Climate Bonds Initiative

DRAFT FOR PUBLIC CONSULTATION

Basic Chemicals Criteria

The Basic Chemicals Eligibility Criteria of the

Climate Bonds Standard & Certification Scheme

Draft Criteria

Version history	Date
Issued as draft for consultation	April 2022

Definitions

A&R Group: A group of key experts from academia, international agencies, industry and NGOs convened by Climate Bonds. The group supports the development of the Adaptation and Resilience requirements of these Basic Chemicals Criteria

Basic chemical production assets and projects: Assets and projects relating to the acquisition, installation, management and/or operation of infrastructure for basic chemicals production, which might include the production of the chemicals in scope for the present criteria.

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 refinance - projects or expenditures which 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 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 the proceeds of which 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 v3) 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 to the CBS

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

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 feedback on the draft sector Criteria developed by the TWG before they are released for public consultation.

Climate Bonds gratefully acknowledges the TWG, A&R Group, and IWG members who supported the development of these Criteria. Members are listed in Appendix 1. Special thanks are given to Elias Martinez, the lead specialist and Marian Rodriguez from Climate Bonds coordinating the development of the Criteria through the Technical Working Group.

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1.Introduction

The Climate Bonds Standard

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. 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 Standard is the overarching Climate Bonds Standard. 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.

Sector-specific eligibility criteria for the chemicals sector

This document details the technical screening criteria for the following within the basic chemicals sector:

- Capital investments within facilities producing basic chemicals – see Section 3
- Basic chemical production facilities – see Section 4
- Basic chemical production companies – see Section 5

Section 2 lists the eligible organic and inorganic basic chemicals within the scope of these Criteria.

Other supporting documents

Further information to support issuers and verifiers using these Criteria is available at https://www.climatebonds.net/standard/basic-chemicals as follows:

- Basic Chemicals Background Paper: detailing the rationale underpinning the selected criteria;
- Basic Chemicals Brochure: providing a high-level overview of the criteria[1];
- Basic Chemicals Frequently Asked Questions (FAQs).[2]

More broadly:

- The Climate Bonds Standard: contains the requirements of the overarching CBS
- The 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 least every three years or earlier if needed – in order to take stock of the latest climate science, updated transition pathways for the sector and developments in improved methodologies and data availability. As a result, the Criteria will be refined and may be tightened over time to maintain decarbonisation pathways aligned with the 1.5°C warming limit. Certification will not be withdrawn retroactively from bonds certified under earlier versions of the Criteria.

[1] Published post-public consultation

[2] Published post-public consultation

2.Eligible basic chemicals

The Basic Chemicals Criteria apply to eligible assets and projects and companies relating to the production of a number of eligible organic and inorganic basic chemicals.

Inorganic basic chemicals

- Ammonia
- Chlorine
- Disodium carbonate/Soda ash
- Nitric acid
- Carbon black

Organic basic chemicals

- High value chemicals (acetylene, ethylene, propylene, butadiene)
- Aromatics (Benzene, Toluene and Xylene (BTX))
- Methanol

3.Criteria for Capital Investments in Facilities Producing Basic Chemicals

Table 1 lists capital investments eligible for certification due to their climate mitigation potential, and any associated eligibility criteria specific to those investments.

In addition to those specific criteria, the capital investment must relate to a production facility where:

- At least 50% of annual production is on the list of basic chemicals in scope (per section 2).
- The energy source is not coal or coal derivatives
- The energy source is not biomass from primary sources. Only secondary organic streams are eligible. Wood and other dedicated crops are not eligible.
- The feedstock is not coal or coal derivatives.
- Adaptation and resilience criteria that apply to all facilities, regardless of the basic chemical being produced, are met (see Section 4.3).

Where the bond portfolio includes several separately identifiable projects, expenditures, or groups of assets, these criteria 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.

Table 1: Criteria for eligible capital investments

Area	Eligible Capital Investment	Mitigation criteria
Various		
Energy efficiency measures	Revamps, modifications or acquisition of equipment (boilers, furnaces, reactors, heat exchanger, distillation columns and other separation units, etc.)	At least a 30 % improvement in energy efficiency.
Switching to low carbon process technologies	Revamps, modification and acquisition of equipment and other infrastructure needed for the implementation and operation of low carbon process technologies	The alternative processes technology does not release direct process CO_2 emissions, e.g. methane pyrolysis, catalytic partial oxidation of methane to methanol.
Carbon Capture and Storage	Infrastructure related to CO_2 capture of emissions from the basic chemicals production, transportation and storage	There is evidence[3] that demonstrates the CO_2 will be suitably transported and stored in line with the criteria below: **Transport** 1. The CO_2 transported from the installation where it is captured to the injection point does not lead to CO_2 leakages above 0.5 % of the mass of CO_2 transported.

[3] Either directly from the issuer or through contracts or agreements with a third party

		2. Appropriate leak detection systems are applied and a monitoring plan is in place, with the report verified by an independent third party. **Storage** 1. Characterisation and assessment of the potential storage complex and surrounding area, or exploration[4] is carried out in order to establish whether the geological formation is suitable for use as a CO_2 storage site. 2. For operation of underground geological CO_2 storage sites, including closure and post-closure 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[5] for geological storage of CO_2. Furthermore, the use of any certification scheme is encouraged. Examples of certification schemes include the U.S. EPA Class VI well certification, which includes reservoir characterization[6]. Another example includes the DNV GL certification framework to verify compliance with the ISO 27914:2017 Carbon dioxide capture, transportation and geological storage – Geological storage[7].
Relating to feedstock used		
Using hydrogen as a feedstock	Infrastructure for production using green hydrogen	Hydrogen used as a feedstock meets the thresholds in Table 2.

[4] '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

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

[6] https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-co2

[7] https://www.dnv.com/news/dnv-gl-launches-certification-framework-and-recommended-practice-for-carbon-capture-and-storage-ccs--108096

	Refurbishment and retrofitting of facilities to use green hydrogen Acquisition of equipment to produce basic chemicals using green hydrogen	
Using biomass as a feedstock	Infrastructure for production using biomass Refurbishment and retrofitting of facilities to use biomass Acquisition of equipment to produce basic chemicals using biomass	The biomass used complies with the criteria applicable for biomass sourcing set out in the CBI Bioenergy criteria
Using CO_2 as a feedstock	Infrastructure for production using CO_2 as a feedstock Refurbishment and retrofitting of facilities to use CO_2 as a feedstock Acquisition of equipment to produce basic chemicals using CO_2 as a feedstock	1. The source of CO_2 sources is either: ● Direct emissions from chemical production; OR ● Direct emissions from other industrial activities 2. The basic chemical produced is used for the manufacture of durable products (e.g. construction materials stored in buildings, or recyclable products e.g. PET). 3. If the basic chemical produced is used for products that release the CO_2 immediately when the products are used (such as in urea, carbonated beverages, or fuels), the capital investment is not eligible. 4. CO_2 is not used for enhanced oil recovery, and the production of other forms of fossil energy sources. 4. This measure may involve the need for electricity when electrochemical processes are used, and also the need for hydrogen as a feedstock. If so, that hydrogen must comply with the criteria for hydrogen set out in Table 2.
Use of recycled material as feedstock (e.g. using olefins recovered from plastics chemical recycling processes)	Infrastructure for the production using recycled feedstock Refurbishment and retrofitting of facilities using recycled feedstock Acquisition of equipment to produce basic chemicals using recycled feedstock	Recycled material should ● represent at least 30% of the feedstock ● have lower cradle-to-gate emissions than the virgin material
Relating to energy used		
Electrification of the processes	Revamps,modifications and acquisition of equipment (furnaces, reactors, separators, etc.) and other	No criteria – automatically eligible

	infrastructure necessary for electrification of the processes	
Heat supplied from geothermal, solar thermal or waste heat recovery systems	New heat exchange equipment, such as evaporators, furnaces, boilers, etc., Revamps or modifications to heating related equipment in existing process	Heat supply complies with the most up to date CBI criteria for the relevant source of energy.
Using hydrogen as an energy source	Revamps or modifications to equipment (boilers, furnaces, burners, etc.) in existing utilities system required for the use of hydrogen as fuel Infrastructure for the production of a basic chemical in scope using hydrogen as an energy source	The hydrogen to be used meets the thresholds in Table 2.
Using biomass as an energy source	Revamps or modifications to equipment (boilers, furnaces, burners, etc.) in existing utilities system required for the use of biomass as fuel Infrastructure for the production of a basic chemical in scope using biomass as an energy source	The bioenergy complies with the CBI Bioenergy criteria. Only secondary organic streams are eligible. Wood and other dedicated crops are not eligible.

4. Criteria for Facilities Producing Basic Chemicals

For certification, the facility must meet:

a. Basic chemical-specific mitigation criteria (see Section 4.1); AND
b. Cross-cutting mitigation criteria that apply to all facilities regardless of the basic chemical being produced (see Section 4.2); AND
c. Adaptation and resilience criteria that apply to all facilities regardless of the basic chemical being produced (see Section 4.3).

In addition to these criteria, the production facility must comply with the following headline requirements:

- At least 50% of annual production is on the list of basic chemicals in scope (per section 2).
- The energy source is not coal or coal derivatives or biomass.
- The feedstock is not coal or coal derivatives.

Where the bond portfolio includes several separately identifiable projects, expenditures, or groups of assets, these criteria 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.

4.1 Basic chemical-specific mitigation criteria

Products need to meet specific carbon or energy intensity thresholds over the term of the bond. These thresholds are captured in Table 2. Two options are proposed for feedback during consultation [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.]:

Option A: The facility must meet the threshold for the year of bond issuance, and at each 3 year interval thereafter, to be demonstrated via verification from an approved verifier. When an issuer fails to demonstrate that the facility meets the threshold in a given year, certification can be revoked. For example**:**

- A bond is issued in 2035 to finance an ethylene production facility. The bond term is 10 years. The issuer should meet the threshold for 2035, 2038, 2041, and 2044. A linear trajectory should be assumed for time periods between the dates and thresholds provided in Table 2.

Option B: The facility must demonstrate it falls under the pathway by taking the threshold at the halfway point of the bond. For example:

- 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.

A note on interpretation for facilities producing chlorine: Table 2 presents quantitative thresholds up to 2039, and qualitative criteria after 2040. In this case, issuers are required to present a transition plan to ensure that the shift to renewable electricity is effective after 2040.

The transition plan should include as a minimum the following details:

- A timeframe for the implementation of the project, with a start and a due date

- Main action steps of the transition plan
- Infrastructure or operation modifications required for the implementation
- Estimation of total additional operating and capital costs
- Technical and financial feasibility

To demonstrate compliance with any of the emissions intensity thresholds set in Table 2, issuers are required to carry out a GHG emissions assessment as described in Box 1.

For facilities producing nitric acid or disodium carbonate/ soda ash whose thresholds cover scope 1 emissions only, issuers must also implement one of the following strategies to address scope 2 emissions:

a. Renewable-based[8] captive power generation
b. Renewable-based power purchase agreement

Table 2: Basic chemical-specific carbon and energy intensity thresholds

Asset type	Criteria			
	2022	**2030**	**2040**	**2050**
Production of ammonia	3 t CO_2e/t H_2, for the life cycle emissions of hydrogen used as feedstock or ammonia recovered from wastewater CO_2 from ammonia production should not be used for urea production.	1.90 t CO_2e/t H_2 for the life cycle emissions of hydrogen used as feedstock or ammonia recovered from wastewater CO_2 from ammonia production should not be used for urea production.	1.0 t CO_2e/t H_2 for the life cycle emissions of hydrogen used as feedstock or ammonia recovered from wastewater CO_2 from ammonia production should not be used for urea production	0.6 t CO_2e/t H_2 for the life cycle emissions of hydrogen used as feedstock or ammonia recovered from wastewater CO_2 from ammonia production should not be used for urea production
Production of nitric acid	0.038 t CO_2e/t nitric acid	0.024 t CO_2e/t nitric acid	0.014 t CO_2e/t nitric acid	0.004 t CO_2e/t nitric acid
Production of chlorine	2.45 MWh electricity/t chlorine	1.85 MWh electricity/t chlorine	Uses only electricity produced from renewable sources	Uses only electricity produced from renewable sources
Production of carbon black	1.141 t CO_2e/t carbon black	0.72 t CO_2e/t carbon black	0.42 t CO_2e/t carbon black	0.12 t CO_2e/t carbon black
Production of disodium carbonate/ soda ash	0.789 t CO_2e/t disodium carbonate/ soda ash	0.50 t CO_2e/t disodium carbonate/ soda ash	0.29 t CO_2e/t disodium carbonate/ soda ash	0.09 t CO_2e/t disodium carbonate/ soda ash
Production of high value chemicals	0.51 t CO_2e/t high value chemical	0.32 t CO_2e/t high value chemical	0.19 t CO_2e/t high value chemical	0.06 t CO_2e/t high value chemical

8 Energy produced from renewable sources such as wind, solar, and small hydropower generation

(ethylene, propylene, butadiene, acetylene)				
Production of aromatics BTX (benzene, xylene and toluene)	0.0072 t CO_2e/t aromatics BTX	0.0046 t CO_2e/t aromatics BTX	0.0027 t CO_2e/t aromatics BTX	0.0008 t CO_2e/t aromatics BTX
Production of methanol	<3 t CO_2e/t H_2, for the life cycle emissions of hydrogen used as feedstock	1.90 t CO_2e/ t CO_2e/t H_2, for the life cycle emissions of hydrogen used as feedstock	1.0 t CO_2e/t H_2 for the life cycle emissions of hydrogen used as feedstock	0.6 t CO_2e/t H_2 for the life cycle emissions of hydrogen used as feedstock

Box 1. Methodological notes for GHG assessment

The following emissions should be accounted for:

- **Nitric Acid, and Soda Ash:** Scope 1 emissions which include all direct emissions from the production processes: emissions generated during the chemical reactions, emissions from fuel combustion on-site.
- **Carbon black, HVC and aromatics**: Scope 1 as defined above, plus Scope 2 emissions which includes indirect emissions from the energy imported from off-site.
- **Ammonia and Methanol:** Scope 1 and 2 emissions, as defined above, from the production of Hydrogen as a feedstock to produce Ammonia or Methanol

The GHG emissions assessment should follow the latest version of the GHG accounting guidance for scope 1 and 2 emissions provided by the GHG protocol[9]. Results should be verified by an independent third party following the latest version of the GHG protocol standards[10]. Calculation using Regulation (EU) 2019/331 will be acceptable for assets located in the EU.

Life Cycle GHG Assessment for hydrogen: Cradle-to-site boundary includes cradle-to-gate emissions plus any transportation emissions to the site where a product is used. In this case, the life cycle assessment should follow ISO standards[11] (ISO 14040 and ISO 14044). The Recommendation 2013/179/EU will be acceptable for assets located in the EU. Results should be verified by an independent third party.

[9] The GHG protocol (2019). GHG accounting guidance for scope 1 and 2 emissions. WBCSD and WRI. https://ghgprotocol.org/sites/default/files/Guidance_Handbook_2019_FINAL.pdf

[10] The GHG protocol (2004). A Corporate Accounting and Reporting Standard. WBCSD and WRI. https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

[11] ISO standards available at: https://www.iso.org/standard/38498.html; https://www.iso.org/standard/37456.html

4.2 Cross-cutting criteria for all facilities – climate mitigation

4.2.1 Additional criteria depending on the age of the facility

Facilities commencing operation in 2022 or after are eligible only if they:

- Implement technologies which avoid or reduce direct process emissions in order to prevent carbon lock-in. (e.g. methane pyrolysis does not generate CO2 in the reaction).
- Do not use virgin fossil feedstock if process emissions are directly released into the atmosphere.
- Do not use fossil gas (with or without CCS).

4.2.2 Additional criteria depending on the feedstock used

Facilities using hydrogen, CO_2 or biomass as feedstock are eligible only if they meet the following criteria:

- **Hydrogen**: The hydrogen used meets the thresholds in Table 2.
- **Biomass**: The biomass used complies with the criteria applicable for biomass sourcing set out in the CBI Bioenergy criteria.
- **CO_2**: The CO_2 used satisfies the criteria described in Table 1.

4.2.3 Additional criteria depending on the energy used

Facilities using fossil gas, CO_2 or biomass as feedstock are eligible only if they meet the following criteria:

- **Fossil gas**: Only eligible for existing facilities prior to 2030, and then only when combined with CCS or CCU measures that meet the criteria for CCS in Table 1. Any venting or burning to be reported and accounted in the GHG assessment. Projects using fossil gas combined with CCS should demonstrate MRV (monitoring, reporting and verification), and mitigation measures for methane leaks.[12]
- **Hydrogen**: The hydrogen used meets the thresholds in Table 1.
- **Biomass**: The bioenergy complies with the CBI Bioenergy criteria. Only secondary organic streams are eligible. Wood and other dedicated crops are not eligible.
- **Facilities using heat supplied from alternative sources**, such as geothermal, solar thermal, and waste heat recovery: The heat source must comply with the CBI most up to date criteria for each source of energy.

4.2.4 Additional criteria to address upstream scope 3 emissions

Issuers must lay out a strategy to address emissions related to purchased goods and services over the term of the bond. This strategy must include one of the following alternatives:

- Evidence for low-carbon procurement policies; or
- Partnerships with suppliers with GHG emissions reduction targets that can be measured; or
- Switching from fossil-based raw materials to alternative feedstocks such as biobased and recycled materials.

[12] Additional guidance can be found in the report Best Practice Guidance for Effective Methane Management in the Oil and Gas Sector. Monitoring, Reporting and Verification (MRV) and Mitigation. United Nations Economic Commission for Europe. 2019 https://unece.org/fileadmin/DAM/energy/images/CMM/CMM_CE/Best_Practice_Guidance_for_Effective_Methane_Management_in_the_Oil_and_Gas_Sector__Monitoring__Reporting_and_Verification__MRV__and_Mitigation-_FINAL__with_covers_.pdf

For alternative feedstocks, results from a life cycle GHG assessment with a cradle-to-site boundary needs to be used to quantify scope 3 upstream emissions.

4.2.5 Other additional criteria

Facilities using low carbon process technologies do not release direct process CO_2 emissions, e.g. methane pyrolysis, catalytic partial oxidation of methane to methanol.

4.3 Cross cutting criteria for climate adaptation & resilience

4.3.1 The adaptation and resilience checklist

To meet the requirements for Climate Bonds Certification, physical climate risks associated with the facility over its operational lifetime must be addressed. This includes both a) any impacts that climate change may have on the facility, and b) any impacts that the facility may have on the wider climate resilience of the system it operates within.

This includes taking appropriate measures to identify and mitigate those risks in the face of the uncertain impact of climate change. In general, issuers must demonstrate that they:

- Understand the acute and chronic climate risks faced by the asset, activity or system in question, including capital assets, operations, logistics and supply, and labour;
- Have addressed those risks by undertaking risk-reduction measures and adopting flexible management plans that take account of inherent uncertainties around climate change, ensuring that the asset, activity or system is robust, flexible and fit-for-purpose in the face of that uncertainty;
- Can deliver resilience benefits over and above addressing identified risks (for system-focused investments[13]);
- Are undertaking regular (re)evaluation of the asset and/or system's climate resilience performance, adjusting to risk reduction measures over time as needed.

To demonstrate compliance, all assets and projects must satisfy the requirements of the checklist detailed in Appendix 2. This checklist is the tool 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.

All elements of this 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. 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.

4.3.2 Other environmental impacts

Issuers must present a thorough Environmental Impact Assessment for the facility and its site consistent with local regulations and conducted by an independent third-party expert.

[13] See CBI's climate resilience principles document. https://www.climatebonds.net/climate-resilience-principles

Issuers must demonstrate that the risks identified have been addressed by implementing mitigation and compensation measures involving key stakeholders. In addition, the following specific requirements apply:

Pollution prevention

- Emissions must be lower than best available techniques emissions levels for the production of large volume organic chemicals[14]or large Volume Inorganic Chemicals-Ammonia, Acids and Fertilisers[15].
- Emissions must be lower than Best Available Techniques emissions levels for the wastewater and waste gas treatment/management systems in the chemical sector[16]
- The activity is not associated with the manufacture, placing on the market or use of: Persistent organic pollutants (POPs)[17] Mercury and mercury compounds, their mixtures and mercury-added products[18], substances that deplete the ozone layer[19], certain hazardous substances in electrical and electronic equipment[20].

4.3.3 Disclosure component

In the interests of transparency and disclosure, issuers of Certified Climate Bonds are required to publicly disclose the following in respect of the assets and use-of-proceeds incorporated in that deal:

- The planning standards, environmental regulations and other regulations that the facility has been required to comply with.
- The environmental impacts assessment and the measures to address potential risks

[14] https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/JRC109279_LVOC_Bref.pdf
[15] https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/lvic_aaf.pdf
[16] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016D0902&from=EN
[17] http://chm.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx
[18]https://www.mercuryconvention.org/sites/default/files/2021-06/Minamata-Convention-booklet-Sep2019-EN.pdf
[19] https://ozone.unep.org/treaties/montreal-protocol/summary-control-measures-under-montreal-protocol
[20]Annex II: https://ec.europa.eu/environment/topics/waste-and-recycling/rohs-directive_en#:~:text=The%20RoHS%20Directive%20currently%20restricts,and%20diisobutyl%20phthalate%20(DIBP).

5. Criteria for companies

- - - These criteria are currently still under discussion. However, feedback is sought on the working proposal outlined below - - -

Working proposal

The criteria per Section 3 for individual facilities apply across the company's whole portfolio of facilities.

For simplicity however, the emissions/ energy intensity thresholds per Table 2 can be assessed across the portfolio average, rather than separately for each facility within the company portfolio.

Appendix 1: TWG, A&R and IWG members

Technical Working Group (TWG) Members

Camilla Oliveira. Industry Project Manager-Agora Energiewende

Carina Oliveira. Chemical Engineering Specialist- Energy Transition Studies- TNO (The Netherlands organisation of applied scientific research).

Denny K. S. Ng. Professor, Heriot-Watt University Malaysia Campus

Fredric Bauer. Associate senior lecturer in Technology and society. Researcher at the division on Environmental and Energy Systems Studies. Lund University. Contributing author to the IPCC Working Group III AR6 chapter on industry.

Gbemi Oluleye. Research Associate in the Department of Chemical Engineering and the Centre for Environmental Policy in the Faculty of Natural Sciences- Imperial College London.

Heriberto Cabezas. Professor. Research Institute of Applied Earth Science, University of Miskolc, Miskolc, Hungary, Hungary.

Jonathan Moncada. Researcher Energy Transition Studies-TNO (The Netherlands organisation of applied scientific research)

Kok Siew Ng. Industrial Innovation (Rutherford) Research Fellow. Principal Investigator of the project SYNERGORS. Oxford University (UK).

Robert Adamczyk Associate Director, Senior Environmental Adviser of EBRD

Thomas Rehm Inaugural Chair-The Climate Solutions Community- American Institute of Chemical Engineers- Institute for Sustainability

Adaptation & Resilience (A&R) Group

Dale Sands, MD Sands Consulting Solutions. Former co-chair of ARISE, a private sector advisory group to the United Nations Office of Disaster Risk Reduction. Expert and advisor- Sustainability, adaptation and resilience in the industry.

Dr Fahim Tonmoy, Associate Principal Engineer, BMT and Adjunct Research Fellow Griffith University

Kristin Marshall, Lux Research Analyst. Expertise assessing climate risk, adaptation and resilience in the chemical industry

Rita Ferreira, Sustainable finance Associate, S&P Global. Research analyst with experience in extreme weather impacts in the chemical industry

Technical Lead Advisor

Elias Martinez. Senior Research Scientist, Biomass Conversion Division, Mexican Institute of Petroleum

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Appendix 2: A&R requirement checklist

Table 3 Checklist for evaluating the issuer's Adaptation & Resilience performance in respect of a Basic Chemicals production facility

	Item	Proof given	Overall assessment
		For verifier to complete	
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 infrastructure and 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) the effects of supply disruption or interruption on dependent electricity users or populations; (2) exacerbation of wildfires; (3) relationships of the asset/activity to surrounding water bodies and water courses; (4) relationships of the asset/project to residential neighbourhoods surrounding the plant; (5) damage or reduction in value of neighbouring property due to boundary structures at risk of falling during storm events; (6) reduction in value of neighbourhood property due to pollution caused by the chemical facilities, due to extreme weather events (e.g., release of toxic chemicals due to failure in safety systems in case of extreme weather events); (7) reduction in biodiversity or High Conservation Value[21] habitat; (8) relationships of the asset/project to nearby flood zones; (9) fire and other practices that affect air quality; (10) appropriation of land or economic assets from nearby vulnerable groups;		
1.3	•Have cascading impacts across infrastructure been considered? •Any ways in which chemical facilities might affect the climate resilience of other users/stakeholders?		
1.4	Potential co-occurrence of risks are identified		
1.5	Force measures implemented locally to mitigate some potential risks are identified		
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	• Is there a good understanding of the risks facing the facility today? In five years? In ten years? • Are risks defined and detailed? • Are locally implemented measures to mitigate potential risks identified? • Are risk areas for hazardous materials[22] identified? •Was a hazard assessment conducted to identify toxic, flammable, volatile and reactive chemicals?[23,24] • Was a Risk management plan (RMP) conducted for the chemicals in the list of regulated substances?[25] •Key physical climate risks and indicators of these 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 the production of basic chemicals.		

[21] High Conservation Value (HCV) habitat criteria in accordance with https://www.hcvnetwork.org.
[22] Hazardous materials include Explosive, flammable, combustible, corrosive, oxidising, toxic, infectious, or radioactive materials (Federal Emergency Management Agency)
[23] UCLID (International Uniform Chemical Information Database) software is a recommended source of data on intrinsic and hazard properties of chemical substances
[24] https://www.openaccessgovernment.org/climate-toxicology-human-health/68647/
[25] EPA. Risk management plan rule

• Risk should be identified for each of the following categories[26]:

a. Capital Assets
b. Operations
c. Logistics and Supply
d. Labour

•Time horizon is set according to the severity of the risks. Higher risk locations: shorter time (every 5 years). Lower risk locations: Longer time (every 10 years).[27] See section 5.4 of the Background Paper for tools and reference guidelines to assess degree of risks.

• Where accurate assessments of climate variability for specific locations are not possible, use worst-case scenarios.
The potential impacts that must be considered in the risk assessment include[28]:

- Temperature rise and heat waves
  1. Potential increase in temperature may result in expansion and stress of plant, pipework and fittings.
  2. There could be an increase in dust emissions from the site.
  3. There could be an increase in odour from the site.
  4. Increase in fugitive or diffuse emissions from the site.
  5. Increase in pollution
  6. Increase in water consumed for cooling purposes.
  7. Increase in energy consumption due to added pumping of cooling water around site.
  8. Limited cooling, which implies that throughputs could need to be reduced or processes shut down
  9. Volatile chemicals can exceed their temperature range during transportation

- Extreme cold weather
  1. Failure of trace heating systems
     Freezing of cooling water, resulting in blockages – particularly on long pipelines and storage in exposed areas
     Process failures
  2. Pipework ruptures, affecting:
  3. Boiler condensate, process water, cooling water, effluent systems, this in turn may lead to process interruption.
  4. Failure of pH control due to caustic systems solidifying (such as effluent treatment)
  5. Catalytic processes can be affected, reducing performance
  6. Freezing of coolant lines, equipment, and chemical reaction vessel resulting in rising reaction temperature and pressure
  7. Frozen onsite roadways may restrict access for staff and emergency vehicles.
  8. Lack of water for fire suppression
  9. Damage to site infrastructure from snow-loading over extended periods.

- Daily extreme rainfall
  1. Flooding could lead to increased site surface water and flash flooding
  2. The site may experience reduced access or egress due to site flooding.
  3. Stored substances can react with water or be contaminated
  4. Uncontrolled chemical reactions, for example due to shut down of refrigeration systems as a consequence of power outages and lack of backup facilities
  5. Emergency relief systems, which work at atmospheric discharge pressure can be affected due to the static head of water.
  6. Process equipment running hot materials can be affected by thermal stress

- Season rainfall increase
  1. Overland flow or groundwater flooding.
  2. Flooding and associated impacts, as previously identified.

- Sea level rise
  If located near the coast a site could experience increased:
  1. Risk of flooding and associated impacts, as previously identified
  2. Corrosion due to increase in saltwater spray
  3. Reduction of useful life of assets due to frequent exposure to salty water

- Drier seasons
  1. Potential increased use or reliance on mains water for dust suppression and cleaning.

[26] Marshall, 2018. In the Path of Destruction: Preparing for Climate Change in the Chemical Industry. Lux Research
[27] High/low risk areas are not generally provided by any source. It is recommended to look at potential climate hazards and identify which assets are likely to be exposed to those hazards, the likelihood and consequences of the exposure, and then identify how risky those assets are to climate change.
[28] Chemical Industries Association, 2021. Safeguarding chemical businesses in a changing climate. How to prepare a Climate Change Adaptation Plan

	2. Potential for increase in dust emissions from the site. ● Decreased river flow 1. Reduced dilution available in receiving watercourse for discharge of effluent, resulting in increased pollution ● Wildfires 1. Severe damage on buildings, process equipment and industrial infrastructure 2. Release of toxic pollutants 3. Volatile organic solvents with low flash points can exacerbate the fire risk 4. Explosions 5. Pipelines for transporting oil and gas, fuel storage facilities, external floating roof tanks for combustible liquids can spread the fire 6. Supply chain disruption Optional guidance for carrying out risk assessments is offered in section 5.4 of the Background Document.		
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	Address the following questions[29]: What information, awareness or skills would improve your resilience to your priority risks? What operational changes could you make to manage your priority risks? What physical changes or technology could you invest in to manage your priority risks? Due to the nature or size of the risk or opportunity are there any strategic responses that should be considered, such as by relocating, developing a new product, exploiting a new market or creating a strategic partnership to manage shared risks? The issuer must annually verify this ongoing monitoring and evaluation of climate resilience performance. This reporting will only be required for the lifespan of the Certified Climate Bond. The following are examples of risk management activities[30] 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. Measures depend on the specific and local conditions of an asset. Additional technologies and innovation for adaptation and resilience, such as digitalisation of the supply chain (The use of sensors, tracking devices, IoT, analytics, and AI to optimise supply chains) are eligible[31] ● Temperature rise and heat waves 1. Identify temperature limits that could impact your processes and workers 2. Regular inspection and preventative maintenance of plant and equipment. 3. Regular site cleaning and use of dust suppression systems 4. Appropriate odour abatement is in place and maintained effectively Appropriate odour management plan is in place 5. Make sure an appropriate fugitive or diffuse emissions plan is in place. 6. Water can be cleaned and recirculated for reuse on site Alternative cooling systems. 7. Assess how efficient the current cooling system is, and to propose upgrades or modifications where necessary. ● Extreme cold weather 1. Identify temperature limits that could impact your processes and workers 2. Regularly inspect and maintain insulation, particularly on pipework and equipment in exposed areas of the site. 3. Consider added insulation on pipework containing water review operating procedures to make sure pipework is not left full of static water when not in use identify any potential dead-legs where static water may be held up 4. Reviewing the capability of caustic systems to remain liquid at expected colder temperatures. 5. Regularly inspect and maintain roadways during winter and remove any standing water 6. Make sure grit is available to treat road surfaces 7. Review the design of structures to withstand increased loadings. ● Daily extreme rainfall 1. Suitable measures are in place for the management of expected surface water and flood waters Drainage systems are inspected and maintained External areas where wastes are handled or stored are provided with contained drainage		

29 Chemical Industries Association, 2021
30 Chemical Industries Association, 2021
31 Marshall, 2019. Lux Research

	The site drainage system and effluent treatment plant has sufficient storage or treatment capacity 2. Make sure there are suitable alternative transport routes to and from the site. ● Season rainfall increase 1. Make sure suitable measures are in place for the management of anticipated overland flow or groundwater flooding. 2. Prepare flood plan including: Risk assessment of process equipment and services at greatest risk from flooding Provision of emergency pumps to remove floodwater and identification of lowest risk location for discharge of floodwaters Protection of control and electrical systems Identification and protection of flat bottom tanks at risk of floating in floodwater 3. Ensure backup power, capable of functioning during extreme weather events and guarantee the stability and safety of the stored chemicals. ● Sea level rise 1. Prepare flood plan including: Risk assessment of process equipment and services at greatest risk from flooding Provision of emergency pumps to remove floodwater and identification of lowest risk location for discharge of floodwaters Protection of control and electrical systems Identification and protection of flat bottom tanks at risk of floating in floodwater 2. Prevent corrosion. Measures could include making sure that plant or equipment prone to corrosion are: Protected, such as by being painted with resistant coating Regularly inspected and maintained ● Drier seasons 1. Measures are in place to review and minimise water use and to maximise collection and use of rainfall Mains water capacity is adequate, taking into account reduced availability of rainwater for activities such as dust suppression and cleaning 2. Potential for increase in dust emissions from the site. ● Decreased river flow 1. Review the environmental risk assessment for discharge to water from on-site effluent treatment 2. Check existing environmental risk assessment to make sure low river flow used in assessment remains valid – if not, discuss with Environment Agency (local site inspector and water quality team) and carry out an updated environmental risk assessment ● Wildfires 1. Implement active fire prevention measures such as fire detector, gas detector, design of sprinkler systems, use of line detectors, design of deluge systems, design of gaseous extinguishing systems[32] 2. Implement passive fire protection measures, like permanent inertization of warehouses, support for pipe racks, fireproofing cabling, use of fire resistance cable coating, protection of tank farms 3. Storage protection measures such as distancing to avoid fires from spreading within an industrial complex 4. Wildland and vegetation management		
4. The infrastructure enhances 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	Issuers are to assess the climate resilience benefits of system focused assets and activities and demonstrate they are 'fit for purpose', in the sense that they enhance climate resilience at a systemic level, with the flexibility to take into account the uncertainty around future climate change impacts. The assessment is conducted according to the principle of best available evidence during the investment period taking into account the infrastructure's boundaries and critical interdependencies as defined in Criteria 1. Any ways in which basic chemicals facilities improve the adaptation capacity of other users/stakeholders? 'Fit for purpose' is defined as measures that mitigate the effects. Some of them are listed in section 1.2 of this checklist as a reference.		

[32] Wehmeier & Mitropetros (2016). Fire Protection in the Chemical Industry

5. 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.			
5.1	Indicators for risks identified under item 2 in this checklist are provided. Risk thresholds/trigger levels, for which new adaptation actions are set[33] ,are monitored		
5.2	Indicators for risk mitigation measures identified under item 3 in this checklist are provided. Determine whether planned outputs and outcomes from adaptation actions have been achieved.[34]		
5.3	Indicators for "fit for purpose" resilience benefit measures identified under item 4 in this checklist are provided.		
5.4	Issuers have a viable plan to annually monitor and evaluate (a) climate risks thresholds/triggers, (b) climate resilience performance, (c) appropriateness of climate resilience measure(s) and to adjust as necessary to address evolving climate risks.		

[33] The adaptation process Coastal Climate Adaptation Decision Support (C-CADS), 2018.
[34] National Climate Change Adaptation Research Facility. NCCARF, 2018.