Cement Criteria

The Cement Eligibility Criteria of the Climate Bonds Standard & Certification Scheme

Draft Criteria

Version history	Date
Issued as draft for consultation	22/02/2022

Definitions

List of acronyms (Put in alphabetical order)

Definitions

Cement: a building material made by grinding calcined limestone and clay to a fine powder. When mixed with water and gravel it acts as the binding agent to make concrete.

Climate Bonds Initiative (Climate Bonds): An investor-focused not-for-profit organisation, promoting large-scale investments that will deliver a global low carbon and climate resilient economy. Climate Bonds seeks to develop mechanisms to better align the interests of investors, industry, and government to catalyse investments at a speed and scale sufficient to avoid dangerous climate change.

Climate Bond: A climate bond is a bond used to finance or re-finance, projects or expenditures needed to address climate change. They range from wind farms and solar and hydropower plants to rail transport and building sea walls in cities threatened by rising sea levels. Only a small portion of these bonds have been labelled as green or climate bonds by their issuers.

Certified Climate Bond: A climate bond that is certified by the Climate Bonds Standard Board as meeting the requirements of the Climate Bonds Standard (see below), as attested through independent verification.

Climate Bonds Standard (CBS): A screening tool for investors and governments that allows them to identify green bonds where they can be confident that the funds are being used to deliver climate change solutions. This may be through climate mitigation impact and/ or climate adaptation or resilience. The CBS is made up of two parts: the parent standard (CBS v2.1) and a suite of sector specific eligibility Criteria. The parent standard covers the certification process and pre- and post-issuance requirements for all certified bonds, regardless of the nature of the capital projects. The Sector Criteria detail specific requirements for assets identified as falling under that specific sector. The latest version of the CBS is published on the Climate Bonds website

Climate Bonds Standard Board (CBSB): A board of independent members that collectively represents $34 trillion of assets under management. The CBSB is responsible for approving i) Revisions to the CBS, including the adoption of additional sector Criteria, ii) Approved verifiers, and iii) Applications for Certification of a bond under the CBS. The CBSB is constituted, appointed, and supported in line with the governance arrangements and processes as published on the Climate Bonds website.

Climate Bond Certification: allows the issuer to use the Climate Bond Certification Mark in relation to that bond. Climate Bond Certification is provided once the independent CBSB is satisfied the bond conforms with the CBS.

Clinker: an intermediate product in cement manufacture. It is made from the decarbonisation of limestone before it is melted (a term called sintering) and then rapidly cooled.

Clinker factor: the percentage of clinker in cement.

Concrete: a material produced by mixing cement, water and gravel where the cement acts as a binder making up about 15% of the total.

Green Bond: A green bond is bond of which the proceeds are earmarked for environmental projects or expenditures. The term generally refers to bonds that have been marketed as green. In theory, green bond proceeds could be used for a wide variety of environmental projects, but in practice they have mostly been earmarked for climate change projects.

Ordinary Portland Cement (OPC): cement made from 95% of ground clinker and 5% gypsum.

Technical Working Group (TWG): A group of key experts from academia, international agencies, industry and NGOs convened by Climate Bonds. The TWG develops the Sector Criteria - detailed technical criteria for the eligibility of projects and assets as well as guidance on the tracking of eligibility status during the term of the bond. Their draft recommendations are refined through engagement with finance industry experts in convened Industry Working Groups (see below) and through public consultation. Final approval of Sector Criteria is given by the CBSB.

Industry Working Group (IWG): A group of key organisations that are potential issuers, verifiers and investors convened by Climate Bonds. The IWG provides consultation, advice and feedback on the draft sector Criteria developed by the TWG before they are released for public consultation. As the TWG develop the Criteria recommendations, they do not necessarily reflect the position or consensus of all IWG members.

Climate Bonds gratefully acknowledges the Technical and Industry Working Group members who provided their time and expertise during the development of these Criteria[1]. Members are listed in Appendix 1. Special thanks are given to Cyrille Dunant, the lead specialist coordinating the development of the Criteria through the Technical Working Group.

[1] The Industry Working Group provided consultation and feedback on the Criteria, but this does not automatically reflect endorsement of the criteria by all members.

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1. Introduction

1.1. The Climate Bonds Standard & Cement Criteria

Investor demand for climate bonds is strong, and is expected to increase in line with the delivery of quality products into the market. However, investor concerns about the credibility of green labelling are also growing. standards, assurance & Certification will be essential to improve confidence and transparency, which in turn will enable further strong growth in the market.

The Climate Bonds Standard and Certification Scheme is an easy-to-use screening tool that provides a clear signal to investors and intermediaries on the climate integrity of Certified Climate Bonds.

A key part of the Standard is a suite of sector-specific eligibility Criteria. Each sector-specific Criteria sets climate change benchmarks for that sector that are used to screen assets and capital projects so that only those that have climate integrity, either through their contribution to climate mitigation, and/or to adaptation and resilience to climate change, will be certified. Where a bond encompasses projects or expenditures spanning multiple sectors, each category of assets will be subject to the relevant sector Criteria.

These sector-specific Criteria are determined through a multi-stakeholder engagement process, including TWG and IWG, convened and managed by Climate Bonds, and are subject to public consultation. Finally, they are reviewed and approved by the CBSB.

The second key part of the CBS is the overarching CBS available at https://www.climatebonds.net/standards/standard_download. This documents the common management of proceeds and reporting requirements that all Certified Climate Bonds must meet, in addition to meeting the sector specific Criteria.

1.2. Key elements to the Criteria

As a general principle, bonds will meet the climate requirements of the CBS if the use-of-proceeds meet all the following requirements:

- Promote Greenhouse Gas (GHG) mitigation through reduced emissions or increased carbon sequestration; and
- Promote adaptation to climate change and facilitate increased climate resilience in the systems in which they are located

Complete details of these requirements for cement assets and activities are in Chapter 3 of this document.

[Insert components of Criteria diagram from the brochure]

1.3. Documents supporting this criteria document

Information to support issuers and verifiers is available at https://www.climatebonds.net/standard/cement as follows:

1. Cement Brochure: a 2-page summary of the Cement Criteria[2].

2. Cement Background Document: the rationale behind the Cement Criteria.

3. Cement Frequently Asked Questions (FAQs)[3].

4. Climate Bonds Standard V3: contains the requirements of the overarching CBS, which all certified bonds need to fulfil.

5. Climate Bonds Standard & Certification Scheme Brochure: provides an overview of the Climate Bonds Standard & Certification Scheme, of which these Criteria are a part.

For more information on Climate Bonds and the Climate Bonds Standard and Certification Scheme, see www.climatebonds.net.

Revisions to these Criteria

These Criteria will be reviewed on a regular basis, at which point the TWG will take stock of the deals that are printed in the early stages and any developments in improved methodologies and data that can increase the climate integrity of future deals. As a result, the Criteria are likely to be refined over time, as more information becomes available. Certification will not be withdrawn retroactively from bonds certified under earlier versions of the Criteria.

[2] Published post-public consultation.
[3] Published post-public consultation.

2. Assets and Projects in Scope

2.1. Assets in scope

The scope of the Cement Criteria includes any assets and activities involved in the production of cement. The scope boundaries begin at the quarrying of limestone and end at the final blended cement product. As such, potential assets and activities that might be certified (subject to meeting eligibility criteria) include whole cement plants, but also kilns, burners, grinding equipment, blending equipment, calciners, precalciners, Supplementary Cementitious Materials (SCM), digitisation measures, heat recovery systems, and others.

The scope of eligible assets and activities is presented in Table 1. To guide the interpretation of the requirements, the table provides signposting as follows:

- A green circle indicates these assets, when fully described and documented, are automatically eligible.
- An orange square indicates that the eligibility of these assets is conditional on meeting specific Criteria.
- A red triangle indicates that these assets are not eligible for certification under any circumstances.

The first column in Table 1, 'Asset of activity class', gives an exhaustive list of all the activity types that are within scope of the Cement Criteria. The second column, 'Example use of proceeds', is an illustrative list of the type of projects that may be included in a Certified Climate Bond. It is not possible to include an exhaustive list of all potential use of proceeds due to the breadth of possibilities, but all use of proceeds must fall within one of the specified eligible activity types.

These assets in Table 1 are eligible for inclusion in a Certified Climate Bond if they meet:

1. The mitigation requirements (see section 3.2 for details); AND
2. The adaptation & resilience requirements (see section 3.4 for details).

Table 1: scope of eligible projects and assets for Climate Bonds Certification under the Cement Criteria

Asset or activity class	Example use of proceeds	Mitigation	Adaptation & Resilience
Integrated cement production facilities – facilities that comprise all stages of cement production from quarrying to the finished cement (as opposed to separated operation of stages)	Construction, upgrade and/or operation of integrated cement production facilities	■	■
Separated production operations – facilities or operations that are responsible for one or more specific production stages, as opposed to covering the whole production process	Construction, upgrade and operation of clinker production facilities	■	■
	Construction, upgrade and operation of grinding and blending facilities	■	■
	Construction, upgrade and operation of blending facilities	■	■
	Construction, upgrade and operation of Supplementary Cementitious Material production facilities This may include: • Limestone • Calcined Clay • Natural pozzolans • Silica fume	■	■
	Production of fly ash and blast furnace slag	▲	▲
Cement production mitigation measures – specific assets or activities that are part of the cement production process and intend to deliver mitigation benefits	Installation and upgrade and operation of precalciners	●	■
	Installation, upgrade, and operation of heat recovery systems	●	■
	Installation, upgrade, and operation of digitized control equipment or infrastructure. This may include: • Software for automated tracking of equipment performance • Software to allow real-time and granular control of processes to improve efficiency	●	■

Asset or activity class	Example use of proceeds	Mitigation	Adaptation & Resilience
	Installation, upgrade, and operation of testing equipment For example: • Automated XRD systems	●	■
	Installation, upgrade, and operation of separated blending equipment	●	■
	Upgrade or retrofit of kilns	■	■
	Installation, upgrade, and operation of grinding equipment	■	■
	Installation, upgrade, and operation of burners	■	■
	Installation, upgrade, and operation of calciners	■	■
	Installation, upgrade, and operation of carbon capture and storage equipment	■	■

2.2. Alignment with other Sector Criteria

Where use-of-proceeds from multiple sectors are combined into one bond, proof of compliance with multiple sector criteria may be required across the portfolio. For example, if the bond is financing both cement activities and geothermal energy, then the issuer would have to prove compliance with the Cement Criteria in respect of the former and the Geothermal Criteria in respect of the latter.

In some cases, it may not immediately be clear whether activities or projects might fall under these criteria or other sector criteria. The most common examples, and appropriate sector criteria to be used, are clarified in Table 2.

Table 2: Assets or projects partially or wholly covered by other sector criteria

Potential use-of-proceeds	Sector Criteria
Buildings, both commercial and residential, that are not solely dedicated to a cement production facility. For example, office buildings adjacent to a facility	Buildings

Vehicles that cannot be demonstrated to exclusively support compliant cement activities	Transport
Energy generation including Solar, Wind, Marine Renewable, Hydropower and Geothermal energy	Relevant corresponding sector criteria

2.3. Assets out of scope

Production of fly ash and blast furnace slag is not within scope. This does not refer to such materials extant from a power plant that no longer functions.[4]

Concrete itself and the associated activities (mix design, mixing itself, transportation to site, quality control, etc. are out of scope).

Quarrying in and of itself (i.e., separate from a cement plant) is not within scope.[5]

Carbon Capture and Utilisation, as distinct from Carbon Capture and Storage, is outside the scope of activity.

Note:

Being outside of the scope of criteria does not indicate that the TWG view these assets and activities as inconsistent with meeting Paris Agreement goals or with a Paris-aligned economy. Rather, due to time and resource constraints, these Criteria do not take a stance on these issues. Future versions of the Cement Criteria may address these and set robust criteria alongside.

[4] For example, from an ash repository (e.g., an ash dam or ash storage facility) that represents prior production.
[5] Integrated cement plants which are directly connected to a quarry are still within scope.

3. Eligibility Criteria for cement assets

To demonstrate compliance with the following Criteria, in accordance with the CBS, it is the issuers responsibility to provide the information to prove compliance with each component of these Criteria. Verifiers must include this information in the scope of verification.

In accordance with the overarching reporting timetable as laid out in the CBS, issuers are required to provide this information as follows:

1. Pre-issuance reporting (supported by independent verifiers report): Full disclosure information.
2. Post-issuance reporting (supported by independent verifiers report): Any amendments to the information provided pre-issuance to be disclosed. Any proceeds unallocated at time of issuance that are allocated at a later date must be included as part of post-issuance reporting.
3. Annual reporting thereafter: Any amendments to the previously provided information should be reported by exception as changes arise.

3.1. Mitigation Criteria

Issuer should consult the diagram below to determine which criteria is relevant for their bond.

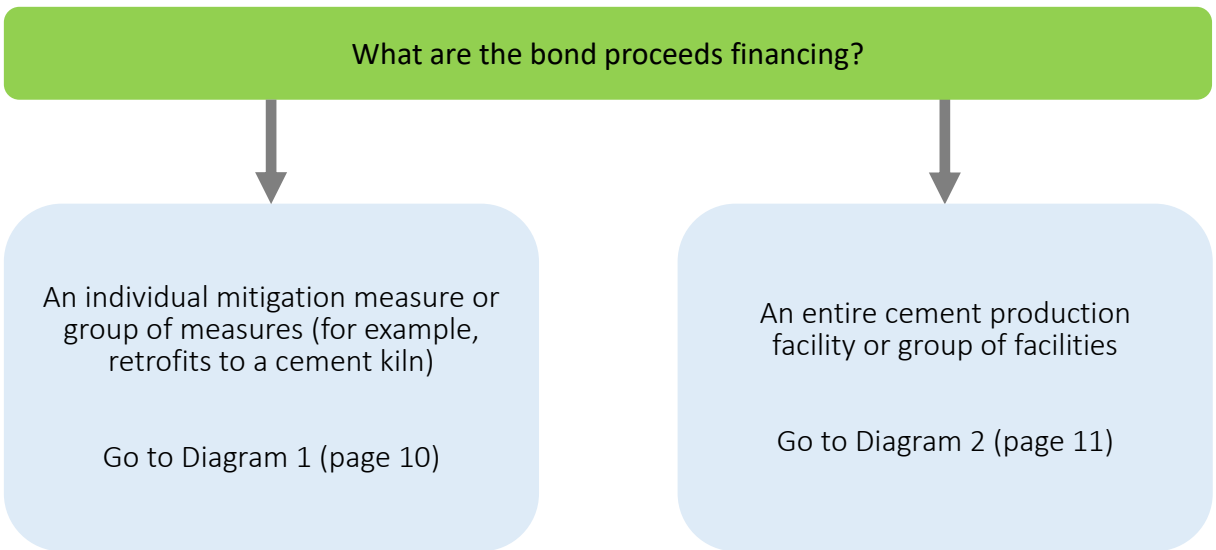


Diagram 1 – Overview of the Criteria for specific mitigation measures within cement production facilities

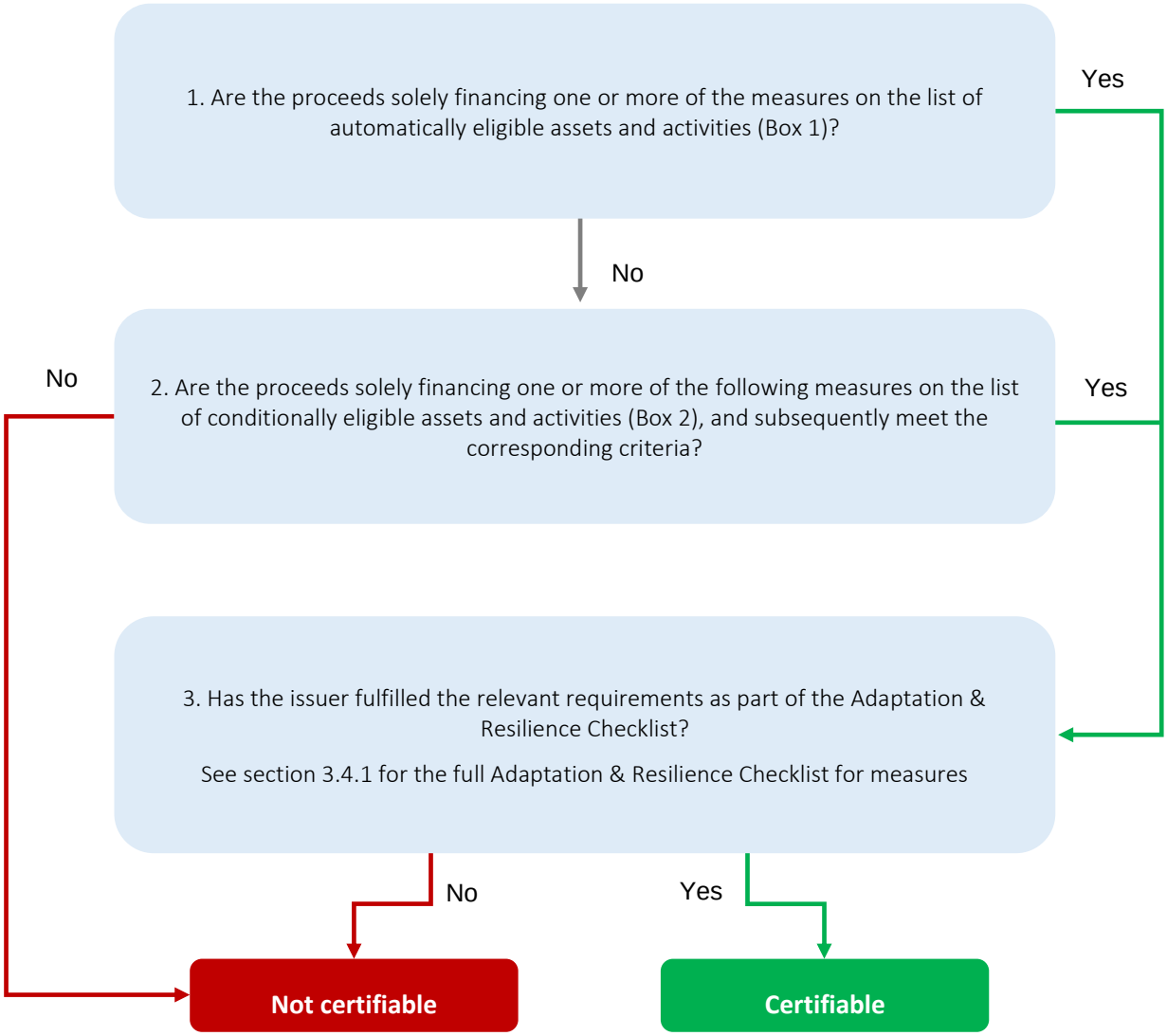
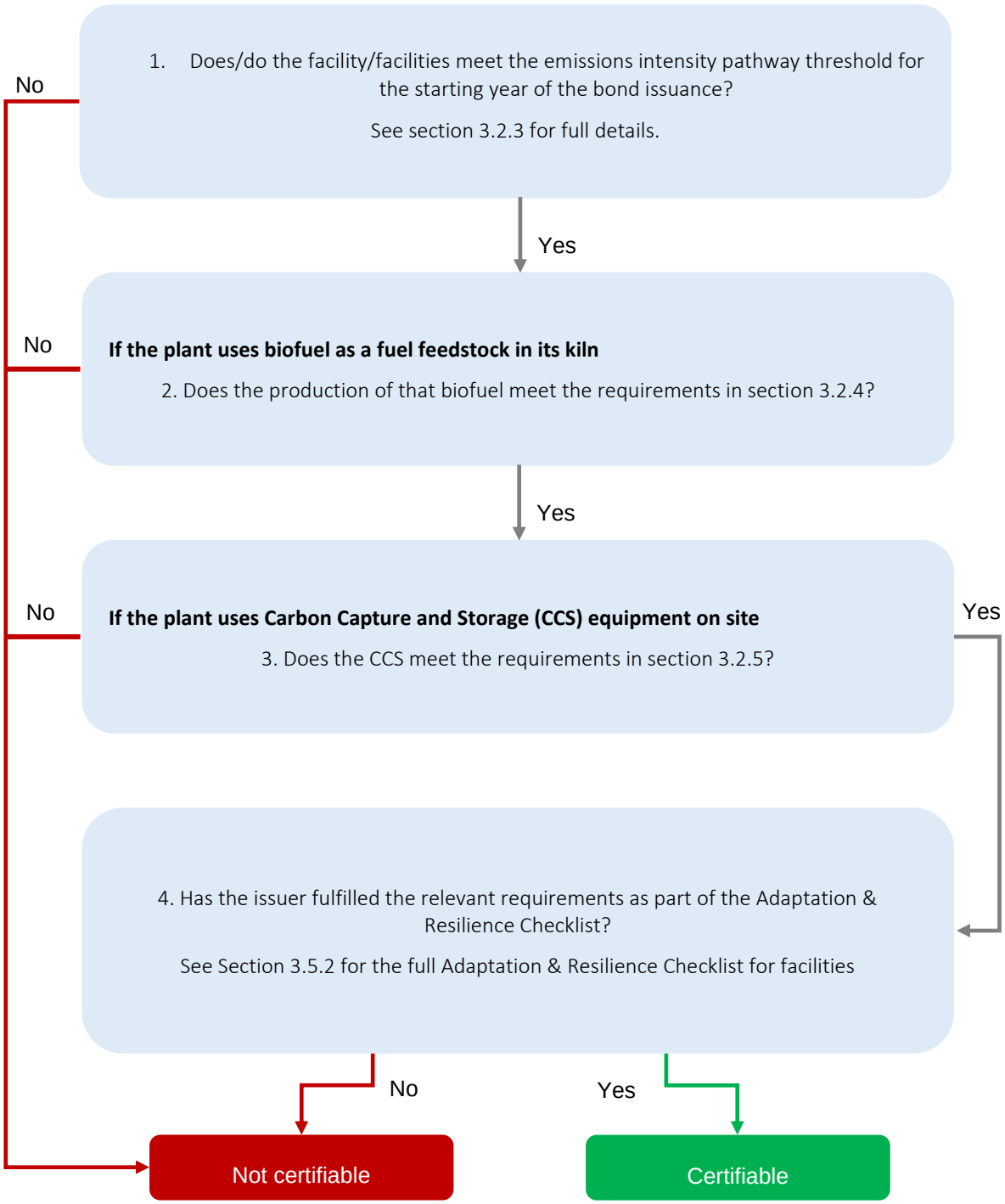


Diagram 2 – Overview of the Criteria for cement production facilities



3.2.1. Mitigation criteria for mitigation measures

Box 1 – Measures which automatically meet the mitigation component

The following measures automatically meet the mitigation component of these criteria and need meet no specific mitigation criteria:

- Installation, upgrade and operation of precalciners
- Installation, upgrade, and operation of heat recovery systems
- Installation, upgrade, and operation of digitized control equipment or infrastructure. This may include:
    - Sensors and measurement tools (including software to allow real-time and close control of processes to improve efficiency)
    - Communication and control (including advanced software and control rooms, and automation of plant processes)
- Installation, upgrade, and operation of testing equipment. For example:
    - Automated XRD systems

Note, these assets and activities must still meet the requirements for Adaptation & Resilience set out in Section 3.4.1.

Box 2 – Measures which conditionally meet the mitigation component

The following measures have unique requirements that must be met in order to be certified:

- Installation, upgrade, retrofit and operation of equipment where the measure achieves a post retrofit upgrade of 30 – 50% dependent on the term of the bond (see section 3.2.2 for full criteria).

[For public consultation: is this criterion sufficiently ambitious and yet realistic for improvement measures within a cement production facility?

Consider that a threshold such as this must reflect absolute best-practice in the sector to drive necessary improvements in existing plants, while avoiding lock-in of unsuitable infrastructure that cannot be further decarbonised. At the same time, it must be technically feasible for a measure or group of measures.]

- Installation, upgrade, and operation of grinding equipment where the measure results in an improvement in cement compressive strength.

- Installation, upgrade, and operation of carbon capture and storage equipment where the criteria for transport and storage components are met by the issuer (see section 3.2.5 for full criteria)

Note: these assets and activities must still meet the requirements for Adaptation & Resilience set out in section 3.4.1.

3.2.2. Mitigation criteria for retrofit measures

[For public consultation: see question on page 13. Climate Bonds seeks input on the threshold for percentage emissions reductions. Below is an example of the methodology used to meet whatever threshold is chosen.]

A minimum improvement in emissions intensity of 50% is required for bond terms of 30 years and 30% for bond terms of 5 years. Between 5 years and 30 years, the minimum improvement required is derived based on the linear trajectory between 30% for 5 years and 50% for 30 years. For bond terms below 5 years, the minimum improvement is equivalent to that required for 5-year bonds (30%). This is demonstrated in Figure 2 below.

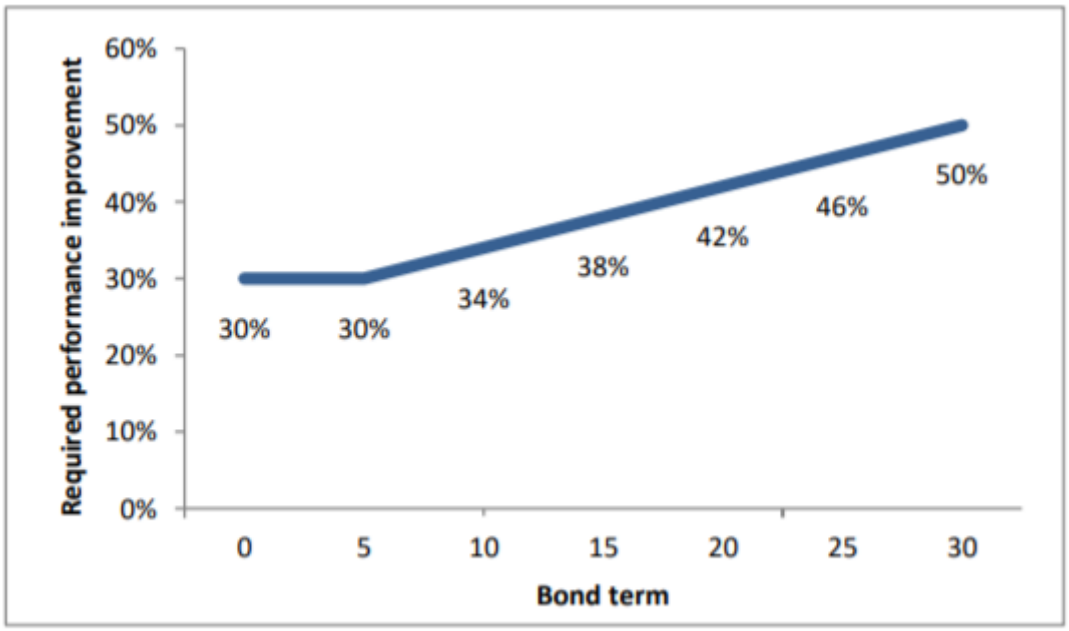


Chart 4: Required minimum improvement for different bond terms

Worked example

A group of cement plants will all have retrofits carried out to replace them with the latest technology burners and calciners. The bond term is 15 years.

It must be demonstrated that the retrofits result in a 38% improvement through reporting the pre-retrofit emission intensity, post-retrofit emissions intensity, and the percent improvement achieved.

3.2.3. Mitigation criteria for cement production facilities

Cement production facilities must show compliance with the emissions intensity pathway (values in Table 3 and illustrated in Figure 1) according to the criteria in this section. Depending on the stage(s) of production taking place within the facility, the scope of emissions may differ. Section 3.3.1 details what emissions are in scope when meeting the mitigation criteria.

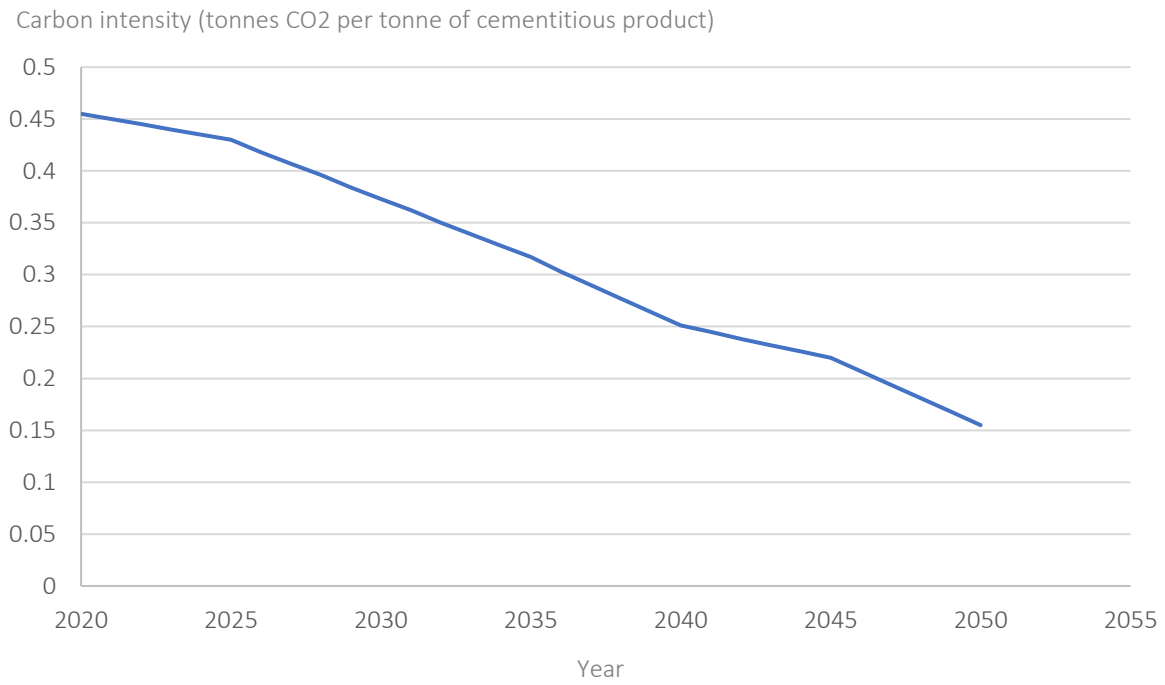


Figure 1 – the emissions pathway for all cement production facilities

Table 3 – threshold values forming the emissions pathway for all cement production facilities[6]

Year	Carbon intensity ($t CO_2$/ t cementitious product)	Year	Carbon intensity ($t CO_2$/ t cementitious product)	Year	Carbon intensity ($t CO_2$/ t cementitious product)	Year	Carbon intensity ($t CO_2$/ t cementitious product)
2020	0.455	2028	0.396	2036	0.303	2044	0.226
2021	0.450	2029	0.384	2037	0.29	2045	0.22
2022	0.445	2030	0.373	2038	0.277	2046	0.207
2023	0.440	2031	0.362	2039	0.264	2047	0.194
2024	0.435	2032	0.35	2040	0.251	2048	0.181
2025	0.430	2033	0.339	2041	0.245	2049	0.168
2026	0.418	2034	0.328	2042	0.238	2050	0.155
2027	0.407	2035	0.317	2043	0.232		

It is against these carbon intensity targets that the cement is assessed. The following sections detail how the pathway thresholds should be used.

Choosing the appropriate threshold(s)

Option 1 – A cement production facility should meet the threshold for the year of bond issuance. Thereafter, verification of continuation of meeting the pathway thresholds shall take place every 36 months. Issuers will be required to demonstrate this as part of the annual reporting for that year (in other words, every 3 years). Upon failure to demonstrate that the facility meets the threshold in a given year, certification can be revoked.

For example, a 10-year bond starting in 2025 would have to meet the thresholds for 2025, 2028, and 2031.

OR:

Option 2 – A cement production facility must demonstrate it falls under the pathway by taking the threshold at the halfway point of the bond.

For example, if a bond is issued in 2025 and matures in 2035, the plant must fall under the threshold for 2030. This ensures that, on average, the facility achieves average performance across the bond period.

[6] Source – the Transition Pathway Initiative: https://www.transitionpathwayinitiative.org/sectors/cement with the methodology accessible here: https://www.transitionpathwayinitiative.org/publications/76.pdf?type=Publication

[For public consultation: these options are both under discussion currently. Please provide input through the form on which of these options is more appropriate, particularly from a standpoint of being able to verify that an issuer continuously meets the thresholds, or level of ambition.]

Where the bond portfolio includes several separately identifiable projects, expenditures, or groups of assets, these conditions must be met for each separately identified project or asset grouping. Bond issuers should determine these project boundaries, which may be based on geographical and/or supply chain linkages. Therefore, if the bond is financing more than one production facility, every facility must meet the pathway. It is not possible to take an average of the group of facilities.

Applying correction factors to the pathway based on cement class

The company/facility shall test their product following EN 197-1 and report the value. Based on the cement class produced (or the average cement class produced where multiple classes are produced by a plant or company), the corresponding correction factor for that class should be applied to the threshold for that year.

The factors are:

Table 4: correction factors to determine the carbon intensity of the production

Cement class	Correction factor
22.5	1.21
32.5	1.09
42.5	1.00
52.5	0.88
62.5	0.85

Worked example 1

- A bond issued in 2025 is financing a single plant which produces several cement products of varying strength class. 62.5 is the average class produced by the plant.
- The carbon intensity threshold in 2025 is 0.430 t CO2/ t cementitious product.
- The plant's carbon intensity is 0.490 t CO2 / t cementitious product.
- 0.490 x 0.85 = 0.417

0.417 < 0.430 - the plant meets the mitigation component

Worked example 2

- A bond issued in 2023 is financing a single plant which produces cement of strength class 32.5 (correction factor of 1.09).
- The carbon intensity threshold in 2020 is 0.440 t CO2 / t cementitious product.
- The plant's carbon intensity is 0.410 t CO2 / t cementitious product.
- 0.410 x 1.09 = 0.447

0.447 > 0.440 – the plant does not meet the mitigation component

3.2.4. Cross cutting mitigation criteria – Biofuel use

For facilities or equipment using biofuels, the production of the biofuel must be demonstrated to meet the requirements set out in section 3.2 of the Climate Bonds Bioenergy Criteria[7] which includes:

1. Meeting the relevant established GHG emissions threshold; and
2. Reduce the risk of indirect land use impact (iLUC).

This criterion is applicable to first- and second-generation biofuels[8] used as a fuel in kilns. It is not applicable to biogenic components of alternative fuels such as municipal waste streams, for which there are no additional criteria.

3.2.5. Cross cutting mitigation criteria – Carbon Capture

Carbon Capture equipment, both as an individual measure and as part of a whole facility being evaluated, is eligible so long as there is evidence[9] that demonstrates the CO_2 will be suitably transported and stored in line with the criteria below:

Transport

1. The CO2 transported from the installation where it is captured to the injection point does not lead to CO2 leakages above 0.5 % of the mass of CO2 transported.

2. Appropriate leak detection systems are applied and a monitoring plan is in place, with the report verified by an independent third party.

[7] https://www.climatebonds.net/files/files/standards/Bioenergy/Bioenergy%20Criteria%20Document%20Mar%202021.pdf
[8] Rationale for a feedstock-agnostic approach can be found in the Bioenergy Criteria.
[9] Either directly from the issuer or through contracts or agreements with a third party

Storage

1. Characterisation and assessment of the potential storage complex and surrounding area, or exploration[10] is carried out in order to establish whether the geological formation is suitable for use as a CO2 storage site.

2. For operation of underground geological CO2 storage sites, including closure and postclosure obligations:

a) appropriate leakage detection systems are implemented to prevent release during operation;

b) a monitoring plan of the injection facilities, the storage complex, and, where appropriate, the surrounding environment is in place, with the regular reports checked by the competent national authority.

3. For the exploration and operation of storage sites, the activity complies with ISO 27914:2017225[11] for geological storage of CO2.

3.3. Methodological notes

3.3.1. The scope of emissions used in meeting the pathway

The pathway methodology scope of emissions addresses net emissions: direct (i.e., Scope 1) emissions from cement production, including from burning fossil fuels to heat kilns, from the calcination process and from on-site use of the company's vehicles, but excluding CO2 emissions from on-site power generation, emissions from alternative fuels and raw materials, and emissions from off-site use of the company's vehicles. For integrated production facilities, demonstrating the finished cement meets the pathway means incorporating scope 1 emissions.

However, because the carbon intensity of the final cement product is the metric, facilities responsible for one specific production stage (for example, grinding facilities) must partially incorporate scope 3 emissions. However, this is only scope 3 emissions up to the point of the finished cement, not downstream emissions associated with transporting or using the cement product.

For example, a clinker production facility must incorporate downstream scope 3 emissions from grinding and the addition of SCMs, while a grinding or blending operation must incorporate upstream scope emissions from clinker production.

[10] 'exploration' means the assessment of potential storage complexes for the purposes of geologically storing CO2 by means of activities intruding into the subsurface such as drilling to obtain geological information about strata in the potential storage complex and, as appropriate, carrying out injection tests in order to characterise the storage site

[11] ISO Standard 27914:2017, Carbon dioxide capture, transportation and geological storage — Geological storage (version of [adoption date]: https://www.iso.org/standard/64148.html).

3.4. Adaptation & resilience

This section describes the Adaptation & Resilience (A&R) Component of the eligibility Criteria for assets and projects under the Climate Bonds Standard.

To demonstrate compliance, all assets and projects with an orange circle in the adaptation & resilience column of Table 1 above must satisfy the requirements of the checklists detailed below, depending on what the bond is financing:

- Diagram 1 (page 10): cement production mitigation measures must meet the checklist in Section 3.4.1

- Diagram 2 (page 11): cement production facilities must meet the checklist in Section 3.4.2

The checklists are tools to verify that the issuer has implemented sufficient processes and plans in the design, planning and decommissioning phases of a project to ensure that the operation and construction of the asset minimises environmental harm and the asset is appropriately adaptive and resilient to climate change and supports the adaptation and resilience of other stakeholders in the surrounding system.

All elements of the checklist must be addressed, and appropriate evidence provided that these requirements are being met or are not applicable in respect of the specific assets and projects linked to the bond. It is expected that their evidence will encompass a range of assessment and impact reports and associated data, including but not limited to those reports required to meet national and local licensing and approval processes. This might include Development Consent Orders, planning regulations adhered to, Environmental Impact Assessments, Vulnerability Assessments and associated Adaptation Plans.

It is the issuers responsibility to provide the relevant information to the verifier. Verifiers must include this information in the scope of verification.

3.4.1. Adaptation & Resilience for mitigation measures

Table 4: Checklist for evaluating the issuer's Adaptation & Resilience performance in respect of cement production mitigation measures

	Adaptation and resilience checklist for cement production mitigation measures	Proof given	Overall assessment
		For verifier to complete	
Section 1: Clear boundaries and critical interdependencies between the infrastructure and the system it operates within are identified.			
1.1	Boundaries of the infrastructure are defined using (1) a listing of all assets and activities associated with the use of the bond proceeds, (2) a map of their location, and (3) identification of the expected operational life of the activity, asset or project.		
1.2	Critical interdependencies between the infrastructure and the system within which it operates are identified. Identification of these interdependencies should consider the potential for adverse impacts arising from, but not limited to: (1) relationships of the asset/activity to nearby flood zones; (2) relationships of the asset/activity to surrounding water bodies and water courses; (3) reduction in pollinating insects and birds; (4) reduction in biodiversity or High Conservation Value[12] habitat; (5) dust and other practices that affect air quality; (6) appropriation of land or economic assets from nearby vulnerable groups[13];		
2. An assessment has been undertaken to identify the key physical climate hazards to which the infrastructure will be exposed and vulnerable to over its operating life.			
2.1	Key physical climate risks and indicators of these risks are identified in line with the following guidelines: • Risks are identified based on (a) a range of climate hazards, and (b) information about risks in the current local context, including reference to any previously identified relevant hazard zones, e.g., flood zones. In order to be confident that assets and activities are robust and flexible in the face of climate change uncertainties, it is essential that the climate risks being assessed and addressed cover those that are of greatest relevance to industrial facilities and infrastructure such as cement production plants and other infrastructure. The physical characteristics of climate change that must be considered in the risk assessment include:		

[12] High Conservation Value (HCV) habitat criteria in accordance with https://www.hcvnetwork.org.
13 According to IFC Performance Standards

	Adaptation and resilience checklist for cement production mitigation measures	Proof given	Overall assessment
		For verifier to complete	

	• Temperature rise
	  ○ High temperatures can impact the operation and efficiency of certain types of equipment.
	• Increasing intense precipitation events
	  ○ Heavy rainfall can result in flash pluvial flooding, which could significantly impact industrial assets.[14]
	  ○ Drought may alter or reduce availability of water with temperature increase.
	• Changes in cloud cover, wind speed or increasing temperature extremes
	  ○ Poses risks to the availability of reliable energy, both electrical or thermal.
	• Sea-level rises
	  ○ Potential for flooding of coastal infrastructure and assets at risk from storm surge events.
	• Increased soil erosion
	  ○ Risks to the availability of raw materials.
	  ○ Risk to transport routes for supply chains.
	
	Guidance for carrying out risk assessments:
	• Users should apply climate scenarios based on representative concentration pathway (RCP) 4.5 and 8.5 or similar / equivalent to ensure consideration for worst case scenario.
	• Risk assessments should use both top-down methods and bottom-up methods that look at inherent system vulnerabilities in local context.
	• A broad range of models can be used to generate climate scenarios
	• Time horizons for assessing climate risk in agriculture can be based on annual seasonal forecasts and every ten years for the lifetime of the assets and projects. Where accurate assessments of climate variability for specific locations are not possible, use worst-case scenarios.
	• Risks can be characterized by the associated annual probability of failure or annual costs of loss or damage.
	• For risk assessment, the TCFD The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities is recommended.		

[14] Flood risk and resilience will likely have interdependencies with local and national agencies, for example related to local flood defenses, coastal flood risk management, shoreline management plans etc.

	Adaptation and resilience checklist for cement production mitigation measures	Proof given	Overall assessment
		For verifier to complete	
3. The infrastructure is suitable to climate change conditions over its operational life			
3.1	The infrastructure must be tolerant to the range of climate hazards identified in item 2 of this checklist and not lock-in conditions that could result in maladaptation.		
3.2	Risk reduction measures must be tolerant to a range of climate hazards and not lock-in conditions that could result in maladaptation.		
4. The infrastructure does no harm to the climate resilience of the defined system it operates within, as indicated by the boundaries of and critical interdependencies with that system as identified in item 1 in this checklist.			
4.1	The intervention itself does not pose significant risk of harm to the facility it is located within or others' natural, social, or financial assets according to the principle of best available evidence during the investment period, taking into account the boundaries and critical interdependencies as defined in item 1 in this checklist. Harm is defined as an adverse effect on any of the following items: (1) adverse effects on local water bodies and water courses; (2) air pollution from dust and other pollutants; (3) relationships of the asset/project to nearby flood zones; (4) reduction in pollinating insects and birds; (5) reduction in biodiversity or High Conservation Value[15] habitat; (6) appropriation of land or economic assets from nearby vulnerable groups[16];		

[15] High Conservation Value (HCV) habitat criteria in accordance with https://www.hcvnetwork.org.
16 According to IFC Performance Standards

3.4.2. Adaptation & Resilience for production facilities

Table 5: Checklist for evaluating the issuer's Adaptation & Resilience performance in respect of cement production facilities

	Adaptation and resilience checklist for cement production facilities **(Note, if the facility shares the same site with a quarry, the issuer must consider both the production plant and the quarry in the scope of the assessment)**	**Proof given** **For verifier to complete**	**Overall assessment**
Section 1: Clear boundaries and critical interdependencies between the infrastructure and the system it operates within are identified.			
1.1	Boundaries of the infrastructure are defined using (1) a listing of all assets and activities associated with the use of the bond proceeds, (2) a map of their location, and (3) identification of the expected operational life of the activity, asset or project.		
1.2	Critical interdependencies between the infrastructure and the system within which it operates are identified. Identification of these interdependencies should consider the potential for adverse impacts arising from, but not limited to: (1) relationships of the asset/activity to nearby flood zones; (2) relationships of the asset/activity to surrounding water bodies and water courses; (3) reduction in pollinating insects and birds; (4) reduction in biodiversity or High Conservation Value[17] habitat; (5) dust and other practices that affect air quality; (6) appropriation of land or economic assets from nearby vulnerable groups[18];		
2. An assessment has been undertaken to identify the key physical climate hazards to which the infrastructure will be exposed and vulnerable to over its operating life.			
2.1	Key physical climate risks and indicators of these risks are identified in line with the following guidelines: • Risks are identified based on (a) a range of climate hazards, and (b) information about risks in the current local context, including reference to any previously identified relevant hazard zones, e.g., flood zones. In order to be confident that assets and activities are robust and flexible in the face of climate change uncertainties, it is essential that the climate risks being assessed and addressed cover those that are of greatest relevance to industrial facilities and infrastructure such as cement production plants and other infrastructure. The physical characteristics of climate change that must be considered in the risk assessment include:		

[17] High Conservation Value (HCV) habitat criteria in accordance with https://www.hcvnetwork.org.
18 According to IFC Performance Standards

	Adaptation and resilience checklist for cement production facilities (Note, if the facility shares the same site with a quarry, the issuer must consider both the production plant and the quarry in the scope of the assessment)	Proof given	Overall assessment
		For verifier to complete	

	• Temperature rise
	  ○ High temperatures can impact the operation and efficiency of certain types of equipment.
	• Increasing intense precipitation events
	  ○ Heavy rainfall can result in flash pluvial flooding, which could significantly impact industrial assets.[19]
	  ○ Drought may alter or reduce availability of water with temperature increase.
	• Changes in cloud cover, wind speed or increasing temperature extremes
	  ○ Poses risks to the availability of reliable energy, both electrical or thermal.
	• Sea-level rises
	  ○ Potential for flooding of coastal infrastructure and assets at risk from storm surge events.
	• Increased soil erosion
	  ○ Risks to the availability of raw materials.
	  ○ Risk to transport routes for supply chains.
	
	Guidance for carrying out risk assessments:
	• Users should apply climate scenarios based on representative concentration pathway (RCP) 4.5 and 8.5 or similar / equivalent to ensure consideration for worst case scenario.
	• Risk assessments should use both top-down methods and bottom-up methods that look at inherent system vulnerabilities in local context.
	• A broad range of models can be used to generate climate scenarios
	• Time horizons for assessing climate risk in agriculture can be based on annual seasonal forecasts and every ten years for the lifetime of the assets and projects. Where accurate assessments of climate variability for specific locations are not possible, use worst-case scenarios.
	• Risks can be characterized by the associated annual probability of failure or annual costs of loss or damage.
	• For risk assessment, the TCFD The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities is recommended.		

[19] Flood risk and resilience will likely have interdependencies with local and national agencies, for example related to local flood defenses, coastal flood risk management, shoreline management plans etc.

	Adaptation and resilience checklist for cement production facilities (Note, if the facility shares the same site with a quarry, the issuer must consider **both the production plant and the quarry** in the scope of the assessment)	Proof given For verifier to complete	Overall assessment
3. The measures that have or will be taken to address those risks mitigate them to a level such that the infrastructure is suitable to climate change conditions over its operational life.			
3.1	The following are examples of risk management activities that bond issuers might consider, or that might be adopted as part of regulations (e.g. codes and standards). This list is not exhaustive and bond issuers should fully assess the mitigation measures that are relevant to the climate risks and impacts identified in the risk assessment. Temperature - Design standards that maintain equipment rating over its lifetime performance in the face of all potential ranges of temperature rise. - Resilience measures that ensure employees can continue to work at more extreme temperatures (e.g., air conditioning). Rainfall - Design for resilience to pluvial flooding. - Assessment of site drainage requirements. Changes in cloud cover, wind speed or increasing temperature extremes - Reduced reliance on imported energy and storage infrastructure. Increased flooding - Flood risk assessment and planning. - Site installations outside of potentially affected zones. - Ensure flood defence systems and coastal management plans are adequate. Increased coastal / river erosion - Shoreline management plans / coastal erosion assessment Landslides / ground movement - The potential for ground movement and landslides should be taken into account when assessing sites for cement production infrastructure. General risk mitigation measures: - Business continuity plans - Production restoration plans - System security standards - Employee capacity building		
3.2	Risk reduction measures must be tolerant to a range of climate hazards and not lock-in conditions that could result in maladaptation.		

	Adaptation and resilience checklist for cement production facilities (Note, if the facility shares the same site with a quarry, the issuer must consider **both the production plant and the quarry** in the scope of the assessment)	Proof given For verifier to complete	Overall assessment
4. The infrastructure does no harm to the climate resilience of the defined system it operates within, as indicated by the boundaries of and critical interdependencies with that system as identified in item 1 in this checklist.			
4.1	The infrastructure itself does not pose significant risk of harm to the system it is located within or others' natural, social, or financial assets according to the principle of best available evidence during the investment period, taking into account the boundaries and critical interdependencies as defined in item 1 in this checklist. Harm is defined as an adverse effect on any of the following items: (1) adverse effects on local water bodies and water courses; (2) air pollution from dust and other pollutants; (3) relationships of the asset/project to nearby flood zones; (4) reduction in pollinating insects and birds; (5) reduction in biodiversity or High Conservation Value[20] habitat; (6) appropriation of land or economic assets from nearby vulnerable groups[21];		
5. Additional requirements for facilities sharing a site with a quarry (facilities without an onsite quarry need not complete this section)			
5.1	Evidence is provided of a viable Quarry Rehabilitation Plan[22] which includes the following details: • Post closure land use • Legal compliance • Progressive rehabilitation • Stakeholder engagement • Baseline conditions have been assessed • Presence of a monitoring plan		
5.2	Evidence is provided of a viable Biodiversity Management Plan[19] which includes the following details: • Post closure land use • Legal compliance • Progressive rehabilitation • Stakeholder engagement • Baseline conditions have been assessed • Presence of a monitoring plan		

[20] High Conservation Value (HCV) habitat criteria in accordance with https://www.hcvnetwork.org.
21 According to IFC Performance Standards
[22] The GCCA provide thorough guidance on developing such plans: https://gccassociation.org/wp-content/uploads/2020/05/GCCA_Guidelines_Sustainability_Biodiversity_Quarry_Rehabilitation_May_2020-1.pdf

	Adaptation and resilience checklist for cement production facilities (Note, if the facility shares the same site with a quarry, the issuer must consider both the production plant and the quarry in the scope of the assessment)	Proof given	Overall assessment
		For verifier to complete	
6. The issuance is required to demonstrate that there will be ongoing monitoring and evaluation of the relevance of the risks and resilience measures and related adjustments to those measures will be taken as needed (reporting will only be required for the lifespan of the Certified Climate Bond).			
6.1	Indicators for risks identified under item 2 in this checklist are provided.		
6.2	Indicators for risk mitigation measures identified under item 3 in this checklist are provided.		
6.3	Indicators for "fit for purpose" resilience benefit measures identified under item 4 in this checklist are provided.		
6.4	Issuers have a viable plan to annually monitor (a) climate risks linked to the infrastructure, (b) climate resilience performance, (c) appropriateness of climate resilience measure(s) and to adjust as necessary to address evolving climate risks.		
6.5	Where production or operation has been interrupted, the extent of disruption (for example in reduction in volume output or revenue) should be measured and reported, together with the cause of the interruption. Any actions taken to reduce the risk of further impacts should also be recorded.		

Appendix 1: TWG and IWG members

CBI Technical Lead Advisor:

Cyrille Dunant, Cambridge University, UK

TWG members:

University of Cape Town, South Africa – Prof Mark Alexander

University of Antwerp, Belgium – Zhi Cao

Wuppertal Institute für Klima, Umwelt, Energie, Germany – Georg Holtz

Universidade de São Paulo, Brazil – Prof Vanderley John

China Building Materials Academy, China – Li Juan

European Bank for Reconstruction and Development (EBRD), UK – Ioanna Kourti

École polytechnique fédérale de Lausanne, Switzerland – Prof Karen Scrivener

Toegepast Natuurwetenschappelijk Onderzoek (TNO), Netherlands – Kira West and Cassio Xavier

TWG observers:

Rocky Mountain Institute – Estefania Marchan

IWG members:

Tobias Hartmann – Heidelberg Cement
Claude Lorea – Global Cement and Concrete Association (GCCA)
Dr Ma Weiping – West China Cement Ltd
Ravi Chandra Chikatimalla – Independent (formerly of JSW Cement)
Adam Gustafsson – UBS Asset Management
Douglas Farquhar – NN Investment Partners
Leanne Bloch-Jorgensen – National Australia Bank
Daniel Kricheff – Affirmative Investment Management
Asja Hossain – Bayern LB
Giuseppe Cosulich – Credit Suisse
Samuel Mary – Pimco
Kaboo Leung – Pimco
Francesca Fraulo – Sustain Advisory
Zonta Yung – SGS Hong Kong
Diana Via – PCS
Ken Zhong – PWC
Atul Sanghal – Emergent Ventures
Jean Hetzel – NSF
Weitai Gao – CCXGF
Mayur Mukati – Sustainalytics
Marine Durrieu – ISS ESG