Corporate Climate Responsibility

GUIDANCE AND ASSESSMENT CRITERIA FOR GOOD PRACTICE CORPORATE EMISSION REDUCTION AND NET-ZERO TARGETS

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About this guidance and assessment criteria

The need for scrutiny on corporate climate action

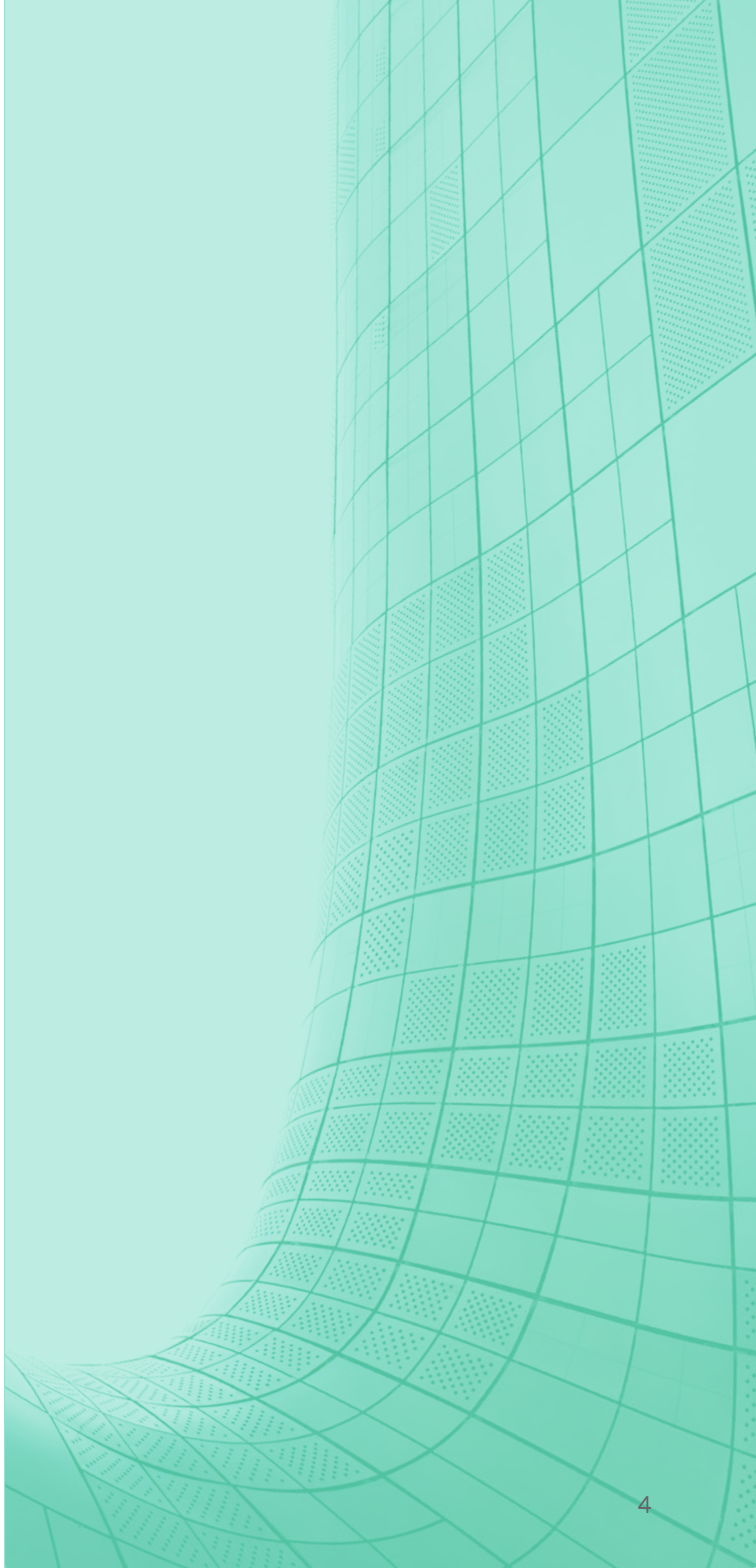
Many companies are putting themselves at the forefront of climate action. Corporate climate pledge setting is becoming standard practice: by February 2024, over 10,000 companies had joined the UNFCCC's Race to Zero campaign (UNFCCC, 2023b), including many of the world's largest companies.

Civil society's increasing concern with the climate crisis is resulting in more pressure from consumers, shareholders and regulators for companies to decarbonise. In parallel, companies realise that the direction of travel is set for the decarbonisation of the global economy, and it is increasingly attractive for them to assume a leading role in that new paradigm. Many companies are scrambling for new approaches and narratives to demonstrate their climate leadership. The rapid acceleration of setting corporate climate pledges, combined with the fragmentation of approaches and the general lack of regulation or oversight, means that it is challenging to distinguish between real climate leadership and unsubstantiated greenwashing.

The goalpost of what constitutes good practice climate action for companies has shifted with the increasingly clear scientific evidence that underpins the urgency of the climate crisis. With the objectives of the Paris Agreement, greenhouse gas emissions need to be reduced at speed, in all countries and in all sectors. The 1.5°C limit requires a reduction in global greenhouse gases and CO_2 emissions by 43% and 48% respectively from 2019 levels by 2030, to reach a state of net-zero global CO_2 emissions by around 2050, net-zero emissions of all greenhouse gases by around 2070, and net-negative emissions thereafter (IPCC, 2022).

Company actions that were considered viable only five years ago are often far from sufficient according to the state of current knowledge. For example, it is no longer sufficient for companies to only address their own direct emissions; rather, companies need to address upstream and downstream emissions as well. It is no longer good practice for a company to offset emissions by reducing or removing emissions elsewhere; rather, emission reductions and removals 'elsewhere' need to be enhanced *in parallel* to the company's emission reductions.

The difficulty of distinguishing real climate leadership from greenwashing is a key challenge that, where addressed, has the potential to unlock more substantial global climate change mitigation. Corporate climate action is key to closing the emissions gap to a 1.5°C-aligned emissions pathway. In a short space of time, and in the absence of sufficient top-down regulation, consumers' and shareholders' expectations have become a major driver for enhanced corporate climate action. Companies appear to be responding. To facilitate this important bottom-up pressure mechanism, it is essential that the credibility of companies' strategies is transparent and can be understood by their target audiences.



The Corporate Climate Responsibility Monitor

The *Corporate Climate Responsibility Monitor* evaluates the transparency and integrity of companies' climate pledges, with the objective to:

- **Identify and highlight good practice approaches** that can be replicated by others, recognising that companies are experimenting to work out what is constructive and credible practice.
- **Reveal the transparency and integrity of major companies' climate leadership claims** and provide a structured methodology for others to replicate such an evaluation. **Transparency** refers to the extent to which a company publicly discloses the information necessary to fully understand the integrity of that company's approaches towards the various elements of corporate climate responsibility. **Integrity**, in this context, is a measure of the quality, credibility and comprehensiveness of those approaches.
- **Identify opportunities for improvement in the corporate climate accountability system**, based on the emerging good practices and issues that we observe.

The guidance and assessment criteria focus on four main areas of corporate climate action: tracking and disclosure of emissions (*section 1*), setting emission reduction targets (*section 2*), reducing own emissions (*section 3*) and taking responsibility for unabated and residual emissions (*section 4*).

The development of the assessment criteria is guided by the principles for good practice corporate climate responsibility set out in this document. We have drawn these guiding principles from a combination of scientific literature review, previous work by the authors, and the identification of existing good practices from company case studies. These guiding principles relate to issues where the state of scientific knowledge and debate is rapidly evolving. The contents of this document represent the views of the authors, based on our interpretation of existing research and current developments. Our assessments of specific companies are based on these perspectives and interpretations, which may not be universally held views, although we note that version 4.0 of the methodology in 2024 is very closely aligned with the converging guidance of other major initiatives including the UN High Level Expert Group on Net Zero Targets and the ISO Net Zero Guidelines on net zero targets (*see Table 1*).

→ *See the evaluation of major international companies in the Corporate Climate Responsibility Monitor (April 2024)*

Good practice overview

Corporates looking to take a position of climate leadership can learn from each other to replicate good practice approaches that are transparent, constructive and robust. The *Corporate Climate Responsibility Monitor* assesses major global companies to draw out good practice in four key areas:

- **Tracking and disclosure of emissions:** To develop a comprehensive and robust climate strategy, it is key that companies understand and are transparent about their GHG emission footprints and their trajectories.
- **Setting specific and substantiated targets:** Companies' headline climate change pledges encompass a broad range of target setting approaches. Regardless of the type of target and the terminology used, the commitments should send a clear signal for immediate action to decarbonise the value chain, and should avoid misleading consumers, shareholders, observers and regulators.
- **Reducing emissions:** Encompassing measures for deep emission reductions are the backbone of ambitious corporate climate targets.
- **Responsibility for unabated and residual emissions:** Corporate climate leadership includes not only ambitious target setting, but also taking responsibility for unabated emissions, and avoiding misleading offsetting claims.

Figure 1 provides an overview of good practice corporate climate responsibility and our rating methodology for each of these four areas. Table 1 demonstrates the alignment of this methodology with our major standards and initiatives.

Our assessments include a rating of the transparency and integrity of companies' approaches. **Transparency** refers to the extent to which a company publicly discloses the information necessary to fully understand the integrity of that company's approaches towards the various elements of corporate climate responsibility. **Integrity**, in this context, is a measure of the quality, credibility and comprehensiveness of those approaches.

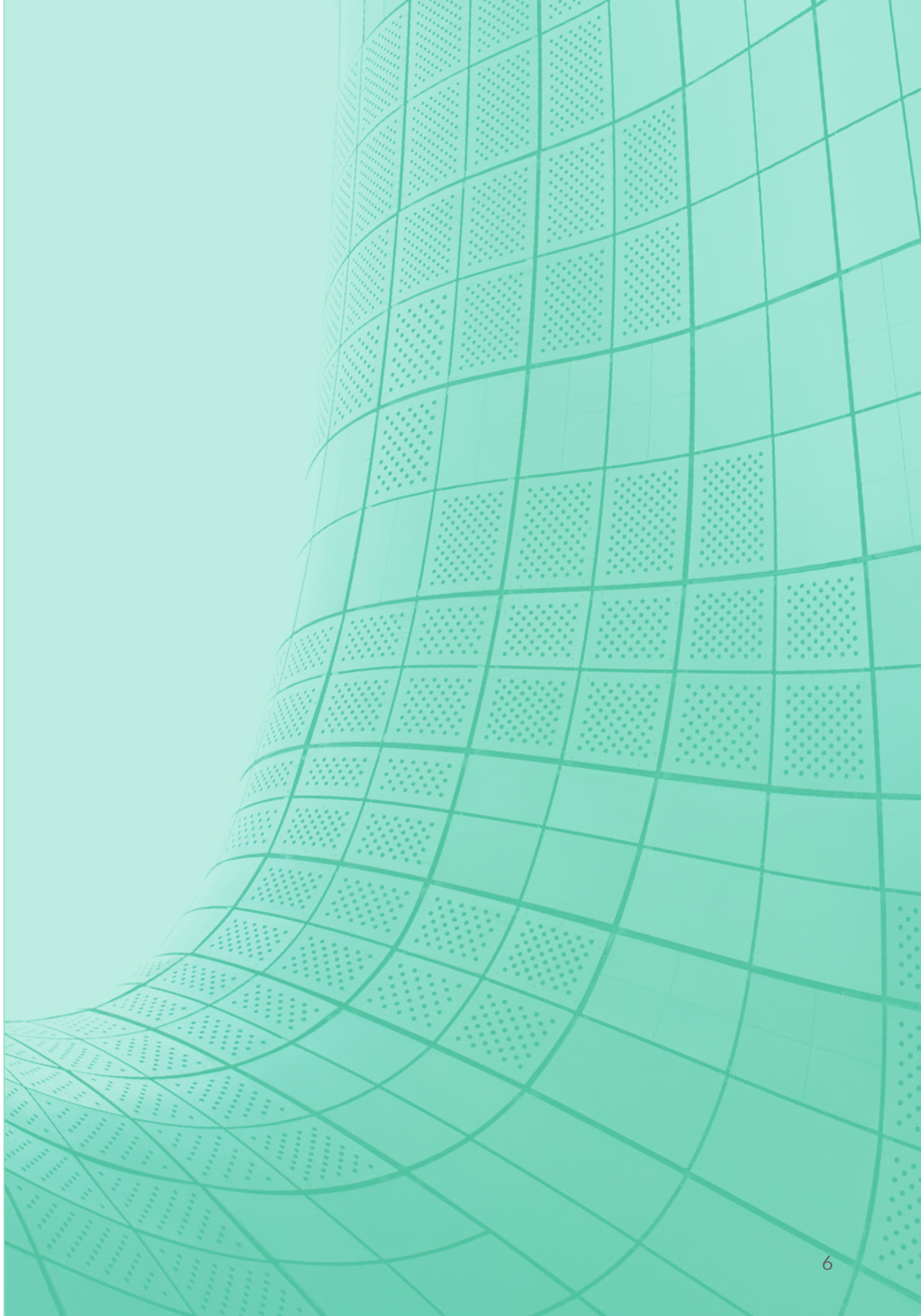


Figure 1: Overview of Corporate Climate Responsibility Monitor assessment methodology

1 TRACKING AND DISCLOSURE OF EMISSIONS

ISO 6, 11

Companies' disclosure of emissions are of **high integrity** when...

- full GHG emissions are publicly disclosed on an anual basis;
- data is broken down to specific emission sources; and
- historical data is presented for each emission source, as far as the target base year.

We assess disclosure for each emission scope separately.

$MtCO_2e$

- Downstream Scope 3
- Upstream Scope 3
- Scope 2
- Scope 1

2 SETTING EMISSION REDUCTION TARGETS

HLEG 1, 2, 3, 4

ISO 8

Headline target or pledge

Short-term targets (up to 2030)

- Scope coverage: S1 S2 S3↑ S3↓
- Own emission reductions (compared to full value chain in 2019): X% by 2030

Medium-term targets (2031 - 2040)

- Scope coverage: S1 S2 S3↑ S3↓
- Own emission reductions (compared to full value chain in 2019): X% by 2030

Longer-term targets (2041 - onward)

- Scope coverage: S1 S2 S3↑ S3↓ ← *For each timeframe, we indicate the scope coverage of the targets.*
- Own emission reductions (compared to full value chain in 2019): X% by 2030 ← *For each timeframe, we estimate what the companies' targets translate to compared to their full value chain emissions in 2029, taking into account any scope exclusions or offsetting plans.*

Targets are of **high integrity** when...

- targeted emission reductions across the value chain (excluding carbon dioxide removals and other offsetting plans) are in line with 1.5°C-compatible benchmarks for the sector, according to available litterature;
- targets are set with maximum 5-year intervals using terminology, scope and metrics that are directly comparable to targets for other time periods;
- targets are formulated as emission reduction targets independant of carbon dioxide removals and other offsetting plans, or in the case of net zero terminology the company also commits to a deep level of emission reductions to ensure that the terminology is not misleading.

3 REDUCING OWN EMISSIONS

HLEG 4, 5

ISO 9

ISO 8

- **Operational emissions** (scope 1)
- **Renewable electricity** (scope 2)
- **Upstream emissions** (scope 3)
- **Downstream emissions** (scope 3)

Companies' strategies are of **high integrity** when relevant measures are...

- adopted or planned for the near future;
- mainstreamed across the entire company; and
- implemented to a depth that is likely to be 1.5°C-compatible, according to the available literature.

Companies' electricity strategies are of **high integrity** when...

- targets are in line with 1.5°C benchmarks for the power sector;
- >95% renewable electricity comes from high quality constructs; and
- renewable generation and consumption is matched on a 24/7 basis.

4 RESPONSIBILITY FOR UNABATED AND RESIDUAL EMISSIONS

ISO 10

Climate contributions today (Beyond-value-chain mitigation)

- Provide an ambitious volume of financial support to climate change migration activities beyond the value chain.

Misleading offseting claims today

- Refrain from using carbon credits to claim carbon neutrality, without having achieved deep decarbonisation.

Approach to residual emissions

- Residual emissions volume is clearly defined and science-aligned.
- Type of CDR has a high likelihood of permanence

Table 1: Comparison of the Corporate Climate Responsibility Monitor (v4.0) methodology (CCRM, 2024) with four other voluntary standards and guidelines. Adapted from Net Zero Tracker (2023).

	CCRM (NewClimate Institute, 2024, v4.0)	How does the CCRM align with other standards?	UN Expert Group (UN HLEG, 2022)	ISO Net Zero Guidelines (ISO, 2022)	UN Race to Zero (Race to Zero, 2022, v3.0)	SBTi Net Zero Standard (SBTi, 2023d, v1.2)
CCRM METHODOLOGY COMPONENT 2: SETTING SPECIFIC AND SUBSTANTIATED TARGETS						
Coverage of all emission scopes along the value chain (scopes 1, 2 and 3)	**Yes** *Scope 1, 2 and 3 emissions and non-GHG climate forcer*	**Fully aligned with HLEG, ISO & RtZ**	**Yes** *'Scope 1, 2 and 3 emissions for businesses'*	**Yes** *'scope 1, 2 and all "relevant" s3 emissions'*	**Yes** *'scope 1, 2 and 3 emissions for businesses'*	**Partially** ***Long-term targets:*** *95% of s1 and s2; 90% of s3* ***Short-term targets:*** *95% of s1 and s2; 67% of s3*
Net-zero target						
Minimum reduction for 'credible net zero' terminology	**>90% for all sectors** *compared with 2019 emissions*	**Fully aligned** *for those standards specifying*	**Not specified**	**>90% for all sectors >72% for FLAG sector** *illustrative example based on the SBTi Net Zero Standard*	**Not specified**	**>90% for all sectors >72% for FLAG sector** *compared to base year emissions*
Requirement to comply with 1.5°C-aligned decarbonisation milestones	**Yes** *by using entire range of 1.5°C benchmarks identified in literature*	**Aligned but going beyond other standards**	**Not specified** *but recommendation to "us[e] a robust methodology consistent with limiting warming to 1.5°C with no or limited overshoot"*	**Yes** *through illustrative examples using SBTi's sector-specific and economy-wide 1.5°C pathways mentioned as one option*	**Not specified** *but general reference that entities should contribute to UNFCCC 2030 Breakthroughs*	**Yes** *by using SBTi's sector-specific and economy-wide 1.5°C pathways*
2030 target(s)						
Five-year intervals for interim targets	**Yes** *5 years*	**Fully aligned**	**Yes** *5 years with targets in 2025, 2030, and 2035*	**Yes** *2 to 5 years*	**Not specified** *'Set an interim target ... by 2030'*	**Partially** *5 to 10 years*
Requirement to comply with 1.5°C-aligned decarbonisation milestones	**Yes** *by using entire range of 1.5°C benchmarks identified in the literature*	**Aligned but going beyond other standards**	**Not specified** *but reference to "credible sector pathways consistent with limiting warming to 1.5°C with no or limited overshoot" and need for third-party verification*	**Not specified** *but minimum target to "halve all types of GHG emissions every decade [...] consistent with a fair share of 50 % global GHG emissions reduction by 2030"*	**Not specified** *but must generally reflect "maximum effort toward or beyond a fair share of the 50% global reduction in CO_2 by 2030"*	**Yes** *by using SBTi's economy-wide absolute annual reduction rates or SBTi's sector-specific intensity convergence*
Offsetting to achieve interim targets	**Not allowed**	**Fully aligned**	**Not allowed**	**Not allowed**	**Recommends prioritizing reductions over offsetting**	**Not allowed** *except for FLAG sector targets that allow companies to use carbon dioxide removals*

CCRM METHODOLOGY COMPONENT 3: EMISSION REDUCTION MEASURES

Specific requirements for transition plans and key mitigation areas	**Yes** *including (1) detailed measures for all scopes, (2) estimated reduction impact, (3) adoption of good practice measures and R&D in new technological solutions, and (4) high-quality renewable electricity procurement*	**Fully aligned** *for those standards specifying*	**Yes** *including (1) estimated impact of emission reduction measures, (2) disclosure of capital expenditure plans, R&D plans and investments, (3) detail value chain engagement approach.*	**Yes** *including detailed requirements for (1) content of mitigation plans, (2) prioritisation of mitigation actions across scope 1, scope 2, and scope 3 emissions*	**Not specified** *beyond general requirement to adopt transition plan*	**Not specified** *But generally recommended to report on emission reduction measures and set transition plans as part of wider guidelines in Section 4.1 and Section 4.7 in SBTi's Corporate Manual*
Fossil fuel phase-out	**Required** *as "clear plan to phase out all carbon-intensive infrastructure and products"*	**Fully aligned** *for those standards specifying*	**Required** *including "specific targets aimed at ending the use of and/or support for fossil fuels"; for both coal for power generation and oil & gas*	**Required** *including "transitioning away from [..] the use of fossil fuels, including phasing out the use of coal" and "establish, apply and disclose financing policies to phase out fossil fuels" for scope 1 and 2 emissions*	**Required** *by phasing down and out all unabated fossil fuels as part of a global just transition*	**Not specified**
Additionality and hourly matching criteria for renewable electricity procurement	**Required** *Standalone Renewable Energy Certificates (RECs) and annual matching are not recognised as high quality procurement constructs*	**Fully aligned with ISO**	**Not specified**	**Recommended** *for RE purchases should lead to the development of further renewable energy; targets should promote availability of RE for every hour or hour day.*	**Not specified**	**Not specified** *Reference to GHG Protocol which does not differentiate between additionality of procurement constructs.*

CCRM METHODOLOGY COMPONENT 4: CLIMATE CONTRIBUTIONS, OFFSETTING CLAIMS AND RESIDUAL EMISSIONS

Climate contributions (beyond-value-chain mitigation)	**Recommended** *Science-aligned carbon price on unabated emissions, channelled to climate projects without a neutralisation claim.*	**Aligned but going beyond SBTi** *due to specificity on claims*	**Not specified**	**Not specified**	**Not specified**	**Recommended** *Science-aligned carbon price on unabated emissions, channelled to climate projects (lack of clarity on claims allowed).*
Carbon neutrality claims today	**Not recommended**	**Going beyond** *as not specified by other standards*	**Not specified**	**Not specified**	**Not specified**	**Not specified**
Approach to residual emissions						
Definition of residual emissions	**Specified** *Sector-specific based on scientific literature (<5% of 2019 emissions in most sectors)*	**Fully aligned** *for those standards specifying*	**Not specified** *maximum amount not specified*	**Specified** *through illustrative sector-specific examples; for <5% of emissions (including scope 3 emissions) for net-zero targets by 2050 compared to 2020 emissions*	**Not specified** *maximum amount not specified*	**Specified** *maximum of 5-10% of emissions covered by the net zero target for most sectors with the exception for the FLAG sector*
Criteria for neutralisation of residual emissions	**Residual emissions definition science aligned; CDR permanence specified.** *Permanence defined as centuries to millenniums.*	**Fully aligned** *for those standards specifying*	**CDR permanence required by not defined.** *General recommendation that "high integrity carbon credits" must fit criteria of additionality and permanence as to be defined by ongoing processes by third-party initiatives such as ICVCM, VCMI, and SBTi*	**Residual emissions definition science aligned; CDR permanence required.** *both high-quality carbon dioxide removals and carbon credits must fit criteria of (1) credible accounting standards, (2) additionality, (3) MRV by third party, (4) permanence, sufficiently long-term storage and plans to manage potential impermanence, (5) avoided double-counting*	**CDR permanence required by not defined** *No specific criteria outlined for either "**high quality carbon credits**" or "**high-quality permanent removals**"*	**Residual emissions definition science aligned; CDR permanence required by not defined** *No specific criteria outlined for "permanent emission removals" beyond a company's value chain; FLAG sector targets additionally allow carbon dioxide removals inside the company's value chain, for which no further criteria have been outlined*

1 Tracking and disclosure of emissions

To develop a comprehensive and robust climate strategy, it is key that companies understand and are transparent about their GHG emission footprints and their trajectories over time. A complete and transparent overview of a company's emissions footprint is crucial to understand a company's scope of influence, to grasp the relevance of its climate-related targets, and to determine whether emission reduction measures are appropriate and comprehensive.

This section assesses the comprehensiveness of companies' GHG emissions tracking and disclosure for specific emission scopes and for subsidiary companies. This report does not assess the rigorousness and accuracy of companies' calculations when quantifying emissions from each emissions scope. Quantified GHG emissions throughout this document are self-reported by the companies and not verified by the authors. Rather, we assess how comprehensive the companies' own disclosure is in terms of the coverage of emission sources.

1.1 Guiding principles

Companies should annually disclose detailed information on their GHG emissions, covering the full spectrum of climate impacts associated with the activities of the company. Meaningful planning for complete decarbonisation depends on a thorough and granular understanding of a company's emission sources. Complete and transparent disclosure covers all direct emissions (scope 1), indirect energy-use emissions (scope 2), and other upstream and downstream indirect emissions (scope 3). Scope 1, 2 and 3 emissions should be measured and reported separately and be broken down into GHG, activity or emissions source, while providing historical data (ISO, 2022, p. 30). Where relevant, companies should also include non-GHG climate forcers in their disclosure. Companies should publish information on the methodologies and assumptions involved in the calculation of emissions, to facilitate comprehension and verification. This is particularly important for emission sources where there remains significant uncertainty and inconsistency in accounting approaches, such as emissions from land-use change and forestry.

Companies should report on all upstream and downstream indirect emissions, including even minor scope 3 emission sources. HLEG recommends that companies annually disclose their emissions data and all other relevant information to understand their targets and transition plans in a standardized and open format via public platforms that feed into the UNFCCC Global Climate Action Portal (UN HLEG, 2022, p. 28). The ISO's Net Zero Guidelines require companies to provide separate data for the different scope 3 categories (ISO, 2022, p. 30), such as emissions from procured products and services, investments, waste, upstream and downstream transport and distribution, and emissions from product use. The GHG Protocol's Scope 3 Standard identifies 15 distinct reporting categories for scope 3 emission sources and requires companies to quantify and report scope 3 emissions from each (GHG Protocol, 2013). It is important for transparency that companies disclose data or at least explanatory information for all 15 of these normal scope 3 emission categories (*see Table 2*), even those deemed minor or irrelevant. Differences in interpretations regarding what constitutes a "minor" or "irrelevant" emissions source could lead to significant inconsistencies between companies' reporting. Some observers may perceive the omission of minor emission sources to be a significant gap in disclosure unless these omissions are explained.

Table 2: Categories of scope 3 emission sources

UPSTREAM SCOPE 3 EMISSION CATEGORIES		
1	Purchased goods and services	Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 - 8.
2	Capital goods	Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year.
3	Fuel- and energy-related activities (not included in scope 1 or scope 2)	Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or scope 2.
4	Upstream transportation and distribution	Transportation and distribution of products purchased by the company between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company); and transportation and distribution services purchased by the company including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company).
5	Waste generated in operations	Disposal and treatment of waste generated in the company's operations (in facilities not owned or controlled by the reporting company)
6	Business travel	Transportation of employees for business-related activities (in vehicles not owned or operated by the reporting company)
7	Employee commuting	Transportation of employees between their homes and their worksites (in vehicles not owned or operated by the reporting company)
8	Upstream leased assets	Operation of assets leased by company (lessee) and not included in scope 1 and scope 2 – reported by lessee
DOWNSTREAM SCOPE 3 EMISSION CATEGORIES		
9	Downstream transport and distribution	Transportation and distribution of products sold by the company between the company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company)
10	Processing of sold products	Processing of intermediate products sold by downstream companies (e.g., manufacturers)
11	Use of sold products	End use of goods and services sold by the company
12	End-of-life treatment of sold products	Waste disposal and treatment of products sold by the company (in the reporting year) at the end of their life
13	Downstream leased assets	Operation of assets owned by the company (lessor) and leased to other entities, not included in scope 1 and scope 2 – reported by lessor
14	Franchises	Operation of franchises, not included in scope 1 and scope 2 – reported by franchisor
15	Investments	Operation of investments (including equity and debt investments and project finance), not included in scope 1 or scope 2

Source: GHG Protocol Corporate Value Chain Standard (GHG Protocol, 2011)

Reporting on scope 3 emissions outside of these normal categories is in some cases crucial for transparency, while in other cases it may not be constructive. Comprehensive coverage of emissions disclosure does not necessarily mean reporting any emissions that are outside of the company's normal reporting scope if a tenuous link to the company can be found. *Indirect use-phase emissions* as well as *direct use-phase emissions from products that are not sold* to an end-user are described by the GHG Protocol Scope 3 Standard as optional reporting components. The vagueness of this specific guidance represents a significant limitation, since the way in which companies report on these emissions and include them in their targets can significantly strengthen or undermine their targets, depending on the specific sector and the context:

- Direct use-phase emissions for products that are not sold to an end-user form a highly significant part of the climate impact associated with the business model of many companies in the energy supply sector, for example. Fossil fuel commodity traders and companies providing distribution infrastructure provide a key service to the fossil fuel supply chain. For many of these companies, the combustion of those fossil fuels constitutes the most significant issue for the companies' climate impact, and the unabated continuation of those business models may be fundamentally misaligned with the objectives of the Paris Agreement. However, those companies may not be required by the GHG Protocol guidance to report on the downstream emissions associated with their fuel sales unless their sales are directly to end-users, leading to the situation that those companies' climate impact is misunderstood. For these companies, focusing on emission reduction measures that fall only in their currently mandatory emissions reporting scope can lead to the situation that investments are made to "green" the fossil fuel production and supply chain industries, creating further financial lock-in to the continuation of that industry, whilst the most important measure for the Paris alignment of the sector would rather be to work towards the phaseout of the use of fossil fuels.

  The guidance for direct use-phase emissions for sales that are not sold to an end-user can also create an accounting loophole for electricity retailers. Electricity retailers that purchase lower-cost wholesale electricity containing a mixture of renewable and non-renewable sources could claim to have no downstream emissions, if they claim to have passed the renewable portion of that electricity onto customers while reselling the remainder of the electricity to other sales partners. This could create limited incentives for electricity retailers to pursue high quality renewable electricity procurement constructs. The significance of this issue may increase with the trend that major electricity utilities are transitioning their business models from electricity generation to electricity retailing to shift their emissions footprint from scope 1 to the less strictly regulated scope 3.

- In contrast to direct use-phase emissions from products, such as the energy consumption of vehicles and appliances, indirect use-phase emissions refer to the emissions that occur indirectly from the use of a product. For example, soap and detergents are often used with heated water when washing clothes; indirect use-phase emissions in this case generate from water heating. While there are circumstances where it could be constructive to report on these emissions and include them in targets, special care should be taken in determining when it is appropriate to do so. If these emissions constitute a major portion of a product's footprint and the company has no control or influence on potential emission reductions, then reporting on these emissions can also lead to distraction from the company's mandatory emissions scope, or targets can be disingenuous.

Companies should report scope 2 emissions using both the location-based and market-based method, taking the highest of the two values for their calculation of their total emissions footprint. According to the GHG Protocol companies should report on scope 2 emissions using both the location-based and market-based accounting methods (WRI and WBCSD, 2015, p. 59):

- The l**ocation-based method** reflects the average emissions intensity of electricity grids from which consumption occurs.
- The **market-based method** reflects emissions from electricity that companies have purposefully chosen to buy. It derives emission factors from contractual renewable electricity procurement instruments.

Both accounting approaches have the potential to mispresent the emission footprint of electricity consumption in different circumstances. Companies have a variety of options for sourcing renewable electricity (*see section 3.1.2*). While for some options, an emissions reduction claim may be legitimate, for others the impact is unclear. As the impact of renewable electricity projects varies and is often unclear, market-based reporting for renewable energy constructs may give the false impression that a company has no or few scope 2 emissions and could divert prioritisation away from energy efficiency improvements.

On the other hand, some companies' market-based emission estimates may be higher than their location-based estimates, due to contractual arrangements for the direct procurement of fossil-fuel-generated electricity. In this case, companies could report location-based emissions based on the local grid emissions factor, while profiting from cheaper electricity procurement constructs from a more emissions-intensive source.

To create a clear incentive both to maximise energy efficiency improvements and to procure renewable electricity, it would be most constructive for companies to report both market- and location-based estimates for scope 2 emissions and to use the larger of the two values towards the company's aggregated emissions footprint. This is aligned with the ISO's Net Zero Guidelines, which require companies to calculate scope 2 emissions using both accounting methods but use the highest of the two estimates to drive energy efficiency improvements; the same estimate should be used for emission reduction targets and tracking progress (ISO, 2022, p. 18).

Companies' disclosure should include contextual information to understand key emission drivers and trends. Complete and transparent disclosure includes historical data, a breakdown of emission sources, activity data and emission intensities. Ambitious companies go beyond the publication of aggregated emissions; they provide a high level of detail to allow for thorough understanding of the specific individual emission sources. Transparency on specific emission sources and activity data is a tool for increasing ambition in its own right; it contributes to a constructive, collaborative dialogue that is required to overcome challenges and share lessons learnt for accelerated decarbonisation.

Companies' disclosure should include the emissions associated with subsidiary companies. Companies may depend on emission-intensive assets and infrastructure that are held by other subsidiary companies. Transparent and complete reporting also includes these emissions, which should be integrated into the company's scope 1, 2 and 3 emissions. The exclusion of these emissions from GHG inventories can lead to inaccurate interpretations regarding specific brands' or products' GHG emissions footprint. If companies report transparently on the emissions of all subsidiaries, this can incentivise those companies to make a real shift away from emission-intensive activities and assets, rather than continuing those emission-intensive activities through subsidiaries.

1.2 Assessment criteria

In line with the guiding principles above, we base our evaluation of companies' reporting and disclosure of GHG emissions on the assessment criteria in Table 3.

Table 3: Assessment criteria for tracking and disclosure of emissions

TRACKING AND DISCLOSURE OF EMISSIONS			
	Assessed for the following emission scopes individually: Scope 1, Scope 2, Scope 3 upstream, Scope 3 downstream		Assessed for subsidiary coverage
High	The disclosure of emissions from the emissions scope is complete and presented in a way that facilitates a thorough understanding. It includes: ✓ An annual disclosure ✓ A breakdown of the data to specific emission sources ✓ The presentation of historical data for the same emission sources, for each year back to the earliest target baseline. Historical data should be updated according to methodological changes. ✓ Explanations on why omitted emission sources are not tracked ✓ Disclosure of non-GHG climate forcers, if relevant ✓ For scope 2, disclosure of both market- and location-based emission estimates, while using the highest estimate for emission aggregates	High	The company includes all emissions from subsidiaries in its emissions disclosure.
Reasonable	The disclosure of emissions from the emissions scope is complete and presented in a way that facilitates a thorough understanding. It includes: ✓ An annual disclosure ✓ A breakdown of the data to specific emission sources ✓ The presentation of historical data for the same emission sources, for each year back to the earliest target baseline. Historical data should be updated according to methodological changes. ✓ Explanations on why omitted emission sources are not tracked ✓ Disclosure of non-GHG climate forcers, if relevant For scope 2, disclosure of both market- and location-based emission estimates, but the lowest estimate is used for emission aggregates	Reasonable	N / A
Moderate	The disclosure of emissions in the scope is complete, including data for the target base year, but the level of detail does not facilitate a thorough understanding of emission sources. For scope 2, disclosure of both market- and location-based emission estimates, but the lowest estimate is used for emission aggregates	Moderate	The company includes most emissions from subsidiaries in its emissions disclosure.
Poor	Disclosure of emissions includes some major sources of emissions but excludes other significant sources.	Poor	N / A
Very poor	The emissions scope is not tracked or disclosed, or emissions for the target base year are not disclosed. For scope 2, this includes the disclosure of *only* market-based emissions.	Very poor	The company does not include emissions from subsidiaries in its disclosure. <OR> The company omits emissions from major subsidiaries from its emissions disclosure.

Rating: High, Reasonable, Moderate, Poor, Very poor

2 Setting emission reduction targets

Companies' climate change pledges encompass a broad range of target setting approaches: some companies opt for specific GHG emission reduction targets as their headline climate change pledges, but most major companies are moving towards 'net-zero' pledges (or similar terminology). These net-zero pledges envisage emission reductions combined with offsetting some emissions. The timeline and emissions scope of companies' pledges can also vary, for example, some companies' headline pledges are long-term visions for 2040 or 2050, while others focus on shorter-term commitments for 2025 or 2030, and any of these pledges can cover the companies' whole value chain emissions or only parts of it. Headline pledges are often supported by short- and medium-term targets towards 2030, but companies do not always explain how these targets align with their longer-term visions in terms of emission coverage and emission reduction commitments. Some companies do not commit to absolute GHG-related targets, but rather focus on emission intensity targets (emissions per unit of output), or targets associated with decarbonisation indicators, such as renewable energy targets.

The high diversity of target setting approaches could stem from differences in companies' specific circumstances, different understandings of mitigation options, and understanding of the materiality of scope 3 emissions. Further, there are differences of opinion and mixed messages regarding the type of targets that represent the highest standard of climate change mitigation ambition.

Regardless of the type of target set and the terminology used, it is most crucial that the targets send a clear signal for immediate action to reduce emissions along the entire value chain paired with a longer-term vision for deep decarbonisation. For this reason, corporates should set both short-term climate targets towards 2030 *and* medium- and longer-term climate targets beyond 2030.

The pathway to net zero is crucial: a 1.5°C limit requires immediate action to achieve a reduction in global CO_2 emissions of about 48% from 2019 levels by 2030 (IPCC, 2022). Further delay puts the Paris Agreement objectives beyond reach. Credible **short-term targets towards 2030** must ensure that corporate emissions decrease in line with what limiting global temperature increase to 1.5°C requires by 2030. Well-defined short- and medium-term targets set within five-year intervals can ensure such immediate action and provide accountability.

Medium- and longer-term targets beyond 2030 must set out a vision towards full decarbonisation. Such targets must provide a clear indication of what the company aims to achieve in the long-term, to inform today's management and investment decisions. Limiting global temperature increase to 1.5°C requires the rapid decarbonisation of all sectors, to reach a state of net-zero global CO_2 emissions by around 2050, net-zero GHG emissions by around 2070, and net-negative emissions thereafter (IPCC, 2022).

Targets should also not mislead consumers, shareholders and observers, whose demands represent a vital pressure mechanism for raising ambition. Nor should they mislead regulators into avoiding or limiting the implementation of policies to incentivise ambitious climate action.

This section assesses the level of specificity and substantiation of short-term targets (towards 2030), medium-term targets (2031–2040) and longer-term targets (2041 onwards). The following sub-sections outline the guiding principles on the coverage of emission sources and emission reductions in line with the Paris Agreement's 1.5°C temperature limit.

2.1 Guiding principles

2.1.1 Coverage of emission sources

Short-, medium-, and longer-term targets should be explicit in their coverage of the complete spectrum of emission sources and greenhouse gases, to maximise impact and avoid misleading communication. The most comprehensive targets cover a company's full GHG emission footprint, including upstream and downstream scope 3 emissions, and non-GHG climate forcers where relevant (*see section 1*). When setting multiple targets, for example targeting specific emission scopes, the company ought to transparently explain what share of its emissions across the value chain these targets cover. Companies setting headline climate pledges (e.g., net-zero or climate neutrality targets) should explicitly set out these pledges' coverage to avoid misinterpretation and to ensure accountability. Targets with partial scope coverage have the potential to mislead: disclaimers get lost or may not be well understood by the audiences of climate pledge communications. The United Nations' High-Level Expert Group (HLEG) recommendations and ISO Net Zero Guidelines,[1] both released at COP27 in November 2022, mandate the coverage of all emission scopes for short- and medium-term targets (ISO, 2022, p. 11; UN HLEG, 2022, p. 17).

Coverage of all mandatory scope 3 emission categories is highly relevant, despite uncertainties and indirect influence. Scope 3 emissions can entail a degree of uncertainty, particularly for complex emission sources related to land-use, such as upstream food processing, and downstream emissions associated with consumer behaviour and product use. The decarbonisation of these emissions may also depend partially on actions taken by others. Despite these uncertainties, the inclusion of all mandatory[2] scope 3 emission sources from the GHG Protocol's Scope 3 Standard in companies' targets is crucial (WRI and WBCSD 2013). This provides a clear incentive for all actors with a potential influence on the decarbonisation of emission sources to take measures to do so. For manufacturers of cars, electric appliances, or electronic devices, scope 3 emissions often account for the major share of those companies' emissions. And the companies are the actors with the greatest influence to decarbonise those emission sources, by manufacturing products with alternative or more efficient technologies. Even in the cases where companies have a lower degree of influence in the reduction of some mandatory scope 3 emissions, this does not justify their exclusion from targets; the full inclusion of mandatory scope 3 emissions in targets can incentivise companies to cooperate with suppliers and consumers to mutually support each other to reduce emissions, including to seek out new solutions where needed. Targets that omit mandatory scope 3 emissions carry a significant potential to mislead, since scope 3 emissions account for a large portion of most companies' climate impact.

2.1.2 Emission reductions along value chain

Short and medium-term targets towards 2030 and beyond must be ambitious enough to align with 1.5°C-compatible emission pathways. To stand a reasonable chance of limiting global warming to 1.5°C, global GHG and CO_2 emissions must decrease by around 43% and 48% respectively between 2019 and 2030, and by 84% and 99% by 2050 (IPCC, 2022). Both the HLEG recommendations and ISO Net Zero Guidelines emphasise the need to align short- and medium-term targets according to these most recent IPCC findings (ISO, 2022, pp. 19–20; UN HLEG, 2022, p. 17). Where available in the literature, benchmarks for specific decarbonisation indicators provide key 1.5°C-compatible milestones for specific sectors and regions at the global, country, and corporate level. Table 4 presents benchmarks identified in existing literature for all key sectors used for the integrity assessment of corporate targets.

Credible short- and medium-term targets requiring immediate action and accountability are vital for credible corporate commitments to fight climate change and should be the focus of corporate target setting. Long-term visions beyond 2041 *can* provide a useful signal for deep decarbonisation in the future, but only when accompanied with adequately ambitious interim targets within a timeframe that requires immediate action. Pathways to decarbonisation that are characterised by initially slow or delayed action will lead to a larger volume of cumulative emissions (Rogelj *et al.*, 2018). Delayed action thus requires even deeper emission reductions and larger amounts of highly uncertain carbon dioxide removal at a later date, and can put the objective to limit global warming to 1.5°C beyond reach. Within a corporate environment, we consider that a maximum 5-year timeframe for interim targets is good practice, since it is particularly challenging to establish a credible accountability mechanism for targets set over the medium or longer-term. The HLEG recommendations and ISO Net Zero Guidelines both emphasise the need for short- and medium-term targets set within five-year intervals findings (ISO, 2022, pp. 19–20; UN HLEG, 2022, p. 17).

Short- and medium-term target should use the same base years and provide transparent explanation on why these base years have been chosen. Emission baselines should appropriately represent a company's GHG emissions profile while not being affected by special circumstances that might distort a company's (ISO, 2022, pp. 15, 18). For example, companies have experienced exceptionally high emissions in certain historical years that do not reflect their normal GHG emission profile that are not suitable as target baselines. Companies should transparently explain and justify if they decide to choose different base years across different targets.

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1 *While the wording of the ISO Net Zero Guidelines that all 'relevant' emission scopes should be covered may be interpreted inconsistently, we understand that this excludes only emission categories that are irrelevant by definition of there being zero GHG emissions from those categories; all emission sources from which companies have any GHG emissions are clearly 'relevant'.*

2 *The inclusion of non-mandatory scope 3 emissions is not always constructive. See section 1.1.*

Net-zero targets set as headline climate pledges (e.g., 'net-zero emissions by 2040') can become highly misleading if they don't explicitly include deep emission reduction commitments that are independent of offsetting and carbon dioxide removals. Corporate climate pledges only contribute to the Paris Agreement objectives in a meaningful way if they put emission reductions across the entire value chain in the spotlight. Such pledges are also more constructive if they avoid ambiguous terminology that can distract from this focus, for example by remaining unspecific on emissions reductions to be achieved without relying on offsets or carbon dioxide removal. A state of global net-zero CO_2 emissions that is compatible with limiting global warming to 1.5°C require the deep reduction of emissions to 91%–97% below 2010 by 2050 (Rogelj *et al.*, 2018; IPCC, 2022), alongside a limited role for carbon dioxide removals to neutralise a small volume of residual emissions from the emission sources that are hardest to abate. The HLEG recommendations mandate companies to inform their targets by these "latest IPCC net zero greenhouse gas emissions modelled pathways that limit warming to 1.5°C with no or limited overshoot, and where global emissions decline at least 50% below 2020 levels by 2030, reaching net zero by 2050 or sooner" (UN HLEG, 2022, p. 17). Other standards, such as the Net Zero Standard of the Science-Based Targets initiative (SBTi) and the ISO Net Zero Guidelines also require companies from any sector with net-zero targets—except the forestry, land-use, and agriculture sectors—to explicitly commit to emission reductions of at least 90% below 2019 levels across all emission scopes (ISO, 2022, pp. 16–17; SBTi, 2024b, pp. 20, 30). Companies should only set a net-zero target if they indeed can commit to such deep emission reductions at that point in time.

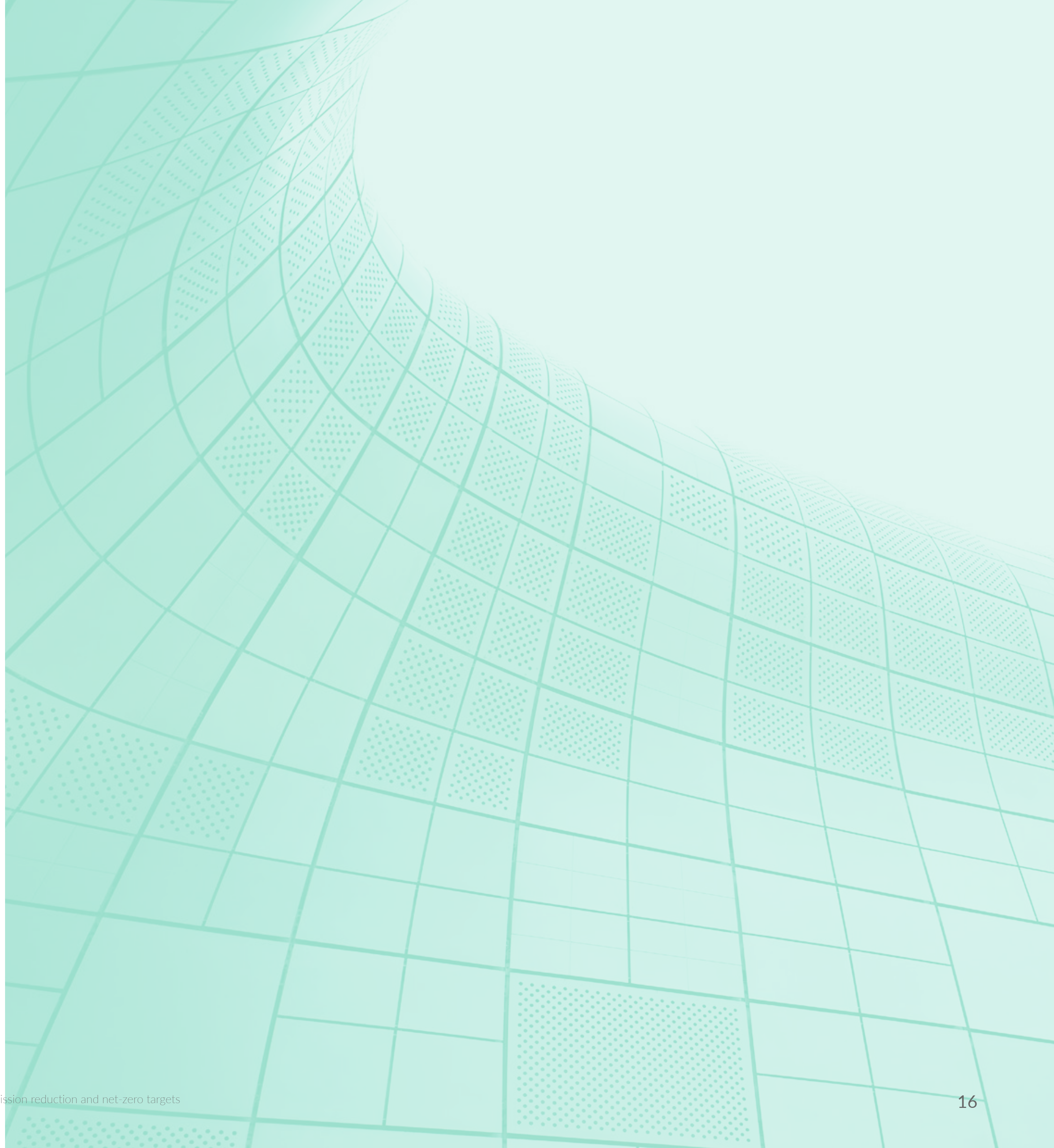

Table 4: **Sector-specific decarbonisation benchmarks identified in existing literature as of April 2024. Sectors listed in alphabetical order.**

Automotive manufacturers – Light-duty vehicles	**Phase out of internal combustion engines (ICEs)** Several studies identify 1.5°C-aligned decarbonisation milestones for the phase-out of internal combustion engines (ICEs) replaced by electric and low-emission vehicles at the global and regional (CAT, 2020, p. 27; Teske *et al.*, 2022, p. 333; Boehm *et al.*, 2023, pp. 77–78; IEA, 2023, pp. 80, 93; SBTi, 2024a, pp. 16–17). **Intensity of vehicles' use-phase emissions** The Science Based Targets Initiative (SBTi) and the Transition Pathways Initiative (TPI) define benchmarks to evaluate corporate intensity targets on the vehicles' use-phase emissions (downstream scope 3 category 11) emissions (SBTi, 2018b, 2018a; Dietz, Chiu, *et al.*, 2023, p. 8). The SBTi has indefinitely paused the use of its methodology for automakers' intensity targets since March 2022 as the method does not reflect a 1.5°C-compatible definition from SBTi's point of view (SBTi, 2022e).
Automotive manufacturers – Heavy-duty vehicles	**Phase-in of zero emission vehicles (ZEVs)** Several studies identify 1.5°C-aligned decarbonisation milestones for the phase in of zero emission vehicles replacing internal combustion engines at the global and regional (UNFCCC, 2021, pp. 10–11; Mission Possible Partnership, 2022b, p. 40; Boehm *et al.*, 2023, pp. 77–78; IEA, 2023, pp. 93, 196; InfluenceMap, 2023).
Aviation	**Use of sustainable aviation fuels (SAFs)** Several studies identify 1.5°C-aligned decarbonisation milestones for the use of sustainable aviation fuels (SAFs) in international aviation (UNFCCC, 2021, p. 12, 2023a, p. 30; Boehm *et al.*, 2023, p. 78; IEA, 2023, p. 94). **Intensity of jet fuel emissions** The TPI and SBTi base their benchmarks on an intensity-based metric exclusively focusing on the use of jet fuel emissions (scope 1) (Dietz, Byrne, Sheer, *et al.*, 2021, p. 14; SBTi, 2021d, 2021b, p. 19). While the TPI uses the *IEA's Net Zero by 2050* report to derive 1.5°C-compatible benchmarks towards 2050 (Dietz, Byrne, Sheer, *et al.*, 2021, p. 14; IEA, 2023, p. 198), the SBTi uses the IEA's *Energy Technology Perspectives* (ETP) report to derive a 'well-below 2°C'-aligned benchmark (IEA, 2020; SBTi, 2021d, p. 11). All benchmarks exclusively focus on jet fuel emissions and do not consider any non-GHG climate forcers from flying, which account for about two thirds of aviation's climate impact (Lee *et al.*, 2021). **Absolute emission reductions of global aviation sector** Several studies identify 1.5°-aligned absolute emission reductions for the global aviation sector (CAT, 2022; Teske, 2022, p. 333; IEA, 2023, p. 198; Teske *et al.*, 2023 data in Dataset 2). The International Council on Clean Transportation (ICCT) further provides absolute reductions in line with a 1.75°C temperature limit (Graver *et al.*, 2022, p. i).
Cement industry	**Intensity of operational emissions in cement production (scope 1 and 2)** Several studies identify 1.5°C-aligned decarbonisation milestones for the emissions intensity for cement production covering scope 1 and 2 (CAT, 2020, p. 41; SBTi, 2022a, 2022d; Boehm *et al.*, 2023, p. 61; Teske *et al.*, 2023 data in dataset 2). The Transition Pathways Initiative (TPI) defines 1.5°C-aligned benchmarks for scope 1 emissions only (Dietz, Hastreiter, *et al.*, 2021, p. 9). **Absolute emission reductions of global cement sector** A few studies identify 1.5°-aligned absolute emission reductions for the global cement sector (SBTi, 2021c, 2022c; Teske, 2022, p. 323; Teske *et al.*, 2023 data in dataset 2).
Chemical industry	We could identify very few and non-conclusive sector-specific decarbonisation milestones for the chemical industry and its various sub-sectors in existing literature (UNFCCC, 2021, p. 12; Mission Possible Partnership, 2022a, p. 11; Teske, 2022, p. 322; IEA, 2023, pp. 97, 198; Teske *et al.*, 2023 data in Dataset 2). For this reason, the assessment of chemical companies currently requires a case-specific approach (e.g., considering particularities of a given sub-sector a company operates in or the overall relevance of scope 3 emissions). Future research needs to put further emphasis on determining sector-specific decarbonisation milestones for the chemical industry in line with the Paris Agreement across the sector's entire value chain.

Electronics	We could not identify sector-specific decarbonisation milestones for the electronics industry in existing literature. For this reason, we compare electronics companies to global economy-wide decarbonisation trajectories to reduce GHG and CO_2 emissions by 43% and 48%, respectively. These emission reductions are necessary to stand a reasonable chance of limiting global warming to 1.5°C (IPCC, 2022). Given that CO_2 is the most relevant GHG in the electronics sector's emission profile and the sector has readily accessible decarbonisation options, we consider that companies should meet at least the global benchmark of a 48% CO_2 reduction by 2030 below 2019 levels.
Energy utilities	**Absolute emissions reduction and emissions intensity pathway of electricity generation (scope 1 and 2)** Several studies identify 1.5°C-aligned decarbonisation milestones for absolute emissions and emissions intensity of electricity generation globally and for specific geographies (Dietz, Gardiner, Jahn, *et al.*, 2021, p. 7; Boehm *et al.*, 2023, p. 29; CAT, 2023a, p. 20; IEA, 2023, pp. 62, 79, 198–199). **Share of renewables and phase-out timeline of unabated fossil fuels** Several studies identify 1.5°C-aligned decarbonisation milestones for the share of renewables in total electricity generation and installed capacity, as well as the phase-out timeline of unabated coal, oil and fossil gas power plants globally and for specific geographies (IEA, 2022b, pp. 137–138, 2023, pp. 62, 79; Teske, 2022; Boehm *et al.*, 2023, pp. 36, 38; CAT, 2023a, p. 5; IRENA, 2023, pp. 47–49, 65).
Fashion retailing	We could identify only few sector-specific decarbonisation milestones for the fashion retailing industry in existing literature. Teske (Teske, 2022; Teske *et al.*, 2023) provides global benchmarks for both the *textile and leather industry* and the *manufactured fibres and synthetic rubber*. Given that emissions in the fashion industry occur in various sectors, including agriculture and energy, we also compare fashion retailing companies to global economy-wide decarbonisation trajectories to reduce GHG and CO_2 emissions by 43% and 48% by 2030 respectively to stand a reasonable chance of limiting global warming to 1.5°C (IPCC, 2022).
Food and agriculture	We could identify only few sector-specific decarbonisation milestones for the agriculture and food industry in existing literature (Boehm *et al.*, 2021, pp. 129, 152, 2023, p. 125; Dietz *et al.*, 2022, p. 14; SBTi, 2022b, pp. 44–45; Teske, 2022, p. 328; Teske *et al.*, 2023 data in Dataset 2). We cannot use SBTi's Forests, Land and Agriculture (FLAG) guidance benchmarks to assess company's *emissions reduction* commitments as they integrally include land sequestration carbon dioxide removal (SBTi, 2022b, pp. 44–45). The TPI also allows companies in the food sector to rely on offsetting for target realisation but we interpret the benchmarks itself not relying on offsetting (Dietz *et al.*, 2022, p. 17). Therefore, we only consider these benchmarks to reduce emissions intensity by 52% by 2030 and 85% by 2050 to evaluate targets excluding offsetting. We also use sub-sector targets for the food and agriculture sector covering major emission sources (Roe *et al.*, 2019; Searchinger *et al.*, 2019; Boehm *et al.*, 2023, p. 125). We further compare companies in the agriculture and food industry to global economy-wide decarbonisation trajectories, including reductions of global methane emissions by 34% between 2019 and 2030 as particularly important for the global food and agriculture sector (IPCC, 2022).
Information and communication technology	We could identify few sector-specific decarbonisation milestones for the technology service industry in existing literature, especially for company's scope 3 emissions. Only SBTi provides benchmarks for ICT sector including mobile network operators, fixed networks operators and data centre operators (SBTi, 2020a, p. 9) . For this reason, we compare technology service companies to global economy-wide decarbonisation trajectories to reduce GHG and CO_2 emissions by 43% and 48%, respectively. These reduction levels are necessary to stand a reasonable chance of limiting global warming to 1.5°C (IPCC, 2022). Given that CO_2 is the most relevant GHG in the sector's emission profile with readily accessible decarbonisation options, we consider that companies should meet at least the global benchmark of a 48% CO_2 reduction below 2019 levels.
Oil and gas industry	**Development of new oil and gas fields and decrease in global production volumes** Several studies identify 1.5°C-aligned milestones to *not* develop any new oil and gas fields globally from 2021 / 2022 onwards (IEA, 2022a, pp. 20–21; 117; IISD, 2022, pp. iv–v; Teske, 2022, p. 319; CAT, 2023a). Several studies further identify 1.5°C-aligned benchmarks for the reduction in global oil and gas production volumes (UNFCCC, 2021, p. 17; IEA, 2022a, pp. 20–21, 117, 2023, pp. 117, 199; IISD, 2022, pp. iv–v; IRENA, 2023, pp. 47–49). **Emissions intensity of oil and gas companies (scope 1, 2, and 3)** The TPI provides emission intensity benchmarks for oil and gas companies for scope 1, 2, and 3 emissions from the use of sold products (Dietz, Gardiner, Hastreiter, *et al.*, 2021, pp. 9–10). The benchmark comprises all *energy products sold externally* by oil and gas companies including, for example, electricity generated from renewables (Dietz, Gardiner, Hastreiter, *et al.*, 2021, p. 13). The TPI allows oil and gas companies to rely on offsetting for target realisation but we interpret the benchmarks itself not relying on offsetting (Dietz, Gardiner, Hastreiter, *et al.*, 2021, p. 19). Therefore, we only consider these benchmarks to evaluate targets *excluding* offsetting. In August 2020, SBTi released a draft guidance for the oil and gas sector for public consultation (SBTi, 2020b). We do not consider this SBTi draft guidance.

Pulp and paper industry	We could identify only very few sector-specific decarbonisation milestones for the pulp and paper sector in the existing literature. Only the TPI provides emission intensity milestones for scope 1 and 2 for paper producers (Dietz, Irwin, Rauis, *et al.*, 2021). As for companies operating in the *food and agriculture sector*, we do not consider the 1.5°C-aligned benchmarks presented by SBTi's FLAG guidance for the assessment of companies in the pulp and paper sector. The FLAG guidance's benchmarks include both reductions and in-supply chain removals (SBTi, 2022b, pp. 44–45), the latter sometimes referred to 'insetting' within a company's value chain. SBTi explicitly acknowledges that the definition of insetting and its suitability towards emission reduction targets remains uncertain, but still allows for its use (SBTi, 2021c, p. 30, Box 3). We cannot use SBTi's FLAG guidance benchmarks to assess company's *emissions reduction* commitments as they integrally include emission removals. For these reasons, the assessment of pulp and paper companies currently requires a case-specific approach (e.g., considering the relevance of scope 3 emissions). Future research needs to put further emphasis on determining sector-specific decarbonisation milestones for the pulp and paper industry in line with the Paris Agreement across the sector's entire value chain.
Shipping	**Use of low emissions fuels** Several studies identify 1.5°C-aligned decarbonisation milestones for the use of low emissions fuels in international shipping (Smith *et al.*, 2021, p. 11; UNFCCC, 2021, p. 15, 2023a, p. 24; IEA, 2022a, p. 138, 2023, p. 94; Teske, 2022; Boehm *et al.*, 2023, p. 78). **Intensity of ocean activities (scope 1)** The TPI defines 1.5°C-aligned intensity benchmarks for the scope 1 emissions intensity of international shipping (Dietz, Byrne, Hastreiter, *et al.*, 2021, p. 14). **Absolute emission reductions of global shipping sector** Several studies identify 1.5°-aligned absolute emission reductions for the global shipping sector (IRENA, 2021; Teske, 2022, p. 333; CAT, 2023b; IEA, 2023, p. 196; SBTi, 2023b; Teske *et al.*, 2023) and one study identifies intensity emission reductions (Teske *et al.*, 2023 data in Dataset 2).
Steel industry	**Intensity of steel production (scope 1 and 2)** Several studies identify 1.5°C-aligned decarbonisation milestones for the emissions intensity for steel production covering scope 1 and 2 (CAT, 2020; Boehm *et al.*, 2021, p. 66, 2022, 2023, p. 61; SBTi, 2021a, 2021c, pp. 18, 27, 2022c, 2023c; Dietz, Amin, *et al.*, 2023, p. 22; Teske *et al.*, 2023 data in Dataset 2). Several studies identify separate global milestones for primary and secondary steel production (Dietz, Amin, *et al.*, 2023; Teske *et al.*, 2023) **Low-emission steel plants** Several studies identify global milestones to introduce low-carbon and near-zero steel plants by 2030 and 2050 (UNFCCC, 2021, p. 15, 2023a, p. 32; Delasalle *et al.*, 2022, p. 69; IEA, 2022a, pp. 20; 129).
Supermarket retail	We could not identify sector-specific decarbonisation milestones for the mixed-good retailer industry in existing literature. For this reason, we compare mixed-good retailers to available 1.5°C-aligned benchmarks for agriculture (see above under *Agriculture & Food*) and global economy-wide benchmarks. The latter require to reduce GHG and CO_2 emissions by 43% and 48% respectively to stand a reasonable chance of limiting global warming to 1.5°C (IPCC, 2022).

2.2 Assessment criteria

In line with the guiding principles in Section 2.1, we evaluate the specificity and sufficiency of emission reduction targets in companies' short-term targets (2023–2030), medium-term targets (2031-2040), and longer-term targets (beyond 2040), based on the assessment criteria in Table 5.

Table 5: Assessment criteria for the specificity and sufficiency of own emission reduction targets

OWN EMISSION REDUCTION TARGETS IN SHORT-, MEDIUM-, AND LONGER-TERM		
	TRANSPARENCY	INTEGRITY
	The target fulfils all the following criteria: ✓ Clearly specifies the scope coverage and target year; and ✓ Specifically commits to *own* emission reductions along the value chain that are independent from offsetting through carbon dioxide removals or emission reduction offsets.	The target fulfils all the following criteria, if applicable to the situation: ✓ Targeted emission reductions across the value chain (excluding offsetting or neutralisation plans) are in line with 1.5°C compatible trajectories or benchmarks for the sector, according to available literature. ✓ Targets are set with maximum 5-year intervals using terminology, scope and metrics that are directly comparable to other targets.
	The target fulfils all the following criteria: ✓ Clearly specifies the scope coverage and target year; and ✓ In the case of *net-zero* or *climate neutrality* targets, the company specifies what portion of that target will be achieved through emission reductions and the specific emission reduction commitment is commensurate with the deep emission reductions that the target terminology implies. This means it should be equivalent to at least 90% below 2019 levels, regardless of the target year (or at least 72% below 2019 levels for agriculture). This ensures that the net-zero terminology is not misleading, regardless of the target year, but it is not a measurement of sufficiency in terms of 1.5°C compatibility (assessed under integrity, compared to sector specific benchmarks).	Targeted emission reductions for most of the company's major emission sources are in line with 1.5°C compatible trajectories or benchmarks for the sector, according to available literature. For other emission scopes the sufficiency or insufficiency of targets cannot be confirmed.
	The target fulfils all the following criteria: • Clearly specifies the scope coverage and target year; and • In the case of *net-zero* or *climate neutrality* targets, the company specifies what portion of that target will be achieved through emission reductions. • In the case of *net-zero* or *climate neutrality* targets, the specific emission reduction commitment is only partially commensurate with the deep emission reductions that the target terminology implies (50–90%, or 50–72% in the case of agriculture, regardless of the target year), and this terminology may therefore be quite misleading. This is not a measurement of sufficiency in terms of 1.5°C compatibility (assessed under integrity, compared to sector specific benchmarks).	Targeted emission reductions for at least one of the company's major emission sources are in line with 1.5°C compatible trajectories or benchmarks for the sector, according to available literature. For other emission scopes the sufficiency or insufficiency of targets cannot be confirmed. <OR> Targeted emission reductions for most of the company's major emission sources are *nearly* in line with 1.5°C compatible trajectories or benchmarks for the sector, according to available literature (based on expert judgement).
	The target fulfils all the following criteria: • Clearly specifies the scope coverage and target year; and • In the case of *net-zero* or *climate neutrality* targets, the company specifies what portion of that target will be achieved through emission reductions. • In the case of *net-zero* or *climate neutrality* targets, the terminology is potentially very misleading because the company only targets minor emission reductions (<50%, regardless of the target year). This is not a measurement of sufficiency in terms of 1.5°C compatibility (assessed under integrity, compared to sector specific benchmarks).	Targeted emission reductions translate to a significant reduction in emissions across the value chain compared to 2019 levels, but fall well short of 1.5°C compatible trajectories or benchmarks for the sector.
	The communication of the company's target is not clear about the scope coverage or does not prominently specify what portion of that target will be achieved through emission reductions.	The company commits to no specific emission reduction target, or the emission reduction target actually translates to a very limited reduction in emissions across the value chain compared to 2019 emission levels.
?		The information provided does not facilitate an assessment; or the absence of sectoral decarbonisation benchmarks do not allow to determine whether a company's target is aligned with a 1.5°C trajectory for the sector at this point in time.

Rating: High | Reasonable | Moderate | Poor | Very poor

3 Reducing own emissions

Encompassing measures for deep emission reductions are the backbone of ambitious corporate climate targets. As companies' emissions profiles vary widely, there is not a standardised set of measures that all companies can implement. The integrity and robustness of companies' decarbonisation efforts must be considered against each company's circumstances and emission profile (*Section 3.1.1*).

Electricity-related emissions are relevant for all companies to address and are often a central feature of companies' plans and claims. For this reason, we single out renewable electricity procurement for deeper assessment (*Section 3.1.2*). Companies across various sectors present bioenergy as a mitigation measures, rather than switching to non-combustible renewable energy sources, like wind and solar. As bioenergy is not an emissions-free source and has a range of negative sustainability implications, *Section 3.1.3* sets out guiding principles for reliance on bioenergy.

3.1 Guiding principles

3.1.1 General principles for emission reduction measures

Corporate actors must implement encompassing and deep decarbonisation measures. Decarbonisation efforts should focus on all relevant emission sources across all three scopes. Adopting readily available measures should be the first priority for companies that claim to be on a decarbonisation pathway, followed by the scaling up of proven flagship projects and—if necessary—investments in research and development to find new decarbonisation solutions. The HLEG recommendations emphasise the need for corporate actors to set out transition plans which refer to credible 1.5°C-compatible sector pathways, and demonstrate how the specific actions they plan to implement will result in the achievement of their short-, medium- and long-term targets (UN HLEG, 2022, p. 21). Demonstrated emission reduction measures vary per sector, although electrification and renewable energy are relevant for many sectors. For instance, this includes a switch from combustion engines to electric vehicles in the automobile sector, and e-fuels instead of fossil-based fuels in the shipping sector. In addition, technological and operational efficiency improvements are necessary steps for every company. Further, companies should have a clear plan to phase out all carbon-intensive infrastructure and products. Net zero is a disingenuous vision for companies that continue to invest in and rely on fossil fuels. Ambitious companies should plan for and implement a set of measures that leads to complete or near decarbonisation of their activities, depending on the sector they are active in.

Transparent disclosure and information sharing can support replication and the identification of new solutions. Companies can show real climate leadership by prioritising transparent exchange on climate change mitigation over industry competition, to support replication of effective measures and to collaborate for the identification of new solutions. Reports that refer to individual flagship projects may potentially inspire readers, but further details are required to support replication and facilitate an assessment of the company's ambition. Companies' planned measures can only be fully appraised if their plans contain details on the scale of planned measures using indicators that demonstrate what proportion of a company's activities will be addressed by the measures, and what the anticipated impacts are for reductions in GHG emissions.

3.1.2 Renewable electricity procurement

3.1.2.1 Coverage of claims and targets

Renewable electricity targets send a clear signal for the need to switch from carbon-intensive sources to lower-carbon alternatives. Reducing global emissions to net zero by 2050 requires a transformation of the power sector and a rapid shift to renewable electricity. Given their scale and influence, large companies can help drive the energy transition and unlock additional renewable electricity generation capacity. Renewable electricity targets provide companies with an incentive to start planning for and investing in new renewable electricity capacity today.

Claims about renewable electricity consumption today should be clear and easy to understand for investors and consumers. Companies can report on their renewable electricity consumption in various ways. Some companies report on total consumed renewable electricity, which includes the share of renewable electricity on the grid, on-site installations and renewable electricity sourced through a number of procurement constructs. Other companies report on *direct procured electricity*, which reflects how much of their electricity consumption comes from Power Purchase Agreements. Corporates may also claim to have invested in a certain number of megawatt installed capacity. To avoid confusion, companies should be clear about the coverage of their claims and provide sufficient context for consumers and investors to understand the meaning of these claims.

Targets for 100% renewable electricity should be aligned with benchmarks for decarbonising the power sector. According to the IEA (2023), advanced economies should achieve overall net-zero emissions from electricity by 2035, with the rest of the world following in 2040. This means that companies with the majority of their operations in OECD countries should commit to 100% renewable electricity by 2035 at the latest, while companies in other parts of the world should reach this milestone no later than 2040.

The significance of renewable electricity targets may be undermined if not accompanied by commitments to electrify all energy-intensive processes that can be electrified. Some sectors continue to emit a large volume of CO_2 emissions from direct fuel combustion, although in many cases the energy consuming processes could be powered by renewable energy directly, or electrified. The electrification of such processes is a key climate change mitigation measure in many sectors. Renewable electricity targets could be very misleading if a company consumes a high proportion of other energy carriers, such as fossil gas or heat. Renewable electricity targets could especially be misleading if a company could feasibly electrify these processes. To avoid this pitfall, companies should ensure that renewable electricity targets are accompanied by commitments to electrify all energy-intensive processes that can be electrified.

3.1.2.2 Procurement constructs

Companies can help drive grid decarbonisation if they pursue high-impact procurement options for renewable electricity. Decarbonising the power sector is the backbone to decarbonising most economic sectors and requires rapid development of additional renewable electricity generation and storage capacity. No company can bring its emissions to zero without investing in renewable electricity. Companies take varying approaches to sourcing renewable electricity (*see Table 6 below*), including on-site capacity, Power Purchase Agreements (PPAs) and standalone Renewable Energy Certificates (RECs). While the causal relation between procurement approaches and additional capacity on the grid is hard to prove, on-site installations and Power Purchase Agreements are generally more likely to contribute to grid decarbonisation than standalone RECs *(see each construct below for further details).*

On-site generation

On-site renewable electricity generation with on-site storage offers the best guarantee that companies use renewable electricity without placing a significant burden on grid infrastructure. This approach reduces scope 1 emissions in the case that those renewable energy technologies replace existing on-site fossil-fuelled generators. Scope 2 emissions are reduced in the case that new renewable energy installations shift energy demand away from external energy procurement, bringing renewable energy generation under the direct control of actors (NewClimate Institute and Data-Driven EnviroLab, 2020). Companies that have on-site installations, but no storage systems are very likely to continue to rely on the local grid. For instance, companies might need to inject surplus electricity into the grid or consume grid electricity when their demand is higher than their electricity generation. Therefore, the option of on-site generation with on-site storage is preferable and more likely to guarantee that companies use renewable electricity for their activities.

Power Purchase Agreements

Higher quality PPAs may lead to additional renewable electricity capacity and fewer GHG emissions. A PPA is a long-term contract between an electricity provider and an electricity consumer, usually spanning 10-20 years. The consumer agrees to purchase a certain amount of electricity from a specific asset under a pre-determined pricing arrangement. PPAs are generally signed with new renewable energy installations and can form part of the project investment decision (NewClimate Institute and Data-Driven EnviroLab, 2020). PPAs can also be signed for existing installations, in which case it is less likely that the PPA results in additional renewable electricity capacity. However, existing installations could cease operations if the operator cannot sign a new PPA. While PPAs have contributed to the development of additional renewable electricity capacity in the past, the falling costs of renewable electricity generation as well as the current high electricity prices, could mean that PPAs are becoming less relevant in the decision to invest or not invest in renewable electricity project.

Procuring renewable electricity is easier in some geographies than in others, but accessibility to PPAs is improving in recent years. There are regional differences with regards to the availability of higher quality procurement constructs, such as PPAs. In many areas of North America and Europe, it is usually relatively straightforward to sign a PPA or connect a private installation to the local grid. In contrast, it has been very complicated for corporates to sign PPAs or set up their own installations in many East and Southeast Asian countries, when the electricity markets are monopolised. At the same time, we also see significant progress in removing these barriers since over the past two years. For instance, recent regulatory reforms in South Korea and Taiwan considerably improved the conditions for major companies to access PPAs (Chung-Hua Institution for Economic Research, 2022; Mayer Brown, 2022a; PwC, 2022; Shin & Kim, 2022). Through 2022 and 2023, a pilot programme for direct PPAs was introduced in Vietnam (Mayer Brown, 2022b; Vietnam Business Law, 2023), while a pilot programme in China continued to be upscaled across more areas of the country (Hao *et al.*, 2023). In 2022, companies signed PPAs for large-scale renewable power installations in Indonesia (Enerdatics, 2022) and Bangladesh (Envision Energy, 2022). The collaborative PPA announced by TSMC in Taiwan in 2023 shows that there are ways to make higher quality renewable procurement accessible when legislation and bureaucracy represent barriers.

Utility green tariffs

High-quality utility green tariffs can bring the advantages of PPAs into a more scalable model, but the same terminology can also be used to simply refer to the procurement of standalone RECs from a utility.

There is a not a single definition of utility green tariffs. In several states in the USA, commercial consumers and energy utilities can agree contracts for bundled renewable electricity from specific installations against a utility tariff rate. These long-term contracts have the advantage that the utility manages the development of new contracts with renewable electricity operators under conditions similar to PPAs, but without off-takers needing to build inhouse expertise on electricity markets to arrange those PPAs directly. This may be a more scalable approach than corporate PPAs, since it is more accessible to smaller organisations, but – as for PPAs – the quality of this approach depends on the details with regards to how it is implemented, such as whether it focuses on new installations only, and whether it is based on long-term contracts.

In contrast to potentially high-quality utility green tariffs, the same terminology can *also* mean that consumers buy fossil-generated electricity bundled with third-party generated RECs from their energy utility. In such cases, we consider this simply a form of procuring standalone RECs, and an unsuitable procurement option to reduce electricity-related emissions.

Investments in RE

Investments in renewable electricity capacity are likely to lead to additional renewable energy capacity but are not necessarily a suitable approach to reduce electricity-related emissions. Investments in renewable electricity projects are a business case in their own right. Companies can only claim a neutralisation of own electricity-related emissions if they set up an agreement to procure the electricity and RECs from the new installation they invested in. Only in this situation, other parties cannot enter into agreement to claim renewable energy from those installations (NewClimate Institute and Data-Driven EnviroLab, 2020). Without the guarantee that other actors cannot claim the renewable electricity, there is a high risk of double counting renewable electricity.

Premium

Energy suppliers can charge a premium on top of the electricity price (USD/KWh) that is dedicated to the construction of additional renewable electricity capacity. Such a premium can be bundled with any form of energy procurement model, such as RECs or a PPA, regardless of the volume of energy procured. More ambitious electricity providers offer their clients an independently verified guarantee that their electricity generation stems from renewable energy installations not older than five or ten years (NewClimate Institute and Data-Driven EnviroLab, 2020). A capacity expansion premium alone cannot underpin the claim of the neutralisation of current electricity emissions, but rather it can be add-on to improve the quality of any other energy procurement model and contribute to more renewable electricity capacity in the near future.

Standalone RECs

Standalone Renewable Energy Certificates (RECs) – also known under various names, such as Guarantees of Origin (GOs) or Energy Attribute Certificates (EACs) – often do not contribute to additional renewable electricity capacity. They are not a suitable approach for corporates to address electricity-related emissions. RECs can serve as an important accounting tool when acquired alongside other renewable electricity procurement constructs, such as PPAs, or may be procured as standalone RECs. We define ***standalone RECs*** as the procurement of RECs *without* any accompanying renewable electricity procurement construct, such as a PPA. The impact of standalone RECs is highly questionable. While the purchase of standalone RECs could in theory send a signal to investors that there is demand for renewable energy, studies indicate that standalone RECs have historically contributed very little to the development of additional renewable energy installations in Europe and the USA (Hulshof *et al.*, 2019). Oversupply of certificates and associated low prices, along with implicit double counting, are key reasons for this problem. For example, in Europe there is an oversupply of RECs at low prices that mostly stems from decades-old hydropower installations in Scandinavia (Hulshof *et al.*, 2019; NewClimate Institute and Data-Driven EnviroLab, 2020).

The very unlikely impact of standalone RECs can have substantial consequences for the credibility of corporate claims related to renewable energy consumption and GHG footprint. Bjørn *et al.* (2022) found that the use of RECs by companies with SBTi-approved reduction targets leads to an inflated estimate of those companies' abatement efforts. The researchers concluded that 42% of committed scope 2 emission reductions may not result in real-world mitigation (Bjørn *et al.*, 2022).

Recent studies suggest that consumers' demand for RECs and their willingness to pay may increase, which could lead to the development of additional renewable electricity installations in the future. For instance, one study modelling the impacts of future corporate procurements in northern Europe found that a high and stable price for RECs can have a positive effect on future renewable electricity generation (Martinsen and Mouilleron, 2020). However, according to this study, the majority of future renewable electricity generation would continue to take place in the absence of a market for RECs, meaning that the procurement of one 1MWh certificate leads to *additional* generation of less than 1MWh (Martinsen and Mouilleron, 2020).

The sale of RECs displaces more carbon-intensive energy to other consumers. When a customer purchases RECs, the actual energy mix that a certificate owner receives does not change, nor does the energy mix in the grid. If fossil-fired power plants and renewable energy technologies feed electricity into a grid, the actors who draw from that grid would all receive a combination of renewable- and fossil-fired electricity. Consequently, if the owner of a renewable energy generation facility were to sell RECs to one actor, that actor may claim a lower grid emission factor to determine its scope 2 GHG emissions but would still continue to receive the same combination of renewable- and fossil-fired electricity. Other customers on the same grid need to apply a higher grid emissions factor, so their reported electricity-related emissions will increase (NewClimate Institute and Data-Driven EnviroLab, 2020).

RECs are often differentiated according to whether or not they are bundled or unbundled with the electricity that a company consumes:

- **Unbundled RECs:** the consumer purchase RECs on the spot market from a third party, separately from the purchase of electricity from another supplier.
- **Bundled RECs – third-party generated:** the consumer purchases electricity and RECs from one and the same supplier, but this supplier has procured the RECs from a third party. In this situation, the supplier may sell fossil fuel power electricity and green it with the sale of RECs.
- **Bundled RECs – supplier generated:** the consumer purchases renewable electricity and associated RECs from one and the same supplier.

We observe that definitions of bundled and unbundled are not always consistent. We also consider that the aforementioned issues with RECs are often relevant regardless of whether those RECs are described as bundled or unbundled. Accordingly, for our methodology and analysis, we do not identify RECs according to this terminology, but rather we differentiate between the procurement of "**standalone RECs**", and RECs that are used as an accounting tool alongside other constructs for procuring renewable electricity.

Table 6: Likelihood of contributing to additional renewable capacity

RENEWABLE ENERGY PROCUREMENT CONSTRUCT	LIKELIHOOD OF ADDITIONAL CAPACITY	
Own RE installation with storage capacity	●	Constructs ensure the installation of capacity that would not have come online otherwise. New storage solutions in combination with these new installations can help reducing the impact on the local grid and support 24/7 matching of demand and supply. However, in most cases, companies still rely on the local grid when their generation and storage does not cover their demand. They should use the location-based emissions factor for the emissions reporting for the energy that is consumed directly from the grid. The emissions factor for the energy that they generate themselves may be zero.
Own RE installation without storage capacity	●	
Power Purchase Agreement (PPA)	● ◐ ◌	PPAs can contribute to additional capacity if the PPA is signed with a new RE installation and provides the energy provider with the necessary financial security to go ahead with the construction of the installation. To contribute to reducing a company's energy-related emissions, it is necessary that the PPA is signed for an installation connected to the same electricity grid as the company's facilities. To avoid double claiming of renewable electricity, companies should acquire RECs from the RE installation for which they signed a PPA. PPAs are unlikely to contribute to the installation of additional capacity if the PPA is signed for an existing installation (unless the energy provider would need to shut down the installation in the absence of a new PPA). PPAs that are signed for an installation in a different geographical area may lead to additional capacity but do nothing to reduce emissions on the company's local energy grid. PPAs do not lead to a direct and immediate reduction of emissions from the consumed electricity at all times of the day. Electricity is still procured from the grid, supplied by a mix of generation technologies. The emission impact is not comparable to a reduction in electricity demand through energy efficiency measures. A location-based emissions factor should be used to accurately indicate the emissions impact associated with electricity consumption.
Utility green tariffs	● ◐ ◌	There is a not a single definition of utility green tariffs. In several states in the USA, commercial consumers and energy utilities can agree contracts for bundled renewable electricity from specific installations against a utility tariff rate. These long-term contracts have the advantage that the utility manages the development of new contracts with renewable electricity operators under conditions similar to PPAs, but without off takers needing to build inhouse expertise on electricity markets to arrange those PPAs directly. This may be a more scalable approach than corporate PPAs, since it is more accessible to smaller organisations, but – as for PPAs – the quality of this approach depends on the details with regards to how it is implemented, such as whether it focuses on new installations only, and whether it is based on long-term contracts. In contrast, a "utility green tariff" can also mean that consumers buy fossil-generated electricity bundled with third-party generated RECs from their energy utility. We consider this simply a form of procuring RECs and an unsuitable procurement option to reduce electricity-related emissions.
Capacity premium	● ◐ ◌	The likelihood of a capacity premium leading to additional capacity can be considered high, moderate or low depending on the integrity of the entity that collects the capacity premium and on the construct (see this table's overview) for which the collected funds are invested in.
Standalone RECs	◌	While some claim that RECs may signal to the market that there is demand for renewable electricity, studies have found no evidence that the procurement of RECs leads to the development of additional renewable electricity capacity (Bjørn *et al.*, 2022). Standalone RECs have a low likelihood of contributing to additional RE capacity. The theoretical case for the procurement of standalone RECs to send a signal for additional capacity may be stronger in markets with very limited existing renewable electricity capacity, but we also cannot identify any clear evidence of this. Even if the circumstances exist for standalone RECs to send a signal for additional capacity, this would not lead to a direct and immediate reduction of emissions from the consumed electricity at all times of the day. Electricity is still procured from the grid, supplied by a mix of generation technologies. The emission impact is not comparable to a reduction in electricity demand through energy efficiency measures. A location-based emissions factor should be used to accurately indicate the emissions impact associated with electricity consumption.
Investments in renewable energy installations		Investments in renewable energy capacity are a business case. They can be combined with a PPA or RECs.

3-point rating scale: ● High ◐ Moderate ◌ Very poor

3.1.2.3 Matching renewable electricity

Matching electricity consumption with renewable electricity generation on an annual basis has significant limitations. Most companies with 100% renewable electricity targets procure as much renewable electricity as they consume within a given year. While this approach has helped the energy transition in its initial phases, it does not lead to full grid decarbonisation because the wind or solar generation that a company purchases will in most cases not align with the timing of the company's electricity consumption (Miller, 2020; Xu *et al.*, 2023). For instance, a company with a PPA for a solar park does not receive sufficient electricity from this installation on cloudy days or during the night. Several studies found that annual matching results in limited or even zero emission reductions, amongst others, because the renewable electricity that companies procure is *not additional* and would have been generated anyway (de Chalendar and Benson, 2019; Xu *et al.*, 2023). Further, in some regions, renewable electricity procured to meet annual matching requirements displaces other renewable electricity projects (Xu *et al.*, 2023).

Hourly matching (also referred to as 24/7 matching or temporal matching) can help drive grid decarbonisation. Some companies have recognised the limitations of annual matching and are moving to hourly matching (e.g. Google and Microsoft). Companies that commit to match their electricity consumption with the generation of renewable electricity on an hourly basis provide a critical demand pull for additional and novel renewable energy generation and storage technologies that will be necessary to completely decarbonise power systems (Xu *et al.*, 2023). The hourly matching approach also requires companies to consider when to use electricity (i.e. when generation peaks) and may lead to efficiency improvements.

Carbon accounting should accurately reflect how much renewable electricity a company uses. Ultimately, carbon accounting should provide companies and externals with a thorough and granular understanding of the company's climate impact and electricity consumption footprint. Annual accounting allows companies to claim renewable electricity that they do not use, which gives a wrong impression of the company's climate impact and distracts from the fact that the majority of companies still rely on carbon-intensive electricity grids. Accounting based on hourly matching more accurately reflects companies' electricity footprint.

3.1.3 Reliance on bioenergy

Companies demonstrating climate leadership plan and take decarbonisation measures that do not rely on bioenergy when possible; and ensure that any bioenergy they use does not have negative sustainability implications. Some sectors that are difficult to electrify and have limited alternatives to decarbonise might rely on bioenergy to some extent, for instance aviation, maritime shipping and heavy industry (Calvin *et al.*, 2020; Clarke *et al.*, 2022). However, increasing demand for bioenergy in industries where the mitigation potential of existing technologies remains limited will lead to competition for limited biomass resources (see e.g. Pavlenko and Kharina, 2018; ETC, 2021), which is likely to further exacerbate sustainability issues. It is estimated that sustainable biomass supply will amount to just 40 to 60 EJ per year by 2050, whereas potential *demand* could amount to over 65 EJ per year in just four sectors (wood materials, pulp and paper, plastic feedstocks and aviation) and higher if including other sectors that are also currently planning to rely on biomass in their decarbonisation trajectories (ETC, 2021).

Companies should therefore use alternative technologies that do not depend on combustion where those exist. If such alternative technologies are likely to emerge in the future, companies should consider using bioenergy only as a *temporary* solution and invest the development of alternative technologies at the same time.

The production of bioenergy may negatively impact food security, water resources and biodiversity (Calvin *et al.*, 2020; Clarke *et al.*, 2022). Large-scale bioenergy generation has adverse sustainability impacts, with the possible exception of biofuels from artificially cultivated algae. For instance, bioenergy production can lead to or exacerbate food insecurity, lead to deforestation, cause biodiversity loss, induce water scarcity and lead to contamination of freshwater resources.

- **Bioenergy can threaten food security through increased food prices and lower food production** (Calvin *et al.*, 2020; Ahmed *et al.*, 2021; Clarke *et al.*, 2022). Growing bioenergy crops may directly conflict with the production, availability, and price of food and feed crops. Increasing demand for bioenergy crops means that less land is available to produce food and feed, potentially leading to increased prices and lower production of food and feed stocks. At the same time, at an individual and community level, growing bioenergy crops may reduce poverty and ensure stable incomes in low-income countries, which could enhance food security (Calvin *et al.*, 2020).
- **Bioenergy production can harm biodiversity and ecosystems** (Kline *et al.*, 2015; Hof *et al.*, 2018; Clarke *et al.*, 2022; Hanssen *et al.*, 2022). For instance, forests may be cut down to use the wood for energy production or lands may be cleared and turned into agricultural land to grow biofuel crops. This likely has a range of implications, including a loss of habitat and soil erosion (Camia *et al.*, 2021; Hanssen *et al.*, 2022). However, planting bioenergy crops on degraded land may reduce emissions on the short term and improve soil fertility and ecosystems (Calvin *et al.*, 2020; Camia *et al.*, 2021).

- **Bioenergy production can induce water scarcity** (Stenzel *et al.*, 2021). The production of food and feed crops and woody biomass requires large amounts of water, which is a scarce resource in many regions. Water needs for bioenergy production may directly compete with food and feed production and sustaining ecosystems.

- **Using fertilisers to produce bioenergy crops may lead to water contamination** (Adeniyi *et al.*, 2018; Calvin *et al.*, 2020). The cultivation of food crops, such as oil palm and sugarcane, and algae requires nitrogen and phosphorus fertilisers. Fertiliser use may contaminate water sources, which can lead to oxygen depletion and algae bloom. This may have various consequences, including suffocating fish and poisoning of animals and humans drinking the water.

- **Third generation biofuels from artificially cultivated algae are the only type of bioenergy that can be produced at scale with limited negative effects.** Algae can be cultivated in open or closed systems. Open systems are easier and less expensive to build but face several sustainability challenges. As the system is open, other microalgae, bacteria and fungi may contaminate the water and there may be large water losses due to evaporation. There is also the risk of fertiliser leakage, which can contaminate ground water and lead to algae bloom in water bodies (Usher *et al.*, 2014; Beacham *et al.*, 2017). Further, the construction of open systems requires water and land, although significantly less than the production of other biomass feedstocks. Closed systems are more expensive than open ones but face fewer sustainability risks. However, leakage and spills may still occur (Beacham *et al.*, 2017).

Bioenergy is not an emissions-free energy source. Bioenergy is not a carbon neutral energy source and companies that use bioenergy need to apply emission factors when reporting on their energy emissions. Emissions may occur, for example, when land with a high carbon stock is cleared to produce bioenergy crops, when converting biomass into fuels or electricity and when transporting bioenergy crops to where they are consumed.

- Bioenergy production may lead to **direct land use emissions** if areas with high carbon stock (e.g. forests, wetlands) are converted into agricultural land to produce bioenergy crops (Calvin *et al.*, 2020). **Indirect land use emissions** may occur when as a result of increasing demand for bioenergy crops, existing agricultural lands are now used to produce bioenergy crops and natural areas are converted to produce food and feed crops.

- Harvesting forest residues results in the **release of carbon stored in the soil** (Achat *et al.*, 2015; Repo *et al.*, 2015; James and Harrison, 2016; Searchinger *et al.*, 2022). Creating revenue streams from forest residues may further incentivise the conversion of forestry land to crop land.

- **Biomass combustion** results in CO_2 emissions, as well as other air pollutants. Although this can potentially be counterbalanced with carbon sequestration by newly planted trees on the longer term, there will be higher CO_2 levels in the atmosphere for decades (Searchinger *et al.*, 2018).

- **Converting biomass into electricity or fuels is an energy-intensive process** (Clarke *et al.*, 2022).

- **Converting feedstocks with high oxygen levels (e.g. sugars and most biomass) to drop-in biofuels requires increased processing and greater volumes of hydrogen.** The source of hydrogen has a key impact on the lifecycle emissions of the final drop-in fuel (Dyk *et al.*, 2019). The supply of hydrogen may also be problematic in its own right, as demand for hydrogen across various sectors will likely increase exponentially in the coming years and its production is resource and energy intensive.

- Like for fossil fuels, demand for bioenergy is not necessarily located at the same place where crops are grown (Clarke *et al.*, 2022). **Transport of crops or biofuels** to where they are consumed leads to emissions.

Land used to grow bioenergy crops cannot be used for other purposes, such as sequestering carbon directly (Searchinger *et al.*, 2022). **This carbon opportunity cost of land should be factored in when calculating the net impact of bioenergy. Using woody biomass to generate energy risks overshooting the carbon budget in the near to medium future.** Given that global CO_2 emissions must reduce by almost 50% between 2019 and 2030 to stand a reasonable chance of limiting global warming to 1.5°C 2030 (IPCC, 2022), using woody biomass as an energy source is problematic. Cutting down trees to produce heat, electricity, or biofuels leads to the release of sequestered carbon; it can take several to hundreds of years to balance out this release of CO_2, depending on the type of trees used (Holsmark, 2012; Mitchell *et al.*, 2012; Ter-Mikaelian *et al.*, 2015; Searchinger *et al.*, 2018). Creating a "carbon debt" hinders realising the necessary emission reductions by 2030.

While use of wood residues does not necessarily lead to the *additional* release of CO_2 into the atmosphere (Madsen and Bentsen, 2018), companies demonstrating climate leadership do not pursue this pathway. Supply of sustainable wood residues is limited; an increase in demand from companies may push others to unsustainable biomass supply. In addition, harvesting forest residues is very likely to result in the release of carbon sequestered in soils (*see above*).

While BECCS can provide negative emissions, its potential is limited by sustainability concerns and insufficient to balance emissions from all industries. Bioenergy can be combined with carbon capture and storage (BECCS) to realise negative emissions, but its potential is constrained by scarcity of land and the limited number of geologic storage sites and environmental concerns (Hanssen *et al.*, 2020, 2022). BECCS' abatement potential is also highly dependent on the area where the biomass is cultivated, and the technologies used to convert biomass into energy. Further, BECCS is not yet available at scale and upscaling the technology from its current demonstration phase is challenging (Hanssen *et al.*, 2020).

Because of the limited number of storage sites, BECCS should be treated as a scarce resource and its mitigation potential should not be claimed by individual companies to neutralise their emissions footprint (*see also sections 4.1.3 and 4.1.4*). Instead, companies demonstrating climate leadership pursue a range of proven measures that lead to emission reductions on the short term.

3.2 Assessment criteria

3.2.1 Scope 1 and Scope 3 emission reduction measures

In line with the guiding principles above, the evaluation of companies' emission reduction measures is based on the assessment criteria in Table 7 below. These are in line with the guiding principles above. We assess the use of bioenergy as part of companies' emission reduction measures when bioenergy replaces fossil fuel energy in direct combustion processes (Table 8). For instance, if companies use biomass instead of coal to fire their factories or use biofuels for their ships, aircraft or vehicles. In some cases, companies may claim to procure renewable electricity based on bioenergy.

Table 7: Assessment criteria for companies' emission reduction measures (assessed individually for scope 1 (3A), scope 3 upstream (3C) and scope 3 downstream (3D)).

EMISSION REDUCTION MEASURES

The methodology below is based on measures identified as most relevant **for transition plans in a sector**, particularly t**hose that we identify as *critically* relevant. Critically relevant measures are those that we consider an essential component of credible 1.5 °C compatible transition plans for the specific sector; without these measures a company's plans are severely undermined and cannot be aligned with the 1.5°C Paris Agreement limit.**

For each of the sectors that we assess in our analysis, we synthesise the scientific literature to identify and compile overviews of the most relevant measures for the sector and identify the 'critically relevant measures. The Corporate Climate Responsibility Monitor 2024 covers the automotive, electric utilities, fashion, and food and agriculture. The respective overviews are provided in section B of the CCRM 2024 report (NewClimate Institute, 2024a).

Rating	TRANSPARENCY	INTEGRITY
		The overall integrity of emission reduction measures is based on expert judgement following the assessment of all the individual measures identified as most relevant for the sector, using the following criteria.
High	The company provides **detailed** information on **all** of the relevant measures identified for the sector. *('Detailed information' includes data that provides a clear indication of the depth and coverage of the measure.)*	• The measure is adopted or planned for the near future. • The measure is mainstreamed across the entire company. • The measure is implemented to a depth that is likely to be 1.5°C-compatible, according to the available scientific literature.
Reasonable	The company provides **detailed** information on **most** of the relevant measures identified for the sector, including **all critically relevant** measures.	• The measure is adopted or planned for the near future. • The measure is partially implemented across most of the company. • The measure is implemented to a depth that is likely to be 1.5°C-compatible, according to the available scientific literature.
Moderate	The company provides **detailed** information on **some** of the relevant measures identified for the sector, including **all critically relevant** measures.	• The measure is adopted or planned for the near future. • The measure is only implemented/piloted in selected parts of the company. • The measure is implemented to a depth that may be partially 1.5°C-compatible, according to the available scientific literature.
Poor	The company provides **detailed** information on **some** of the relevant measures identified for the sector, but **not all critically relevant** measures.	• The measure is adopted or planned for the near future. • The measure is only implemented/piloted in selected parts of the company • The measure is implemented to a depth that is unlikely to be 1.5°C-compatible, according to the available scientific literature.
Very poor	The company does not provide detailed information for any of the critically relevant measures.	• The measure is not adopted or planned for the future.
?		The company's measures are unclear, and no assessment is possible.

Rating: High | Reasonable | Moderate | Poor | Very poor

Table 8: Assessment criteria for bioenergy

EXTENSION TO 3A, 3C AND 3D – BIOENERGY	
When companies refer to significant plans for bioenergy, we assess the extent to which these plans could undermine the emission reduction measures assessed in Table 7, with the following logic	
CONDITIONS	**EXTENT TO WHICH PLANS MAY UNDERMINE OTHER EFFORTS**
• The company operates sector where the technical mitigation potential of existing technologies remains limited and with very limited opportunities to electrify • Bioenergy is one of several decarbonisation measures that a company pursues • The bioenergy that a company uses does not have direct or indirect negative sustainability implications.	Plans may be reasonable and may not undermine other potential efforts.
• The company does not operate in a sector where the technical mitigation potential of existing technologies remains limited, and has alternatives to decarbonise its activities <OR> • The bioenergy has or is very likely to have negative sustainability implications	Plans are less reasonable and may significantly undermine other potential efforts.
The company provides no or very limited information	The extent to which plans are likely to undermine other potential efforts are unclear.

3.2.2 Renewable electricity procurement (scope 2)

In line with the guiding principles above, our evaluation of companies' renewable electricity procurement is based on a combination of three distinct aspects: the *coverage/share* of renewable electricity procured; the quality of the *procurement construct*; and the *method for matching* renewable electricity to electricity consumption.

We assess the approaches that companies pursue today towards the realisation of their targets. This may deviate from the approaches that companies have pursued in the past.

The assessment criteria for these sub-components are set out in Table 9 and Table 10.

Table 9: Assessment criteria for transparency of renewable electricity procurement

PROCUREMENT OF RENEWABLE ELECTRICITY - TRANSPARENCY

The transparency rating is based on the average ratings across the 3 columns that make up the sub-components of this assessment.
The transparency rating is based on the company's own communication, including its website and public reports, but does not consider non-public information such as CDP climate change disclosures.

	COVERAGE OF CLAIMS AND TARGETS	PROCUREMENT CONSTRUCT	MATCHING METHOD
High	• The company clearly communicates the scope of the claim. • When other major energy carriers exist, the company clearly communicates the limited relevance of electricity compared to other energy carriers in own operations. *(The relevance of other energy carriers is determined at the sector level, through the judgement of the authors)*	The company provides thorough details on the renewable electricity constructs it pursues and plans to pursue to meet its future target. This includes details on the following: • Type of renewable electricity/supply construct • Location of renewable electricity generation capacity for each construct • Volume of electricity procured through each construct. • Agreements regarding the bundling (or cancellation) of any associated certificates.	The company explicitly states what accounting method it uses to match its electricity consumption with the generation of renewable electricity <AND> The company clearly communicates any relevant limitations associated with this accounting method.
Reasonable	N / A	The company provides some details on the pursued renewable electricity constructs, but only three of the criteria above are met.	N / A
Moderate	The company communicates the scope of its claims and targets, but only with respect to existing electricity consumption, and without clarity on the relevance of electricity consumption compared to other energy consumption.	The company provides some details on the pursued renewable electricity constructs, but only two of the criteria above are met.	The company explicitly states what accounting method it uses to match its electricity consumption with the generation of renewable electricity <BUT> The company does not communicate any relevant limitations associated with this accounting method.
Poor	N / A	The company provides very limited details on the pursued renewable electricity constructs. Only one of the criteria above is met.	It can be reasonably determined which accounting method the company uses to match its electricity consumption with the generation of renewable electricity, although this is not explicitly stated.
Very poor	The company's communication is not clear about the scope coverage.	No information identified.	It is not clear what the accounting method is. The company provides no information on REC vintage.

Rating: High | Reasonable | Moderate | Poor | Very poor

Table 10: Assessment criteria for integrity of renewable electricity procurement

PROCUREMENT OF RENEWABLE ELECTRICITY - INTEGRITY

The integrity rating is based on the average ratings across the 3 columns that make up the sub-components of this assessment.

	COVERAGE OF CLAIMS AND TARGETS	PROCUREMENT CONSTRUCT	MATCHING METHOD
	• Claims and targets cover all operational electricity consumption. • Claims and targets are in line with benchmarks for decarbonising the power sector. For OECD countries, this means 100% renewable electricity by 2030. • Where relevant, the renewable electricity target is accompanied by a commitment to electrify all energy processes that can be electrified.	Over 95% of **procured** renewable electricity comes from high quality constructs (see Table 6)	The company matches its electricity consumption with the generation of renewable electricity 24/7 (on an hourly basis or less).
	• Claims and targets cover all operational electricity consumption. • Claims and targets years are nearly aligned with benchmarks for decarbonising the power sector (less than 3 years). • Where relevant, the renewable electricity target is accompanied by a commitment to electrify all energy processes that can be electrified.	66-95% of **procured** renewable electricity comes from high quality constructs.	N / A
	• Claims and targets cover all operational electricity consumption. <BUT> • Claims and targets are 3-5 years misaligned with benchmarks for decarbonising the power sector. <OR> • When relevant, the company does not commit to electrifying all energy processes that can be electrified, which potentially undermines the renewable electricity commitment.	36-65% of **procured** renewable electricity comes from high quality constructs.	N / A
	• Claims and targets cover all operational electricity consumption. <BUT> • Claims and targets are 5-10 years misaligned with benchmarks for decarbonising the power sector.	6-35% of **procured** renewable electricity comes from high quality constructs.	The company matches its electricity consumption with renewable electricity generation on an annual basis, using certificates generated in the same year as the company's electricity consumption.
	• Claims and targets do not cover all operational electricity consumption. <OR> • Claims and targets are >10 years misaligned with benchmarks for decarbonising the power sector.	0-5% of **procured** renewable electricity comes from high quality constructs	The company uses RECs that predate the year of the company's electricity consumption.

Rating: High | Reasonable | Moderate | Poor | Very poor

4 Responsibility for unabated and residual emissions

4.1 Guiding principles

4.1.1 Climate contributions (BVCM)

Corporate climate leadership includes both setting ambitious targets for emission reductions in the company's own value chain, as well as taking responsibility for unabated emissions in the meantime.

Most companies do not have the ability to immediately eliminate their entire GHG emissions footprint. While more and more companies are charting a pathway to complete decarbonisation and although far reaching reductions are possible and required in the next years, it will usually take years or decades until companies are able to entirely achieve this goal, even the most ambitious ones.

We define climate contributions as the financial support provided by a company to support climate change action beyond the company's own value chain, without claiming to neutralise its own emissions.

A company can claim to *contribute* to climate change mitigation activities, without claiming ownership of the emission reduction outcomes and without subtracting associated reductions from their own GHG inventory or net-zero target.

An internal carbon price on emissions can inform the volume of financial support. Responsible companies should price their emissions at a level of at least USD 100-250 per tonne and rising over time.

This way, climate contributions are linked to a company's responsibility for its own unabated emissions. The volume of financial contributions can serve as a key indicator of climate leadership. Ambitious companies could, for example, use the proceeds of an internal carbon price that is set at a high enough level to send a clear incentive signal for embarking on a 1.5°C-compatible decarbonisation trajectory.

Identifying an appropriate carbon price level is a critical part of the climate contribution approach and will have a major influence on its overall effectiveness at both driving internal climate action within a company's value chain, as well as stimulating increased ambition elsewhere.

One metric to inform the level of the price is the **social cost of carbon**. This is a measure of the net damages imposed on society over time from emitting one tonne of carbon dioxide equivalent units (tCO_2e). Estimates of the social cost of carbon are used to inform policy making in a number of countries. In Germany, the Federal Environment Agency currently recommends a social cost of carbon of EUR 237 per tCO_2 in 2022, increasing to EUR 286 in 2050, which is used to inform certain policy decisions. Government agencies in the United States use a central figure of USD 51 per tCO_2, with a proposal tabled by the EPA to materially raise this to USD 190 per tCO_2.

Another way of identifying an appropriate carbon price is to decide on a global temperature limit, or emissions trajectory – such as the headline target of the Paris Agreement – and derive an estimate of the **carbon price needed to achieve that goal**. In 2017 a 'High-level Commission on Carbon Prices' identified the need for a carbon price of USD 50-100 per tCO_2e by 2030, and rising thereafter, along with a wider policy package of measures, to avoid warming of 2°C above pre-industrial levels (Carbon Pricing Leadership Coalition, 2017). In the International Panel on Climate Change's Special Report on Global Warming of 1.5°C, carbon prices for scenarios aligned with limiting global temperature rise to 1.5°C, or below 2°C, are on the order of USD 90-220 per tCO_2e by 2030 (Rogelj *et al.*, 2018). The IPCC also found that a carbon price of around USD 25/ tCO_2e alongside a supportive policy environment would be sufficient at least to reduce a further 10 $GtCO_2e$ compared to countries' NDCs in 2030 (IPCC, 2018, p. 153). The International Monetary Fund recommends a global average carbon price of at least USD 75 per tCO_2e by 2030 (Parry *et al.*, 2021). And a poll of 30 climate economists by the news agency Reuters, prior to COP26 in Glasgow in late 2021, found that these experts recommended carbon prices of USD 50-250 per tCO_2e to fully decarbonise our economies by mid-century, with over half (median value) suggesting a level at, or above, USD 100 per tCO_2e (Bhat, 2021).

We recommend that companies adopt of carbon fee of at least USD 100-250 per tCO_2e, with a clear plan to raise this level over time and in response to emerging new evidence. Whilst there is no definitive answer on what a suitable carbon fee level should be, responsible companies should aim to price their emissions around, or above, the more ambitious end of the ranges available in the literature. The evidence indicates global average carbon pricing should be at least around the level of USD 100 per tCO_2e to facilitate a transition to net-zero carbon emissions by 2050 and some national government agencies recommend valuing the cost of social damages in the order of USD 200-250 per tCO_2e.

Companies can channel their climate contributions towards a wide range of activities.

Since they are not planning to claim to neutralise their emissions, companies making climate contributions are not tied to procuring carbon offset credits and enjoy far greater flexibility in the type of activities they can support to advance global decarbonisation. This could include, for example, support for land sequestration carbon removals, which does not offer sufficient guarantees of permanence to truly neutralise emissions (*see section 4.1.3*), but which is critical to addressing climate change and requires more financial support globally. Other examples include emerging technologies and measures for sectors where the technical mitigation potential of existing technologies remains limited, where innovation and investment are needed to find new solutions. Uncertainties regarding the eventual emissions reductions delivered by more immature technologies and higher-risk investments may make them less attractive to project developers looking to generate offset credits, but a more suitable avenue for those channelling financial support in the form of climate contributions.

Climate contributions without neutralisation claims can provide a transparent, constructive, and ambitious approach to take responsibility for unabated emissions.

Targets that are formulated independently from offsetting, without any netting-out of actual climate impacts, **are more transparent** and provide a clearer signal to decarbonise the company's own value chain.

Developing countries need more financial support to ramp up their mitigation action; voluntary action from companies is a vital channel of such support. A **constructive environment** is required, where this finance positively reinforces ambition raising, rather than one that provides perverse incentives to limit the ratcheting up of national climate commitments. In contrast to offsetting approaches, if the financial support from voluntary action results in emission reductions that are owned by the actors supported and the host country they operate in, this action will not conflict with the host country's GHG emission reduction target. Instead, it can provide support for reaching and ratcheting up those targets.

The contribution claim model is aligned with the concept of **ratcheting ambition** through a race to the top, a concept that underpins the Paris Agreement. If companies are free to self-determine their own ambition for their climate contributions – as countries do through Nationally Determined Contributions – this may result in a race to the top to demonstrate the highest ambition, without limits. This would mark a significant shift from the offsetting approach in which many companies race to the bottom and exploit loopholes to deliver a fixed target at the lowest cost.

Despite these potential advantages, there are still open issues to address with the climate contribution model to ensure that the approach can lead to high quality action. The increased flexibility regarding the types of projects that can be supported under this model can be beneficial for supporting carbon dioxide removals or emerging technologies, but it will also be a challenge to ensure that this flexibility is not used to pursue lower quality projects. In this regard, there remains a significant role for existing market players and standard setting initiatives to contribute to the discussion and tools available for quality assurance.

Companies should disclose details on their climate contributions, including the basis for determining the volume of their financial contributions, the amount that they contribute each year, the recipients and the anticipated or measured impacts. It is critical that communication around these climate contributions avoids any implication that they serve to offset the actual emissions of the company.

Voluntary corporate guidelines are increasingly including guidance on climate contributions, and established providers of carbon credits are transitioning to the model.

In February 2024, the **SBTi** published its new report on **Beyond Value Chain Mitigation (BVCM)** (Benson *et al.*, 2024). To follow the BVCM guidance, companies need to qualify by setting and working to deliver a science-based target. The SBTi BVCM report follows best practice recommendations on setting an internal carbon price (based on a "science-based carbon price") and investing the corresponding budget in climate action (Benson *et al.*, 2024). The report includes a broad definition on what climate action can be: not only emissions reductions, but also adaptation and loss and damage as well as activities related to capacity building, behaviour change, or policy advocacy. However, the report does not explicitly rule out companies making compensation claims under the BVCM approach, although this goes against the concept of climate contributions. Another important point missing from the report is that it does not plan to validate BVCM claims, relying instead on emerging regulatory requirements and on the VCMI guidance. This could be a highly relevant and consequential omission, depending on other key decisions made during 2024 on whether to introduce flexibility into scope 3 targets. If a decision is made to depart from the core principles of SBTi to allow offsetting toward target fulfilment – under whatever terminology – then the BVCM recommendations could have a very different meaning compared to how they are understood in the current situation.

The **Gold Standard** has also published a "Step by step guidance for organisations taking responsibility for their unabated emissions" (Gold Standard, 2024) which follows all best practice recommendations on BVCM and is also prescriptive on claims. Climate contributions, are also a central feature of **NewClimate Institute's *Climate Responsibility*** approach (NewClimate Institute, 2020; Fearnehough *et al.*, 2023) and the **WWF-BCG *Climate Blueprint*** (WWF and BCG, 2020).

4.1.2 Fundamental limitations of offsetting claims today

Companies make an offsetting claim when they assert that unabated GHG emissions within their value chain are 'neutralised', 'netted-out', 'offset', 'inset', 'compensated', or 'counterbalanced' through other emission reduction activities or carbon dioxide removals – inside or outside of their value chain.

The practice of claiming to offset emissions has been afflicted by controversy and contention due to significant uncertainties in the real impact of carbon credit use as well as the suitability of carbon dioxide removals for offsetting emissions. Accordingly, terminology for claiming to have offset emissions is highly sensitive and inconsistent. Many actors now avoid the term offsetting entirely; companies and initiatives more often refer to "neutralisation", "netting-out", "compensation", "reducing the footprint", "counterbalancing", or other equivalent terminologies. "Insetting" is also gaining traction as a term to claim to have offset emissions through carbon dioxide removals or emission reductions within a company's own value chain (*see section 4.1.5*).

Although it is also a form of offsetting, we recognise an emerging consensus that the terminology 'neutralisation' is often differentiated by other forms of offsetting on the basis that it should apply only to *residual* emissions, and we recognise that net-zero emissions claims and neutralisation plans are currently the mainstream approach to corporate climate target setting (*see section 4.2.3*). This differentiation is not always consistent: some companies use the terminology 'neutralisation' interchangeably with other synonyms of offsetting to describe the practice of offsetting any emissions, not only *residual* emissions.

The global governance framework of the Paris Agreement represents a different context from the Kyoto-era, under which most existing offsetting mechanisms and standards were developed.

The environmental integrity of an offsetting claim has always been dependent on various factors, including but not limited to additionality, permanence, avoidance of double counting, leakage, and the accuracy of quantified impacts (CCQI, 2021). But in addition to these long-established issues, several other factors present fundamental issues for the integrity of offsetting claims, since the Paris Agreement has come into force. The limitations discussed below must be recognised as a reality, rather than a reason to identify more lenient rules for offsetting claims.

Offsetting claims risk to distract from the necessity of immediate emission reductions.

To maintain a chance of meeting the 1.5°C temperature limit, all sectors need to embark now on deep decarbonisation trajectories to reach net-zero GHG emissions and eventually net-negative GHG emissions worldwide (IPCC, 2018). The HLEG recommendations, for example, emphasize the need for non-state actors to prioritise urgent and deep reduction of emissions across their value chain (UN HLEG, 2022, p. 19). In this ever more urgent context, the most pressing issue for offsetting claims is the risk that they may pose for distracting from the need for immediate emission reduction measures. If consumers, investors and regulators are led to believe that a company's emissions are lower than they really are, this may lead to a reduction in the extent to which these actors provide further pressure, incentives or support for necessary emission reductions. The relevance of this issue is independent of the quality of the means used to claim offsetting.

Targets and claims that significantly depend on offsetting claims are not conducive to the achievement of the Paris Agreement objectives, which require the full decarbonisation of all economies, and transparent dialogue to support that achievement. The Paris Agreement highlights the importance of transparency and facilitative dialogue for ambition raising. In this regard, we consider that a transparent communication of an organisation's own emissions and the plans and challenges faced in reducing emissions further, is more constructive than a subjective claim that emissions have been offset through whatever means.

An accounting mechanism for avoiding double counting is yet to be established under any international offsetting standard, though this could be possible through the procurement of authorised A6.4ER credits[3] in the future.

Corresponding adjustments on carbon credit transactions for offsetting purposes are a minimum requirement to limit double counting of the emission reduction.
A corresponding adjustment requires that the country hosting an activity is required to make adjustments to their GHG emissions inventory to account for the volume of internationally transferred mitigation outcomes (UN HLEG, 2022, p. 20). Corresponding adjustments help ensure that the same emission reduction cannot be used towards multiple purposes, such as the national target of the project host country (referred to as "Nationally Determined Contribution", or NDC, under the Paris Agreement) as well as the NDC of another country, or in support of a corporate's climate claim or target. While this is an intuitive concept, it is not yet a standard facilitated practice for any offsetting standards.

Under the rules for Article 6 of the Paris Agreement, agreed at COP26 in 2021 and COP27 in 2022, corresponding adjustments are required for the transaction of any authorised A6.4ERs for any purpose. Alternatively, actors are not required to apply corresponding adjustments in the case that carbon credits are designated for a 'mitigation contribution' rather than 'authorised for the international transfer of mitigation outcomes'. Given the potential complexities of establishing a functional system for corresponding adjustments, it remains unclear whether the voluntary offsetting standards will also introduce systems for corresponding adjustments, or if they will align and integrate with the Article 6.4 project registry.

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3 *A6.4ER credits refer to authorised emission reduction credits established under Article 6.4 of the Paris Agreement.*

Some offset providers and companies continue to reject the concept of corresponding adjustments and claim that this should not be required for companies. More ambitious standards and companies will view corresponding adjustments as a minimum requirement.

This accounting adjustment alone does not guarantee the environmental integrity of an offsetting claim, but is a minimum requirement to uphold integrity in combination with the criteria described below.

In today's context, offset credits can only provide an appropriate guarantee of additionality if they are generated from high-hanging-fruit mitigation projects, but the identification of such projects would require a radical shift of the carbon markets.

The high hanging fruit of mitigation potential refers to the technologies and measures to decarbonise emission sources that remain otherwise entirely inaccessible to host country governments in the near- and mid-term future, on account of extraordinary costs or other insurmountable barriers that cannot reasonably be overcome (Day *et al.*, 2023).

A key condition for determining the integrity of carbon credits is the *additionality* of the emission reduction project (UN HLEG, 2022, p. 19); that is, the guarantee that credited emission reductions are additional to what could be achieved without the incentives of the offsetting programme. In historical offsetting mechanisms, additionality could be proven by showing that local legislation did not require the activity and that offsetting revenues could help overcome barriers which would otherwise prevent implementation. Since the Paris Agreement has come into force, the concept of additionality needs to be redefined and should imply certainty that the project supported could not realistically have been implemented otherwise through unilateral ambition enhancements on the part of host-country governments.

The impact from carbon credits cannot be considered *additional* if it presents credit-selling territories with a perverse incentive to limit the extent to which they ratchet up their own ambition during NDC revision cycles. The prospect of potential revenues from emission reduction credits presents a risk that, to maximise foreign investment, countries or subnational territories may limit their own national GHG reduction targets so that more of their mitigation potential can be tapped by international offsetting mechanisms. To overcome this potential ambition pitfall, carbon crediting projects would need to be sufficiently ambitious that they avoid presenting any conflict with the host country's own ambition.

A shift to high-hanging fruit carbon crediting projects marks a significant transition. There are very few, if any, examples of existing credited projects that represent "high-hanging fruit" and could be considered truly additional in the context of safeguarding ambition in the Paris-era. Most emission reduction projects registered under crediting programmes to date have been developed in the context of cost-saving mechanisms under a pre-Paris governance framework in which not all countries had climate targets, rather than in the context of an ambition-raising mechanism that is aligned with the new post-Paris global climate governance framework. Accordingly, shifting the focus towards high hanging fruit projects requires a radical transformation of the carbon markets.

Project developers that look to operate in post-2020 offsetting mechanisms with high-hanging fruit mitigation projects will need to adjust their market search to move from upscaling accessible mitigation technologies to the development and implementation of more innovative technologies for harder-to-abate emission sources. This will take considerable time and resources to develop. Moreover, the scope of technologies and measures that would count as high-hanging fruits will be a gradually decreasing niche of activities, as countries' ambition and capabilities increase over the years.

On these considerations, it seems unlikely that high-hanging fruit mitigation projects can serve the mass demand for carbon credits that some analysts have forecast for the coming decades, and which some companies currently plan for.

The untenability of offsetting claims is increasingly recognised by companies, consultancies and regulators.

2023 saw a wave of business consultancies and carbon credit sellers transitioning away from carbon neutrality labels. The business consultancy *myclimate* – which has been an internationally recognised provider of offsets and carbon neutrality labels – announced in December 2022 that it will discontinue its climate neutrality label and transition to a new impact label in the vein of the climate contribution model. This announcement was based on the explicit recognition that the current market cannot deliver carbon credits that can credibly facilitate climate neutral claims in the era of the Paris Agreement (myclimate, 2022). In April 2023 business consultancy *ClimatePartner* announced the launch of new "ClimatePartner certified" label alongside the discontinuation of their carbon neutral label (ClimatePartner, 2023). In June 2023 business consultancy *SouthPole* announced a transition from their carbon neutrality labels to an alternative "Funding Climate Action" claim, noting the increased scrutiny on carbon neutrality claims and the need for claims that can be made with confidence and transparency (SouthPole, 2023).

Legislators and advertising ombudsmen also ruled against carbon neutrality claims in the European Union, but similar developments are yet to materialise in other regions. In 2024, the EU adopted a ban on climate-neutral advertising on products and services (European Parliament, 2024). This breakthrough legislation is the first time that carbon neutrality claims have been banned by policymakers anywhere in the world and may set a precedent for developments in other countries.

While the integrity of offsetting claims is fundamentally flawed, there are differences in the quality of offsetting claims that must be assessed on a case-by-case basis.

Given the level of fragmentation and obfuscation in current offsetting markets, as well as the limited availability of truly objective and independent advice on credible approaches, we try to distinguish claims and plans that at least represent goodwill and reasonable efforts.

On account of the huge surplus of carbon offset credits available from existing projects and the low market prices for offset credits, among other factors, many available offset credits today may represent little-to-no meaningful climate impact. Emission reduction credits generated by existing and more easily accessible projects are generally sold at relatively low prices on both compliance and voluntary markets. Buyers paid an average USD 4.04/tCO_2e for voluntary offset credits in 2021 (Donofrio *et al.*, 2022), substantially less than the carbon price range of USD 40-80/tCO_2e which the High-Level Commission on Carbon Prices (2017) found to be consistent with the Paris Agreement “well below 2˚C” temperature goal. Such prices cannot sufficiently incentivise companies to make operational changes to further reduce their own scope 1, 2 and 3 emissions.

A small niche of higher-quality existing offset projects that rely on carbon revenues may represent a moderate chance of meaningful climate impact, but none of these projects carry a guarantee of additional action that can be considered equivalent to emission reductions and few, if any, send a meaningful signal for decarbonisation of the buyer’s own emissions footprint.

4.1.3 Carbon dioxide removals

It can be good practice for companies to support the development of carbon dioxide removals (CDR) inside or outside their value chain, in parallel to emission reductions.

All scenarios consistent with a 1.5°C temperature increase include a major role for carbon dioxide removals (CDR) (Rogelj *et al.*, 2018). This includes biological carbon sequestration in forests, soils, peatlands and mangroves, technological solutions such as bioenergy with carbon capture and storage (BECCS) and direct air carbon capture with storage (DACCS), and solutions with mineral storage. Finance is needed to scale up carbon dioxide removal efforts, and corporates could play a key role.

However, issues related to the mitigation hierarchy, non-permanence of carbon storage, scarcity of storage potential, and environmental damages, mean that CDR must be strictly regulated.

Based on the following issues, we conclude that it could only be credible for companies to complement their emissions reductions strategy with removals under the specific conditions that this is based on a strict definition of residual emissions and that only carbon dioxide removals with a high likelihood of sufficient permanence are used. Scarce potential and environmental damages mean that CDR measures cannot be considered a credible alternative to emissions reductions for emission sources that could feasibly be eliminated.

The mitigation hierarchy gives the primacy to emissions reductions. Emissions reductions and removals are not equivalent (Zickfeld *et al.*, 2021). Removals cannot reverse the effects of climate change caused by emissions and even technological removals with a higher permanence are not equivalent to emissions not occurring in the first place since they will need unachievably high liability guarantees and continued MRV.

The permanence of carbon dioxide removals must be guaranteed over a timeframe of centuries to millenniums. The permanence of a carbon dioxide removal refers to the degree of certainty that the sequestered carbon will not be released at a later point in time. The permanence of different technologies depends on where in the earth’s system the carbon is sequestered. Sequestration in the lithosphere (such as injection into depleted fossil fuel reservoirs and aquifers or mineralisation into rocks) and in the hydrosphere (storage in deep oceans) have a more robust (and thus longer) degree of permanence compared to the biosphere (such as in trees or soils) due to its vulnerability to natural and anthropogenic disturbances. The release of previously sequestered carbon negates any benefits of the sequestration: at the point at which the carbon dioxide is released, the atmospheric concentration of carbon dioxide is restored to the same value that it would have been had the CDR activity never taken place. If non-permanent removals are used to offset emissions instead of reducing them, the global CO_2 concentration will *increase* as a result (Jeffery *et al.*, 2020).

Scarce carbon dioxide removal potential must be reserved for balancing out residual emissions in sectors where the technical mitigation potential of existing technologies remains very limited, for it to remain technically possible to achieve global net-zero emissions. The maximum potential of most carbon dioxide removal measures is technically limited, and further restricted by environmental constraints. Due to issues such as land requirements, high water consumption, high energy consumption, land degradation and pollution, carbon dioxide removal technologies can only be scaled up so far without significantly endangering sustainable development goals, including food security.

The scarcity of carbon dioxide removal measures is an important consideration when evaluating net-zero claims at the level of individual actors. Robust future use of scarce carbon dioxide removal options must be consistent with achieving net-zero and eventually net-negative emissions at the global level, which is required to avoid the most damaging effects of climate change over the coming decades. To align with 1.5°C compatible pathways at the global level, some sectors with the technical ability to fully decarbonise will need to reach zero emissions, while carbon dioxide removals are likely needed to balance out the residual emissions from other sectors where the technical mitigation potential of existing technologies remains very limited. Any allocation of rights of ownership to scarce carbon dioxide removals will require international oversight as well as detailed (and likely highly complex) considerations of fairness and appropriate use to ensure efficient and effective efforts to contain and then reduce the atmospheric stock of emissions.

Accordingly, it is not necessarily appropriate for companies today to make climate pledges which assume they will have the right to use scarce carbon dioxide removals to neutralise their own emissions decades in the future. If specific companies – for example in the energy industries – claim ownership of scarce carbon dioxide removals now or for a time in the future, then it will not be possible for those removals to balance out residual emissions in sectors where the technical mitigation potential of existing technologies remains very limited, and it will not be possible to reach net-zero emissions at the economy-wide level.

We consider the technical potential of carbon dioxide removal measures considering environmental constraints, since these potentials cannot be exceeded without causing significant environmental damages and major conflicts with other resource demands. We consider the scarcity of technical potential against the understanding that 1.5°C-compatible pathways may require carbon dioxide removals of up to approximately 20 $GtCO_2e$/yr by 2050 (Rogelj *et al*., 2018), to balance out residual emissions from sectors where the technical mitigation potential of existing technologies remains very limited, and go beyond to overall net-negative emissions thereafter.

Table 11 gives an overview of the suitability of carbon dioxide removal measures and technologies for offsetting claims, in line with the issues of permanence and scarcity set out in this section, according to best available information in 2023.

Assessment of specific CDR measures and technologies (according to best available information in 2023)

Table 11: Overview of the factors affecting suitability of CDR technologies for neutralising GHG emissions

APPROACH		FACTORS AFFECTING SUITABILITY FOR OFFSETTING				
		LIKELY PERMANENCE	SCARCITY IN TERMS OF ADDITIONAL POTENTIAL [A] (GtCO$_2$e-yr)		ENVIRONMENTAL CONSTRAINTS	DISPLACEMENT OF EMISSIONS
			TOTAL TECHNICAL POTENTIAL	ENVIRONMENTALLY CONSTRAINED POTENTIAL		
CDR measures with mineral storage have a reasonable likelihood to meet the criteria of *permanence* and *additional potential* to be considered a credible neutralisation of residual emissions from hard-to-abate emission sources. Uncertainties on the environmental limitations mean that the credibility of claiming the neutralisation of other unabated emissions is contentious.	Enhanced weathering	Centuries to millenniums	Likely vast 4-95 (Lenton, 2014; Taylor *et al.*, 2015; Strefler *et al.*, 2018)	Finite but possibly moderate 2-4 (Fuss *et al.*, 2018)	Loss of habitats, water and air pollution from rock mining.	No issue
	Mineral carbonation	Centuries to millenniums	Likely vast 8,200-34,700 GtCO$_2$e cumulative (Kelemen *et al.*, 2019)	Unknown, likely vast	High-water requirements; induced seismicity; groundwater contamination.	No issue
For BECCS and DACCS with underground storage, high storage permanence is possible, although uncertainty on the risk of leaks remains. The limited additional potential of these measures, as well as the considerable environmental concerns and energy system inefficiencies, mean that these measures are not a reasonable equivalent alternative to emission reductions for unabated emissions when further emission reductions are feasible.	Bioenergy with carbon capture and storage (BECCS)	Theoretically centuries to millenniums, (uncertain)	Finite and possibly scarce 0.4-11.3 (Roe *et al.*, 2019)	Finite and possibly scarce 0.5-5 (Fuss *et al.*, 2018)	Land scarcity; monoculture affecting biodiversity and soil health; very high-water requirements.	No issue
	Direct air carbon capture and storage (DACCS)	Theoretically centuries to millenniums, (uncertain)	Likely vast 5-40 (Fuss *et al.*, 2018)	Finite and possibly scarce 0.5-5 (Fuss *et al.*, 2018)	High water and energy requirements; pollution from by-products.	No issue
CDR measures based on biological capture and storage do not have the necessary degree of permanence, nor the additional potential, to be credibly considered an equivalent to emission reductions. These measures are also vulnerable to the displacement of emissions to other locations.	Soil carbon sequestration	Years to decades	Finite and possibly scarce 0.3-6.8 (Roe *et al.*, 2019)	Finite and possibly scarce 0.9-1.9 (Hepburn *et al.*, 2019)	Soil saturation; land scarcity.	Vulnerable
	Biochar	Decades to centuries	Finite and possibly scarce 0.03-6.6 (de Coninck *et al.*, 2018)	Finite and possibly scarce 0.3-2 (Fuss *et al.*, 2018)	Plant resilience; ecosystem albedo; land degradation; loss of habitat.	Vulnerable
	Afforestation & reforestation (AR)	Years to decades	Finite and possibly scarce 0.5-10.1 (Roe *et al.*, 2019)	Finite and possibly scarce 0.5-3.6 (Fuss *et al.*, 2018)	Land availability; food security.	Vulnerable

4.1.4 Neutralisation of residual emissions

Residual emissions are the remaining GHG emissions from emission sources where the technical mitigation potential of existing technologies remains very limited, where no known feasible options remain for further decarbonisation.

Fundamentally, companies' plans to neutralise emissions towards net-zero targets constitute a form of offsetting. The use of net-zero target terminology with 'neutralisation' is not necessarily the most transparent way for companies to express their targets. Companies can also express their long-term visions in terms of explicit emission reduction targets, and can still support carbon dioxide removals as separate targets.

There remains a lack of a science-aligned consensus on the role for corporates to support carbon dioxide removals. There is a need for further research and conceptualisation on the extent to which it is appropriate and necessary for different companies to support CDR, even after reaching very deep levels of decarbonisation, recognising that we eventually need to achieve net-negative emissions and that CDR will be required to make up for *historical* as well as residual emissions.

Nevertheless, we recognise an emerging consensus that the terminology 'neutralisation' is differentiated by other forms of offsetting on the basis that it should apply only to *residual* emissions, and we recognise that net-zero claims and neutralisation plans are currently the mainstream approach to corporate climate target setting.

Due to issues related to the mitigation hierarchy, non-permanence of carbon storage, scarcity of storage potential, and environmental damages (*see sections 4.1.2 and 4.1.3*) we conclude that it could only be credible for companies to complement their emissions reductions strategy with removals under the specific conditions that this is based on a strict definition of residual emissions and that only carbon dioxide removals with a high likelihood of sufficient permanence are used. Scarce potential and environmental damages mean that CDR measures cannot be considered a credible alternative to emissions reductions for emission sources that could feasibly be eliminated.

4.1.5 Insetting claims

"Insetting" is a business-driven concept with no universally accepted definition. The approach can lead to low credibility offsetting claims and the double counting of emission reductions.

The concept of insetting is promoted by some actors as a better alternative to offsetting, mainly for companies with links to agriculture and land-use sectors in their supply chains. Insetting is sometimes described as *offsetting within the value chain*. This can mean two different things, both of which are highly contentious:

- **Emission reduction projects in the value chain:** Here, an emission reduction project – similar to an offsetting project – is implemented within the company's value chain, rather than outside of it. Describing this as insetting is a false concept; this is simply a measure for the reduction of the company's own emissions. In claiming that the reduction of certain emissions neutralises the company's other GHG emissions, the company is either: **a)** rejecting responsibility for those sources and excluding them from the scope of its target or claim; or **b)** counting the emission reductions of those measures twice to claim reductions for some emission sources *and* neutralisation of other emission sources. The credibility of the claim is critically compromised in either case.

  In the most extreme case, companies may claim the complete carbon neutrality of their scope 1 and 2 emissions, by claiming the *reallocation* of marginal reductions from their scope 3 emissions. Given that scope 3 emissions account for the major share of many companies' emissions, such a claim may be possible with only very marginal reductions to scope 3 emissions that could possibly be achieved under business-as-usual trajectories. The possible outcome is that a company claims to be carbon neutral without haven taken any action to reduce its scope 1 and 2 emissions.

- **Carbon dioxide removals in the value chain:** In this case, measures are taken within a company's value chain to achieve carbon dioxide removal and storage. This may include carbon storage in agricultural soils, and carbon storage in harvested wood and wood-based products. Here, the same environmental integrity issues apply as for any other carbon dioxide removal offsetting projects (*see section 4.1.3*): the suitability of these measures for claiming the neutralisation of GHG emissions is compromised by the lack of permanence of the carbon storage and the scarcity of nature-based solutions for carbon dioxide removals. An apparent key difference between carbon dioxide removals under an 'insetting' approach, as opposed to carbon dioxide removals through certified offsets, is that the companies implementing an insetting approach may not seek independent measurement and verification of the carbon dioxide removals. As such, this is simply a weaker variation of an already non-credible offsetting approach.

Several major companies are currently advocating for standards that legitimise insetting as valid carbon compensation, including through holding prominent roles on advisory committees and technical working groups of key standard setting initiatives such as GHG Protocol's *Guidance for corporate accounting of land sector emissions and removals* (GHG Protocol, 2021).

Climate Positive **pledges are based on the principles of insetting and avoided emissions, neither of which is recognised as a legitimate approach for claiming to offset emissions.**

In recent years, a small group of companies have started to use the terminology "Climate Positive" for their climate targets. Those companies define climate positive as a state of reducing more greenhouse gas emissions than the value chain emits. We understand that those companies seek to differentiate this approach from offsetting, but we believe that observers are highly likely to interpret the terminology climate positive to mean that unabated emissions have been neutralised.

Companies' *climate positive* targets typically include a combination of insetting measures and claims of *avoided emissions*. 'Avoided emissions' is defined by the ISO Net Zero Guidelines as "a potential effect on greenhouse gas emissions that occurs outside the boundaries of the organization but arising through the use of its products or services, outside scope 1 emissions, scope 2 emissions and scope 3 emissions" (ISO, 2022). A key difference here from emission reduction offsets is that there is no case for demonstrating the additionality of these avoided emission claims. For example, a company which sells PV modules to its customers may claim *avoided emissions* from the customers' use of those PV modules over their expected lifetime. If the sales of these PV systems constitute normal commercial transactions to supply an existing market demand, rather than special interventions from the company, it cannot be determined that these estimated avoided emissions are in any way additional to what may have occurred had the company not participated in this market. The GHG Protocol already specified in 2003 that any claims of *avoided emission* may not be accounted against scope 1, scope 2 or scope 3 emissions. Most recently, the ISO Net Zero Guidelines confirmed this position (ISO, 2022).

Recognising that neither the concepts of insetting nor avoided emissions are legitimate approaches for claiming the neutralisation of emissions, we understand that companies using the *climate positive* terminology seek to differentiate this approach from offsetting, by arguing that *climate positive* does not constitute a neutralisation claim. On the contrary, we believe that observers are very likely to interpret the terminology *climate positive* to mean that unabated emissions have been neutralised and that the company has a net-positive impact on the climate through a net-negative GHG emissions balance.

4.2 Assessment criteria

4.2.1 Climate contributions today

In line with the guiding principles above, our evaluation of companies' climate contributions is based on the assessment criteria in Table 12.

Table 12: **Assessment criteria for good practice climate contributions**

CLIMATE CONTRIBUTIONS WITHOUT A NEUTRALISATION CLAIM		
	TRANSPARENCY	INTEGRITY
High	The company discloses information on its approach to climate contributions, including details on all of the following: ✓ the basis for determining the volume of the financial contributions; ✓ the total volume of finance (per year); ✓ the project recipients;	The company fulfils SBTi guidance to derive the volume of finance that it contributes to beyond value chain mitigation (BVCM), without claiming compensation of neutralisation of emissions: ✓ The financial contribution is equivalent to science-aligned carbon price. (We understand that this should entail a carbon price of at least USD 100/tCO_2; see section 4.1.1). ✓ The carbon price is applied to 100% of scope 1, 2 and 3 emissions.
Reasonable	N / A	The company partially fulfils SBTi guidance to derive the volume of finance that it contributes to beyond value chain mitigation (BVCM) , without claiming compensation of neutralisation of emissions: ✓ The financial contribution is equivalent to an internal carbon price of at least USD 50/tCO_2e. ✓ The carbon price is applied to at least 50% of scope 1, 2 and 3 emissions.
Moderate	The company only discloses some information on its approach to climate contributions, including: ✓ The total volume of finance (per year).	The company makes significant contributions to climate change mitigation beyond its value chain, without claiming the neutralisation of its emissions, but does not meet the criteria above.
Poor	N / A	
Very poor	The company alludes to possible climate contributions but without providing sufficient clarity on the volume of finance provided and other details.	The company does not assume responsibility for its unabated emissions through climate contributions, or the volume of finance is insufficient, compared to the thresholds indicated above.
?		The company provides insufficient information to assess the sufficiency of its climate contributions.

Rating: High | Reasonable | Moderate | Poor | Very poor

4.2.2 Offsetting claims today

In line with the guiding principles of the previous sections, the evaluation of companies' offsetting claims is based on the assessment criteria in Table 14.

Table 13: **Assessment criteria for offsetting claims**

OFFSETTING CLAIMS TODAY

Rating	TRANSPARENCY	INTEGRITY
High	N / A *(Offsetting claims are fundamentally not a highly transparent approach, compared to reporting actual emissions.)*	N / A *(The credibility of offsetting claims is currently fundamentally flawed: without a mechanism for corresponding adjustments and a definition of additionality that considers the context of the Paris Agreement, it is not possible that an offsetting claim today can deliver on the criteria necessary for that claim to be credible.)*
Reasonable		
Moderate	✓ The dependence on offsetting is presented alongside the claim as a clear disclaimer. ✓ The company discloses the portion of its emissions that it claims to have offset. ✓ The company sets out details on the specific projects supported.	Given the level of fragmentation and obfuscation in current carbon credit markets, as well as the limited availability of truly objective and independent advice on credible approaches, we try to distinguish claims and plans that at least represent goodwill and an effort to reach. To differentiate between a moderate and low rating for integrity, the merits and drawbacks of claims and plans are discussed and assessed on a case-by-case basis. As a minimum for a moderate rating, offsetting claims should not be framed in misleading terms, offset projects must be additional in the context of the Paris Agreement, and carbon dioxide removals must carry a high likelihood of permanence.
Poor	✓ The company discloses the portion of its emissions that it claims to have offset. ✓ The company sets out details on the specific projects supported. ✗ But the dependence on offsetting is not presented alongside the claim as a clear disclaimer.	
Very poor	✗ The above transparency criteria are not fulfilled.	
N/A	The company does not claim to have offset any emissions.	The company does not claim to have offset any emissions.
?		The company provides insufficient details on its offsetting plans for an assessment of integrity.

Rating: High | Reasonable | Moderate | Poor | Very poor

4.2.3 Approach to residual emissions

In line with the guiding principles set out in section 4.1.4, our methodology assesses the transparency and integrity of companies' so-called 'neutralisation' plans in the context of current best practices and guidance.

We recognise that neutralisation claims and net-zero targets are not necessarily the most transparent and credible way for companies to express their ambition. Further work is needed to reconsider currently available and establish the most appropriate approaches for supporting CDR that are compatible with reaching net-zero and net-negative emissions at the level of the society.

Table 14: **Assessment criteria for assessing companies so-called 'neutralisation' plans**

APPROACH TO RESIDUAL EMISSIONS	TRANSPARENCY	INTEGRITY
High	**For *separate* emission reduction and CDR targets that are not combined into a net-zero target:** ✓ The company discloses the absolute volume of both the emission reduction and carbon dioxide removal targets. ✓ The company discloses the types of CDR that it will support, or principles for how it will make these decisions in the future.	**For *separate* emission reduction and CDR targets that are not combined into a net-zero target:** ✓ CDR targets do not distract from the mitigation hierarchy: companies also commit to reduce emissions to a level of ***residual*** emissions consistent with best available scientific guidelines on the definition of residual emissions in each sector (SBTi, 2023a). ✓ CDR targets are equivalent in volume at least to the company's residual emissions, but potentially more. ✓ The company counts CDR outcomes only towards its CDR targets and does not claim ownership of these. ✓ Storage has a high likelihood of high permanence.
	The concept of ***separate emission reduction and CDR targets*** is an emerging issue of active debate. Further research and conceptualisation is required to refine high integrity for CDR targets that are independent of net zero targets.	
Reasonable	**For net zero or carbon neutrality targets:** ✓ The (maximum) share of emissions to be neutralised through CDR is disclosed. ✓ The company discloses the types of CDR that it will support, or principles for how it will make these decisions in the future. ✓ CDR reliance is presented alongside the target as a clear disclaimer.	**Neutralisation claims do not mislead, or distract from the mitigation hierarchy:** ✓ Any neutralisation claims apply to all emission scopes. ✓ Companies only plan to neutralise ***residual*** emissions, consistent with best available scientific guidelines on the definition of residual emissions in each sector. (SBTi, 2023a). **The type of CDR is appropriate for a neutralisation claim:** Storage has a high likelihood of high permanence
Moderate	**For net zero or carbon neutrality targets:** ✓ The (maximum) share of emissions to be neutralised through CDR is disclosed.	✓ Neutralisation claims do not mislead or distract from the mitigation hierarchy (as per criteria above). ✗ But the type of CDR is not appropriate for a neutralisation claim (as per criteria above), or the type of CDR is not specified.
Poor	N / A	N / A
Very poor	✗ It is not clear whether the company plans to claim the neutralisation of emissions; or. ✗ The company's neutralisation plans do not fulfil the above transparency criteria.	✗ The company's neutralisation plans do not fulfil the above integrity criteria.
?		The company provides insufficient details on its offsetting plans for an assessment of integrity.

Rating: High · Reasonable · Moderate · Poor · Very poor

Glossary and abbreviations

Additional potential (of CDR)	See "*Scarcity (of CDR)*"
BECCS	Bioenergy with carbon capture and storage
BEV	Battery electric vehicles
Biological capture and storage	See "*Nature-based solutions*".
BVCM	Beyond value chain mitigation (SBTi terminology; see *Climate contribution*)
CAR	Climate Action Reserve
CCS	Carbon capture and storage
CCU	Carbon capture and utilisation
Climate contribution	We define climate contributions as the financial support provided by a company to support climate change action beyond the company's own value chain, without claiming the neutralisation of its own emissions in return.
Carbon dioxide removals (CDR)	All scenarios consistent with a 1.5°C temperature increase include a major role for carbon dioxide removals (Rogelj *et al.*, 2018). This includes nature-based solutions for carbon sequestration in forests, soils, peatlands and mangroves, technological solutions such as BECCS and DACCS with underground storage, and solutions with mineral storage.
Carbon credit	A carbon credit is a certified unit of a reduction of GHG emissions, or a removal of carbon dioxide (see *Carbon dioxide removals*). Companies sometimes used carbon credits to claim to balance out GHG emissions elsewhere.
CDM	Clean Development Mechanism
CDP	Formerly the Carbon Disclosure Project: Many companies report emissions as well as other details of their climate strategies to CDP. CDP provide companies with a certified rating of their level of climate transparency, which is often used in company's marketing materials.
CEO	Chief Executive Officer
CO_2	Carbon dioxide
COP	Conference of the Parties (see *UNFCCC*).

DACCS	Direct Air Carbon Capture and Storage, see also "*Carbon dioxide removals (CDR)*"
DRI-EAF	Direct reduced iron – Electric arc furnace
ESG	Environmental Social Governance
EU	European Union
EV	Electric vehicle
FLAG	Forest, Land and Agriculture Science Based Target Setting Guidance (a standard by the Science Based Targets initiative for land-based emissions disclosure and target setting).
GHG Protocol	The GHG Protocol is an initiative driven by the World Resources Institute and World Business Council for Sustainable Development, that provides international guidance and standards for GHG emissions accounting.
GHG	Greenhouse gas
Guarantees of origin (GOs)	Other terminology for Renewable Energy Certificates (REC), see "*Renewable Energy Certificates (REC)*"
HDV	Heavy-duty vehicle
High-hanging fruit	The high-hanging fruit of mitigation potential refers to the technologies and measures to decarbonise emission sources that remain otherwise entirely inaccessible to host country governments in the near- and mid-term future, on account of high costs or other insurmountable barriers that cannot reasonably be overcome.
HLEG	The United Nations' High-Level Expert Group on the Net-Zero Emissions Commitments of Non-State Entities
ICT	Information and communications technology
IEA	International Energy Agency
Insetting	'Insetting' is a business-driven concept used by a limited number of actors with no universally accepted definition. Insetting is often described as offsetting within the value chain. The approach can lead to low credibility GHG emission offsetting claims and presents a significant risk of double counting the same emission reductions.
Integrity (rating)	The *Corporate Climate Responsibility Monitor* assesses the transparency and integrity of companies' climate pledges. Integrity, in this context, is a measure of the quality, credibility and comprehensiveness of a company's approaches towards the various elements of corporate climate responsibility.
IPCC	Intergovernmental Panel on Climate Change

ISO	International Organisation for Standardisation
Land sequestration CDR	Measures for carbon dioxide removal that involve biological carbon capture and storage in natural ecosystems, such as soils, forests, peatland and mangroves.
LEV	Low-emission vehicles
LNG	Liquified natural gas
Location-based method (for scope 2 emissions accounting)	The location-based method for scope 2 emissions accounting reflects the average emission intensity of the electricity grid from which the consumer's energy is delivered.
Market-based method (for scope 2 emissions accounting)	The market-based method for scope 2 emissions accounting reflects the emissions from electricity generation specifically procured by the consumer (which may not reflect the electricity they actually consume from a grid that features multiple buyers and sellers). It derives emission factors from contractual renewable electricity procurement instruments.
Nationally determined contributions (NDCs)	Nationally determined contributions (NDCs) are the pledges made by national governments to the United Nations Framework Convention on Climate Change to mitigate climate change. The Paris Agreement requires all Parties to submit and regularly update their NDCs to represent their possible highest level of ambition. Recognising the insufficiency of climate change mitigation commitments in existing NDCs, the Glasgow Pact from COP26 urged all Parties to update their NDCs again ahead of COP27.
Neutralisation	Fundamentally, companies' plans to neutralise emissions towards net zero targets constitute a form of offsetting. Nevertheless, we recognise an emerging consensus that the terminology 'neutralisation' is differentiated by other forms of offsetting on the basis that it should apply only to residual emissions.
Non-GHG climate forcers	Non-GHG climate forcers include the emission of gases and aerosols, and processes that change cloud abundance, leading to radiative forcing. Radiative forcing is a change in the balance of radiation in the atmosphere, which contributes to global warming. For example, the non-GHG climate forcers are estimated to increase the climate impact of GHG emissions from the aviation industry by a factor of approximately 3 (Atmosfair, 2016).
Offsetting	See *carbon credits*.
Permanence (of CDR)	The *permanence* of a CDR outcome refers to the timescale and degree to which sequestered carbon remains stored and not released into the atmosphere.

Power purchase agreement (PPA)	A PPA is a long-term contract between an electricity provider and an electricity consumer, usually spanning 10-20 years. The consumer agrees to purchase a certain amount of electricity from a specific asset under a pre-determined pricing arrangement. PPAs are generally signed with new renewable energy installations and form part of the project investment decision (NewClimate Institute and Data-Driven EnviroLab, 2020). PPAs can also be signed for existing installations, in which case it is less likely the PPA results in additional renewable electricity capacity. However, it may be that existing installations would cease operations if the operator cannot sign a new PPA.
PV	Photovoltaics
R&D	Research & development
Renewable energy certificate (REC)	Renewable Energy Certificates (RECs) are also known under various names, such as Guarantees of Origin (GOs) or Energy Attribute Certificates (EACs). RECs can be acquired simply as an accounting tool alongside other renewable electricity procurement constructs, or may be procured as "standalone RECs". *Standalone RECs*: The procurement of RECs without any accompanying renewable electricity procurement construct, such as a PPA.
Residual emissions	Residual emissions are the remaining GHG emissions from hard-to-abate emission sources where no known feasible options remain for further decarbonisation. (See also *unabated emissions*)
Scarcity (of CDR)	The maximum potential of most carbon dioxide removal measures is technically limited, and even further restricted by environmental constraints. Due to issues such as land requirements, high water consumption, high energy consumption, land degradation and pollution, among other environmental costs, carbon dioxide removal technologies can only be scaled-up so far without significantly endangering sustainable development goals, including food security. The scarcity of carbon dioxide removals measures – in terms of their maximum absolute or annual technical potential – is an important consideration when evaluating the feasibility of net-zero claims at the level of individual actors. Robust future use of scarce carbon dioxide removal options must be consistent with achieving net-zero and eventually net-negative emissions at the global level, which is required to avoid the most damaging effects of climate change over the coming decades.
Science Based Targets initiative (SBTi)	SBTi reviews and certifies the climate targets of companies who join the initiative as members. Companies' climate targets are certified as 1.5°C or 2°C compatible if they align with SBTi's own methodology and benchmarks.
Scope (of GHG emissions)	The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes' (WBCSD and WRI, 2004):
Scope 1 emissions	Scope 1 emissions are direct emissions from owned or controlled sources.

Scope 2 emissions	Scope 2 emissions are indirect emissions from the generation of purchased energy (see also *location-based method* and *market-based method*).
Scope 3 emissions	Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions (GHG Protocol, 2013).
Upstream scope 3 emission sources	Upstream emissions are indirect GHG emissions related to purchased or acquired goods and services (GHG Protocol, 2013).
Downstream scope 3 emission sources	Downstream emissions are indirect GHG emissions related to sold goods and services (GHG Protocol, 2013).
Normal scope 3 emission sources	The GHG Protocol's Scope 3 Standard identifies 15 distinct reporting categories for scope 3 emission sources, and requires companies to quantify and report scope 3 emissions from each category (GHG Protocol, 2013).
Optional scope 3 emission sources (indirect use-phase emissions)	*Indirect use-phase emissions* are described by the GHG Protocol Scope 3 Standard (GHG Protocol, 2013) as an optional reporting component. In contrast to direct use-phase emissions from products, such as the energy consumption of vehicles and appliances, indirect use-phase emissions refer to the emissions that occur indirectly from the use of a product. For example, apparel requires washing and drying; soaps and detergents are often used with heated water.
Sustainable aviation fuels (SAF)	Sustainable aviation fuels are aviation fuels derived from renewables or waste considering certain sustainability criteria.
Transparency (rating)	The *Corporate Climate Responsibility Monitor* assesses the transparency and integrity of companies' climate pledges. Transparency ratings refer to the extent to which a company publicly discloses the information necessary to fully understand the integrity of that company's approaches towards the various elements of corporate climate responsibility.
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
Unabated emissions	Unabated emissions are GHG emissions from emission sources for which further emission reductions are technically feasible at that point in time. (See also *residual emissions*)
Value chain emissions	A company's full value chain emissions refers to the entirety of scope 1, scope 2, and scope 3 emissions.
US	United States
Value chain emissions	A company's full value chain emissions refers to the entirety of scope 1, scope 2, and scope 3 emissions.

Data sources

Public documentation

For our assessments, we only consider documentation that is publicly available, for two reasons. Firstly, we consider that when companies make public announcements on claims to climate leadership, they have a responsibility to make available to the same public audience the information that would be required to understand and appraise those claims. Secondly, we do not consider that there is any *accountable commitment* associated with any targets or plans that are not made public.

CDP responses

Many companies report on aspects of their climate-related targets and strategies through annual disclosures to CDP. Companies' CDP responses are available either through the purchase of data from CDP, through registration on the CDP website (with limitations), or from the website of the specific companies in the case that companies choose to publish those responses.

Assessing transparency

We do not consider companies' CDP responses to be accessible public documentation, on the grounds that the information is only available either behind a paywall, or behind a registration-wall with significant limitations. Even in the case that companies publish the responses to their websites, we still do not consider these documents to be accessible public documentation given the technical nature of CDP response documents and their limited accessibility for a non-expert audience. It is not transparent practice if specific information that is fundamental for an understanding of the meaning or integrity of a company's climate strategy can *only* be found in those documents.

Assessing integrity of commitments ex-ante

We do not consider the details of future commitments if these details can only be found in CDP responses, and are not published in accessible public documentation. This is in line with the aforementioned position that we do not consider that there is any *accountable commitment* associated with any targets or plans that are not made public.

Assessing integrity of chronicled facts ex-post

For historical ex-post data – such as GHG emission disclosures for historical years, or reporting on renewable energy constructs in historical years – we may refer to chronicled facts from individual CDP responses to understand gaps in companies' public communications, and to identify inconsistencies in reported information. This information may be used to determine the integrity of companies' approaches.

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The rapid acceleration in the volume of corporate climate pledges, combined with the fragmentation of approaches and the general lack of regulation or oversight, means that it is more difficult than ever to distinguish between real climate leadership and unsubstantiated greenwashing.

The Corporate Climate Responsibility Monitor 2024 evaluates the climate strategies of 20 major corporations. It critically analyses the transparency and integrity of corporate pledges and claims to identify replicable good practice and areas for improvement.

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