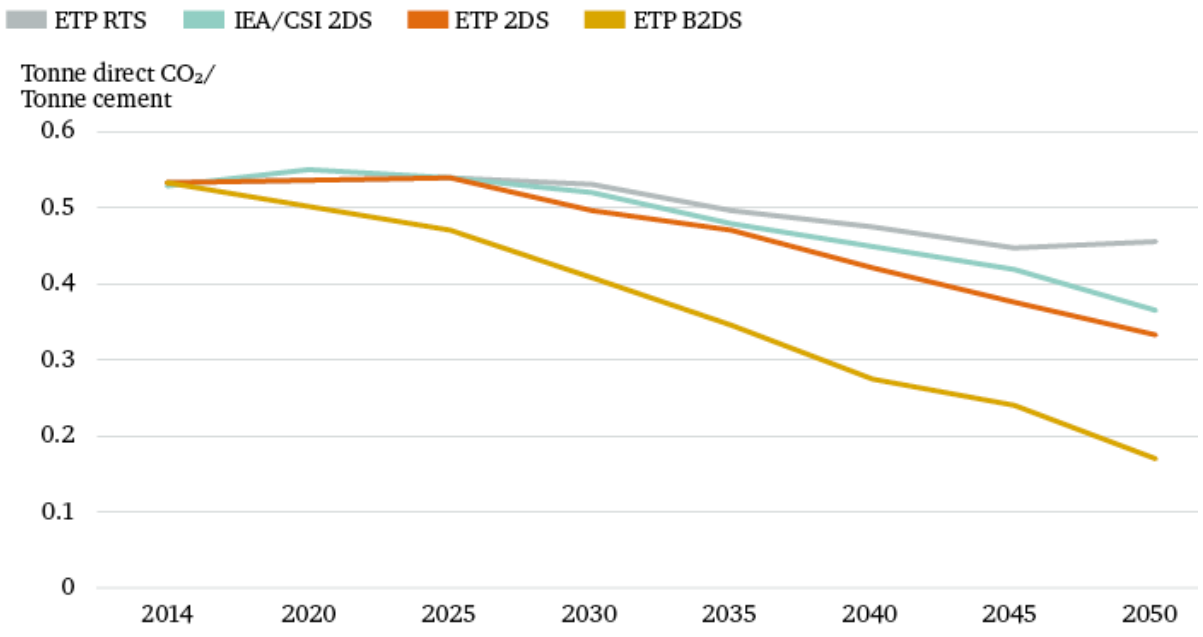


FIGURE 15: DIRECT CO2 INTENSITY OF CEMENT AT WORLD LEVEL (SCOPE 1) [2]

[6] https://www.euractiv.fr/section/climat/news/laie-voit-la-neutralite-carbone-a-portee-de-main/

Geographical areas coverage

The geographical zones are defined as a large world zone containing similar characteristics. The external sources and available data used (IEA ETP 2017, n.d.) [9] (International Energy Agency, 2013 [12] [11] for the construction of the benchmark covers the following areas for the cement sector:

- OECD
- Non-OECD

The scope 1 is extracted from industry data and the scope 2 is extracted from scenario data from IEA ETP 2017 [9].

The scope 2 is calculated by multiplying electricity consumption for cement (final energy consumption in TWh) by direct CO2 emissions from power sources (MtCO2) divided by gross electricity generation (TWh).

The cement company production emissions benchmark (CB_G as in the indicator calculation) is the company's allocated decarbonization pathway, it is calculated from the sectoral decarbonisation pathway, whatever the types of cement (grey or white cement, CEM I, CEM II, CEM III, alternative binders, etc.).

The sectoral decarbonisation pathway is divided into two pathways corresponding to the two regions represented (OECD and Non-OECD). The extent to which a company is tied to a scenario in any region is proportional to its production capacity in that country. Hence the CB_G is geographically weighted based on activity.

The allocation mechanism, as defined in the SDA, is the convergence mechanism. This allocation takes the company's emissions intensity in the initial year and converges it to the sector's emissions intensity in 2050.

Thus, companies starting from a lower intensity will have a shallower decarbonization pathway than companies starting from a higher intensity. In this way, past action or inaction to reduce intensity is incorporated.

6.2. BENCHMARKS USED FOR INDICATORS

The following table lists the benchmarks used for the quantitative indicators and their sources:

TABLE 5: BENCHMARKS FOR THE INDICATORS

BENCHMARK	PARAMETER	SOURCE	INDICATOR RELEVANCE
Company benchmark for production emissions including clinker emissions (Inclusive scope 1+2)	CB_G	IEA ETP [9] – background scenario data SDA [10] – specific benchmark pathway definition	CEM 1
Average lifetime of the company assets		INNOVATION IN THE CEMENT INDUSTRY, CEMBUREAU [11] p.5 "cement plants typically have a lifetime of as long as 30-50 years" p.5	CEM 2A CEM 4B

		ETSAP, IEA Technology Brief I03 - Cement Production [12] p.2 “Plant lifetime in the order of 15-20 years” 30 years is chosen as a proxy	
Sectoral projection of activity		IEA ETP [9]	
R&D benchmark for cement technology	TRL B_{RD} (mitigation R&D intensity)	Maturity of technology – TRL https://www.iea.org/topics/innovation/industry/ https://www.iea.org/topics/innovation/industry/gaps/ccs-applied-to-cement-manufacturing-2.html Ecofys / WWF report [14]	CEM 3
Governance benchmark for cement sector		TCFD	CEM 5
Average values	Kiln type Total production volumes of clinker CO2 emissions (gross and net) Cement plant power consumption Heat consumption and production Mineral component Clinker to ratio cement	Cement Sustainability Initiative - Getting the number right (CSI GNR) https://gccassociation.org/sustainability-innovation/gnr-gcca-in-numbers/	CEM 1 CEM 2A CEM 4B
Business model		Chatham House [8] Ellen Macarthur Foundation [18] Roadmaps [11] [2] [22]	CEM 9

6.3. WEIGHTINGS

The selection of weights for both the modules and the individual indicators was guided by the principles of value of information, impact of variation, future orientation and data quality sensitivity (see ACT framework [1]). The ACT Guidance [5] gives percentage ranges for the modules.

A. Concerns integrated companies, who produce their own clinker
B. Concern blenders and grinding operators who purchase the clinker from suppliers

For hybrid companies, who get A and B types of assets, the final rating is calculated according to the quantity of cement produced by type of assets (A or B). Then to aggregate the scores into a final rating, the analyst shall:

- For Module 2, multiplied the score by the quantity **a,** and
- For Module 4, multiplied by the quantity **b.**
- Then both module scores should be divided by the total quantity of cement produced (a+b).

With “a” represents the quantity of cement produced for A assets, “b” represents the quantity of cement produced for B assets.

TABLE 6: PERFORMANCE INDICATOR WEIGHTINGS

CEM	MODULE	INDICATOR	MODULE WEIGHT	INDICATOR WEIGHT (A)	INDICATOR WEIGHT (B)
1.1	Targets	Alignment of scope 1+2 emissions reduction targets	15%	10%	10%
1.2		Time horizon of targets		3%	3%
1.3		Achievement of previous targets		2%	2%
2.1a	Direct operations	Trend in past emissions intensity	*For A* 33%	7%	0%
2.2a		Locked-in emissions		16%	0%
2.3a		Trend in future emissions intensity		8%	0%
2.4a		Alternative fuels activities		2%	0%
3.1	Intangible Investment	R&D spending on low-carbon technologies	10%	10%	10%
4.1b	Indirect operations	Trend in past emissions intensity	*For B* 33%	0%	9%
4.2b		Electricity management		0%	9%

4.3b		Clinker / material-specific interventions		0%	15%
5.1	Governance	Oversight of climate change issues	10%	2%	2%
5.2		Climate change oversight capabilities		1%	1%
5.3		Low-carbon transition plan		3%	3%
5.4		Climate change management incentives		1%	1%
5.5		Climate change scenario testing		3%	3%
6.1	Supplier Engagement	Strategy to influence suppliers to reduce their GHG emissions	7%	3,5%	3,5%
6.2		Activities to influence suppliers to reduce their GHG emissions		3,5%	3,5%
7.1	Client Engagement	Strategy to influence customer behaviour to reduce their GHG emissions	10%	5%	5%
7.2		Activities to influence customer behaviour to reduce their GHG emissions		5%	5%
8.1	Policy Engagement	Company policy on engagement with trade associations	5%	1%	1%
8.2		Trade associations supported do not have climate-negative activities or positions		2%	2%
8.3		Position on significant climate policies		2%	2%
9.1	Business Model	Business activities that reduce structural barriers to market penetration of low-carbon cement	10%	3%	3%

9.2		Business activities that contribute to low-carbon optimization of construction		4%	4%
9.3		Business activities around the circular economy		3%	3%
OVERALL			**100%**	**100%**	**100%**

The quantitatively scored modules (Targets, Direct operations, Intangible investment, Indirect operations) carry 58% of the final weight, and the qualitatively scored modules (Governance, Policy engagement, Business model) carry 42%. The indicators within the modules also carry their own weighting.

RATIONALE FOR WEIGHTINGS

The selection of weights for both the modules and the individual indicators was guided by a set of principles. These principles helped define the value of the indicators.

PRINCIPLE	EXPLANATION
Value of information	The value of the information that an indicator gives about a company's outlook for the low-carbon transition is the primary principle for the selection of the weights.
Impact of variation	A high impact of variation in an indicator means that not performing in such an indicator has a large impact on the success of a low-carbon transition, and this makes it more relevant for the assessment.
Future orientation	Indicators that measure the future, or a proxy for the future, are more relevant for the ACT assessment than past & present indicators, which serve only to inform the likelihood and credibility of the transition.
Data quality sensitivity	Indicators that are highly sensitive to expected data quality variations are not recommended for a high weight compared to other indicators, unless there is no other way to measure a dimension of the transition.

According to roadmaps [23] [2] for the cement sector, weightings have been defined as below:

Targets 15%

An ambitious target has been set for this sector because it is the second largest industrial carbon emitter.

Most of the CO2 emissions are accounted in the phase production emissions, including clinker emissions (inclusive scope 1+2).

In the roadmap, alternative fuels are a solution to reach the low-carbon pathways. Alternative fuels have been accounted in the target indicators in the production phase (inclusive scope 1+2).

The Targets module has a relatively large weight of 15%. Most of it is placed on the alignment of inclusive scope 1+2 emissions reduction targets, with a strong weight of 10%. This indicator contains most of the information about the company's future commitments with respect to GHG emissions reductions. Not having an ambitious target means it is very unlikely that the company is committed to a transition, and therefore this indicator has a high influence on the likelihood of a successful transition. Targets are also future oriented, as a valuable proxy for assessing the company's long-term emissions pathway.

The '*Time horizon of targets'* and '*Achievement of previous targets'* have a medium weight of 3% and 2% respectively. The time horizon of targets is a proxy of how forward-looking the company is, which is very long-term oriented. Finally, the '*Achievement of previous targets'* indicator measures the company's past credentials on target setting and achievement, which provides more contextual information on the company's ability to meet ambitious future targets.

A: Direct operations 33%

This module is specific to companies A – companies that produce their own clinker.

Manufacturing cement and notably manufacturing clinker requires high and long-term investment with best available technologies. Roadmaps specific to the cement sector show that resources and energy efficiency are key for low-carbon transition.

This is the primary module that assesses the development of the company's assets, and how these existing assets influence the likelihood of a low-carbon transition.

The locked-in emissions indicator uses the same information but tries to measure the amount of GHG emissions that the company has already committed from its individual carbon budget. This means it is also very future oriented and robust because of the secured activity ratio. It receives a strong weight of 16%.

In the short-term, the company's current portfolio and confirmed planned assets are used to generate an estimate of the company's trend in future emissions intensity. As this is a direct measurement of the decarbonization pathway, with a high impact of variation, and which looks to the future, it receives a weighting of 8%.

Finally, the trend in past emissions intensity is an indication of the 'adjustment' that the company must make to place itself on a low-carbon pathway. It is scored 7%.

In the cement industry, the reporting in gross and net emissions is important because of the use of alternative fuels. The specific indicator "alternative fuels activities" receives a score of 2%.

Intangible Investment 10%

Intangible investment is focused entirely on R&D. R&D technology such as carbon sequestration and use can be some means of avoiding CO2 emissions that cannot be avoided because there originate from the chemical reaction (transformation of limestone into lime). In a long-term perspective the investment in R&D for cement, especially in CCS/CCU could help other sectors to also have access to these types of technologies.

Intangible investment is a necessary condition for the cement industry to achieve progress in technology for a low-carbon future, and large R&D programs in climate-mitigating technologies are indicative of a strong financial commitment by the company. The analysis would like to focus on those R&D processes that contribute to climate change mitigating technologies, described in R&D for low-carbon transition. This is very future oriented, and thus has a relatively large weight of 10%.

B: Indirect operations 33%

This module is specific to companies B – blenders and grinding operators. As the locked-in emissions are less important than integrated assets, this module needs to encourage downstream actors to have best practices from hotspot suppliers via '*Clinker / material specific interventions'* indicator but also actions towards their own assets via *'Electricity management indicator'.*

The future emissions and the present and future actions are key to ensure the reduction of GHG emissions and justifies the weighting of the indicator *'Clinker / material-specific interventions* to be 15%.

The '*Trend in past emissions'* is an indication of the 'adjustment' that the company has to make to place itself on a low-carbon pathway. It principally adds information about what kind of changes the company needs to undergo in order to become low carbon aligned, and therefore receives a medium weight of 9%.

Governance 10%

Governance is a multi-faceted module that makes up 10% of the score, because it incorporates many different smaller indicators that together paint a picture of the company's management and strategic approach to the low-carbon transition. A significant part of the weighting is placed on the oversight of climate change issues and the climate change oversight capability, which are respectively weighted 2% and 1%. These two indicators measure the ability of the company to integrate sustainability to its strategy and to embrace the main challenges related to low-carbon transition. Besides, according to the principle of future orientation, the transition plan provides more information on how this company will specifically deal with the transition, and has a weight of 3%. The remaining indicators (climate change management incentives and climate change scenario testing) have a weight of 1% and 3% respectively. These are contextual indicators whose outcome can either strengthen or undermine the company's ability to carry out the transition plan and meet ambitious science-based targets.

Suppliers 7%

In order to develop the technology required for the low-carbon transition, it is essential that cement manufacturers involve their supply chains. Nonetheless, it is not an indicator that is easy to measure and relies heavily on data quality to make a proper analysis. Therefore, considering these aspects, this indicator is given a weight of 7%.

This indicator focuses on the global strategy and general activities that a cement company has in place with respect to its engagement with suppliers.

Client 10%

The client engagement indicator is focused on the company's efforts to promote low-carbon cement and more efficient use of cement (right cement for the right use, with the right quantities) to their customers. This is an important characteristic to identify companies making real efforts to make low-carbon cement a significant part of their sales. Nevertheless, this indicator alone is a narrow aspect of the transition and therefore its total weight is medium at 10%.

Policy Engagement 5%

In line with the rationale for the management indicators of low weight, the policy engagement indicators are also contextual aspects which tell a narrative about the company's stance on climate change and how the company expresses it in their engagement with policy makers and trade associations. The total weight for this module is therefore medium at 5%. Two indicators are allocated with 2%: The *''Trade associations supported do not have climate-negative actions or positions'* indicator and the company's *'Position on*

significant climate policies'. The '*Company policy on engagement with trade associations*' has a weighting of 1%.

Business Model 10%

The integration of a low-carbon economy in current and future business models is a composite indicator that captures many elements and aspects that cannot otherwise be captured in any of the other modules. It includes those aspects that are relevant to the transition but are not directly a part of the primary activities. It is future oriented by asking the companies on their narrative on certain future directions that the sector can/must take to transition. As this is an important aspect of any business long-term future planning, it holds a medium weight of 10% in the analysis.

The low-carbon ways of construction cover new ways of building infrastructures with a part about maintenance and renovation towards better use of this material. This indicator, weighted at 4%, asks cement companies how they are engaging with the projected construction shift under a low-carbon scenario, which is important because this can have major impacts on the company's future business model. Furthermore, activities like these have a key role in cement roadmaps [16] [2].

The '*Business activities around the circular economy'* covers for example, waste management and integration of recycled resources into cement material. It is weighted at 3%.

The '*Business activities that reduce barriers to market penetration of low-carbon cement'* indicator includes those aspects that are relevant to low-carbon cement adoption but are not directly a part of the primary manufacturing activities. Cement manufacturing is the core activity of the companies and with rising populations, continued manufacture of cement will be necessary, giving this indicator a weighting of 3%.

7. Rating

The ACT rating shall comprise of:

→ A Performance Score

→ A Narrative Score

→ A Trend Score

These pieces of information shall be represented within the ACT rating as follows:

a. Performance score as a number from 0 (lowest) to 100 (highest)

b. Narrative score as a letter from E (lowest) to A (highest)

c. Trend score as either "+" for improving, "-" for worsening, or "=" for stable.

The highest rating is thus represented as "100A+", the lowest as "0E-" and the midpoint as "50C=".

TABLE 7: LOWEST, HIGHEST AND MIDPOINT FOR EACH ACT SCORE TYPE

LOW SCORES	MID SCORES	HIGH SCORES
0 E -	50 C =	100 A +

See the ACT Framework [1] for general information and methodology on the ACT rating.

7.1. PERFORMANCE SCORING

A detailed description of the Performance indicators and of their weightings for the CEM sector is presented in 5.3 Performance indicators.

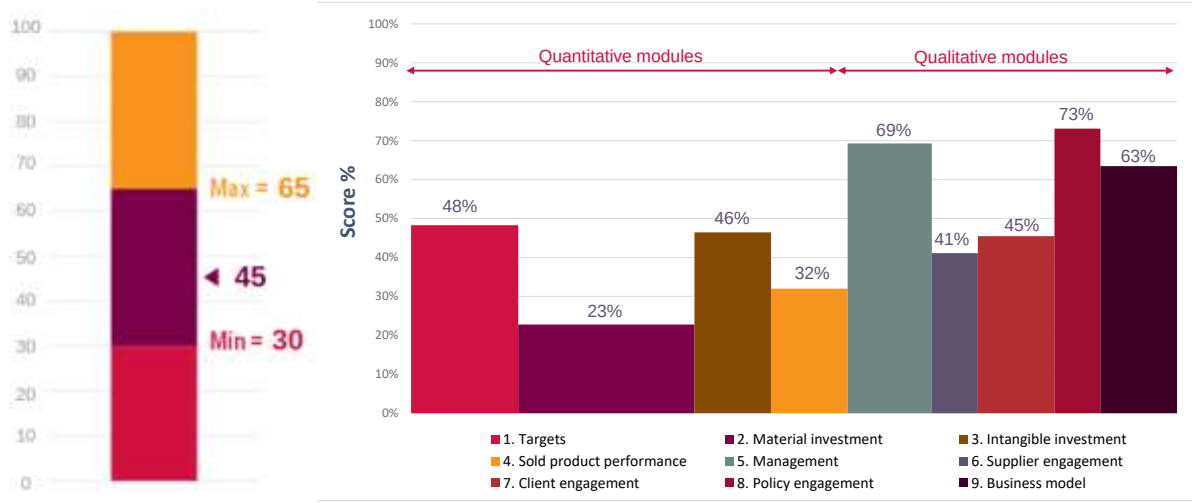


FIGURE 16: AVERAGE RATINGS FOR THE PERFORMANCE SCORE FOR THE CEMENT SECTOR FROM ROADTEST PHASE.

Performance scoring shall be performed in compliance with the ACT Framework. No additional sector-specific issue impacting the Performance scoring for this sector has been identified to date.

7.2. NARRATIVE SCORING

Narrative scoring shall be performed in compliance with the ACT Framework.

The information reported in Module 2A (for integrated companies) and in Module 4B (for blenders and grinding operators) shall be considered as key indicators in the narrative scoring because they assess most parts of CO2 emissions due to cement production. The information reported in Module 7 shall be considered with particular attention for the narrative assessment and narrative scoring for the CEM sector: with this information, the analyst can take a holistic view on the company's sales efforts to redouble the identification of compliance cement and reward companies who have made real efforts to promote efficient and low-carbon systems and services.

The organisation of the company – integrated, blenders or grinding operators – shall be considered in the narrative assessment and narrative scoring for the CEM sector. The collected value for clinker CO2 emissions need to be looked at closely because companies can have multiple numbers of assets. Companies shall collect clinker emissions data that is at minimum included in the upstream value chain. However, the company targets should ideally also include 'downstream' value chain emissions, even if they are not benchmarked with the performance indicators. While downstream emissions targets are not assessed on the merits of that target itself, companies shall be recognized for their efforts.

The evolution of the average compressive strengths (MPa) of the cement for the last five years shall be considered for the analysis because it helps having a comprehensive view of the efforts of the company on the market (only reduction of CO_2 emissions or reduction of CO_2 emission without degrading the performance of the cement sold).

No other sector-specific issue impacting the Narrative scoring for this sector has been identified to date.

7.3. TREND SCORING

Trend scoring shall be performed in compliance with the ACT Framework.

To apply the Trend scoring methodology presented in the ACT Framework, the analyst should identify the trends from the existing data infrastructure based on the data points and/or indicators that can indicate the future direction of change within the company.

The table below includes an overview of which indicators/data points could possibly have valuable information about future directions for the CEM sector.

TABLE 8 : RELEVANT PERFORMANCE INDICATORS FOR TRENDS IDENTIFICATION FOR THE CEM SECTOR

MODULE	INDICATOR
1.TARGETS	CEM 1.1 Alignment of inclusive scope 1+2 emissions reduction targets CEM 1.2 Time horizon of targets
2A. DIRECT OPERATIONS	CEM 2.2 A Locked-in emissions CEM 2.3 A Trend in future emissions intensity

3. INTANGIBLE INVESTMENT	CEM 3.1 R&D for low-carbon transition
4.B INDIRECT OPERATIONS	CEM 4.2 B Electricity management CEM 4.3 B Clinker / material specific interventions
5. GOVERNANCE	CEM 5.3 Low-carbon transition plan CEM 5.5 Climate change scenario testing
6. SUPPLIER	CEM 6.1 Strategy to influence suppliers to reduce their GHG emissions CEM 6.2 Activities to influence suppliers to reduce their GHG emissions
7. CLIENT	CEM 7.1 Strategy to influence customer behaviour to reduce their GHG emissions CEM 7.2 Activities to influence customer behaviour to reduce their GHG emissions
9. BUSINESS MODEL	CEM 9.1 Business activities that reduce structural barriers to market penetration of low-carbon cement CEM 9.2 Business activities that contribute to low-carbon optimization of construction CEM 9.3 Business activities around the circular economy

8. Aligned state

The table below presents the response of a low-carbon aligned company of the sector to the five ACT questions:

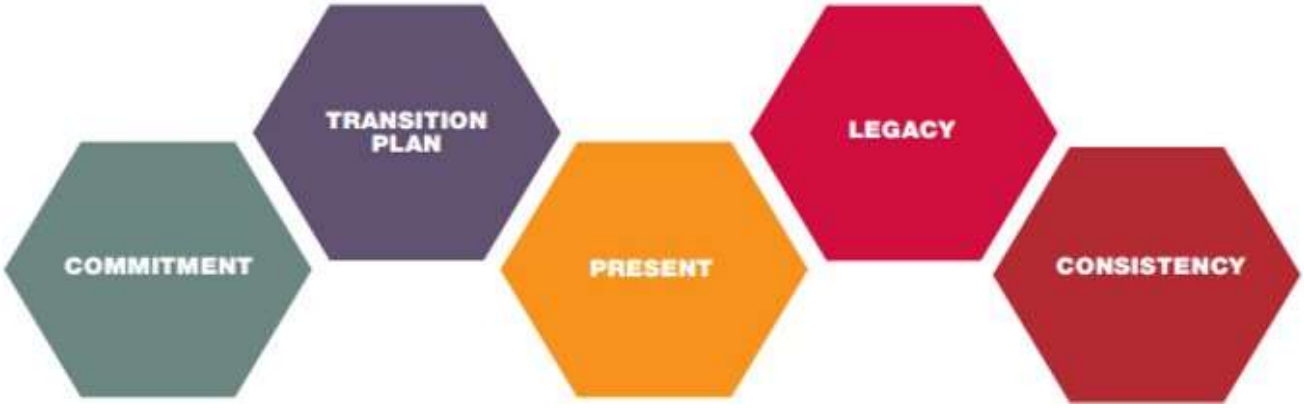
→ What is the company planning to do? **[Commitment]**

→ How is the company planning to get there? **[Transition Plan]**

→ What is the company doing at present? **[Present]**

→ What has the company done in the recent past? **[Legacy]**

→ How do all these plans and actions fit together? **[Consistency]**



1	2	3	4	5
The company has science-based targets on several dimensions of the value chain, for high-intensive production processes in particular. The company collaborates with suppliers and clients to making a low-carbon product that is of both high quality and performant to be used in infrastructures and buildings.	The company discloses a transition plan that details a growing share of low-carbon systems and services and operational steps to achieve their objectives	The investment strategy for new production capacity and R&D places clear focus on low-carbon alternatives or technologies for decarbonization	A trend is evident of lowering emissions intensity of delivered product and developing systems and services. The company achieved this decrease through deliberate operational or investment decisions	The company's targets, transition plan, present action and past legacy show a consistent willingness to achieve the goals of low-carbon transition. The company operates as a strong actor in the circular economy during all the life cycle stages of the product

FIGURE 17 : ALIGNED STATE FOR COMPANIES IN THE CEMENT SECTOR

9. Sources

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10. Glossary

10.1. DEFINITIONS

2 DEGREES (2°C)	A political agreement was reached at COP21 on limiting global warming to 2°C above the pre-industrial level (COP21: Why 2°C?). A 2°C scenario (or 2°C pathway) is a scenario (or pathway) compatible with limiting global warming to 2°C above the pre-industrial level.
ACT	The Assessing low-Carbon Transition (ACT) initiative was jointly developed by ADEME and CDP. ACT assesses how ready an organization is to transition to a low-carbon world using a future-oriented, sector-specific methodology (ACT website).
ACTION GAP	In relation to emissions performance and reduction, the action gap is the difference between what a given company has done in the past plus what it is doing now, and what must be done. For example, companies with large action gaps have done relatively little in the past, and their current actions point to continuation of past practices.
ACTIVE CAPACITY	Active capacity is considered as production quantity. Active capacity + Discontinued capacity = Total capacity
ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie; The French Environment and Energy Management Agency (ADEME web page).
ALIGNMENT	The ACT project seeks to gather information that will be consolidated into a rating that is intended to provide a general metric of the 2-degree alignment of a given company. The wider goal is to provide companies specific feedback on their general alignment with 2-degrees in the short and long term.
ANALYST	Person in charge of the ACT assessment.
ASSESS	Under the ACT project, to evaluate and determine the low-carbon alignment of a given company. The ACT assessment and rating will be based on consideration of a range of indicators. Indicators may be reported directly from companies. Indicators may also be calculated, modelled or otherwise derived from different data sources supplied by the company. The ACT project will measure three gaps (Commitment, Horizon and Action – defined in this glossary) in the GHG emissions performance of companies. This model closely follows the assessment framework presented above. It starts with the future, with the goals companies want to achieve, followed by their plans, current actions and past actions.

ASSET	An item of property owned by a company, regarded as having value and available to meet debts, commitments, or legacies. Tangible assets include 1) fixed assets, such as machinery and buildings, and 2) current assets, such as inventory. Intangible assets are nonphysical such as patents, trademarks, copyrights, goodwill and brand value.
BARRIER	A circumstance or obstacle preventing progress (e.g. lacking information on supplier emissions and hotspots can be a barrier to companies managing and reducing their upstream Scope 3 emissions).
BASE YEAR	According to the GHG Protocol and ISO14064-1, a base year is “a historic datum (a specific year or an average over multiple years) against which a company’s emissions are tracked over time”. Setting a base year is an essential GHG accounting step that a company must take to be able to observe trends in its emissions information (GHG Protocol Corporate Standard).
BENCHMARK	A standard, pathway or point of reference against which things may be compared. In the case of pathways for sector methodologies, a sector benchmark is a low-carbon pathway for the sector average value of the emissions intensity indicator(s) driving the sector performance. A company’s benchmark is a pathway for the company value of the same indicator(s) that starts at the company performance for the reporting year and converges towards the sector benchmark in 2050, based on a principle of convergence or contraction of emissions intensity.
BUSINESS-AS-USUAL	No proactive action taken for change. In the context of the ACT methodology, the business-as-usual pathway is constant from the initial year onwards. In general, the initial year – which is the first year of the pathway/series – is the reporting year (targets indicators) or the reporting year minus 5 years (performance indicators).
BUSINESS MODEL	A plan for the successful operation of a business, identifying sources of revenue, the intended customer base, products, and details of financing. Under ACT, evidence of the business model shall be taken from a range of specific financial metrics relevant to the sector and a conclusion made on its alignment with low-carbon transition and consistency with the other performance indicators reported.
CAPITAL EXPENDITURE	Money spent by a business or organization on acquiring or maintaining fixed assets, such as land, buildings, and equipment.
CARBON CAPTURE AND STORAGE (CCS)	The process of trapping carbon dioxide produced by burning fossil fuels or other chemical or biological process and storing it in such a way that it is unable to affect the atmosphere.
CDP	Formerly the "Carbon Disclosure Project", CDP is an international, not-for-profit organization providing the only global system for companies and cities to measure, disclose, manage and share vital environmental information. CDP

	works with market forces, including 827 institutional investors with assets of over US$100 trillion, to motivate companies to disclose their impacts on the environment and natural resources and take action to reduce them. More than 5,500 companies worldwide disclosed environmental information through CDP in 2015. CDP now holds the largest collection globally of primary climate change, water and forest risk commodities information and puts these insights at the heart of strategic business, investment and policy decisions (CDP website).
CEMENT	A building material made by grinding clinker together with various mineral components such as gypsum, limestone, blast furnace slag, coal fly ash and natural volcanic material. Cement acts as a binding agent when mixed with sand, gravel or crushed stone and water to make concrete [2]
CLIMATE CHANGE	A change in climate, attributed directly or indirectly to human activity, that alters the composition of the global atmosphere and that is, in addition to natural climate variability, observed over comparable time periods' (UNFCCC).
CLINKER	An intermediate product in cement manufacturing and the main substance in cement. It is the result of calcination of limestone in the kiln and subsequent reactions caused through burning. [2]
COMPANY	A commercial business.
COMPANY PATHWAY	A company's past emissions intensity performance pathway up until the present.
COMPANY TARGET PATHWAY	The emissions intensity performance pathway that the company has committed to follow from the initial year on until a future year, for which it has set a performance target.
COMMITMENT GAP	In relation to emissions performance, the difference between what a company needs to do and what it says it will do.
CONFIDENTIAL INFORMATION	Any non-public information pertaining to a company's business.
CONSERVATIVENESS	A principle of the ACT project; whenever the use of assumptions is required, the assumption shall err on the side of achieving 2-degrees maximum.
CONSISTENCY	A principle of the ACT project; whenever time series data is used, it should be comparable over time. In addition to internal consistency of the indicators reported by the company, data reported against indicators shall be consistent with other information about the company and its business model and strategy found elsewhere. The analyst shall consider specific, pre-determined pairs of data points and check that these give a consistent measure of performance when measured together.

COP21	The 2015 United Nations Climate Change Conference, held in Paris, France from 30 November to 12 December 2015 (COP21 webpage).
DATA	Facts and statistics collected for reference and analysis (e.g. the data points requested from companies for assessment under the ACT project indicators).
DECARBONIZATION	A complete or near-complete reduction of greenhouse gas emissions over time (e.g. decarbonization in the electric utilities sector by an increased share of low-carbon power generation sources, as well as emissions mitigating technologies like Carbon Capture and Storage (CCS)).
DECARBONIZATION PATHWAY	Benchmark pathway (See 'Benchmark').
EMISSIONS	The GHG Protocol defines direct GHG emissions as emissions from sources that are owned or controlled by the reporting entity, and indirect GHG emissions as emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity (GHG Protocol).
ENERGY	Power derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines.
FOSSIL FUEL	A natural fuel such as coal, oil or gas, formed in the geological past from the remains of living organisms.
FUTURE	A period following the current moment; time regarded as still to come.
POWER GENERATION	The process of generating electric power from other sources of primary energy.
PRIMARY ENERGY	Primary energy is an energy form found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels, and other forms of energy received as input to a system. Primary energy can be non-renewable or renewable.
GREENHOUSE GAS (GHG)	Greenhouse gas (e.g. carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and three groups of fluorinated gases (sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs)) which are the major anthropogenic GHGs and are regulated under the Kyoto Protocol. Nitrogen trifluoride (NF_3) is now considered a potent contributor to climate change and is therefore mandated to be included in national inventories under the United Nations Framework Convention on Climate Change (UNFCCC).
GUIDANCE	Documentation defining standards or expectations that are part of a rule or requirement (e.g. CDP reporting guidance for companies).

HORIZON GAP	In relation to emissions performance, the difference between the average lifetime of a company's production assets (particularly carbon intensive) and the time-horizon of its commitments. Companies with large asset-lives and short time horizons do not look far enough into the future to properly consider a transition plan.
INCENTIVE	A thing, for example money, that motivates or encourages someone to do something (e.g. a monetary incentive for company board members to set emissions reduction targets).
INDICATOR	An indicator is a quantitative or qualitative piece of information that, in the context of the ACT project, can provide insight on a company's current and future ability to reduce its carbon intensity. In the ACT project, fundamental types of indicators can be considered: → Key performance indicators (KPIs) → Key narrative indicators (KNIs) → Key asset indicators (KAIs).
INTENSITY (EMISSIONS)	The average emissions rate of a given pollutant from a given source relative to the intensity of a specific activity; for example, grams of carbon dioxide released per MWh of energy produced by a power plant.
INTERVENTION	Methods available to companies to influence and manage emissions in their value chain, both upstream and downstream, which are out of their direct control (e.g. a retail company may use consumer education as an intervention to influence consumer product choices in a way that reduces emissions from the use of sold products).
LIFETIME	The duration of a thing's existence or usefulness (e.g. a physical asset such as a power plant).
LONG-TERM	Occurring over or relating to a long period of time; under ACT this is taken to mean until the year 2050. The ACT project seeks to enable the evaluation of the long-term performance of a given company while simultaneously providing insights into short- and medium-term outcomes in alignment with the long-term.
LOW-CARBON SCENARIO (OR PATHWAY)	A low-carbon scenario (or pathway) is a 2°C scenario, a well-below 2°C scenario or a scenario with higher decarbonization ambition.
LOW-CARBON VEHICLES	Following the general principles detailed in the Taxonomy Technical Report of the EU, the guidelines to define low-carbon vehicles are these ones: Vehicles powered by biofuels, bio natural-gas or advanced fuels (e.g. electrofuels / synfuels), assuming these fuels have demonstrated a clear GHG reduction compared to conventional fossil-derived fuels, on a full lifecycle

perspective. Thanks to policies instruments, that will be probably the case in Europe, but not elsewhere.

Electric, plug-in hybrid, hydrogen-fuelled and ammonia-fuelled vehicles, assuming electricity to generate these energy carriers is low-carbon

Additional vehicles for passenger rail transport:

If direct emissions (TtW) are below 50 gCO2e/p.km until 2025

Additional vehicles for freight rail transport:

If direct emissions (TtW) are below 50 percent of the average reference for heavy-duty vehicles defined by the Heavy Duty CO2 regulation

Additional vehicles for freight road transport:

Low-emission heavy-duty vehicles with specific direct CO2 emissions of less than 50 percent of the reference CO2 emissions of all vehicles in the same sub-group are eligible.

Additional vehicles for urban and suburban passenger transport:

Other vehicles are eligible if direct emissions are below 50 gCO2e/p.km

Additional vehicles for maritime transport:

Vehicles using wind for propulsion

Additional vehicles for urban freight:

Vehicles using electric/human propulsion (cargo-bikes, pedestrian)

Additional vehicles for inland waterways passenger transport:

Other Inland waterways vessels are eligible if direct emissions are below 50 gCO2e/pkm. Eligibility should be reviewed in 2025.

Additional vehicles for inland waterways freight transport:

Other inland waterway vessels are eligible if direct emissions per tkm are 50 percent lower than the average reference value defined for HDVs (Heavy Duty CO2 Regulation). Eligibility should be reviewed in 2025.

The table hereafter compiles some exclusions to bring more clarification, on a mode by mode basis:

- Aviation: biofuels that don't respect the ICAO standards can’t be considered as low-carbon, hence the same for aircraft using them.
- Shipping: LNG-powered vessels are not considered as low-carbon vehicles, unless natural gas is replaced by biogas.
- Rail: LNG or CNG-powered trains are not considered as low-carbon vehicles, unless natural gas is replaced by biogas.
- Road: LNG or CNG-powered trains are not considered as low-carbon vehicles, unless natural gas is replaced by biogas

LOW-CARBON TRANSITION	The low-carbon transition is the transition of the economy according to a low-carbon scenario.
MANUFACTURE	Making objects on a large-scale using machinery.

MATURITY MATRIX	A maturity matrix is essentially a “checklist”, the purpose of which is to evaluate how well advanced a process, program or technology is according to specific definitions.
MITIGATION (EMISSIONS)	The action of reducing the severity of something (e.g. climate change mitigation through absolute GHG emissions reductions)
MODEL	A program designed to simulate what might or what did happen in a situation (e.g. climate models are systems of differential equations based on the basic laws of physics, fluid motion, and chemistry that are applied through a three-dimensional grid simulation of the planet Earth).
PATHWAY (EMISSIONS)	A way of achieving a specified result; a course of action (e.g. an emissions reduction pathway).
PERFORMANCE	Measurement of outcomes and results.
PLAN	A detailed proposal for doing or achieving something.
POINT	A mark or unit of scoring awarded for success or performance.
POZZOLANA	A material that exhibits cementitious properties when combined with calcium hydroxide. [2]
POWER	Energy that is produced by mechanical, electrical, or other means and used to operate a device (e.g. electrical energy supplied to an area, building, etc.).
RELEVANT / RELEVANCE	In relation to information, the most relevant information (core business and stakeholders) to assess low-carbon transition.
RENEWABLE ENERGY	Energy from a source that is not depleted when used, such as wind or solar power.
REPORTING YEAR	Year under consideration.
RESEARCH AND DEVELOPMENT (R&D)	A general term for activities in connection with innovation; in industry; for example, this could be considered work directed towards the innovation, introduction, and improvement of products and processes.
SCIENCE-BASED TARGET	To meet the challenges that climate change presents, the world’s leading climate scientists and governments agree that it is essential to limit the increase in the global average temperature at below 2°C. Companies making this commitment will be working toward this goal by agreeing to set an emissions reduction target that is aligned with climate science and meets the requirements of the Science-Based Targets Initiative.

SCENARIO	The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) presents the results of an extensive climate modelling effort to make predictions of changes in the global climate based on a range of development/emissions scenarios. Regulation on climate change-related issues may present opportunities for your organization if it is better suited than its competitors to meet those regulations, or more able to help others to do so. Possible scenarios would include a company whose products already meet anticipated standards designed to curb emissions, those whose products will enable its customers to meet mandatory requirements or those companies that provide services assisting others in meeting regulatory requirements.
SCENARIO ANALYSIS	A process of analysing possible future events by considering alternative possible outcomes.
SECTORAL DECARBONIZATION APPROACH (SDA)	To help businesses set targets compatible with 2-degree climate change scenarios, the Sectoral Decarbonization Approach (SDA) was developed. The SDA takes a sector-level approach and employs scientific insight to determine the least-cost pathways of mitigation and converges all companies in a sector towards a shared emissions target in 2050.
SHORT-TERM	Occurring in or relating to a relatively short period of time in the future.
SCOPE 1 EMISSIONS **DIRECT GHG EMISSIONS AND REMOVALS**	All direct GHG emissions (GHG Protocol Corporate Standard). Category 1 from ISO 14064-1:2018*: Direct GHG emissions and removals occur from GHG sources or sinks inside organizational boundaries and that are owned or controlled by the* [reporting] *organization. Those sources can be stationary (e.g. heaters,electricity generators, industrial process) or mobile (e.g. vehicles).*
SCOPE 2 EMISSIONS **INDIRECT GHG EMISSIONS FROM IMPORTED ENERGY**	Indirect GHG emissions from consumption of purchased electricity, heat or steam (GHG Protocol Corporate Standard). Category 2 from ISO 14064-1:2018: *GHG emissions due to the fuel combustion associated with the production of final energy and utilities, such as electricity, heat, steam, cooling and compressed air* [imported by the reported company]. *It excludes all upstream emissions (from cradle to power plant gate) associated with fuel, emissions due to the construction of the power plant, and emissions allocated to transport and distribution losses.*
SCOPE 3 EMISSIONS **INDIRECT GHG EMISSIONS**	Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. Transmission & Distribution losses) not covered in Scope 2, outsourced activities, waste disposal, etc. (GHG Protocol Corporate Standard). Scope 3 also encompass the emissions related to the use of sold-products. ISO 14064-1:2018: *GHG emission that is a consequence of an organization's operations and activities, but that arises from GHG sources that are not owned or*

	controlled by the [reporting] *organization*. *These emissions occur generally in the upstream and/or downstream chain.* *Category 3 : indirect GHG emissions from transportation* *Category 4: Indirect GHG emissions from products used by an organization* *Category 5: Indirect GHG emissions associated with the use of products from the organization* *Category 6: Indirect GHG emissions from other sources*
SECTOR	A classification of companies with similar business activities, e.g. automotive manufacturers, power producers, retailers, etc.
STRATEGY	A plan of action designed to achieve a long-term or overall aim. In business, this is the means by which a company sets out to achieve its desired objectives and its long-term business planning.
SUPPLIER	A person or entity that is the source for goods or services (e.g. a company that provides engine components to an automotive manufacturing company).

TARGET	A quantifiable goal (e.g. to reduce GHG emissions).
	• The following are examples of absolute targets:
	  ○ metric tonnes CO2e or percentage reduction from base year
	  ○ metric tonnes CO2e or percentage reduction in product use phase relative to base year
	  ○ metric tonnes CO2e or percentage reduction in supply chain relative to base year
	• The following are examples of intensity targets:
	  ○ metric tonnes CO2e or percentage reduction per passenger. kilometre (also per km; per nautical mile) relative to base year
	  ○ metric tonnes CO2e or percentage reduction per square foot relative to base
	  ○ metric tonnes CO2e or percentage reduction per MWh

TRADE ASSOCIATION	Trade associations (sometimes also referred to as industry associations) are an association of people or companies in a business or trade, organized to promote their common interests. Their relevance in this context is that they present an "industry voice" to governments to influence their policy development. Most organizations are members of multiple trade associations, many of which take a position on climate change and actively engage with policymakers on the development of policy and legislation on behalf of their members. It is acknowledged that in many cases companies are passive members of trade associations and therefore do not actively take part in their work on climate change (CDP Climate Change Guidance).

TRANSPORT	To take or carry (people or goods) from one place to another by means of a vehicle, aircraft, or ship.
TREND	A general direction in which something (e.g. GHG emissions) is developing or changing.
TECHNOLOGY	The application of scientific knowledge for practical purposes, especially in industry (e.g. low-carbon power generation technologies such as wind and solar power, in the electric power generation sector).
TRANSITION	The process or a period of changing from one state or condition to another (e.g. from an economic system and society largely dependent on fossil fuel-based energy, to one that depends only on low-carbon energy).
VERIFIABLE / VERIFIABILITY	To prove the truth of, as by evidence or testimony; confirm; substantiate. Under the ACT project, the data required for the assessment shall be verified or verifiable.
WEIGHTING	The allowance or adjustment made in order to take account of special circumstances or compensate for a distorting factor.

10.2. ACRONYMS

2DS: 2°C scenario

ASTM: American Society for Testing and Materials

B2DS: Beyond 2°C scenario

CCS: Carbon Capture Storage

CEN: European Committee for Standardization

CCU: Carbon Capture and Utilization

HER: Excess Heat Recovery

ETP: Energy Technology Perspectives

GHG: Greenhouse gas

IEA: International Energy Agency

IIGCC: Institutional Investors Group on Climate Change

IPCC: Intergovernmental Panel on Climate Change

ISO: International Organization for Standardization

LCA: Life Cycle Assessment

SBTi: Science-Based Targets Initiative

UNEP: United Nations Environment Program

UNFCC: United Nations Framework Convention on Climate Change

TFCD: Task Force on Climate-related Financial Disclosures

TRL: Technology Readiness Level

WBCSD: World Business Council for Sustainable Development

11. Annexes

11.1. TWG MEMBERS

ACT cement methodology has been developed with inputs and feedbacks of the Cement Technical Working Group, which met five times over the course of the development phase and once at the end of the cement road-test.

TABLE 9 : LIST OF CEMENT TWG MEMBERS

Organisation	Name
ADEME	Marlène Dresch
ADEME	Anaïs Goburdhun
ADEME	Edouard Fourdrin
ADEME	Guillaume Daill
ADEME	Elliot Mari
ATHIL	Fabrice Copin
ATHIL	Laurent Izoret
Bouygues Construction	Romain Bonnet
Caisse des Dépôts	Jean Lanteri-Laura
CDP	Alice de Palma
CDP	Esther Stoakes
Cembureau	Vagner Maringolo
CEMENTIR Holding	Bruno Legato
CEMENTIR Holding	Jesper Damtoft
Ciments Calcia	Bernard Germaneau
Ciments Calcia	Patrick Mézière
Ecocem France	Nicola Rizzo
Eqiom	Sylvain Codron
Eqiom	Pierre Bultez
Fayat Bâtiment	Laëtitia Houzot
Heidelberg cement	Manuela Ojan
Heidelberg cement / Ciments Calcia	Catherine Barbier-Azan
I CARE & Consult	Léo Génin
IDDRI	Yann Briand
Lafarge Holcim	Antonio Carrillo
Lafarge Holcim	Florent Dubois
Lafarge Holcim	Maud Tarnot
Lafarge Holcim	Sylvie Combe
SFIC	Raoul de Parisot
SFIC	Laure Hélard
Solinnen	Cécile Beaudard
Solinnen	Guillaume Audard
Solinnen	Philippe Osset
Unicem	Jean-Marc Potier
Vicat	Eric Bourdon

Vicat	Laurent Duveau
Vicat	Céline Abboud
WBA	Vicky Sins
WBA	Charlotte Hugman

11.2. COMPANIES INVOLVED IN THE ROAD-TEST

Dalmia
Ecocem
Hoffmann Green Cement Technologies
JSW Cement
LafargeHolcim
UltraTech Cement
Vicat

11.3. CEMENT PRODUCTS AND USES

11.3.1. WHITE AND GREY CEMENT

Cement can be white or grey. White cement is quite similar to grey cement and has the same properties. Obtaining this color requires substantial modification to the manufacturing method, with a selection of the limestone and addition of kaolin to the mixture, in the process, with a higher temperature of the kiln (1600°C rather than an average of 1450°C). These additional tasks and specific requirements entail a manufacturing cost higher for white cement than grey cement. A key advantage of using white cement for decorative and architectural concrete is that it provides a neutral tinting base and consistent color results.

There are only 45 plants for white cement production distributed in 29 countries (31 producers) in 2014[7]

The CO2 emissions for grey and white cement at world level give 637 kg CO2/t cement equivalent (Gross CO2 emissions average for 2016)[8].

The CO2 emissions for only white cement at world level give 928 kg CO2/t white cement (Gross CO2 emissions average for 2016).

[7] https://www.globalcement.com/magazine/articles/890-white-cement-review, Article, written by Amy Saunders, Global Cement Magazine, November 2014 updated on 2 January 2015

[8] GNR project, https://www.wbcsdcement.org/GNR-2016/index.html, Cement (equivalent) is a cement production value, which is determined from clinker produced on-site applying the plant specific clinker/cement-factor. Hence, it is a virtual cement production under the assumption that all clinker produced in a plant is consumed for cement production in the same plant and applying the real plant specific clinker/cement factor.

https://www.cement-co2-protocol.org/en/#Internet_Manual/faq.htm?Highlight=equivalent

11.3.2. MORTAR

Mortar is produced by mixing a binding material (cement or lime) with fine aggregate (sand, surki, etc) with water. For construction purpose, different types of mortar are used. Depending upon the materials used for mortar mixture preparation, the mortar could be classified as follows.

1. Cement Mortar
2. Lime Mortar
3. Surki Mortar
4. Gauged Mortar
5. Mud Mortar.

Some of the numerous functions of mortar in construction are given below.

1. Mortar is used to bind together the bricks or stones in brick or stone masonry.
2. It is used to give a soft even bed between different layers of brick or stone masonry for equal distribution of pressure over the bed.
3. It is used to fill up the spaces between bricks or stones for making walls tight.
4. It is used in concrete as a matrix.
5. It is used in plastering works to hide the joints and to improve appearance.
6. It is used for moulding and ornamental purpose.

Mortar as concrete can use cement as raw material and is on the bottom of the supply chain. Mortar producers as concrete producers are clients of cement manufacturers.

11.3.3. CONCRETE

Concrete is the most significant application for the use of cement

Concrete is a versatile building material, in fact the most used man-made substance after water. Concrete is made of cement, sand, aggregates, water and admixtures. It can be moulded when in its “wet” state and solidifies over time, gaining strength and durability.

11.4. IDENTIFICATION OF THE TECHNOLOGIES USED TO DECARBONIZE THE CEMENT SECTOR

This table is used for CEM 3.1 R&D spending on low-carbon activities calculation.

TABLE 10: MATURE AND NON MATURE TECHNOLOGIES FOR CEM 3.1 INDICATOR CALCULATION

	Non mature		Mature	
Technologies	**Definition: TRL 1 - 4** • **Initial idea** • **Application formulated** • **Concept needs validation** • **Early prototype**	**Prototype: TRL 5 - 8** • **Large prototype** • **Full prototype at scale** • **Pre-commercial demonstration** • **First-of-a-kind commercial**	**Commercially available: TRL 9 – 10** • **Commercial operation in relevant environment** • **Integration at scale**	**Predictable growth: TRL 11** • **Proof of stability**
Improving energy efficiency		- Grinding technologies: • Contact-free grinding systems • Ultrasonic comminution • High voltage power pulse • Fragmentation • Low temperature comminution - 3D printing	- Process kiln: • Long-dry-process kilns retrofitting (precalciner and multistage preheater) • Adding mineralisers (lower the viscosity and the temperature to form clinker) • Operating the kiln with oxygen-enriched air	- Process kiln: • Dry-process kilns with a precalciner, a multistage cyclone preheater, and multichannel burners
Switching to alternative fuels			- Discarded or shredded tyres - Waste oils and solvents - Pre-processed or raw industrial waste, including lime sludge from paper and similar industries - Non-recyclable plastics, textiles and paper residues - Fuels derived from municipal solid waste	

			- Effluent treatment sludge from water and wastewater treatment plants	
Reducing the clinker to cement ratio			- Cement constituents: • Gypsum • GGBFS • Fly ash • Natural pozzolanic materials • Limestone • Calcined clay	
Using emerging and innovative technologies	- Post-combustion capture technologies: • Membrane • Calcium looping - CO2 sequestration in inert carbonate materials (mineralisation)	- Post-combustion capture technologies: • Chemical absorption post-combustion capture • Oxy-fuel capture	- Renewable power generation - Excess Heat Recovery (EHR) for power generation	
Alternative binding materials	- Magnesium oxides derived from magnesium silicates (MOMs)	- Belite calcium sulphoaluminate (BCSA) clinker - Carbonation of calcium silicates (CACS) - Pre-hydrated calcium silicates (PHCS)	- Belite clinker - Calcium sulphoaluminate (CSA) clinker - Alkali-activated binders	

Technology Readiness Level (TRL) from IEA:

1. Initial idea: basic principles have been defined
2. Application formulated: concept and application of solution have been formulated
3. Concept needs validation: solution needs to be prototyped and applied
4. Early prototype: prototype proven in test conditions
5. Large prototype: components proven in conditions to be deployed
6. Full prototype at scale: prototype proven at scale in conditions to be deployed
7. Pre-commercial demonstration: solution working in expected conditions
8. First-of-a-kind commercial: commercial demonstration, full-scale deployment in final form

9. Commercial operation in relevant environment: solution is commercially available, needs evolutionary improvement to stay competitive
10. Integration at scale: solution is commercial but needs further integration efforts
11. Proof of stability: predictable growth