GREENHOUSE GAS PROTOCOL

Land Sector and Removals Standard

Version 1.1: Agriculture and CO_2 removal technologies

Supplement to the GHG Protocol Corporate Standard and Scope 3 Standard

Scope of the Land Sector and Removals Standard and Guidance version 1

This version of the *Standard* and *Guidance* applies to agriculture and CO_2 removal technologies. This version does not apply to forestry. Future versions of this *Standard* may include forestry.

WORLD RESOURCES INSTITUTE

World Business Council for Sustainable Development

Land Sector and Removals Standard	
Version	Version 1.1
Date of approval	01 October 2025
Publication date	30 June 2026
Effective date	01 January 2027
Date by which the standard will be reviewed	2030
Contact information	ghgprotocol.org/contact-us

Version 1.1. Summary of changes from Version 1.0

Administrative and non-substantive changes

- Corrected and reformatted text and figures to address non-substantive changes.

Clarifications

- Requirement 14: Clarified which carbon pools are required or optional when accounting for land management net biogenic CO_2 emissions.
- Requirement 17 and Reporting requirements for biogenic product emissions: Clarified how entities should account for emissions from biogenic food or feed products and biogenic waste. Clarified that life cycle GHG emissions include land use change.
- Requirement 19.LMR: Clarified that net land carbon stock change accounting requirements in Requirement 14 are also applicable to land management CO_2 removals.
- Product carbon storage – ongoing storage monitoring plan recommendation (section 15.3): Clarified examples of digital tracking methods.
- Requirement 31 and reporting requirements: Clarified the reporting requirements for scope 3.
- Requirement 32: Clarified the accounting categories included in total emissions.
- Glossary: Clarified terms and definitions.

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CHAPTER 1.

Introduction

This chapter provides background and an introduction for the Land Sector and Removals Standard, including information on its intended audience and how to navigate the Standard.

The global scientific consensus makes it clear that the world needs to reduce greenhouse gas (GHG) emissions and remove carbon dioxide (CO_2) from the atmosphere to avoid a 1.5°C (or even 2°C) rise in global average temperature compared to pre-industrial levels.

The Intergovernmental Panel on Climate Change (IPCC) identifies pathways to avoid dangerous levels of climate change that require significant and rapid emissions reductions across all sectors. Globally, the agriculture, forestry, and other land use sector, or land sector for short, is responsible for approximately 22 percent of annual net anthropogenic GHG emissions.[1] Due to a combination of natural and anthropogenic factors, the global land sink currently removes about 30 percent of annual anthropogenic net CO_2 emissions across all sectors.[2] 1.5°C pathways require additional CO_2 removal on the scale of 100 billion to 1 trillion tonnes over the course of the 21st century.[3] Both land sector mitigation approaches and new CO_2 removal technologies will play an important role in reducing, halting, and ultimately reversing the accumulation of GHGs in the atmosphere.[4]

1.1 About the Greenhouse Gas Protocol

The Greenhouse Gas Protocol (GHG Protocol) is a multi-stakeholder partnership of businesses, non-governmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). Established in 1998, the mission of the GHG Protocol is to develop internationally accepted GHG accounting and reporting standards, guidance, and tools, and promote their adoption to achieve a net-zero emissions economy worldwide. The GHG Protocol is an accounting and reporting standard that facilitates participation in voluntary and mandatory GHG programs, used at companies' and programs' own risk.

1.2 About the Land Sector and Removals Standard, Guidance, and Executive Summary

Table 1.1 Comparison table of the use case of each document

Executive Summary	Land Sector and Removals Standard	Land Sector and Removals Guidance
Provides a high-level summary of the content and structure of the *Standard and Guidance* for non-technical users.	Establishes requirements and recommendations to account for, report, and track GHG emissions, CO_2 removals, and other relevant metrics that reflect anthropogenic activities in the land sector, as well as other CO_2 removal technologies.	Complements the *Standard* by providing comprehensive guidance on implementing the requirements and recommendations in the *Standard*, as well as examples, case studies, and calculation guidance.

This *Standard* builds upon and supplements the GHG Protocol's *A Corporate Accounting and Reporting Standard* (Revised Edition) (hereinafter the *Corporate Standard*) and *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (hereinafter the *Scope 3 Standard*), which provide the foundation for producing a corporate GHG inventory for all sectors.

This *Standard* provides land sector-specific requirements and guidance and should be used in combination with the *Corporate Standard* and *Scope 3 Standard.* This *Standard* can also be used with the *Product Life Cycle Accounting and Reporting Standard* (hereinafter referred to as the *Product Standard)* and includes elements related to and aligned with *The GHG Protocol for Project Accounting* (hereinafter the *Project Protocol*). This *Standard* supersedes GHG Protocol's previous land sector-specific and removals-specific requirements and guidance, such as in the *Agricultural Guidance*.

The *Land Sector and Removals Standard* was developed through an international multi-stakeholder governance process between 2020 and 2025. Guided by the GHG Protocol's Independent Standards Board, an Advisory Committee, Technical Working Group, pilot testing companies and supporting partners, and public reviewers, this *Standard* is the result of the voluntary engagement and collaboration of hundreds of companies, NGOs, scientists, and other experts from around the world. These stakeholders were motivated by a common recognition: the need for a clear and standardized framework to account for land emissions, CO_2 removals, and other impacts on the climate caused by human activities on land previously underreported or excluded from companies' GHG inventories.

Following the *Corporate Standard* and *Scope 3 Standard*, the primary focus of the *Land Sector and Removals Standard* is annual, entity-level GHG inventory accounting, thereby differentiating it from the *Product Standard*. This *Standard* is designed to ensure the accuracy, completeness, consistency, relevance, transparency, permanence, and conservativeness of companies' annual GHG inventories.

This *Standard* provides requirements and recommendations on how to account for land emissions, removals, and other metrics from products produced by the reporting company as part of their scope 1 inventory, or products purchased or sold by the reporting company as part of their scope 3 inventory. The requirements and recommendations in this *Standard* are also applicable to product life cycle inventories for land sector products and products with removals, that are prepared following the *Product Standard*.

This *Standard* does not provide requirements or guidance on project accounting, GHG credit certification, or GHG credit verification (see the *Project Protocol* for details), but does include some requirements on evaluating the impacts of actions to inform decision-making and avoiding double counting with GHG credits.

1.3 Structure of the Standard

Both the *Land Sector and Removals Standard* and *Guidance* are organized into four overarching parts for a company to follow when developing a GHG inventory that includes information on land sector activities and/or removals (Figure 1.1):

- **Part 1. Define business goals and inventory design** provides core requirements related to the principles of this *Standard*, explores why companies may choose to apply this *Standard*, establishes the company's inventory boundary, and determines the spatial boundary based on the company's level of traceability and the data and methods framework.
- **Part 2. Compile the GHG inventory** provides the accounting and reporting framework used to compile a complete GHG inventory for land sector and CO_2 removal activities.

- **Part 2.1 Requirements for land sector companies** provides the requirements to account for and report all GHG emissions and related metrics applicable to all land sector companies, including land use change–related metrics, land management emissions, and biogenic product emissions.
- **Part 2.2 Requirements for companies choosing to report CO_2 removals** provides the requirements for companies choosing to report net CO_2 removals from land management, technological removals, and CO_2 capture with geologic storage. This part is applicable only if relevant to business goals (see Chapter 2 for examples of business goals).
- **Part 2.3 Requirements for companies choosing to report product carbon storage** provides the requirements for companies choosing to report agricultural and technological carbon dioxide removal (TCDR)-based product carbon storage (this part is applicable only if relevant to business goals).

- **Part 3. Act based on the GHG inventory** provides guidelines for companies to evaluate actions, set targets, track progress, and avoid double counting with GHG credits when setting targets. These guidelines are applicable if relevant to the business goals of the company.
- **Part 4. Obtain assurance and report the GHG inventory** provides information on how to obtain third-party assurance and disclosure of the GHG inventory.

These four parts are organized into 20 chapters that each address a unique accounting category or topic (Figure 1.1). Each chapter provides the relevant requirements for that accounting category or topic, along with recommendations and options. This *Standard* contains a total of 32 requirements. Not all of them will be relevant to all companies, as this will depend on the company's business goals and inventory boundary. The difference between requirements, recommendations, and options is as follows:

Requirements – A statement that users must comply with to meet GHG Protocol standards and guidance. Requirements are written with "shall" statements. Section [X].2.1 in each chapter presents the accounting requirements. Each accounting requirement is numbered sequentially (except for "chapter-specific instances," see below) and indicated in **pink**. Section [X].2.2 in each chapter presents the reporting requirements (which are not numbered). In some cases, additional information is found below the requirement, labeled as:

- **Specific cases** are instances of the main requirement that are required to conform with this *Standard* for specific industries, under certain circumstances. Specific cases are numbered with the number of the main requirement followed by a sequential decimal number (e.g., Requirement 10.1, Requirement 10.2).
- **Chapter-specific instances of a main requirement** are instances of a main requirement as it applies to a specific accounting category or topic. These instances are numbered with the number of the main requirement followed by a decimal and an alphabetical abbreviation of the relevant accounting subcategory or topic. For example:
  - The main removals traceability requirements in Chapter 12 (e.g., Requirement 20) have specific instances by accounting subcategory that appear in Chapters 13 and 14 (e.g., Requirement 20.LMR and Requirement 20.GS).

Recommendations for companies - A statement that identifies best practice approaches or methods that users are encouraged to implement, but are not required to meet GHG Protocol standards and guidance. They are written with "should" statements. Recommendations for companies are indicated in **blue**.

Recommendations for GHG program administrators and regulators - A statement that identifies best practice approaches that GHG programs, regulators, or policymakers are encouraged to adopt but are not required when using GHG Protocol standards and guidance for entity-level inventory accounting and reporting of land emissions,

removals, and other relevant metrics. They are written with "should" statements. Recommendations for GHG program administrators and regulators are included within an **orange** text box.

Options - A statement describing approaches or methods that are allowable for users to meet GHG Protocol standards and guidance. They are written with "may" statements. Options are indicated in **purple**.

Figure 1.1 Structure of the Land Sector and Removals Standard and Guidance

Parts			Chapters
			Chapter 1. Introduction
Part 1. Define business goals and inventory design			**Chapter 2.** Business goals
			Chapter 3. GHG accounting and reporting principles
			Chapter 4. Setting the inventory boundary
			Chapter 5. Spatial boundaries and traceability
			Chapter 6. Data and methods
Part 2. Compile the GHG inventory	**Part 2.1. Requirements for land sector companies**	Land use change–related metrics	**Chapter 7.** Land use change emissions
			Chapter 8. Land use and leakage
		Agricultural land management emissions	**Chapter 9.** Land management net biogenic CO_2 emissions
			Chapter 10. Land management production emissions
		Biogenic and TCDR-based product emissions	**Chapter 11.** Biogenic product and TCDR-based product emissions
	Part 2.2. Requirements for companies choosing to report CO_2 removals		**Chapter 12.** CO_2 removal accounting
			Chapter 13. Land management CO_2 removals
			Chapter 14. CO_2 removals and CO_2 capture with geologic storage
	Part 2.3. Requirements for companies choosing to report product carbon storage		**Chapter 15.** Product carbon storage
Part 3. Act based on the GHG inventory			**Chapter 16.** Evaluating the impact of actions
			Chapter 17. Setting targets and tracking progress
			Chapter 18. Accounting for credited emission reductions and removals
Part 4. Obtain assurance and report the GHG inventory			**Chapter 19.** Assurance
			Chapter 20. Reporting

Applicability

- Required for all applicable companies
- Required for land sector companies
- Optional; contains requirements if companies choose to report the relevant category
- Optional; contains requirements if applicable to business goals

1.4 Applicability and intended audience

This *Standard* applies to entities (i.e., companies or other organizations) that meet the criteria provided in Requirement 1. Table 1.2 provides examples of entities that may meet these criteria.

REQUIREMENT 1

Applicability of the Land Sector and Removals Standard and Guidance

Companies[5] reporting a corporate- or organization-level GHG inventory in conformance with the Greenhouse Gas Protocol **shall** follow the *Land Sector and Removals Standard* and *Guidance* if the company has significant[6] land sector activities in its operations or value chain and/or if the company chooses to account for and report CO_2 removals or CO_2 capture with geologic storage in the current year or has done so in previous years.

Companies with land sector activities in their operations or value chain that do not follow and report in conformance with the *Land Sector and Removals Standard* and *Guidance* **shall** disclose and justify why those activities are not significant.

Table 1.2 Intended audience of the Land Sector and Removals Standard, version 1

Sector	Relevant chapters	Example companies
Agriculture and other land-based sectors	1–20	• Companies that own or control significant areas of land (e.g., agricultural producers or land developers) • Companies that purchase, consume, process, or sell significant amounts of food, fiber, feed, bioenergy, or other agricultural products (e.g., food and beverage companies, consumer goods companies, bioenergy producers and consumers, biomaterial producers and consumers, retailers, or food service companies) • Companies that supply significant amounts of products to agricultural producers • Companies that manage significant areas of land to increase carbon stored in biomass or soil
Technological CO_2 removal and CO_2 capture with geologic storage	1–6, 11, 12, 14–20	• Companies that own or control technological CO_2 removal operations • Companies that purchase, consume, process, or sell products that store CO_2 that was technologically removed • Companies that store captured fossil CO_2, captured biogenic CO_2, or CO_2 that was technologically removed in geologic reservoirs

Version 1 of this *Standard* does not apply to forestry or non-productive land uses (see Box 1.1 for details).

Box 1.1 Scope of the Land Sector and Removals Standard and Guidance, version 1

Version 1 of this *Standard* and *Guidance* applies to agriculture and CO_2 removal technologies. Version 1 of this *Standard* and *Guidance* does not apply to forestry, as it does not provide comprehensive requirements for companies that own or control forest land or are in forest product value chains. The GHG Protocol's Independent Standards Board did not reach a decision on forest carbon accounting for corporate GHG inventories. Instead, it recognized a need for further methodological development to account for anthropogenic CO_2 emissions and removals attributable to corporate activities in the forest sector. The issue of isolating anthropogenic CO_2 emissions and removals also applies to management activities on proximate and adjacent non-productive lands, which can include forests or non-forest land uses; therefore, Requirement 7 in this *Standard* cannot currently be implemented.

While version 1 of this *Standard* does not apply to forestry, it does provide requirements to account for and report biomass carbon stock changes on productive agricultural lands (e.g., in agroforestry and silvopasture systems), land use change emissions from the conversion of natural forests to plantation forests, and land management production emissions due to activities on forest lands.

Future versions of this *Standard* and G*uidance* may include comprehensive requirements for forestry and non-productive lands. To inform the future approach on forest carbon accounting and related topics and to motivate methodological advances for corporate GHG accounting in the forest sector, the GHG Protocol will release a request for information on forest carbon accounting in 2026.

Endnotes

1 IPCC 2023.

2 IPCC 2022.

3 IPCC 2018.

4 IPCC 2019b.

5 Throughout this *Standard* and *Guidance*, the term "company" is used as a shorthand to refer to the entity (i.e., company or other organization) developing a GHG inventory.

6 The GHG Protocol makes no specific recommendations as to what constitutes a "significant" exclusion threshold. However, some GHG programs do specify numerical significance exclusion thresholds (e.g., SBTi requires companies to set a Forest, Land, and Agriculture [FLAG] target if their FLAG-related emissions are 20 percent or more of overall emissions across scope 1, 2, and 3).

PART 1.

Define business goals and inventory design

CHAPTER 2.

Business goals

This chapter defines possible goals that companies can consider when accounting for and reporting land sector activities and CO_2 removals in their company GHG inventories.

2.1 Overview

Preparing a GHG inventory that includes land sector activities and CO_2 removal technologies in accordance with the accounting and reporting principles (Chapter 3) can support several business goals (Table 2.1). Establishing business goals prior to compiling the inventory can help determine how to effectively use this *Standard* (e.g., if increasing removals is part of a company's strategy, Part 2.2 will be applicable). Aligning with other programs and/or regulations, in addition to aligning with this *Standard,* may be necessary to meet specific goals (e.g., if a company is setting GHG targets, it should follow the guidelines of the corresponding program). Program administrators and regulators can also use this *Standard* to inform their own GHG accounting and reporting rules.

Refer to the Guidance for additional details on how this Standard can serve multiple goals.

2.2 Recommendation and guidance

Identify business goals

Companies **should** consider which business goals they intend to achieve through the accounting and reporting of land sector activities and CO_2 removals, and identify which sections of this *Standard* are relevant to achieving those goals.

Table 2.1 Examples of business goals

Identify and understand emissions-related risks and opportunities for the company	Land sector activities are drivers behind business risk concerns, including financial, regulatory, and reputational risks, as the use of land can lead to deforestation, soil degradation, etc. Increased attention to land sector activities through GHG inventory accounting helps identify mitigation opportunities, such as restoration or improving management on working lands.
Set GHG targets and track performance	Companies face consumer, investor, and stakeholder pressure to develop and achieve ambitious GHG targets. This *Standard* helps to set targets to reduce land-based emissions and increase CO_2 removals in addition to tracking the progress made towards those targets through annual GHG inventories.
Inform strategies to reduce emissions and increase removals	This *Standard* supports the design and implementation of effective mitigation strategies that reduce emissions and increase removals across the value chain by incorporating land sector and carbon removal impacts.
Enhance transparency and stakeholder information	Investors, customers, non-governmental organizations, and other stakeholders are increasingly demanding transparency and credibility on corporate GHG emissions and reduction targets. This guidance enables transparent and credible disclosure of the climate risks associated with corporate land sector and removal activities.

CHAPTER 3.

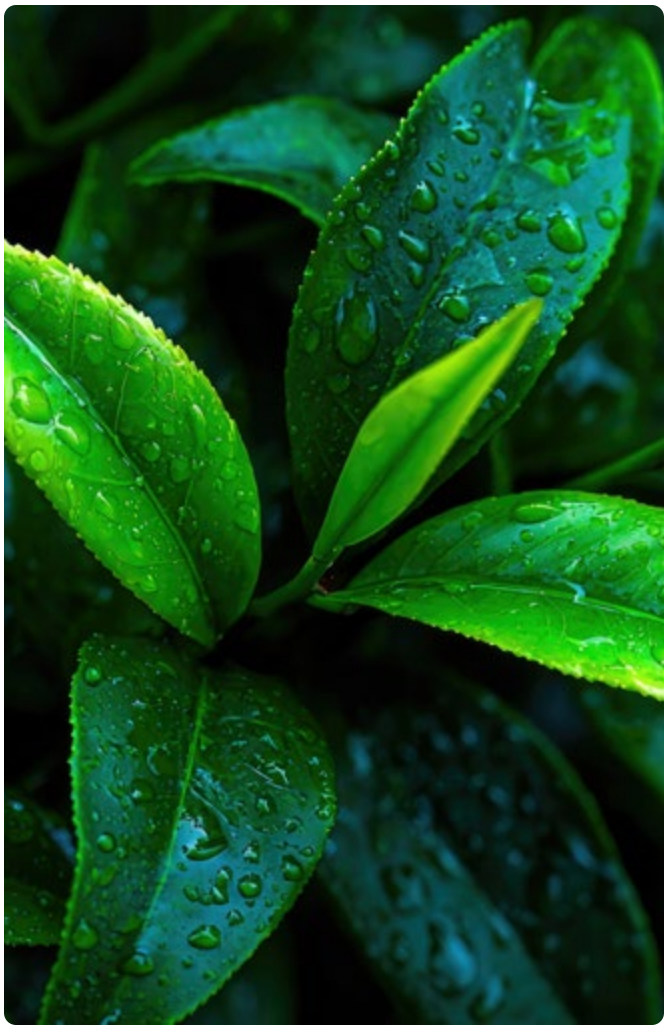
GHG accounting and reporting principles

This chapter provides definitions of the GHG accounting and reporting principles that are required and recommended for a GHG inventory to be in conformance with this Standard. GHG accounting refers to identifying, quantifying, recording, and classifying GHG emissions, removals, and other related metrics using standardized methods per agreed-upon protocols. GHG reporting refers to presenting data to internal management and external users such as regulators, shareholders, the general public, or specific stakeholder groups.

3.1 Overview

Principles underpin and guide GHG accounting and reporting to ensure the reported inventory represents a faithful, true, and fair account of a company's GHG emissions and CO_2 removals. The relevance, completeness, consistency, transparency, and accuracy principles are fundamental to the GHG Protocol *Corporate Standard* and *Scope 3 Standard* and also guide the *Land Sector and Removals Standard* and *Guidance*. The conservativeness and permanence principles guide the accounting and reporting of removals in a company's GHG inventory. The comparability principle is recommended when relevant to business goals.

Principles specific to accounting for credited GHG emission reductions or removals are distinct from the inventory accounting principles and are provided in Chapter 18.



3.2 Requirements

REQUIREMENT 2:

Required GHG accounting and reporting principles

Companies **shall** follow the principles of relevance, completeness, consistency, transparency, and accuracy when compiling a GHG inventory that includes land sector activities and/or removals. Companies **shall** also follow the principles of conservativeness and permanence if accounting and reporting for removals.

Table 3.1 Definitions and applicability of principles

Principle	Definition	Applicability
Relevance	Ensure the GHG inventory appropriately reflects the GHG emissions, removals (if applicable), and other metrics of the company and serves the decision-making needs of users, both internal and external to the company.	Required for emissions, removals, and other metrics accounting.
Completeness	Account for and report on all GHG emissions, removals (if applicable), and other metrics from sources, sinks, and activities within the inventory boundary. Disclose and justify any specific exclusions.	
Consistency	Use consistent methodologies to allow for meaningful performance tracking of GHG emissions, removals (if applicable), and other metrics over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.	
Transparency	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.	
Accuracy	Ensure that the quantification of GHG emissions, removals (if applicable), and other metrics is systematically neither over nor under actual emissions, removals (if applicable), and other metrics, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.	
Conservativeness	Use conservative assumptions, values, and procedures when uncertainty is high and accurate estimates are not practicable. Conservative values and assumptions are those that are more likely to overestimate GHG emissions and other related metrics and underestimate removals.	Required for removals accounting.
Permanence[a]	Ensure mechanisms are in place to monitor the continued storage of reported removals and captured CO_2, account for reversals, and report emissions from associated carbon pools.	
Comparability	Apply common methodologies, data sources, assumptions, and reporting formats such that the reported GHG inventories can be compared across multiple companies, as well as internally within each company.	Recommended for emissions, removals, and other metrics accounting when relevant.

Note: a. The permanence principle for GHG inventory accounting and reporting is distinct from the permanence principle for GHG credits. See Chapter 18 of the *Guidance* for details.

3.3 Recommendations

Comparability principle

Companies **should** follow the principle of comparability when relevant.

CHAPTER 4.

Setting the inventory boundary

This chapter provides requirements and guidance for setting the GHG inventory boundary, including setting the organizational and operational boundaries. It also defines required and optional accounting categories for land sector and removal activities.

4.1 Overview

Land sector companies and companies reporting CO_2 removals are required to conform with existing GHG Protocol standards to establish their inventory boundary and account for all fossil fuel and industrial emissions (Requirement 3).

Companies organize their GHG inventory into accounting categories that represent distinct impacts to the climate resulting from the activities occurring within the company's inventory boundary.

The inventory boundary is defined based on the following components:

- **Organizational boundary**: This determines what operations, lands, or other assets the company owns or controls.
- **Operational boundary**: This determines which scope (i.e., scope 1, scope 2, or scope 3) emissions, removals, or other metrics are reported in.
- **Accounting categories**: These represent the unique impacts a company's activities have on the climate (see Table 4.1 for details).

Table 4.1 Accounting category descriptions within the inventory boundary

Accounting category	Description	Examples
Physical GHG inventory		
Fossil fuel and industrial emissions	An accounting category representing the release of GHGs into the atmosphere from sources other than land emissions, including stationary combustion, mobile combustion, fugitive emissions, and process emissions.	GHG emissions from the combustion of fossil fuels.[a]
Land emissions	A land sector accounting category representing the release of GHGs into the atmosphere from the land and biogenic products, including the following subcategories: • Land use change emissions • Land management net biogenic CO_2 emissions • Land management production emissions • Biogenic product emissions[b]	GHG emissions from clearing land for agricultural production; GHG emissions from livestock manure management; GHG emissions from combusting fossil fuels.[c]
Removals	A land sector and technological removals accounting category representing the net transfer of CO_2 from the atmosphere to storage within a non-atmospheric pool. This category includes the following accounting subcategories: • Land management CO_2 removals • Captured biogenic CO_2 with geologic storage • Technological CO_2 removals with geologic storage	The net land carbon stock increases or net CO_2 removed through increases in soil organic carbon; CO_2 removed by direct air capture facilities and stored in geologic reservoirs.
Additional accounting categories		
Land use	A land sector accounting category representing the amount of agricultural land occupied by the company for products it produces or sources. This accounting category includes the following accounting subcategories: • Land occupation • Carbon opportunity cost of land use	Area of land needed to produce soy sourced by a company; the total amount of carbon lost from plants and soils on land used by agriculture relative to native carbon stocks.
Land carbon leakage	A land sector accounting category representing a specific type of leakage resulting from corporate actions that displace food or feed production to locations beyond the lands in their operations or value chain, leading to agricultural expansion and land use change. Such leakage is driven by increased demand for agricultural products and a fixed amount of global land.	GHG impacts from agricultural expansion linked to the diversion of crops for non-food, non-feed use.
Total emissions	The sum of: • Fossil fuel and industrial emissions • Land use change emissions • Land management net biogenic CO_2 emissions • Land management production emissions • Biogenic product CH_4 and N_2O emissions • CO_2 removals (if relevant) • Land carbon leakage	

Table 4.1 Accounting category descriptions within the inventory boundary (cont.)

Accounting category	Description	Examples
Additional accounting categories (cont.)		
Gross CO_2 fluxes	A land sector and technological removals accounting category representing the sum of one-directional transfers of CO_2 or its constituent carbon from one carbon pool to another. This accounting category includes the following accounting subcategories: • Biogenic product CO_2 emissions[b] • Gross biogenic land CO_2 emissions • Gross biogenic land CO_2 removals • TCDR-based product CO_2 emissions • Gross CO_2 emissions from geologic storage • Gross technological CO_2 removals	Gross CO_2 emissions from combusting biofuels; fugitive CO_2 emissions from CO_2 that was captured and transferred to geologic reservoirs; gross CO_2 removals from direct air capture facilities.
Product carbon storage	A land sector and technological removals accounting category representing changes in carbon stored in product carbon pools during the use stages of the product life cycle, including recycling and reuse, from carbon derived from biogenic or technological CO_2 sinks. This accounting category includes the following accounting subcategories: • Biogenic product carbon storage • TCDR-based product carbon storage	Changes in carbon stored in direct air capture CO_2-cured cement, sold by the manufacturer.
Reversals	A land sector and technological removals accounting category representing an emission from a carbon pool that stores carbon associated with a removal or CO_2 capture that was previously reported by the reporting company, in cases where the carbon pool is no longer within the company's operations or value chain. This accounting category includes the following accounting subcategories: • Reversals of land management CO_2 removals • Reversals of CO_2 removals with geologic storage • Reversals of CO_2 capture with geologic storage	Net carbon stock losses within soil carbon pools associated with removals previously reported by a company that are located in a sourcing region that the company no longer sources from.

Notes: a. Reported under "fossil fuel and industrial emissions" where data permits, or under "land management production emissions" if not; b. Refer to Requirement 17 for the required biogenic product emissions accounting and reporting approach; c. Refer to Chapter 10 for the recommendation on accounting for land sector fossil fuel and industrial emissions.

Land sector companies are required to include the accounting categories and subcategories outlined in Requirement 4 and further detailed in Part 2.1. This *Standard* also includes recommended and optional accounting categories and subcategories with specific requirements detailed in Parts 2.2 and 2.3.

Figure 4.1 summarizes the required and optional accounting categories and subcategories for companies that own or control land or operate in land sector value chains. See the glossary for definitions of accounting subcategories and Section 4.4.3 in the *Guidance* for examples of corporate activities that fall into each land sector accounting subcategory.

Figure 4.1 Required and optional accounting categories and subcategories for land sector value chains

	Physical GHG inventory					
	Emissions					Removals
Accounting category	Fossil fuel and industrial emissions[a]	Land emissions				Removals
Accounting subcategory		Land use change emissions[b]	Land management net biogenic CO_2 emissions	Land management production emissions	Biogenic product emissions[c]	Land management CO_2 removals
Scope 1						
Scope 2[d]						
Scope 3						
Reference	Corporate & Scope 3 Standards	Chapter 7	Chapter 9	Chapter 10	Chapter 11	Chapter 12 & 13

	Additional accounting categories							
Accounting category	Land use	Land carbon leakage	Total emissions	Gross CO_2 fluxes			Product carbon storage	Reversals
Accounting subcategory	Land occupation			Biogenic product CO_2 emissions[c]	Gross biogenic land CO_2 emissions	Gross biogenic land CO_2 removals	Biogenic product carbon storage	Reversals of land management CO_2 removals
Scope 1								
Scope 2[d]								
Scope 3								
Reference	Chapter 8	Chapter 8	Chapter 20	Chapter 11	Chapter 9	Chapter 13	Chapter 15	Chapter 12

Required categories Optional categories Not applicable

Notes: a. Refer to Chapter 10 for the recommendation on accounting for land sector fossil fuel and industrial emissions; b. This accounting subcategory quantifies land use change emissions as measured by a dLUC or sLUC calculation approach. Land use change emissions driven by increased land use or leakage are accounted for in the "land use" and "land carbon leakage" accounting categories; c. Refer to Requirement 17 for the required biogenic product accounting and reporting approach; d. Scope 2 is not relevant to many land sector and removals accounting categories because these categories are not directly related to the process of generating electricity, heating, cooling, or steam and are instead related to the life cycle of such processes and therefore reported in scope 3, category 3.

Figure 4.2 summarizes the required and optional accounting categories and subcategories for companies with technological CO_2 removals, CO_2 capture with geologic storage, or removals with geologic storage in their operations or value chain.[1] See the glossary for definitions of accounting categories and Section 4.4.3 in the *Guidance* for examples of corporate activities that fall into each technological CO_2 removal accounting subcategory.

Figure 4.2 Required and optional accounting categories and subcategories for technological CO_2 removal (TCDR) value chains

	Physical GHG inventory			Additional technological removals accounting categories				
	Emissions	Removals						
Accounting category	Fossil fuel and industrial emissions[a]	Removals		Gross CO_2 fluxes			Product carbon storage	Reversals
Accounting subcategory		Captured biogenic CO_2 with geologic storage	Technological CO_2 removals with geologic storage	TCDR-based product CO_2 emissions[b]	Gross CO_2 from geologic storage	Gross technological CO_2 removals	TCDR-based product carbon storage	Reversals of geologic storage
Scope 1								
Scope 2[c]								
Scope 3								
Reference	Corporate & Scope 3 Standards	Chapter 12 & 14	Chapter 12 & 14	Chapter 11	Chapter 14	Chapter 14	Chapter 15	Chapter 12 & 14

Required categories Optional categories Not applicable

Notes: a. Refer to Chapter 14 for inclusion of captured CO_2 that does not meet the geologic storage requirements and net carbon losses from geologic reservoirs; b. Refer to Requirement 18 for the required TCDR-based product accounting and reporting approach; c. Scope 2 is not relevant to many accounting categories because these categories are not directly related to the processes of generating electricity, heating, cooling, or steam and instead relate to the life cycle of such processes, and therefore are reported in scope 3, category 3.

4.2 Requirements

REQUIREMENT 3

Conformance with other GHG Protocol standards

Corporate GHG inventory accounting: Companies reporting a GHG inventory in conformance with the *Land Sector and Removals Standard* **shall** also follow and meet all the requirements of the GHG Protocol *Corporate Standard* and *Scope 3 Standard,*[2] including:

- **Organizational boundary**: Select a consolidation approach to define the organizational boundary (following the *Corporate Standard*) that determines which lands are owned or controlled by the reporting company. Disclose the consolidation approach selected.
- **Operational boundary**: Account for and report all scope 1, scope 2, and scope 3 emissions, including emissions from the 15 scope 3 categories (following the *Scope 3 Standard*).
- **GHG emissions**: Account for and report emissions of the following GHGs: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3.
- **Global Warming Potential (GWP) values**: Apply 100-year GWP values provided by the IPCC and report the source of the GWP values.
  - Companies **should** use GWP values from the most recent IPCC Assessment Report.[3]

- **Disclose exclusions**: Disclose and justify any exclusions of any scope 3 categories, accounting categories, gases, sources, or sinks from the GHG inventory.
- **Reporting period**: Disclose the reporting period covered by the GHG inventory.
- **Scope 3 minimum boundary**: Account for all life cycle GHG emissions specified in the *Scope 3 Standard* and meet or exceed the minimum boundary requirements for each scope 3 category. For land sector value chains, this specifically includes:
  - **Product life cycle GHG emissions**: Emissions in the life cycle of products associated with producing agricultural products purchased by the reporting company and/or bioenergy feedstocks associated with bioenergy products purchased or consumed by the reporting company. Such products include animal feed, fertilizers, pesticides, herbicides, and other agricultural inputs.
  - **Emissions from food loss and waste**: Emissions and other metrics associated with losses and waste of agricultural products that occurred prior to purchase by the reporting company.

Product life cycle accounting: Companies preparing a scope 3 GHG inventory **may** follow the *Product Standard* to account for product-level GHG emissions. When applying the *Product Standard*, companies **shall** apply the accounting and reporting requirements in the *Land Sector and Removals Standard* for land emissions, removals, land use, land carbon leakage, gross CO_2 fluxes, product carbon storage, and reversals when accounting for and reporting a product life cycle inventory report for a specific product.

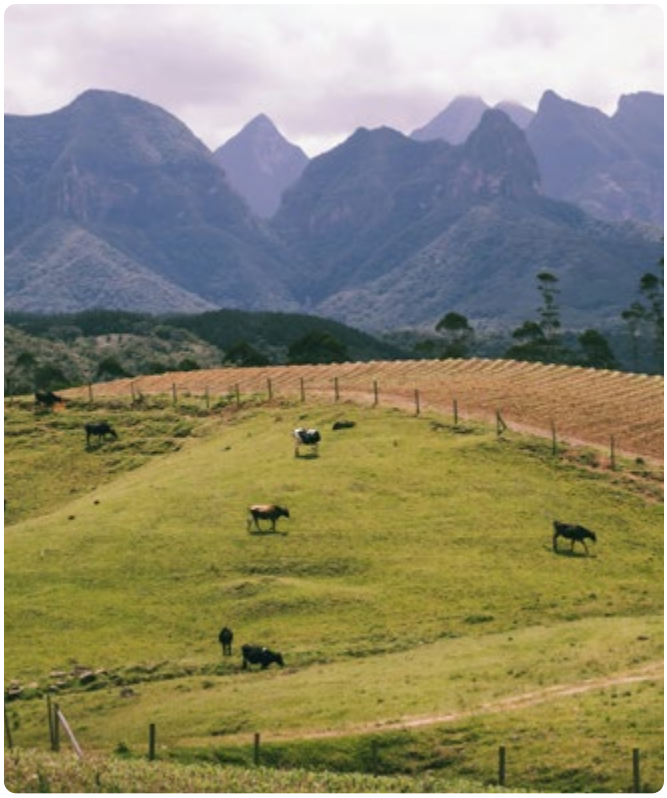
REQUIREMENT 4
Required accounting categories

Companies **shall** account for all of the following:

- **Scope 1, scope 2, and scope 3 emissions**
  - Fossil fuel and industrial emissions (Chapter 10, 14)
- **Scope 1 and scope 3 land emissions**[4]
  - Land use change emissions (Chapter 7)
  - Land management net biogenic CO_2 emissions (Chapter 9)
  - Land management production emissions (Chapter 10)
- **Scope 1 and scope 3 land use** (Chapter 8)
- **Scope 1 and scope 3 land carbon leakage**, when applicable (Chapter 8)
- **Scope 1, scope 2, and scope 3 biogenic product emissions** (Chapter 11)
  - This includes CH_4, N_2O, and in some cases CO_2 (see Requirement 17 in Chapter 11)
- **Scope 1, scope 2, and scope 3 gross CO_2 emissions**
  - Biogenic product CO_2 emissions, when applicable (see Requirement 17 in Chapter 11)
  - TCDR-based product CO_2 emissions, if relevant (Chapter 11)
  - Gross CO_2 emissions from geologic storage, if relevant (Chapter 14)
- **Scope 1 and scope 3 reversals**, when applicable (Chapter 12)

Companies **shall** separately report these categories by accounting category for scope 1, scope 2 (if relevant), and scope 3 for each scope 3 category (see Requirements 31 and 32 for details).

4.3 Recommendations and options



Recommended and optional accounting categories

The following accounting categories can also be included in the company's GHG inventory:

- **Removals**: Companies **should** account for and report "removals" if relevant and applicable, subject to meeting all requirements in part 2.2.
- **Product carbon storage**: Companies **may** account for and separately report "product carbon storage" if relevant and applicable, subject to meeting all requirements in part 2.3.
- **Additional gross CO_2 fluxes subcategories**: Companies **may** account for "gross CO_2 fluxes" and disaggregate into accounting subcategories:
  - Companies **should** account for and separately report "gross biogenic land CO_2 emissions" (e.g., gross CO_2 emitted from fires, other disturbances, and soil respiration) disaggregated by scope 1, and scope 3 gross emissions for each scope 3 category.
  - Companies **may** account for and separately report "gross biogenic land CO_2 removals" (e.g., gross CO_2 removed via plant growth) disaggregated by scope 1, and scope 3 gross removals for each scope 3 category.
  - Companies **may** account for and separately report "gross technological CO_2 removals" (e.g., gross CO_2 removed via direct air capture) disaggregated by scope 1, and scope 3 gross removals for each scope 3 category.

Endnotes

1 Companies seeking to account for captured biogenic CO_2 and geologic storage in their operations or value chain must account for and report both land sector and technological CO_2 removals–related accounting categories.

2 The GHG Protocol plans to update and align the *Corporate Standard*, *Scope 2 Guidance*, *Scope 3 Standard*, and *Land Sector and Removals* Standard where any differences exist.

3 For more details, see the 2013 GHG Protocol amendment "Required Greenhouse Gases in Inventories," and Version 2.0 (2024) of GHG Protocol's "IPCC Global Warming Potential values."

4 There are no scope 2 land use change emissions, land management net biogenic CO_2 emissions, or land management production emissions. Instead, such land emissions in the life cycle of generating electricity, heating, cooling, or steam (e.g., related to bioenergy feedstocks, hydropower, or other energy infrastructure) are reported in scope 3, category 3 by the company purchasing or acquiring the electricity, steam, heating, and cooling. The company providing the electricity, steam, heating, and cooling reports land emissions relative to their organizational boundaries, according to the consolidation approach selected.

CHAPTER 5.

Spatial boundaries and traceability

This chapter provides requirements and recommendations for setting spatial boundaries when estimating emissions, removals, and other metrics. Setting the spatial boundary is determined by the type and level of traceability a company can establish to lands in its value chain. The concept of a spatial boundary is relevant for both scope 1 and scope 3 accounting; traceability is relevant for scope 3 accounting.

5.1 Overview

Spatial boundaries determine the specific lands that are included when accounting for scope 1 or scope 3 emissions, removals, or other metrics. The ability to accurately account for emissions, removals, and other metrics impacted by a company's activities depends on a company's level of traceability to the relevant lands and activities in its operations or value chain.

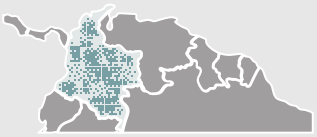
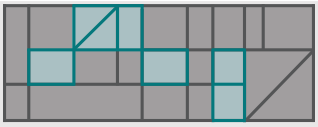
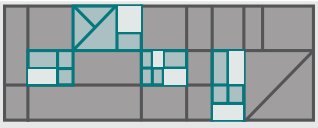
To account for emissions, removals, and other metrics, companies are required to:

- Define their scope 1 spatial boundary based on their organizational boundary. Define their scope 3 spatial boundaries (i.e., global, jurisdiction, sourcing region, land management unit [LMU], or harvested area) based on the level of traceability the company can establish to lands in its value chain (Requirement 5).
  - Apply the same spatial boundary for all accounting categories in their inventory.
- If companies account for agricultural scope 3 emissions, removals, and other metrics at a jurisdiction or sourcing region level, they are required to only include attributable productive lands within their spatial boundary (Requirement 6).
- Companies applying an LMU-level scope 3 spatial boundary may include non-productive lands proximate and adjacent to the productive lands if the required criteria are met (Requirement 7). However, the accounting approach for how to separate anthropogenic from natural impacts on non-productive lands when accounting for land management net biogenic CO_2 emissions and land management CO_2 removals is not covered in this version of the *Standard* (see Box 5.1 and Box 9.1 for details).
- If the company seeks to demonstrate physical traceability to define its spatial boundary (see Table 5.1), which may vary by activity in its value chain and/or volume of product, it is required to implement traceability systems (Requirement 8).
  - Table 5.2 provides definitions of eligible chain of custody models to demonstrate physical traceability.
  - If companies choose to report on impact traceability, they must report GHG emissions or removal impacts of projects and interventions separately from the physical GHG inventory.[1]

Table 5.1 Traceability and spatial boundaries for emissions and removals accounting

Type of traceability	Level of traceability	Spatial boundary (see Figure 5.1)	Emissions accounting	Removals accounting
N/A	No knowledge of origin	**Global**	The most appropriate level of traceability, and the associated scope 3 spatial boundary, for an activity and/or product is context-specific based on the type of LMUs producing the goods or services and the reporting company's position in the value chain (see Recommendation in Section 5.3 for details)	N/A
Physical traceability recommended	Known jurisdiction, country, or political region of origin	**Jurisdiction**		
Physical traceability required (Requirement 8)	Known first point of aggregation or first processing facility	**Sourcing region**		For removals, companies are required to establish physical traceability to the sourcing region, LMU, or harvested area (Requirement 20.LMR)
	Known land management units of origin	**Land management unit (LMU)**		
	Known field of origin	**Harvested area**		

Figure 5.1 Scope 3 spatial boundaries based on a company's level of traceability

Spatial Boundary	Description	
Global	A spatial boundary representing all lands globally where biogenic products or raw materials are sourced from.	
Jurisdiction	A predefined, spatially explicit area based on a political or administrative boundary within which biogenic products or raw materials are sourced. This includes political boundaries based on a subnational jurisdiction (e.g., state or province), country, or political region (e.g., the European Union) of origin.	
Sourcing region	A predefined, spatially explicit land area that supplies a given raw material to the first point of aggregation or first processing facility in the value chain. Sourcing region boundaries may be defined relative to the tier of the value chain that is inclusive of multiple first points of aggregation or first processing facilities with overlapping areas that supply harvested raw materials.	
Land management unit (LMU)	A predefined, spatially explicit area of a given land use, managed according to a clear set of objectives according to a single land management plan to produce a given raw material or set of raw materials. An LMU may represent spatially explicit areas such as a farm, field, or plot.	
Harvested area	A spatially explicit area of productive agricultural land that was harvested at a given time to produce the relevant raw material.	

Attributable productive lands

Lands not attributable to the product

Lands outside the scope 3 spatial boundary

5.2 Requirements

REQUIREMENT 5:

Spatial boundary requirements[2]

Determining the spatial boundary: Companies **shall** define spatial boundaries as follows when accounting for scope 1 or scope 3 emissions, removals, or other metrics:

- **Scope 1 spatial boundary**: Companies **shall** define the scope 1 spatial boundary as the lands owned or controlled by the reporting company based on the selected consolidation approach.
- **Scope 3 spatial boundary**: Companies **shall** define scope 3 spatial boundaries (i.e. global, jurisdiction, sourcing region, land management unit, or harvested area), and the lands included or excluded within those boundaries, according to the definition of each scope 3 category and based on the company's level of traceability to known lands or regions for a given volume of a given product. Requirement 8 sets forth how companies establish traceability.

Same boundary across accounting categories: Companies **shall** apply the same spatial boundary when accounting for all land emissions, removals, and other land-related metrics in their inventory, as specified below:

- **Scope 1 spatial boundary**: Companies **shall** apply the same scope 1 spatial boundary to account for all scope 1 land emissions, removals, and other accounting categories in the inventory.
- **Scope 3 spatial boundary**: Companies **shall** apply the same scope 3 spatial boundary to account for all scope 3 land emissions, removals, and other accounting categories in the inventory, for a given volume of a given product or other specific scope 3 activity (e.g., certain leased lands or investments).

Determining scope 3 spatial boundary by category: The specific lands included within the scope 3 spatial boundary depend on the scope 3 category, as detailed below:

- **Lands associated with purchased and sold products or services** (i.e., scope 3 categories 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, and 12): Companies **shall** include lands in the scope 3 spatial boundary associated with the life cycle of products, materials, or services (e.g., crops, animal products, agricultural inputs, etc.) purchased, processed, used, or sold by the reporting company (as applicable), depending on the company's level of traceability associated with a given volume of a given product or service:
  - If companies have no traceability, they **shall** include all lands globally where biogenic products or raw materials are sourced from.
  - If companies know the jurisdiction of origin, they **shall** include only attributable productive lands within the jurisdiction (see Requirement 6).
  - If companies have physical traceability to the first point of aggregation, they **shall** include only attributable productive lands within the sourcing region (see Requirement 6).
  - If companies have physical traceability to an LMU, they **shall** include all productive lands within the LMU boundary, and may include relevant proximate and adjacent non-productive lands (see Requirement 7).
  - If companies have physical traceability to an individual harvested area, they **shall** include productive lands within the harvested area boundary.
- **Lands related to franchises, leased assets, and investments** (i.e., scope 3 categories 8, 13, 14, and 15): Companies **shall** include lands associated with scope 3 leased assets, franchises, or investments in their scope 3 spatial boundary. Such lands are determined based on their selected consolidation approach.

REQUIREMENT 6:
Attributable productive lands for scope 3 accounting[2]

Companies that set a jurisdiction-level or sourcing region-level scope 3 spatial boundary **shall** only include attributable productive agricultural lands within their jurisdiction or sourcing region boundaries.

Attributable productive lands: All productive agricultural lands that produce the product or material sourced by the reporting company, or productive agricultural lands that use the product sold by the reporting company. Attributable productive lands **shall** exclude the following types of land:

- **Non-productive lands**: Lands that are not directly producing and/or not capable of producing the product or material sourced by the reporting company in the reporting year.
- **Lands producing other products or materials**: Productive lands or LMUs in land uses, forest types, or crop types not relevant to, or only producing something different than, the product or material sourced by the reporting company.
  - Productive lands that produce multiple products, including those associated with the reporting company, do not need to be excluded; see Section 5.4.1 in the *Guidance* for additional details.
- **Lands with harvest restrictions**: Lands with legal or regulatory restrictions that prohibit harvesting in the reporting year.
- **Lands with other protective status**: Lands with other protective status that would prevent the production of products or materials sourced by the reporting company or the use of products sold by the reporting company.

Lands that issued GHG credits: Companies **shall** identify any lands where emission reductions or removals were issued as GHG credits to be used as an offset or for compensation, to disclose information on GHG credits issued within the scope 3 spatial boundary (see Reporting GHG credits in Section 18.2.2).

Where data limitations prevent companies from meeting all the criteria for excluding specific lands, companies **should** apply a broader scope 3 spatial boundary to complete the accounting. In such cases, companies **should** explain the use of proxy data or other approaches that seek to exclude such lands and identify planned improvements.

REQUIREMENT 7:

Interim requirement on proximate and adjacent non-productive lands within LMUs for scope 3 LMU-level accounting[3]

Companies that set an LMU-level scope 3 spatial boundary **shall** include all productive lands in the LMU boundary and **may** include proximate and adjacent non-productive lands within the LMU boundary. Any proximate and adjacent non-productive lands included in the LMU boundary **shall** meet the following criteria:

- **Single land management plan**: Non-productive lands **shall** be owned or operated by the same farmer (or collective) and managed under a single land management plan as the land area producing the raw materials.
- **Connection to productive agricultural lands**: Non-productive lands **shall** be connected bio-physically, ecologically, and/or socio-economically to the productive lands such that they provide direct benefits to the sustainability and socio-economic health of the productive lands, and **shall** be limited to one or more of the following:
  - Land used for edge-of-field management practices (e.g., windbreaks, hedgerows, riparian buffers), subject to additional considerations (see Box 5.1).
  - Land integrated in agroforestry systems (e.g., tree intercropping/alley cropping, multi-strata agroforestry/shade trees, silvopasture).
  - Set-aside lands (e.g., conservation reserve land) that directly benefit the agricultural production system (e.g., reduce soil erosion, improve water quality, attract pollinators and other beneficial insects), subject to additional considerations (see Box 5.1).
- **Same boundaries across accounting categories**: If removals are accounted for on proximate and adjacent non-productive lands, all land emissions and other metrics associated with these lands **shall** also be accounted for and reported.
- **Same allocation methods**: The same allocation method **shall** be applied for emissions, removals, and other metrics across all products produced within the LMU to ensure no double counting (including no overcounting of removals or undercounting of emissions from the system).

- **Avoid double counting**: If removals on adjacent or proximate non-productive lands are accounted for, companies **shall** provide justification that these removals were not already accounted for, either by other companies at the same or similar tiers of the value chain that source from or sell to that LMU (see Requirement 22), or by other companies or GHG programs as GHG credits used toward GHG targets (e.g., issuance and retirement of GHG credits for compensation targets; subject to Requirement 30).
- **Location limitations**: The location(s) of the adjacent and/or proximate non-productive lands **shall** meet the following criteria:
  - **Adjacent lands**: Lands that are abutting the productive land area and integrated into the agricultural management system.
  - **Proximate lands**: Lands that are near the productive land area and integrated into the agricultural management system.
- **Additional safeguards to account for anthropogenic CO_2 emissions and removals**:
  - Size thresholds – subject to forest and non-productive lands carbon accounting decision (see Box 5.1 for details).
  - Distance thresholds – subject to forest and non-productive lands carbon accounting decision (see Box 5.1 for details).
  - Additional criteria and/or safeguards may be necessary pending the final resolution on how to account for anthropogenic CO_2 emissions and removals on all forest lands and non-productive, non-forest lands (see Box 9.1 for details).

See Box 5.1 for a description of why Requirement 7 cannot currently be implemented and the plan to address this in future versions of the Standard.

Box 5.1 Additional considerations for proximate and adjacent non-productive lands to account for anthropogenic CO_2 emissions and removals

The interim Requirement 7 cannot currently be implemented because the following topics are still pending:

- The accounting approach for separating anthropogenic from natural impacts on all forest lands and non-productive non-forest lands when accounting for land management net biogenic CO_2 emissions and land management CO_2 removals. This topic is not covered in this version of the *Standard* (see Box 9.1 for details).
- The additional safeguards listed in Requirement 7 to account for anthropogenic CO_2 emissions and removals, including size thresholds, distance thresholds, and possible additional criteria and/or safeguards, pending the final resolution of the topic in the previous bullet point.

These topics have not been decided upon by the Independent Standards Board of the GHG Protocol. The final approach seeks to ensure only anthropogenic CO_2 emissions and removals are accounted for and to address concerns with companies including large areas of non-productive lands within LMUs that have limited connection to the production of agricultural products purchased by the reporting company. The criteria for proximate and adjacent non-productive lands may be revised in future versions of this *Standard*.

REQUIREMENT 8:
Interim traceability requirement

To account for scope 3 emissions, removals, and other metrics, companies apply a scope 3 spatial boundary determined by the level of traceability they can establish to known lands or regions. To apply a sourcing region, LMU, or harvested area as the scope 3 spatial boundary to account for emissions, removals and other metrics, companies **shall** have physical traceability to the sourcing region, LMU, or harvested area within their value chain. The level of traceability may vary by activity and/or volume of product.

Physical traceability: If companies seek to demonstrate physical traceability for an activity and/or volume of product in their value chain, companies **shall** implement traceability systems (e.g., through certification programs or audited internal systems) that apply the following chain of custody models:

- Identity preservation;
- Segregation;
- Controlled blending;
- Mass balance approaches in which the volume or proportion of specified characteristics in the product or material entering and leaving the batch, site, or group of sites within the same country and sourcing region[4] is known and attributed[5] over a defined reconciliation period (i.e., batch-level, site-level, multi-site-level, or group-level within the same country and sourcing region); and/or
- Mixes of these approaches.[6]

Companies cannot demonstrate physical traceability using book-and-claim approaches or those mass balance approaches where:

- the volume of inputs and outputs with the specified characteristics is unknown or not specified;
- non-proportional allocation[7] was used to assign the specified characteristics to a volume of outputs;

- a reconciliation period was not defined (for a site-level, multi-site-level, or group-level); or
- mixing occurred in a group of multiple sites in different countries or sourcing regions.

Table 5.2 Chain of custody model definitions

Chain of custody model	Definition (Adapted from: ISO 22095:2020; ISEAL Alliance 2025)	Demonstrates physical traceability?	Physical relationship
Identity preservation	A chain of custody model in which materials or products with specified characteristics originating from a single source or origin are kept physically separate from materials or products originating from other sources throughout the value chain.	Yes	**Strong physical relationship**
Segregation	A chain of custody model in which materials or products with a set of specified characteristics are kept physically separate from materials or products without that set of characteristics. This model allows for mixing of materials with the same set of characteristics from multiple sources, but not mixing with materials or products without that set of characteristics.	Yes	
Controlled blending	A chain of custody model in which materials or products with a set of specified characteristics are mixed according to certain criteria with materials or products without that set of characteristics, resulting in a proportional attribution of the specified characteristics within all parts of the final output(s) or product group(s). • **System boundaries**: At a given stage in the value chain for a batch of products.	Yes	
Mass balance	A chain of custody model in which materials or products with a set of specified characteristics are mixed according to defined criteria with materials without that set of characteristics, and where the volume of content with the specified characteristics can be attributed to any of the parts of the final output(s) or product group(s), at the transfer boundary. If the transfer boundary is producing various outputs or product groups, allocation has to be performed first.7 The transfer boundary can be at a given stage in the value chain, where the volume of content with specified characteristics is reconciled at a: • **Batch-level**: for the final outputs from the batch at the point of blending. • **Site-level (facility)**: for the final outputs at the site over a defined reconciliation period, recommended to not exceed 12 months. • **Multi-site/group-level**: for the final outputs from the multiple sites over a defined reconciliation period, recommended to not exceed 12 months.	Yes, for the specified transfer boundaries, and if it meets specified criteria. No, for specified transfer boundaries that do not meet criteria, or for other unspecified transfer boundaries	
Book and claim	A chain of custody model in which the transfer of specified characteristics is not connected to the physical flow of material or products through the supply chain.	No	**No physical relationship**

Note: For definitions of terms in this table and additional guidance on applying them, refer to ISEAL Alliance (2025).

Impact traceability: If companies use alternative approaches to traceability, such as impact traceability systems, they **shall** report the associated values separately from the physical GHG inventory and disclose and justify the approach used. In the absence of requirements and guidance on impact traceability in this version of this *Standard*, companies using such approaches may wish to consult with their auditors and consider rules provided by relevant target-setting programs or applicable regulatory schemes in their jurisdiction(s) on how to disclose such activities in their reports, while ensuring full transparency and following all GHG accounting and reporting principles.[8]

5.3 Recommendations and options

Recommended considerations to determine the level of traceability and the scope 3 spatial boundary

The most appropriate level of traceability, and the associated scope 3 spatial boundary, that a company **should** strive to establish for a given product is context-specific based on the type of land management units producing the goods/services and the reporting company's position in the value chain.

Companies **should** strive towards establishing a level of traceability and set the scope 3 spatial boundary that enables the following:

- The most accurate, precise accounting for emissions, removals, and other metrics in the specific context. Companies **should** also follow the "higher accuracy data and methods" Recommendation in Section 6.3.
- The most credible allocation for emissions, removals, and other metrics.
- The most effective and efficient way to improve land management practices and foster collaborative investment for climate change mitigation within value chains.

In the absence of other information, companies **should** apply the scope 3 spatial boundary corresponding to the most specific level of physical traceability a company can establish. In general, setting a global scope 3 spatial boundary (i.e., corresponding to global or no traceability) does not satisfy the above criteria.

Recommendation for free, prior, informed consent; equity; and landholder rights

When engaging with value chain partners and other landholders included in a company's scope 3 spatial boundary, companies **should** ensure equity and acknowledge the rights of landholders by obtaining free, prior, informed consent; providing fair compensation for mitigation actions aimed to reduce their scope 3 emissions or increase scope 3 removals; and following best practices:

- **Free, prior, informed consent**: Companies **should** follow international best practices for obtaining free, prior, informed consent to include such lands within their scope 3 inventory. This **should** include explaining to farmers or other landholders the various options they have to monetize their emissions reductions or removals, including current and projected carbon prices.
- **Provide fair compensation**: Companies **should** provide fair compensation to farmers or other landholders for GHG mitigation efforts annually, in addition to payments for the products or services associated with the reporting company's value chain, and disclose that compensation.
- **Follow best practices**: For further resources and best practices, refer to guidance provided by the Food and Agriculture Organization,[9] the Office of the UN High Commissioner for Human Rights, the Institute for Human Rights and Business, CARE Principles for Indigenous Data Governance,[10] Science Based Targets initiative's *Forest, Land and Agriculture Guidance*, and so on.

Endnotes

1 This interim requirement will be revisited in future versions of this *Standard* to reflect the outcomes of the GHG Protocol's workstream on actions and market instruments. The current requirement does not set a precedent for that process and is not a final approach.

2 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

3 This interim requirement is relevant to defining the spatial boundary of agricultural value chains. The approach to account for CO_2 emissions and removals on all forest lands and non-productive non-forest lands is not covered in this version of the *Standard*. See Box 5.1.

4 Companies may provide justification where mass balance is applied for a sourcing region that comprises more than one country. Such sourcing regions should be justified based on the sourcing region definition, considering which producers supply raw materials to the first point of aggregation or processing facility (i.e., a global mass balance system does not conform with the sourcing region definition).

5 This requirement is for the proportional or non-proportional attribution of specified characteristics within product groups.

6 This approach builds on Version 2.0 (2025) of ISEAL's "Chain of custody models and definitions," and ISO's 22095:2020 "Chain of custody – General terminology and models".

7 For the allocation of specified characteristics between product groups, refer to the "scope 3 allocation recommendations" and "agriculture sector allocation recommendations" in Section 6.3.

8 The GHG Protocol's workstream on actions and market instruments may provide further updates to the definition and how it relates to the GHG inventory and broader GHG report.

9 See FAO FPIC guidance.

10 See Global Indigenous Data Alliance guidance.

CHAPTER 6.

Data and methods

This chapter provides requirements and recommendations on collecting data, quantification methods, scope 3 allocation, and uncertainty. These topics are further elaborated in the Guidance.

6.1 Overview

A variety of methods and data sources are available to quantify land sector GHG emissions, CO_2 removals, and other metrics. Methodological decisions should be made based on a combination of factors, including data and method availability, the company's location within the value chain and level of traceability, and the additional data requirements for removals accounting (Chapter 12). Quantifying emissions and removals from specific practices occurring within a company's operations and value chain requires data and methods specific to the relevant lands and land management practices.

All companies must use the same allocation methods across metrics (Requirement 9).

All companies must report:

- Information on the data sources, methods, and assumptions used to develop their inventory by meeting the data and methods reporting requirement in Section 6.2.2 (See "Reporting GHG inventory data and methods").
- Additional information specific to each accounting subcategory is provided in each subsequent chapter, as an elaboration of the reporting requirement in this chapter. These additional reporting requirements are provided in Section [X].2.2 of each subsequent chapter (e.g., Reporting requirements for land use change emissions are provided in Chapter 7, Section 7.2.2).

All companies are encouraged (see Recommendations in Section 6.3) to:

- Aim for higher accuracy data and methods, evaluate data quality, and improve their inventory over time.
- Calibrate models using empirical data.
- Disclose if metrics within the inventory are non-comparable within the organization.
- Allocate emissions, removals, and other metrics to multiple outputs of a process in a way that best reflects the causal relationship between the production of the outputs and the resulting emissions, removals, or other metrics.

6.2 Requirements

6.2.1 Accounting requirements

REQUIREMENT 9:

Same allocation methods across metrics

Companies **shall** apply the same allocation method across accounting categories (i.e., emissions, removals, and other metrics) within a given spatial boundary.

6.2.2 Reporting requirements

Reporting GHG inventory data and methods

Companies **shall** disclose in their GHG report:

- **Data and methods**: For each scope, scope 3 category, and accounting subcategory, companies **shall** describe:
  - Methodologies, scope 3 allocation methods, and assumptions used to calculate emissions, removals, or other metrics.
  - Types and sources of data (e.g., activity data, emissions factors, carbon opportunity cost factors, conversion factors, and GWP values) used to calculate emissions, removals, and other metrics.
  - Data quality of reported data, including, if applicable, sampling method(s) used and uncertainty of the results, with methodology (if quantitative) or description (if qualitative).
- **Share of supplier-specific data**: For each scope 3 category, companies **shall** disclose the percentage of emissions calculated using data obtained from suppliers or other value chain partners.
- **Spatial boundaries**: Companies **shall** describe:
  - Scope 1 spatial boundary: the spatial boundary for lands owned or controlled by the company.
  - Scope 3 spatial boundary: the level of traceability and spatial scale used (i.e., harvested area, LMU, sourcing region, jurisdiction, global), by a given volume of a given product (e.g., crops, animal products, bioenergy feedstock, etc.) or other specific scope 3 activity (e.g., certain leased lands or investments). The description **should** include a summary of the LMUs and/or attributable productive lands included in the spatial boundary.[1]
  - If applicable, the type of chain-of-custody model and/or certification program used to demonstrate traceability (described in Requirement 8).
- **Use of aggregated data**: If companies use aggregated data to report emissions, removals, or other metrics that are required to be disaggregated by accounting subcategory (see Requirement 32), they **shall** justify how the accounting category (or categories) comprise a small share of the total GHG inventory.
- **Evidence for recycled waste**: If companies use the recycled content allocation method for post-consumer waste that is recycled or reused, companies **shall** provide evidence that the waste is post-consumer and that the waste has been reused or recycled.

See additional reporting requirements in Section [X].2.2 of each chapter for additional reporting information on each accounting subcategory or topic.

6.3 Recommendations

Higher accuracy data and methods

Companies **should** prioritize using higher accuracy methods and reduce uncertainty as far as is practical. Companies **should** collect supplier-specific data for the GHG sources and sinks that are most significant (i.e., comprise the greatest share of the inventory) across their operations and value chain and/or where the opportunity for emissions reduction and removals enhancements is greatest. Companies **should** improve their data collection over time to increase the accuracy of their reported GHG emissions, removals, land use, and leakage, and additional accounting categories by gathering more supplier-specific data, evaluating and improving data quality, and prioritizing data and methods that reduce uncertainty, as relevant to meeting their specific business goals.

See the Guidance (Chapter 6) and Scope 3 Standard for additional information on evaluating data quality and uncertainty.

Model calibration and validation recommendation

Companies **should** calibrate model-based and remote sensing-based calculation approaches using empirical data specific to the land area, management practices, and GHG impacts (i.e., carbon stock changes or GHG emissions) under analysis. Companies **should** report a description of the process undertaken to calibrate the model, including reference to the data used to calibrate the model and its applicability to the GHG impacts being estimated.

Disclosing internal non-comparability

Companies **should** disclose and justify if the emissions, removals, or other land-related metrics within their inventory are not comparable across each of their products, business units, and/or regions due to differences in methods and/or data used for each.

Scope 3 allocation recommendations

In most product life cycles, there is at least one common process that has multiple products as outputs, and for which it is not possible to collect data at the individual output level. In these situations, the total emissions, removals, and other metrics from the common process need to be partitioned among the multiple outputs (see Requirement 9). The most appropriate allocation method for a given process depends on the specific circumstances of the process (see Section 6.4.5 in the *Guidance* for additional details). Different allocation methods may yield significantly different results.

As a general principle, companies **should** select the allocation method that:

- best reflects the causal relationship between the production of the outputs and the resulting emissions, removals, and other metrics, either because:
  - the physical properties of the product and co-products determine the emissions, removals, and other metrics of the process; or
  - the demand for a product or co-product determines the emissions, removals, and other metrics of the common process.
- results in the most accurate and credible emissions, removals, and other metrics estimates

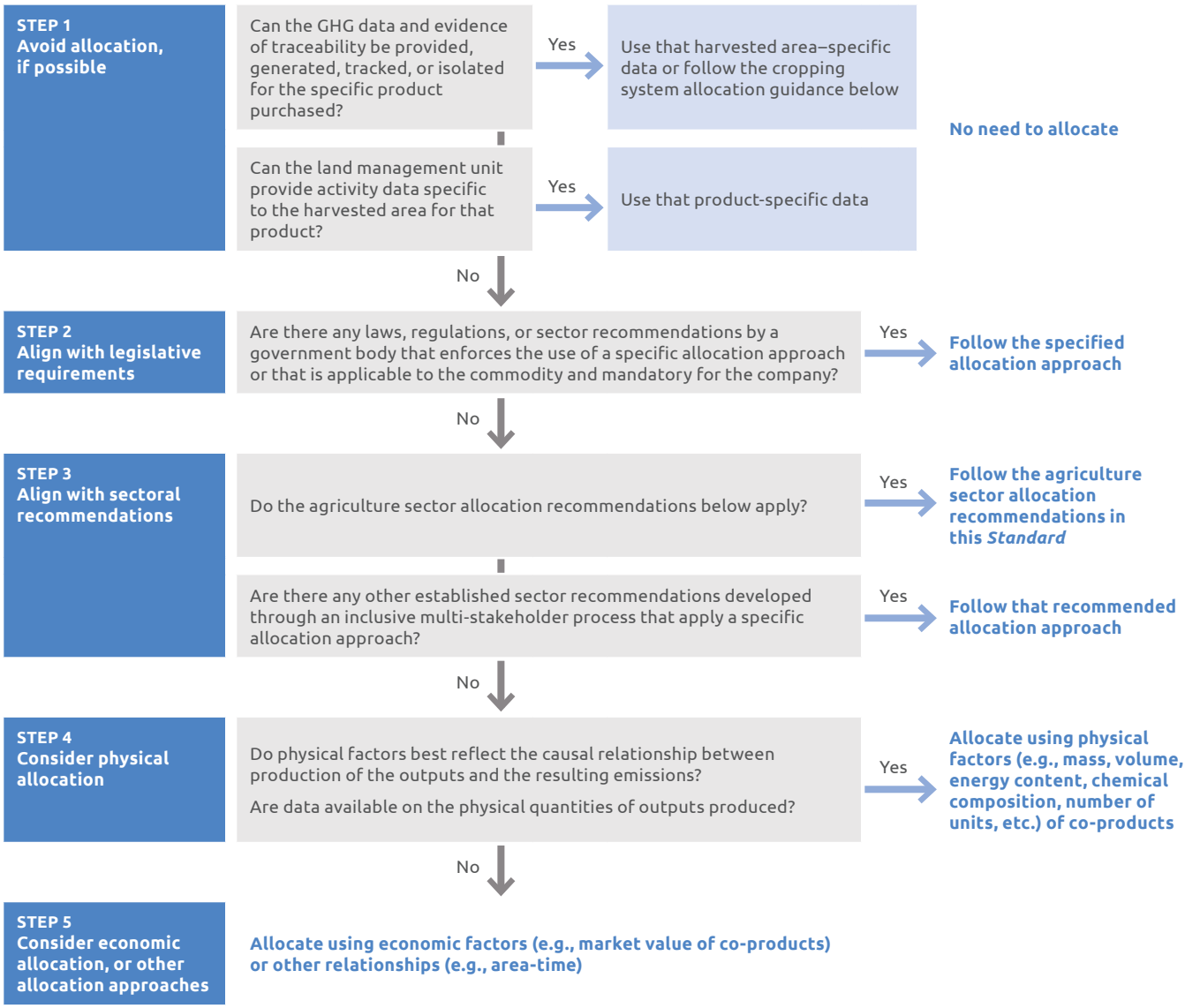
- best supports effective decision-making for GHG reduction activities
- otherwise adheres to the principles of relevance, accuracy, completeness, consistency, and transparency

Chapter 8 in the Scope 3 Standard (2011) provides guidance on how to apply these principles generally to different sectors. Guidance for applying these principles to the agriculture sector is provided below (see "Agriculture sector allocation recommendations").

Companies **should** ensure that the same allocation methods are used for each process to avoid the over-counting or under-counting of total emissions from the system, in accordance with the *Scope 3 Standard*. Companies must ensure that allocated removals do not exceed total removals in the system, following Requirement 22 in Chapter 12.

Companies **should** use the decision tree in Figure 6.1 as guidance on how to best adhere to the recommendations above.

Figure 6.1 Allocation method decision tree for companies, as applied to the LSR Standard



Agriculture sector allocation recommendations

For the agriculture sector, companies **should** choose an allocation approach according to the following tiers in the value chain where the partitioning of GHG emissions, removals, or other land-related metrics among materials or products is occurring:

- **Allocation at the land**: Where different agricultural products are generated on the same LMU and benefit from the same inputs (e.g., cropping systems such as intercropping, double- or multi-cropping systems), physical allocation is not recommended. Companies **should** first follow the guidance below for the specific cropping system (if applicable), and then follow the hierarchy of land allocation approaches among agricultural products:
  - **Allocation approaches for specific cropping systems**
    - **Crop rotations**: Calculate carbon stock changes and other GHG emissions over the full crop rotation and allocate across all crops in the rotation.
    - **Crop rotations with cover crops**: Allocate net land carbon stock changes and other GHG emissions associated with cover crop production (or other non-cash crops, including temporary fallow land) across all cash crops in the crop rotation or to the subsequent cash crop if not part of a crop rotation with multiple cash crops. This allocation approach may also apply to agroforestry systems which include plants or trees that are not associated with the harvested product.
    - **Intercropping systems**: Follow the hierarchy below of land allocation methods among agricultural products of the intercropping system.
  - **Hierarchy of land allocation methods among agricultural products**
    1. **Consider economic allocation**: Allocate emissions, removals, and other metrics based on the share of the total economic value for all products from the agricultural production system in the reporting year or over the crop rotation.
    2. **Consider area–time allocation**: Allocate emissions, removals, and other metrics based on the square meter-year (m^2yr) for all products from the agricultural production system in the reporting year or over the crop rotation.
- **Allocation at the agricultural product processing facility**: If multiple co-products are generated from the same agricultural product at a processing facility, companies **should** allocate based on the share of the total economic value for each co-product. Some examples include:[2]

Primary co-product	Secondary co-product
Cereal or flour	Bran, germs, and hulls of seeds
Oil	Cake
Sugar	Pulp and molasses
Starch	Pulp, gluten, and germs
Fruit or vegetable	Pomace and stones
Cotton fiber	Hulls of seeds

Allocation approaches for waste and recycled material

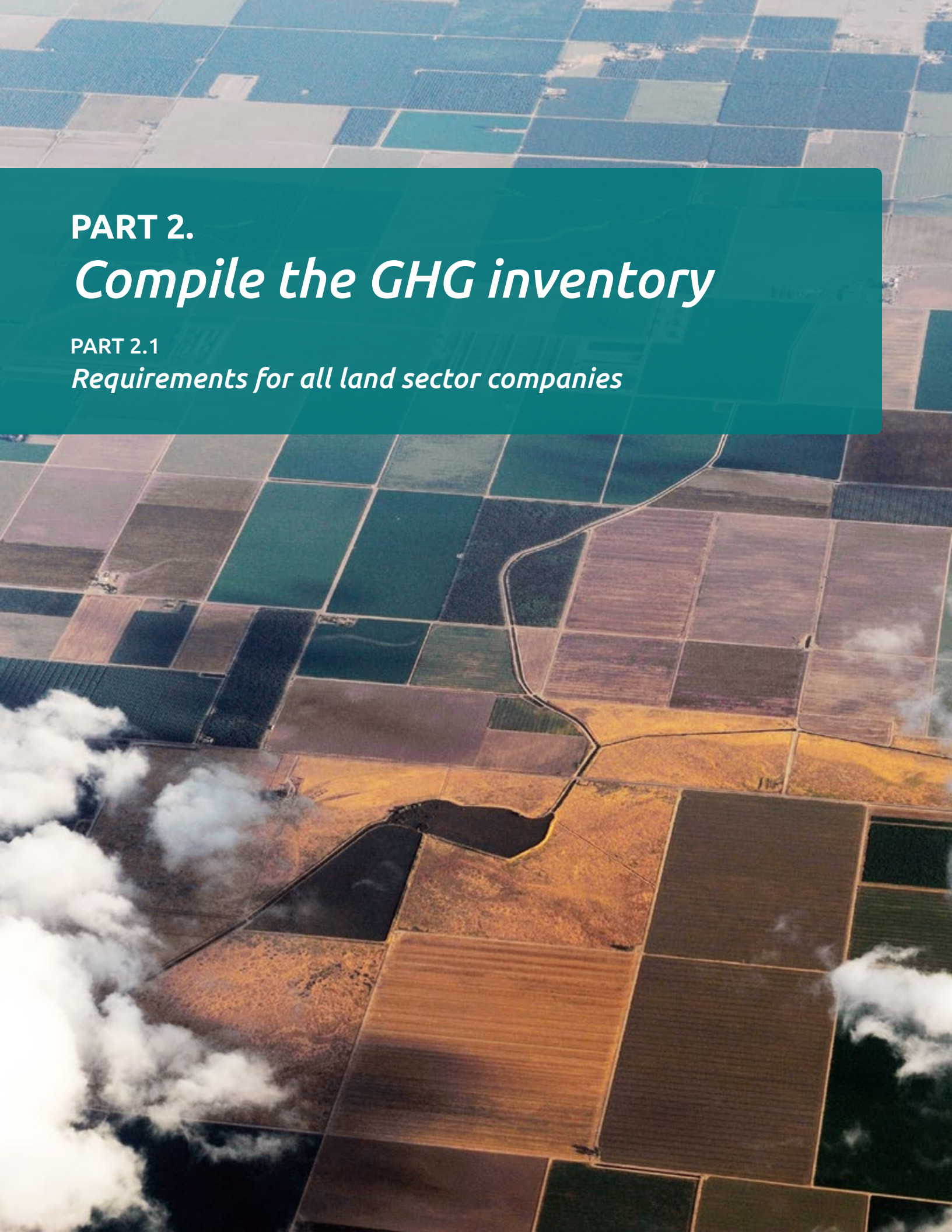
Companies **should** apply the following allocation approaches for waste and recycled material:

- **Waste**: Waste is an output of a system that has no market value. If a system or process produces waste during production, no emissions, removals, or other metrics from the system or process **should** be allocated to the waste. The company sourcing waste **should not** account for any upstream indirect emissions, removals, or other metrics associated with waste within their scope 3, prior to the generation of the waste. All emissions, removals, and other metrics from the system **should** instead be allocated among the system's other outputs. Note that this allocation guidance for waste is distinct from how companies must account for emissions and other metrics associated with losses and waste of agricultural products (e.g., food loss and waste) that occurred prior to purchase by the reporting company, in scope 3, category 1; see Requirement 3.
- **Recycling**: Recycling occurs when a product or material exits the life cycle of one product to be reused or recycled as a material input in another product's life cycle. Companies **should** follow the *Scope 3 Standard* system boundaries for recycling, based on the recycled content allocation method. The life cycle of acquired recycled material(s) is assumed to start with the recycling process. Therefore, the use of recycled material **should** not be associated with any impacts upstream of the recycling process. All subsequent emissions in the life cycle (beginning with the recycling process) are accounted for.
    - Companies may use the recycled content allocation method for post-consumer waste that is recycled (e.g., used cooking oil, recovered fiber) or reused (e.g., material/residue that is reused as a material input in another process) regardless of the market value of the waste.

Endnotes

1 In some regions, legislative requirements on data protection and farmer protection might prevent companies from accessing or sharing some of these data. Established regulations regarding disclosures (e.g., anti-trust regulations, data privacy laws) take precedence over this requirement.

2 Adapted from Szebiotko (1985).



PART 2.
Compile the GHG inventory

PART 2.1
Requirements for all land sector companies

Introduction to Chapters 7 and 8: Land use change–related metrics

Producing agricultural products requires the use of cropland and pastureland, and clearing of natural ecosystems for agricultural land generally leads to large losses in carbon otherwise stored in vegetation and soils. The majority of the world's croplands, and at least 30 percent of its pasturelands, were formerly forested or otherwise had higher carbon stocks than today.[a] Due to rising global demand for agricultural products, cropland is expanding on both a gross and net basis globally, and pastureland is expanding in carbon-rich terrestrial ecosystems. Agricultural expansion is generally estimated to contribute around 10 percent of global GHG emissions.[b]

Regardless of when agricultural land was cleared, the total quantity of agricultural land required by a company contributes to global land pressure that leads to land use change emissions from net global land use change.

To account for a company's contribution to emissions from agricultural land expansion, this *Standard* requires reporting of multiple metrics:

- **Chapter 7.** Land use change (LUC) emissions metrics (direct and statistical land use change emissions) measure annual emissions from gross, recent expansion of agricultural land due to activities on lands in a company's operations or value chain.
- **Chapter 8.** Land use metrics (required to be expressed as agricultural land occupation in hectares, and optionally as land occupation by land use category or the carbon opportunity cost of land use) quantify a company's contribution to global agricultural land use. Changes in land use metrics, particularly intensity metrics, reflect contributions to land use change, either positive or negative. Companies are also required to report **land carbon leakage** in cases where corporate actions displace food or feed production.

Full accounting of a company's contribution to land use change includes a combination of both land use change emissions and a measure of the company's contribution to global agricultural land use.

Notes: a. Klein Goldewijk et al. 2017. Estimates for pastureland vary based on land cover threshold assumptions (see, e.g., Hayek et al. 2024); b. IPCC 2022. This estimate considers agricultural land use expansion on a net basis at the country level and factors in agricultural abandonment and forest regrowth. Global emissions due to gross agricultural expansion are larger.

CHAPTER 7.

Land use change emissions

This chapter provides requirements and recommendations on accounting for and reporting GHG emissions due to recent land use change (LUC) in a company's GHG inventory. LUC emissions include emissions due to deforestation or other types of conversion between land use categories or subcategories that have occurred in recent years.

7.1 Overview

Emissions from LUC are any release of GHG emissions due to a change in land use from one land use category or subcategory to another (see Glossary and *Guidance* for land use category definitions). Subcategory land use change is a change between subcategories within a land use category, such as conversion from natural forest to plantation forest (see Requirement 11 below). LUC emissions are calculated based on the total land carbon stock decrease across all land ecosystem carbon pools and other GHG emissions due to land use change. Removals due to LUC (e.g., reforestation or afforestation) are accounted for as "land management CO_2 removals" separately from "land use change emissions" (see Chapter 13).

LUC emissions are generally released to the atmosphere quickly following conversion, but a land use conversion can enable continuous agricultural production, not only during the following year but for many years, depending on the production system. LUC emissions from conversion are assigned to all products grown during the LUC assessment period (20 years or greater), not only to the production that occurred in the year the LUC occurred. Using a method called linear amortization, products grown closer in time to the year of conversion are weighted more heavily (i.e., assigned greater LUC emissions) than products grown more distant in time from the year of conversion.

Companies account for LUC emissions using the "LMU-level" direct land use change (dLUC) calculation approach on lands they own or control, or those LMUs to which they have complete traceability in their value chain (Figure and Table 7.1). Companies account for land use change emissions using the "jurisdictional" dLUC calculation approach or the statistical land use change (sLUC) calculation approach when specific sourcing lands are unknown (Figure and Table 7.1). Companies can use sLUC emission factors provided by third-party databases, but must verify that the sLUC emission factor applies the product expansion allocation method and satisfies other requirements set forth in Requirement 10 below.

Companies that raise livestock or have animal products in their value chain must follow the LUC accounting Requirement 10.1. Companies that own or control water reservoirs or have water reservoirs in their value chain (e.g., by purchasing electricity from hydropower) must follow the LUC accounting Requirement 10.2.

Figure 7.1 Land use change emissions calculation approaches based on value chain traceability

Scope 3 spatial boundary	Statistical land use change (sLUC)	Direct land use change (dLUC)	
		"Jurisdictional" direct land use change (jdLUC)	"LMU-level" direct land use change
Global			
Jurisdiction			
Sourcing region			
Land management unit (LMU)			
Harvested area			

Calculation approach is applicable Calculation approach not applicable

7.2 Requirements

7.2.1 Accounting requirements

REQUIREMENT 10:

Land use change emissions accounting

Companies **shall** account for land use change emissions according to the following requirements:

- **GHG emissions**: Companies **shall** account for CO_2, CH_4, and N_2O emissions caused by LUC.
- **Carbon pools**: Companies **shall** account for LUC CO_2 emissions based on the total land carbon stock decrease across all land carbon pools (i.e., above-ground and below-ground biomass, dead organic matter, and soil carbon pools).
  - When LUC results in net removals or removals following an initial conversion that resulted in emissions, companies **shall** first account for the gross LUC emissions of the initial land use change, and then may separately account for the land management net CO_2 removals of the subsequent land use following the removals accounting requirements set forth in Chapters 12 and 13.
- **Time period**: Companies **shall** account for LUC emissions that occurred within the LUC assessment period.
  - For annual crops or other land-based products or services with a cultivation cycle or rotation period less than or equal to 20 years, the LUC assessment period is 20 years. The LUC assessment period is prior to and includes the reporting year (e.g., 2001–20 assessment period for 2020 reporting year).
  - For land-based products with a cultivation cycle or rotation period more than 20 years, the length of that cycle or period is used as the LUC assessment period (prior to and inclusive of the reporting year).
  - Companies **shall** allocate the LUC emissions to each year in the LUC assessment period using linear amortization according to the formula set forth in Section 7.5 of the *Guidance* or **shall** disclose and provide justification if another time amortization method is used (e.g., equal amortization) in the specific circumstances set forth in Table 7.1 (see "jurisdictional dLUC, scenario B").

- **Spatial boundary**: Companies **shall** account for scope 1 LUC emissions on lands they own or control and scope 3 LUC emissions on lands in their value chain. Requirements for defining the lands included in the scope 1 and 3 spatial boundaries are set forth in Requirement 5.
  - For clarification on how Requirements 5 and 6 are satisfied when accounting using sLUC or dLUC calculation approaches, see Section 7.4 in the *Guidance*.
- **Calculation approach**: Companies **shall** use either a direct land use change (dLUC, either "LMU-level" or "jurisdictional" dLUC approach) or statistical land use change (sLUC) calculation approach for a given product type by sourcing jurisdiction (see also the "Recommendation for a consistent calculation approach" in Section 7.3).
  - Companies **shall** select the most accurate calculation approach that their data availability and value chain traceability allow. The selected approach **should** follow the hierarchy of calculation approaches for land use change accounting in Table 7.1.
  - Companies using the sLUC calculation approach **shall** apply the product expansion allocation method or **shall** provide justification if the shared responsibility allocation method is used in the specific circumstance set forth in Section 7.3 (see "sLUC allocation method exception").
- **Re-baselining**: Companies **shall** re-baseline when there is a change in:
  - the LUC emissions calculation approach (i.e., between sLUC and dLUC calculation approaches); or
  - the data/methods used within the calculation approach (e.g., a change from non-spatialized to spatialized crop statistics data) for a given product by sourcing jurisdiction.

See Requirement 29 for details regarding base year or period recalculations.

Specific cases

REQUIREMENT 10.1

Animal products:

Companies that raise livestock or have animal products in their value chain shall account for land use change emissions on both lands used for livestock grazing and croplands used for feed production consumed by the livestock over the animal's life cycle.

REQUIREMENT 10.2

Water reservoir emissions:

Companies that own or control water reservoirs, companies that purchase electricity generated from hydropower at water reservoirs, companies that produce or purchase agricultural products irrigated with water stored in water reservoirs, or companies that otherwise have water reservoirs in their value chain **shall** account and report emissions from water reservoirs as land use change emissions.

- **Hydropower-associated emissions**: Companies acquiring or purchasing electricity generated from hydropower **shall** account for emissions from the water reservoir as LUC emissions in scope 3, category 3.
- **Assessment period for CO_2**: CO_2 emissions from land converted to a water reservoir **should** be accounted for during the first 20 years after the LUC (i.e., the creation of the water reservoir).

- **Assessment period for CH_4**: CH_4 emissions from land converted to a water reservoir **should** be accounted for during the first 100 years after the LUC (i.e., the creation of the water reservoir).
- **Hierarchy of methods**: Companies **should** account for LUC emissions from water reservoirs using the following hierarchy of methods: 1) on-site measurements; 2) modeling tools (e.g., G-Res tool); and 3) IPCC emission factors. If using on-site measurements or modeling tools, companies **should** account using a 5- to 10-year average.

REQUIREMENT 11:
Subcategory land use change emissions accounting[1]

Companies **shall** account for subcategory land use change emissions according to the following requirements:

- **GHG emissions, carbon pools, time period, spatial boundary, and calculation approach**: Companies **shall** follow the requirements set forth in Requirement 10 when accounting for subcategory land use change emissions.
- **Forest land subcategory land use change**: Companies **shall** account for forest subcategory land use change emissions if:
  - There is clearance of natural forest or severe and sustained degradation[2] of natural forest within the LUC assessment period; or
  - There is replacement of natural forest with a plantation forest or with tree crops (e.g., fruit tree plantations, oil palm plantations, olive orchards, and agroforestry systems when crops are grown under tree cover).[3]

    Plantation forest: Defined as a forest predominantly (i.e., > 50 percent of growing stock at maturity) composed of trees established through planting and/or deliberate seeding that is intensively managed and meets all the following criteria at planting and stand maturity: one or two species, even age class, and regular spacing.[4]
- **Grassland subcategory land use change**: Companies **shall** account for grassland subcategory land use change emissions when there is:
  - Conversion of natural grasslands (e.g., savannahs, shrublands, and other land cover that falls below the forest land threshold) to intensively managed grasslands (e.g., improved or planted pastures or grazing land characterized by severe and sustained degradation).[2]
- **Wetland subcategory land use change**: Companies **shall** account for wetland subcategory land use change emissions when there is:
  - Conversion (i.e., drainage) of natural wetlands to productive wetlands. Note: This conversion is treated as a land use change, not a subcategory land use change, in the IPCC classification system.

7.2.2 Reporting requirements

Reporting requirements for land use change emissions

Companies **shall** report:

- Land use change and subcategory land use change emissions in the "land use change emissions" accounting subcategory under "land emissions" in the physical GHG inventory.

Companies **shall** disclose in their GHG report the following information related to land use change and subcategory land use change emissions:

- **Calculation approach**: Whether a dLUC or sLUC calculation approach was used to account for scope 1 and scope 3 land use change emissions (see "Recommendation for a consistent calculation approach" in Recommendations), with justification regarding accuracy and data availability for the approach used.
  - If sLUC metrics were used, whether an alternative to the product expansion allocation method was used to calculate sLUC emissions; if so, provide justification for the approach used (see "sLUC allocation method exception" in Section 7.3).
  - If dLUC metrics were used, the allocation method(s) used for land use change emissions and information on how the company demonstrated traceability to relevant land areas within their value chain for scope 3 land use change emissions.
- **Time period**: The length of the LUC assessment period(s) used and how it relates to the relevant cultivation cycle or rotation period, and whether an alternative method to linear amortization was used to distribute land use change emissions over the LUC assessment period (see "jurisdictional dLUC, scenario B" in Table 7.1). If an alternative to linear amortization was used, justify the approach taken.
- **Animal products and reservoir emissions**: Whether reported land use change emissions include LUC emissions attributable to animal products and/or water reservoirs. If these activities are not relevant to the reporting company, provide justification.

7.3 Recommendations

Choosing a direct or statistical land use change calculation approach

Recommendation for a consistent calculation approach:

Companies **should** determine a single calculation approach for: 1) their scope 1 LUC emissions, and 2) each land use change-related product type by sourcing jurisdiction within their scope 3 LUC emissions. They **may** use both dLUC and sLUC calculation approaches across their inventory, but **should** not use two approaches for a given product type by sourcing jurisdiction. Note: "LMU-level" and "jurisdictional" dLUC calculation approaches are two types of dLUC calculation approaches and may be used for the same product type.

- **LUC calculation approach exception for livestock and other systems**: Companies **may** use two different LUC calculation approaches to complete the accounting for LUC emissions attributable to lands on which the primary product is produced and LUC emissions attributable to lands on which products that are inputs into the production of that primary product are produced (e.g., a dLUC approach for land on which animals are grazed, and an sLUC approach for land where supplemental animal feed is produced).

Recommendations for selecting a calculation approach:

Companies **should** follow the hierarchy of approaches in Table 7.1, as explained below:

"LMU-level" direct land use change (dLUC) calculation approach: Companies **should** use the LMU-level dLUC calculation approach (see Table 7.1) to account for LUC emissions on:

- All lands owned or controlled by the company
- All lands in LMUs the reporting company sources from, and to which the company has complete traceability, following Requirement 8

"Jurisdictional" direct land use change (dLUC) calculation approach: Companies **should** use the jurisdictional dLUC calculation approach (see Table 7.1) to account for LUC emissions when companies have traceability to a sourcing region or jurisdiction, and adequate spatial data exists to estimate "jurisdictional" dLUC emissions on all attributable productive lands (see Requirement 6) in the sourcing region or jurisdiction the company sources from (i.e., to spatially locate LUC that occurred in the LUC assessment period on all attributable productive agricultural lands).

- This approach requires spatial data, including a complete crop extent map of all LMUs where the sourced product was produced in the jurisdiction or sourcing region in the reporting year (i.e., all attributable productive agricultural lands), and jurisdictional land use/land cover maps for all or some years in the LUC assessment period, ideally including the first and last year in the LUC assessment period. See the *Guidance* for how to implement a "jurisdictional" dLUC approach.
- Because the two calculation approaches are methodologically compatible, companies can combine "jurisdictional" and "LMU-level" dLUC calculation approaches to complete the LUC accounting for a product type by sourcing jurisdiction. Companies **should** use LMU-level dLUC emission factors for any LMUs the reporting company sources from and has complete traceability to, following Requirement 8.

Statistical land use change (sLUC) calculation approach: Companies **should** use the sLUC calculation approach (see Table 7.1) to account for LUC emissions on all lands in the jurisdiction or sourcing region when the most granular level of traceability the company has is to that jurisdiction or sourcing region and where only statistical data is available (i.e., where a spatial, *non*-statistical crop extent map is not available in the reporting year to implement the "jurisdictional" dLUC approach). See the *Guidance* for how to implement an sLUC calculation approach.

Recommendations for transitioning from sLUC to dLUC calculation approaches:

As companies transition from statistical to spatially explicit data to estimate LUC emissions (i.e., from an sLUC to a jurisdictional dLUC approach, see Table 7.1), companies **should** follow the guidance below. Note that companies must also satisfy the re-baselining requirement in Requirement 10.

- **Moving from sLUC to dLUC calculation approaches**: If a company has data to estimate LUC emissions using the jurisdictional dLUC calculation approach for 80 percent or more of their key land use change-related commodity volumes, but adequate data is not available to estimate jurisdictional dLUC emissions for the remaining 20 percent of commodity volumes, to complete the accounting, companies **may** use spatially explicit statistical data following the sLUC calculation approach to estimate the remaining LUC emissions. When using spatially explicit data to estimate sLUC emissions in such cases, companies **should** prioritize using the product expansion allocation method, followed by the shared responsibility allocation method, depending on data availability.

- **sLUC allocation method exception**: As an exception to Requirement 10, companies **may** use the shared responsibility allocation method if spatially explicit statistical data is used to estimate sLUC emissions, but such data does not enable the consistent representation over time needed to apply the product expansion allocation method.

Table 7.1 Hierarchy of calculation approaches for land use change emissions accounting

Priority based on accuracy	Calculation approach	Traceability requirement	Spatial data requirement	Amortization method
Most accurate	**Land management unit (LMU)-level direct land use change (dLUC):** Use LMU-level dLUC emissions data.	Complete traceability to LMUs in the reporting year.	Jurisdictional or sourcing region area land use/land cover map for all or most years (should include the first and last year in the LUC assessment period).	Linear
Intermediate accuracy	**Jurisdictional dLUC:** Use jurisdictional (i.e., national or subnational) dLUC emission factors where companies do not have complete traceability to all LMUs and complete jurisdiction-level land use maps are available for all (Scenario A) or some (Scenario B) years (see "selecting a land use change approach" in 7.3). If applicable, can combine with the use of LMU-level dLUC emission factors where companies have complete traceability to the LMU.	Less than complete traceability to LMUs in the reporting year.	**Scenario A**: Jurisdictional or sourcing region area land use/land cover map for all or most years in the LUC assessment period (should include the first and last years in the assessment period). Crop-specific map for attributable productive agricultural land in the jurisdiction or sourcing region in the reporting year.	**Scenario A**: Linear
			Scenario B: Jurisdictional or sourcing region area land use/land cover map for some years in the LUC assessment period (should include the first and last year in the assessment period). Crop-specific map for attributable productive agricultural land in the jurisdiction or sourcing region in the reporting year.	**Scenario B**: *Linear* (if > two years of land use/land cover maps available in LUC assessment period). *Equal* (if only two years of land use/land cover maps in the LUC assessment period, e.g., the first and last year).
Least accurate	**Statistical land use change (sLUC):** Use national, subnational, or sourcing region sLUC emission factors only.	Less than complete traceability to LMUs in the reporting year.	Only statistical data available[a]	Linear

Note: a. Note that a "spatial" sLUC approach is possible if statistical data is spatially distributed (i.e., with a predictive crop distribution model). If a company has a spatial, non-statistical crop extent map for the relevant commodity in the reporting year, use a jurisdictional dLUC approach.

Endnotes

1 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

2 See the Accountability Framework Initiative (AFi) for further guidance on conversion from natural ecosystems.

3 As set forth in Requirement 10, to account for forest subcategory LUC emissions, a company must first account for subcategory LUC CO_2 emissions based on the gross initial land carbon stock decrease across all land carbon pools due to the subcategory LUC. Accounting for land management CO_2 removals due to regrowth and management of plantation forests is subject to the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

4 Definition adapted from FAO (2018).

CHAPTER 8.

Land use and leakage

This chapter provides requirements, recommendations, and options to account for and report the "land use" and "land carbon leakage" accounting categories. The former quantifies a company's annual agricultural land use impact, and the latter quantifies the GHG impacts of displaced food or feed production (i.e., land carbon leakage) due to corporate actions.

8.1 Overview

Agricultural land is an input to agricultural production and typically requires the loss of carbon from native vegetation and soils. Regardless of when agricultural land was cleared, the total quantity of agricultural land required by a company contributes to global land pressure that leads to land use change emissions from net global land use change.[1] Accounting for agricultural land use helps to quantify a company's contribution to global land use and conversion pressure.

In the land sector, where land area is finite and competition for land is increasing, there is a high potential for land carbon leakage, in which displacement of food or feed production drives agricultural land expansion, leading to land use change beyond the lands in a company's operations or value chain (Figure 8.1). By quantifying land carbon leakage, companies can properly account for these impacts and aim to reduce their total emissions.

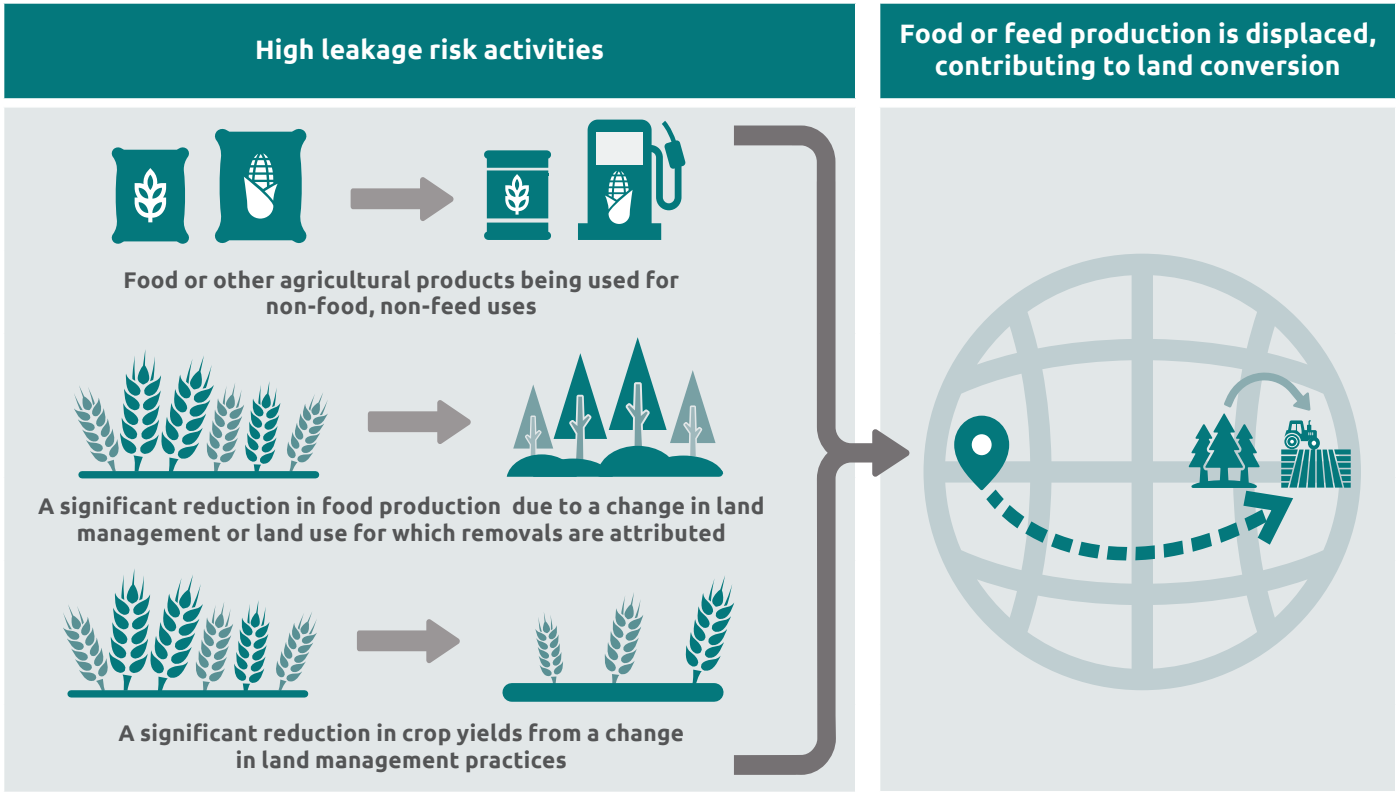
Companies are required to account for the following:

- Land occupation, measured in hectares (Requirement 12).
- Land carbon leakage, measured in carbon dioxide equivalent (CO_2e) (Requirement 13). Land carbon leakage is calculated as the amount of carbon lost from plants and soils from the conversion of native ecosystems to agricultural land to replace the quantity and type of reduced or diverted food or feed production due to corporate actions, using the carbon opportunity cost approach.

Companies are recommended to account for the following (see "Detailed reporting for land use" Recommendation in 8.3):

- Land occupation, measured in hectares, disaggregated by land use category (e.g., cropland, grassland, etc.).
- Carbon opportunity cost (COC) of land use, measured in CO_2e. The "land use" accounting category can also be calculated in carbon terms, instead of hectares (i.e., land occupation), using the COC approach. The COC of land use is the total amount of carbon lost from plants and soils on land occupied by agriculture relative to native vegetation.

Figure 8.1 Land carbon leakage



8.2 Requirements

8.2.1 Accounting requirements

REQUIREMENT 12:

Land use accounting

Companies **shall** account for agricultural land occupation (in hectares) in scope 1 and scope 3 for each scope 3 category.

REQUIREMENT 13:

Land carbon leakage accounting

If companies implement activities with high risk for land carbon leakage (specified below) and as a result report reduced GHG emissions, increased removals, or reduced emissions relative to use of an alternative non-biogenic product, but also reduce or divert food or feed production on agricultural land, they **shall** quantify land use–related GHG impacts of displaced food production, and report such leakage separately in the "land carbon leakage" accounting category relative to scope 1 and scope 3 for each scope 3 category.

- **Activities with high risk for land carbon leakage**: Companies **shall** quantify land carbon leakage if any of the following activities occur in a company's operations or value chain in the reporting year:
  - Use of food or other agricultural products for non-food, non-feed use (e.g., crop-based biofuels or bio-based feedstocks).

- Significant reduction in food production that occurs over the long-term, resulting from a change in land management or land use for which land management CO_2 removals are attributed (e.g., change in land use from cropland to forest land), except where such a change is made to improve the long-term sustainability of food production.
- Significant reduction in crop yields per hectare that occurs over the long-term, resulting from a change in cropland management practices (e.g., practices that reduce chemical inputs but also significantly reduce crop yields), except where such a change is made to improve the long-term sustainability of food production.

- **Quantification approach**: Companies **shall** quantify land carbon leakage using the annualized, average carbon stock losses from the conversion of native ecosystems to agricultural land to replace the quantity and type of reduced or diverted food or feed production at average yields ("carbon opportunity cost").[2]

8.2.2 Reporting requirements

Reporting requirements for land use

Companies **shall** report:

- Land occupation in hectares under the "land occupation" accounting subcategory under "land use" separately from the physical GHG inventory.

Additionally, they **shall** disclose in their GHG report the yields and factors used to calculate land occupation. If companies choose to report "carbon opportunity cost of land use," they shall disclose the factors used.

Reporting requirements for land carbon leakage

Companies with high leakage risk activities in their operations or value chain **shall** report:

- Leakage under the "land carbon leakage" accounting category separately from the physical GHG inventory.

Companies **shall** disclose the following information in their GHG report:

- **Activities with a high risk for land carbon leakage**: Whether there are high leakage risk activities in their operations or value chain and a description of those activities.
  - If companies have high leakage risk activities and account for and report "land carbon leakage," they **shall** disclose in their report the total quantity of reduced or diverted food or feed crop(s), the land carbon leakage boundary (or boundaries), and corresponding carbon opportunity cost factor(s) used to calculate land carbon leakage.
  - If companies do not have high leakage risk activities or if this requirement is not applicable, and they do not account for and report "land carbon leakage," they **shall** provide justification.

8.3 Recommendations

Detailed reporting for land use

Land use, when measured in hectares, does not differentiate between different types of land or the ability of those lands to store carbon, which can vary widely globally due to factors such as rainfall and temperature. Companies **should** go beyond reporting total scope 1 and scope 3 land occupation in hectares using one or both of the following approaches:

- **Disaggregating by land type**: Separately report scope 1 and scope 3 agricultural land occupation in hectares by land use category (e.g., cropland, grassland) in the "land occupation" accounting subcategory under "land use."
- **Quantifying the carbon opportunity cost of agricultural land use**: Separately report scope 1 and scope 3 agricultural land use using the carbon opportunity cost (COC) metric in the "COC of land use" accounting subcategory under "land use." COC factors can be represented in units of CO_2e per unit product or per unit area of land. See the *Guidance* for how to account for the land use category using the COC metric.

Endnotes

1 Ritchie and Roser 2019; Houghton and Nassikas 2017; Burney et al. 2010.

2 The carbon opportunity cost approach estimates leakage by assuming 1:1 replacement of displaced food via conversion of native ecosystems to agriculture, and as such, is relevant information to report. If regulations or GHG programs separately specify how the "land carbon leakage" category is applied for the purpose of their regulation or program, covered companies may report parallel leakage estimates in addition to carbon opportunity cost-based values.

Introduction to Chapters 9 and 10: Agricultural land management emissions

Agricultural land management emissions are emissions due to anthropogenic activities on existing agricultural land (i.e., management activities that do not constitute a land use change). Agricultural land management emissions include net biogenic CO_2 emissions, non-biogenic CO_2 emissions, and other GHG emissions (i.e., CH_4, N_2O, etc.) due to agricultural land management activities. Agricultural land management emissions account for approximately 50 percent of total global emissions in the land sector (with land use change emissions accounting for the other half).[a] Agricultural land management emissions are accounted for in separate accounting subcategories in the inventory:

- **Chapter 9.** Agricultural activities on existing agricultural land (e.g., tillage, field preparations, thinning and pruning, harvests, and other in-field or edge-of-field management practices) can impact above- and below-ground biomass carbon pools, soil carbon pools, and dead organic matter carbon pools. Net losses across land carbon pools due to management activities on existing agricultural land are accounted for in this category as **land management net biogenic CO_2 emissions**. Biogenic CO_2 emissions due to recent land use changes are accounted for as land use change emissions; see Chapter 7.
- **Chapter 10.** Agricultural activities also cause emissions of other GHGs, such as methane, nitrous oxide, non-biogenic CO_2 emissions, and other GHGs. Example emission sources in this category include emissions due to enteric fermentation, manure management practices, inputs on managed soils (e.g., fertilizer, lime, etc.), and rice production, among others. GHG emissions from these sources are accounted for in this category as **land management production emissions**.

Note: a. IPCC 2022.

CHAPTER 9.

Land management net biogenic CO_2 emissions

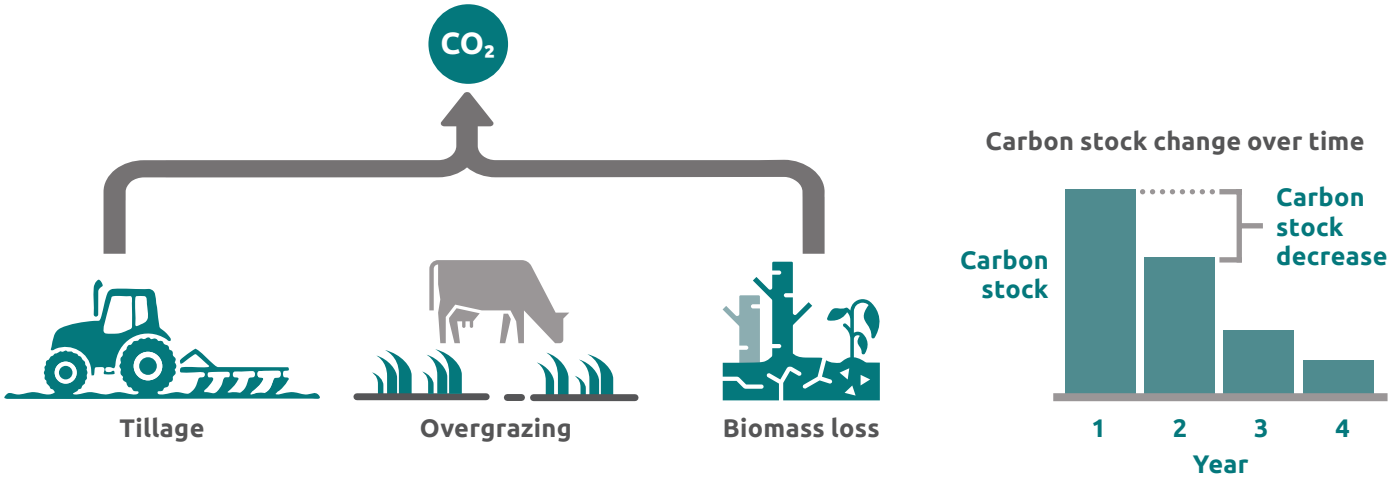
This chapter provides requirements and guidance on accounting for net biogenic CO_2 emissions from land management activities on lands remaining in the same land use (e.g., agricultural management activities on existing agricultural land), from both a scope 1 and scope 3 perspective.

9.1 Overview

Land management net biogenic CO_2 emissions are net biogenic CO_2 emissions that occur due to management actions on land that remains in the same land use category or subcategory in the reporting year. Land management activities on existing agricultural land (e.g., field preparations or harvests) can impact land-based carbon pools, including above- and below-ground biomass, dead organic matter, and soil carbon pools (Figure 9.1).

- Land management net biogenic CO_2 emissions are calculated using a stock change accounting approach. Companies are required to estimate the net land carbon stock change for all required carbon pools (Requirement 14). If the net land carbon stock change decreases, the difference is accounted for as land management net CO_2 emissions. If the net land carbon stock change increases, the difference may be accounted for as land management CO_2 removals. Land management CO_2 removals, if reported, are accounted for separately from emissions and are subject to additional accounting and reporting requirements (see Chapter 13).
- GHG inventories are designed to account only for direct anthropogenic impacts on land carbon stocks. All changes in land carbon stocks on existing productive agricultural land are considered anthropogenic (Requirement 15).

Figure 9.1 Examples of net land carbon stock changes



9.2 Requirements

9.2.1 Accounting requirements

REQUIREMENT 14:

***Land management net biogenic CO_2 emissions accounting*[1]**

Companies **shall** account for land management net biogenic CO_2 emissions on productive agricultural lands according to the following requirements:

- **Accounting approach**: Companies **shall** account for land management net biogenic CO_2 emissions based on annual or annualized net land carbon stock losses occurring in the reporting year using stock-change accounting methods.
  - Companies **may** account for cropland carbon stock changes using monitoring frequencies at timescales that reflect the relevant crop rotation or crop cultivation cycle. See Section 9.4.3 in the *Guidance* for additional details.
- **Spatial boundaries**: See Requirement 5 to define the scope 1 and scope 3 spatial boundaries.
  - **Scope 1**: Companies **shall** account for net land carbon stock changes from land management activities on all agricultural land in their scope 1 spatial boundary.
  - **Scope 3**: Companies **shall** account for net land carbon stock changes on all:
    - attributable productive lands in relevant jurisdictions or sourcing regions (see Requirement 6)
    - productive lands and, if applicable, proximate and adjacent non-productive lands (see Requirement 7) within relevant LMUs
    - productive lands within relevant harvested areas
    - lands related to leased assets, franchises, and investments in their scope 3 spatial boundary
- **Carbon pools and land uses**: Companies **shall** account for the net land carbon stock change (rather than assuming no carbon stock change) for the following carbon pools:
  - **Biomass carbon stock changes**, including above-ground and below-ground biomass on:
    - all forest lands
    - grasslands, croplands, wetlands, and/or settlements with woody or permanent cover
  - **Dead organic matter carbon stock changes**, including dead wood and litter on:
    - forest lands, grasslands, and croplands where management practices significantly impact woody residues
  - **Soil carbon stock changes**, including soil organic carbon in mineral and organic soils on:
    - all grasslands and croplands
    - forest lands, wetlands, and settlements where management practices significantly disturb soils

  Companies **may** account for net land carbon stock changes for all carbon pools in all land uses (e.g., account for biomass carbon stock changes in grassland with no woody or permanent vegetation).
- **No emissions**: If carbon stocks increase, companies can choose to report zero emissions and are not subject to comply with removals requirements (as long as they report zero removals as well).

REQUIREMENT 15:

Anthropogenic impacts on agricultural land[1]

All changes in land carbon stocks on productive agricultural land in the reporting year are considered anthropogenic. Companies **shall** fully account for all net land carbon stock losses on all agricultural lands in the reporting year, including changes due to degradation and carbon stock losses from fires, storms, and other natural disturbances.

Box 9.1 Accounting for land management net biogenic CO_2 emissions and land management CO_2 removals on forest lands and non-productive, non-forest lands

To compile a complete and accurate GHG inventory, companies that own or control forest lands, companies that own or control other non-forest lands outside of agricultural production, companies that source forestry products (e.g., timber, paper, pulp, wood pellets, resins, etc.), and/or companies that include proximate and adjacent non-productive lands in their scope 3 spatial boundary for agricultural products they source, need to account for how their harvesting, management, and/or purchasing activities result in land management net biogenic CO_2 emissions and land management CO_2 removals. The IPCC states that "anthropogenic emissions and removals means that greenhouse gas emissions and removals included in national inventories are a result of human activities" (IPCC 2006, 1.4; 2019a). However, distinguishing anthropogenic from non-anthropogenic emissions or removals due to forest management activities or land management on non-forest lands outside of agricultural production is complex. This is because forest lands and non-productive, non-forest lands emit and remove CO_2, and do so both because of and despite human activities.

Rules for accounting for emissions and removals on forest lands and non-productive, non-forest lands in corporate GHG inventories have not been decided on by the Independent Standards Board of the GHG Protocol. Final accounting requirements and guidance for land management net biogenic CO_2 emissions and land management CO_2 removals on forest lands and other non-forest lands outside of agricultural production may be published in future versions of this *Standard* (see Box 1.1).

9.2.2 Reporting requirements

Reporting requirements for land management net biogenic CO_2 emissions

Companies **shall** report:

- Net land carbon stock losses in the "land management net biogenic CO_2 emissions" accounting subcategory under "land emissions" in the physical GHG inventory.

Companies **shall** disclose the following information in their GHG report:

- **Accounting approach**: Whether one year or a longer period was used to calculate the annual or annualized carbon stock loss.
- **Carbon pools and land uses**: The specific land carbon pools included in their analysis of net carbon stock changes, including when "no carbon stock change" is assumed for a particular carbon pool and land use.

9.3 Recommendations

Gross biogenic land CO_2 emissions reporting

Companies **should** also account for and separately report "gross biogenic land CO_2 emissions" as a disaggregated accounting subcategory of "gross CO_2 fluxes." Disclosing "gross biogenic land CO_2 emissions" provides additional transparency to the gross land carbon stock losses contributing to estimates of the net land carbon stock change (e.g., the gross land carbon stock losses associated with fire or other natural disturbances included when estimating the net land carbon stock change).

Endnotes

1 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

CHAPTER 10.

Land management production emissions

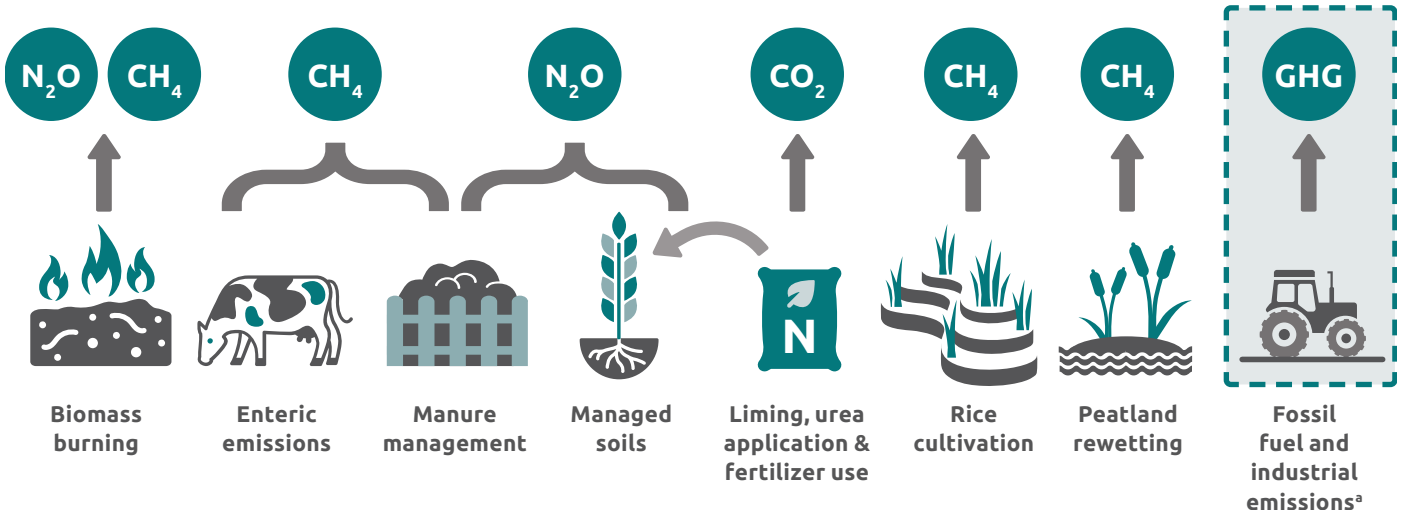
This chapter provides requirements and recommendations on accounting for GHG emissions from land management production activities across land uses from both a scope 1 and scope 3 perspective.

10.1 Overview

Land management production emissions include methane (CH_4), nitrous oxide (N_2O), and non-biogenic CO_2 emissions that occur due to recurring agricultural production and other land management actions (Figure 10.1). Together, these sources of emissions make up approximately 11 percent of annual global GHG emissions from all human activities.[1]

Companies are required to report land management production GHG emissions from all sources (Requirement 16). Emissions from on-site energy and fuel use or that occur in the life cycle of products used as inputs to production activities must also be accounted for (under "fossil fuel and industrial emissions" where data permit, or under "land management production emissions" if not). For transparency, companies must disclose whether these emissions are reported in the inventory as "fossil fuel and industrial emissions" or "land management production emissions."

Figure 10.1 Land management production emission sources



Note: a. Companies shall disclose whether emissions from on-site fuel and energy consumption, fuel combustion, air-conditioning and refrigerant use, on-site waste or wastewater management, and indirect emissions from purchased energy associated with land management are reported as land emissions or fossil and industrial emissions.

10.2 Requirements

10.2.1 Accounting requirements

REQUIREMENT 16:

Land management production emissions accounting

Companies **shall** account for land management production emissions according to the following requirements:

- **Emissions sources**: Companies **shall** account for land management production emissions from the following sources:
  - CH_4 and N_2O emissions from livestock, including emissions due to enteric fermentation, manure managed in controlled settings, and manure deposited by livestock on pastures, paddocks, and rangelands
  - N_2O and non-biogenic CO_2 emissions from soil management, including N_2O emissions due to nitrogen inputs and internal soil processes on managed soils, and CO_2 emissions resulting from soil amendments, such as lime, urea, and other inputs
  - CH_4 and N_2O emissions from biomass burning and fires
  - CH_4 emissions from rice production
  - CH_4 emissions from peatland rewetting
- **Animal products**: Companies that raise livestock, practice aquaculture, or have animal products in their value chain **shall** account for land management production emissions on lands used for livestock grazing and croplands used for feed production consumed by the livestock or other animals over their life cycle.

10.2.2 Reporting requirements

Reporting requirements for land management production emissions

Companies **shall** report:

- Production emissions in the "land management production emissions" accounting subcategory under the "land emissions" category in the physical GHG inventory.

Companies **shall** disclose the following information in their GHG report:

- **Emissions sources**: A description of the emissions sources considered, including those in the life cycle of animal products.
- **Emissions from on-site fuel and energy consumption**: Whether life cycle GHG emissions from products used to produce the agricultural products (e.g., GHG emissions from feed crops, fertilizers, and other agricultural input production), air-conditioning and refrigerant use, on-site waste or wastewater management, and indirect emissions from purchased energy associated with land management production activities are reported as "fossil fuel and industrial emissions" or "land management production emissions."

10.3 Recommendations

Fossil fuel and industrial emissions

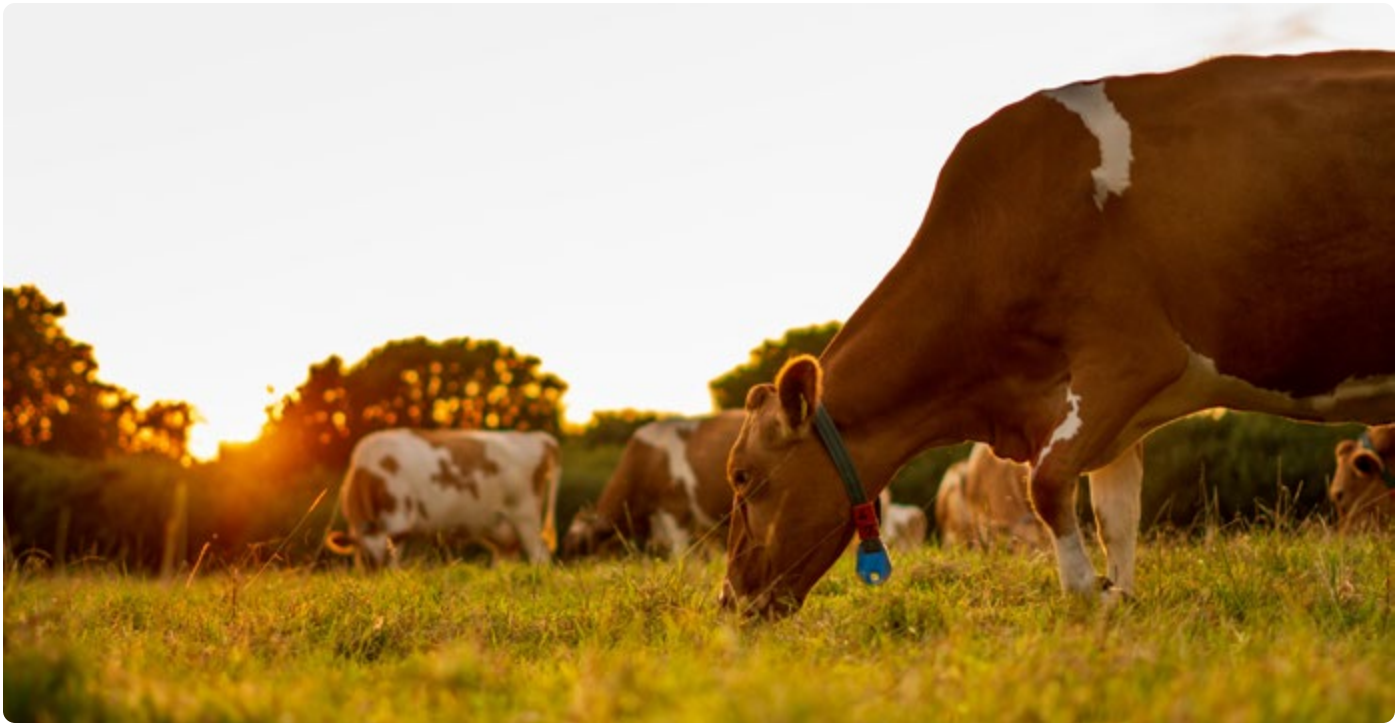
Other CH_4, N_2O, non-biogenic CO_2, hydrofluorocarbons (HFCs), and perfluorocarbons (PCFs) emissions associated with recurring agricultural production or other land management activities that are not technically "land emissions" are often included in life cycle land management production emission factors. These types of emissions include, but are not limited to:

- Fossil-based land management production emissions, including CO_2 emissions from on-site machinery (e.g., tractors, feller bunchers, irrigation pumps, etc.)
- Life cycle GHG emissions from products used to produce the agricultural products (e.g., GHG emissions from feed crops, fertilizers, and other agricultural input production)
- HFC and PCF emissions (e.g., from air-conditioning and refrigerant use)
- Emissions from on-site waste or wastewater management
- Indirect emissions from purchased energy associated with land management production activities

Companies **should** report these emissions as "fossil fuel and industrial emissions" if data allows. If not, companies **ma**y report these emissions as "land management production emissions."

Endnotes

1 IPCC 2022.



CHAPTER 11.

Biogenic product and TCDR-based product emissions

This chapter provides requirements and recommendations on accounting for and reporting biogenic product emissions (i.e., biogenic CO_2 emissions not related to land management) and emissions from technological carbon dioxide removal (TCDR)-based products. To account for and report on the storage of biogenic or TCDR-based carbon that is physically contained in product or waste carbon pools, see Chapter 15.

11.1 Overview

Biogenic product CO_2 emissions (i.e., gross biogenic product CO_2 emissions) are CO_2 emissions released to the atmosphere at the point of oxidation (from combustion, decomposition, or other processes) from biogenic products (e.g., bioenergy feedstocks, fiber, etc.).

Biogenic product CO_2 emissions are not zero, and biogenic products cannot be assumed to be carbon neutral. Biomass combustion releases CO_2 emissions to the atmosphere at a rate (per energy content) comparable to that of fossil fuels.[1] Companies calculate biogenic CO_2 emissions using emission factors that reflect the CO_2 emissions released at combustion, decomposition, or other processes, by type of biogenic product, such as those provided by the IPCC and those made available on the GHG Protocol website.[2] Similarly, companies must also account for and report any CH_4 and N_2O emissions from biogenic product use or disposal.

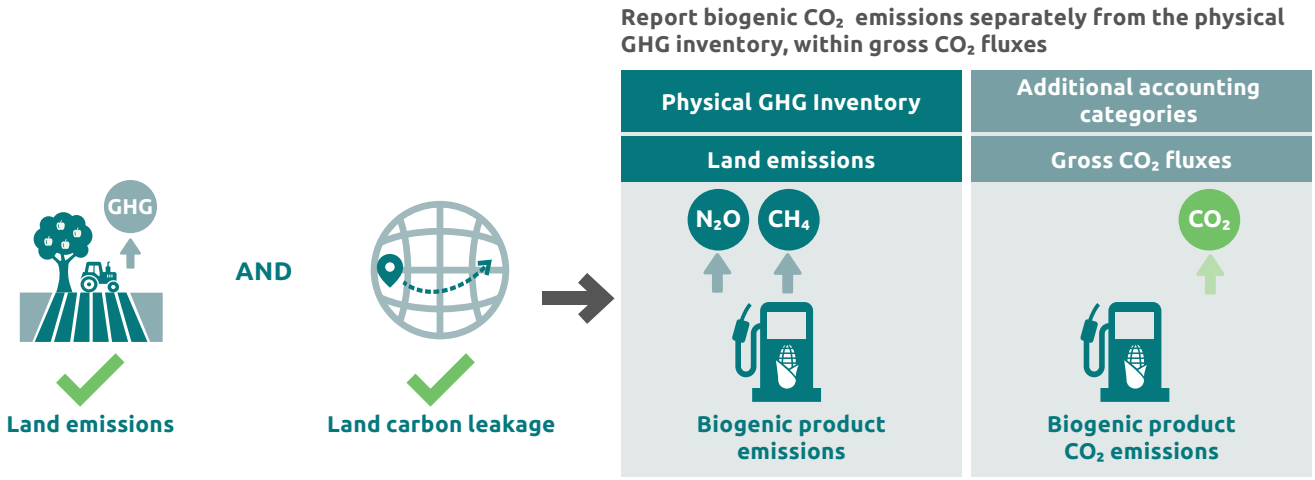
Only by quantifying the life cycle impacts of biogenic products can companies understand the net CO_2 flux (i.e., the net of gross biogenic land CO_2 removals, gross biogenic land CO_2 emissions, and gross biogenic product CO_2 emissions) associated with a biogenic product's life cycle. Where all land emissions are accounted for, the net biogenic CO_2 flux is included under the "emissions" (or "removals") accounting categories, and the gross CO_2 emissions and gross CO_2 removals may be separately reported under the

"gross CO_2 fluxes" accounting category, to ensure transparency and avoid double counting. A similar approach is taken for technological CO_2 removal and use pathways (e.g., direct-air-captured carbon-based fuels).

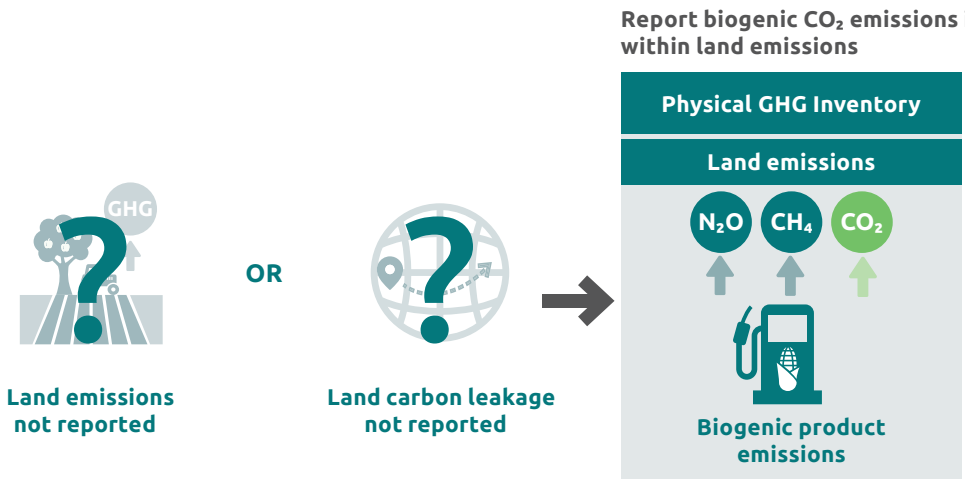
- How non-food, non-feed biogenic product CO_2 emissions are reported in this *Standard* depends on whether or not the reporting company accounts for and reports all life cycle GHG emissions associated with biogenic products, including net land carbon stock changes (Figure 11.1 and Requirement 17).
- Technological carbon dioxide removal (TCDR)-based product CO_2 emissions are separately reported depending on whether or not the company reports all life cycle GHG emissions (Requirement 18).

Figure 11.1 Two scenarios for biogenic product emissions reporting

SCENARIO 1. Life cycle emissions and land carbon leakage are accounted for and reported



SCENARIO 2. Life cycle emissions or land carbon leakage are unknown or not reported



11.2 Requirements

11.2.1 Accounting requirements

REQUIREMENT 17:

Biogenic product emissions accounting[3]

Companies that purchase, consume, process, or sell biogenic products (excluding food and feed products and biogenic waste) **shall** account for biogenic product emissions associated with such products according to the following requirements:

- **Biogenic product CO_2 emissions**: Companies **shall** account for scope 1, scope 2, and scope 3 biogenic product CO_2 emissions from combustion, decomposition, or other processes, using biogenic product CO_2 emission factors by type of biofuel or biomaterial. Companies **shall** report biogenic product CO_2 emissions in one of the following two accounting categories, depending on whether or not the company reports all scope 3 life cycle GHG emissions and other metrics:
  - **Separately as "gross CO_2 fluxes"**: Companies **shall** report "biogenic product CO_2 emissions" under "gross CO_2 fluxes" (separately from "emissions") in the scope corresponding to the point of oxidation, if they meet the following criteria associated with the biogenic product:
    - **Life cycle GHG emissions**: The company **shall** account for and report all life cycle GHG emissions associated with the biogenic product, including land use change emissions and the annual net land carbon stock changes of sourcing lands, and
      - The company **should** have information on where the biogenic product was sourced from (at a minimum, country of origin, or more precise levels of traceability),[4] and
    - **Land carbon leakage**: The company **shall** account for and report land use and land carbon leakage (where required) associated with the biogenic product.
  - **As "land emissions"**: If companies do not meet both criteria above, they **shall** report "biogenic product emissions" under "land emissions" (within "emissions") in the scope corresponding to the point of oxidation.

- **Biogenic product CH_4 and N_2O emissions**: Companies **shall** account for direct and indirect biogenic product CH_4 and N_2O emissions from combustion, decomposition, or other processes, using biogenic product CH_4 and N_2O emission factors by type of biofuel or biomaterial. Companies **shall** report biogenic product CH_4 and N_2O emissions in the scope corresponding to the point of oxidation.
- **Life cycle GHG emissions, land use, and land carbon leakage of biogenic products**: Companies **shall** account for all life cycle GHG emissions, land use, and land carbon leakage (where required) of biogenic products and report the upstream life cycle GHG emissions, land use, and leakage in either scope 3, category 1 or scope 3, category 3 as follows:
  - **Biomaterials**: For biomaterials consumed by the reporting company, report upstream life cycle GHG emissions, land use, and leakage in scope 3, category 1 (Purchased goods and services).
  - **Bioenergy feedstocks**: For bioenergy consumed by the reporting company, report upstream life cycle GHG emissions, land use, and leakage in scope 3, category 3 (Fuel- and energy-related activities not included in scope 1 or scope 2).
- **Any other scope 1, scope 2, or scope 3 emissions**: If applicable.

Food and feed products and biogenic waste: Companies that purchase, consume, process, or sell biogenic food or feed products and/or that acquire, use, or dispose of biogenic waste **shall** account for biogenic product emissions associated with such products or materials according to the following requirements:

- **Biogenic product CO_2 emissions:** Companies **shall** account for and report biogenic product CO_2 emissions that occur in the reporting company's operations or value chain under "gross CO_2 fluxes" separately from the physical GHG inventory.
  - Biogenic product CO_2 emissions from food and feed products intended for human or animal consumption **may** be excluded.
- **Biogenic product CH_4 and N_2O emissions:** Companies **shall** account for and report biogenic product CH_4 and N_2O emissions in the "biogenic product emissions" accounting subcategory under "land emissions" in the physical GHG inventory.

REQUIREMENT 18:
TCDR-based product emissions accounting

Companies **shall** account for scope 1, scope 2, and scope 3 CO_2 emissions from technological carbon dioxide removal (TCDR)-based products at the point of oxidation (when they are released to the atmosphere). Companies **shall** report TCDR-based product CO_2 emissions in one of the following two categories, depending on whether or not the company reports all scope 3 life cycle GHG emissions:

- **Separately as "gross CO_2 fluxes"**: If companies have information on the origin of the CO_2 or carbon in the TCDR-based product that demonstrates the CO_2 is technologically removed CO_2, and account for and report all life cycle GHG emissions associated with the TCDR-based product in scope 3, they **shall** report "TCDR-based product CO_2 emissions" under "gross CO_2 fluxes" separately from "emissions," in the scope corresponding to the point of oxidation.
- **As "fossil fuel and industrial emissions"**: If companies do not have information on the origin of the CO_2 or carbon in the TCDR-based product (i.e., whether the carbon is technologically removed CO_2) or do not account for and report all life cycle GHG emissions associated with the TCDR-based product in scope 3, they **shall** report TCDR-based product CO_2 emissions under "emissions" as "fossil fuel and industrial emissions," in the scope corresponding to the point of oxidation.

11.2.2 Reporting requirements

Reporting requirements for biogenic product emissions

Companies that purchase, consume, process, or sell biogenic products (excluding food and feed products and biogenic waste) **shall** report:

- **Biogenic product CO_2 emissions** either in the "biogenic product CO_2 emissions" accounting subcategory under "gross CO_2 fluxes" separately from the physical GHG inventory, or in the "biogenic product emissions" accounting subcategory under "land emissions" in the physical GHG inventory, depending on whether or not the company reports all scope 3 life cycle GHG emissions, land use, and land carbon leakage, if relevant.
- **Biogenic product CH_4 and N_2O emissions** in the "biogenic product emissions" accounting category under "land emissions" in the physical GHG inventory.
- **Life cycle GHG emissions** attributable to the biogenic products in the relevant "emissions" accounting category and subcategory.
- **Land use** associated with the biogenic product in the "land occupation" accounting subcategory under "land use" separately from the physical GHG inventory.
- **Land carbon leakage** associated with the biogenic product, if relevant, in the "land carbon leakage" accounting category separately from the physical GHG inventory.
- **Any other scope 1, scope 2, or scope 3 emissions** if applicable.

Food and feed products and biogenic waste: Companies that purchase, consume, process, or sell biogenic food or feed products and/or that acquire, use, or dispose of biogenic waste **shall** report:

- **Biogenic product CO_2 emissions** that occur in the reporting company's operations or value chain under "gross CO_2 fluxes" separately from the physical GHG inventory, in the scope corresponding to the point of oxidation.
  - Biogenic product CO_2 emissions from food and feed products intended for human or animal consumption **may** be excluded.
- **Biogenic product CH_4 and N_2O emissions** in the "biogenic product emissions" accounting subcategory under "land emissions" in the physical GHG inventory, in the scope corresponding to the point of oxidation.

Reporting requirements for TCDR-based product emissions

Companies that purchase, consume, or sell TCDR-based products **shall** report:

- **TCDR-based product CO_2 emissions** either in the "TCDR-based product CO_2 emissions" accounting subcategory under "gross CO_2 fluxes" separately from the physical GHG inventory or in the "fossil fuel and industrial emissions" accounting category in the physical GHG inventory, depending on whether or not the company reports all life cycle GHG emissions and has information on the origin of the CO_2.

11.3 Recommendations

Box 11.1 Policy implications

Policymakers and GHG programs **should** set their own policies for regulating or setting targets for biogenic product CO_2 emissions at the emissions source (e.g., smokestack or tailpipe) and land use regulations that limit agricultural land expansion for bioenergy production, as relevant to policy objectives. Policymakers and GHG programs are encouraged to consider the entirety of emissions, removals, land use, and land carbon leakage associated with the production and consumption of biogenic products.

Endnotes

1 For example, CO_2 emission factors for coal are up to 103 kg CO_2 per MMBtu (one million British thermal units) and for petroleum products up to 76 kg CO_2 per MMBtu. CO_2 emission factors for wood and other solid byproducts are up to 105.51 kg CO_2 per MMBtu, and for other liquid biomass fuels up to 81 kg CO_2 per MMBtu. See EPA (2013).

2 Recommended emission factor databases to calculate biogenic product CO_2 emissions are provided in Chapter 11 of the *Guidance*. See Section 11.5.1.

3 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

4 This criterion is recommended for agricultural products. Whether it is recommended or required for forest products may be revisited in a future version of the *Standard*.

PART 2 (CONTINUED).
Compile the GHG inventory

PART 2.2
Requirements for companies choosing to report CO_2 removals

CHAPTER 12.

CO_2 removal accounting

This chapter provides requirements companies must follow to account for and report CO_2 removals in a GHG inventory. Given the unique nature of CO_2 removals and the additional requirements companies must meet, reporting CO_2 removals in a GHG inventory is optional in this Standard.

12.1 Overview

A removal is the transfer of a GHG from the atmosphere to storage within a non-atmospheric pool. A sink is the process, activity, or mechanism by which the transfer occurs. There are two general types of sinks that remove CO_2 from the atmosphere:

- **Biological sink**: A biological process, primarily photosynthesis, that removes CO_2 from the atmosphere.
- **Technological sink**: A mechanical or chemical process that removes CO_2 from the atmosphere or captures biogenic CO_2 from a source and stores such CO_2 or TCDR-based carbon in non-atmospheric carbon pools.

The storage process is specific to the carbon pool(s) in which CO_2 removed from the atmosphere is stored. This *Standard* covers two categories of removals based on the type of storage:

- **Land management CO_2 removals**, stored in land carbon pools (Chapter 13)
- **Removals with geologic storage**, stored in geologic carbon pools (Chapter 14)

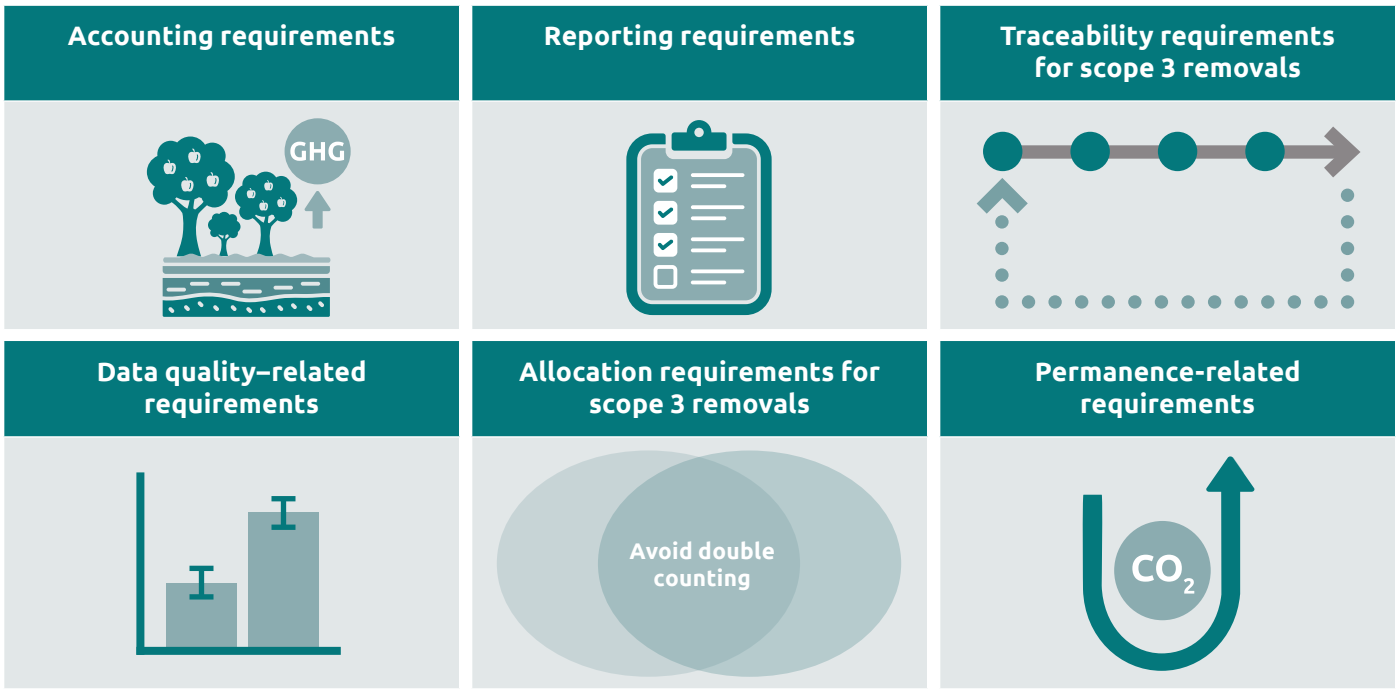
This *Standard* is based on a stock-change accounting approach that quantifies the net CO_2 flux between the atmosphere and non-atmospheric carbon pools. Throughout the text, the term "CO_2 removals" is used to describe *net* CO_2 removals. Gross CO_2 removals only reflect the *transfer* of CO_2 from the atmosphere, whereas net CO_2 removals reflect the transfer of CO_2 from the atmosphere with *continued storage* in non-atmospheric pools. Reporting gross CO_2 removals is optional for additional transparency under the "gross CO_2 fluxes" accounting category.

When CO_2 is removed from the atmosphere and continues to be stored in a non-atmospheric carbon pool, this contributes to reducing cumulative net CO_2 emissions in the atmosphere, which is most correlated with long-term warming.[1] If CO_2 is only temporarily stored, it does not reduce cumulative net CO_2 emissions or atmospheric CO_2 concentrations. Removals reported in a GHG inventory are therefore required to meet the permanence principle (see Table 3.1) and follow permanence-related requirements.

Reporting CO_2 removals is optional. If companies account for and report removals in their GHG inventory, they must meet the following requirements (Figure 12.1):

- Report on all emissions and account for removals based on annual or annualized carbon stock increases (Requirement 19)
- Have traceability throughout the full CO_2 removals pathway (Requirement 20)
- Have sufficient data quality (Requirement 21)
- Ensure the same scope 3 allocation methods are applied for removals to prevent double counting (Requirement 22)
- Meet the permanence principle by ensuring CO_2 removals reported in an inventory are monitored and any losses of stored carbon are accounted for and reported (Requirement 23)

Figure 12.1 Removals requirements



12.2 Requirements

12.2.1 Accounting requirements

REQUIREMENT 19:

Removals accounting

If companies account for and report removals in their GHG inventory, they **shall** meet the following general requirements:

- **Accounting approach**: Companies **shall** account for removals based on annual or annualized net carbon stock changes occurring in the reporting year using stock-change accounting methods.[2]
- **Life cycle GHG emissions**: Companies **shall** account for all life cycle GHG emissions and other metrics in the value chain of the removal pathway (across scope 1, scope 2, and scope 3).
- **Operational boundary**: Companies **shall** separately account for and report scope 1 and scope 3 removals for each scope 3 category, separate from scope 1 and scope 3 emissions.
- **Scope 3 removals**: Companies **shall** only account for scope 3 removals that are associated with scope 3 categories as defined in the *Scope 3 Standard*. For scope 3 categories associated with products, materials, or services that are purchased, processed, used, or sold by the reporting company, this only includes removals resulting from attributable processes in the life cycle of relevant products, materials, or services.
- **Removals by storage type**: Companies **shall** account for removals with land-based storage separately from removals with geologic storage.
- **Excluded GHG pools and gases**: If companies choose to account for removals with storage in ocean or freshwater carbon pools and/or non-CO_2 GHG removals, companies **shall** report these other categories separately from scope 1 and scope 3 removals in the physical GHG inventory. Product carbon storage is not reported as a removal.

See Requirement 19.LMR for more details on general removals requirements for land management CO_2 removals.

See Requirement 19.GS for more details on general removals requirements for geologic storage.

REQUIREMENT 20:
Scope 3 removals traceability

If companies account for and report scope 3 removals in their GHG inventory, they **shall** account for and report scope 3 removals only if the reporting company has traceability (following the interim traceability requirement, Requirement 8) throughout the full CO_2 removals and storage pathway, including to the sink (where CO_2 is transferred from the atmosphere to non-atmospheric pools), to the carbon pools where the carbon is stored, and to any intermediate processes if relevant.

See Requirement 20.LMR for additional details on traceability for land management CO_2 removals.

See Requirement 20.GS for additional details on traceability for geologic storage.

REQUIREMENT 21:
Data quality for removals

If companies account for and report removals in their GHG inventory, they **shall** meet the following data quality requirements:

- **Data specific to sinks and pools**: Companies **shall** account for and report removals only if net carbon stock changes are accounted for using empirical data specific to the sinks and pools where carbon is stored in the reporting company's operations or value chain.[2]
- **Uncertainty**: Companies **shall** provide quantitative uncertainty estimates for removals, including the removal value, the confidence interval for the estimated removal value based on a specified confidence level, and justification of how the removal value does not overestimate removals.

See Requirement 21.LMR for additional details on data quality for land management CO_2 removals.

See Requirement 21.GS for additional details on data quality for geologic storage.

REQUIREMENT 22:
Scope 3 allocation for removals

If companies account for and report removals in their GHG inventory, they **shall** meet the following allocation requirements:

- **Avoid double counting**: If companies account for and report removals in their GHG inventory, they **shall** not double count scope 3 removals from the same LMU, sourcing region, or technological CO_2 removal operation with other companies at the same or similar tiers of the value chain that source from or sell to that land management system or operation.
- **No over-allocating removals**: The sum of the allocated removals from an LMU, sourcing region, or technological CO_2 removal operation **shall** not exceed 100 percent of the removals occurring in the LMU, sourcing region, or technological CO_2 removal operation in the reporting year.
    - This requirement **may** be achieved by ensuring the same allocation methods are applied in scope 3 accounting across companies, increasing data sharing and transparency across the value chain through third-party registries, obtaining a documented "right to report," establishing regulatory systems to avoid double counting, or a combination of these and other approaches.

      For more details, see the "right to report" option in Chapter 13.

REQUIREMENT 23:

Permanence for removals

If companies account for and report removals in their GHG inventory, they **shall** adhere to the permanence principle by meeting the following requirements:

- **Ongoing storage monitoring**: Companies **shall** account for and report removals only if there is ongoing storage monitoring of the relevant carbon pool(s), as specified through a periodic monitoring plan, to demonstrate that the carbon remains stored or to detect losses of the stored carbon.
- **Losses of stored carbon**: Companies **shall** account for and report net carbon stock losses of previously reported removals in the year the losses occur, as either:
  - **Net CO_2 emissions**, if the carbon pools are within the inventory boundary in the reporting year; or
  - **Reversals**, if the carbon pools are no longer in the inventory boundary in the reporting year.

If companies lose the ability to monitor carbon stocks associated with previously reported removals or if the monitoring plan is not renewed, companies **shall** assume previously reported removals are emitted and report net CO_2 emissions or reversals. Emissions or reversals from losses of stored carbon **shall** be allocated using the same methods as used in previous inventories when the removals were reported.

See Requirement 23.LMR for additional details on permanence for land management CO_2 removals.

See Requirement 23.GS for additional details on permanence for geologic storage.

12.2.2 Reporting requirements

Reporting requirements for removals

If companies account for and report removals in their physical GHG inventory, they **shall** report:

- **Life cycle GHG emissions**: All life cycle GHG emissions and other metrics in the value chain of the removal pathway (across scope 1, scope 2, and scope 3) in the relevant "emissions" accounting category and subcategory.
  - This includes losses of stored carbon of previously reported removals that are still within the inventory boundary.
- **Removals by storage type**: Removals that meet the removals requirements, separately by storage pool.
  - CO_2 removals with storage in land-based carbon pools in the "land management CO_2 removals" accounting subcategory under "removals" in the physical GHG inventory.
  - CO_2 removals with storage in geologic carbon pools in the "removals with geologic storage" accounting subcategory under "removals" in the physical GHG inventory. Companies **should** disaggregate further by sink type into: "captured biogenic CO_2 with geologic storage" and "technological CO_2 removals with geologic storage".
- **Reversals**: Net losses of stored carbon (occurring in the reporting year) of previously reported scope 1 and/or scope 3 removals (no longer in the inventory boundary), reported in the "reversals" accounting category separately from the physical GHG inventory and disaggregated by "reversals of land management CO_2 removals" and "reversals of CO_2 removals with geologic storage," and if applicable, information regarding any reserve approach used.

Additionally, they **shall** disclose the following information in their GHG report:

- **Accounting approach**: Whether one year or a longer period was used to calculate the annual or annualized carbon stock change.
    - Monitoring approach and frequency used to estimate CO_2 removals for each relevant activity in scope 1 or scope 3.
- **Traceability**: Systems in place to establish physical traceability.
- **Uncertainty**: The confidence interval associated with reported scope 1 and/or scope 3 removals, based on a specified confidence level, methods used, and justification for how reported removals use conservative assumptions and values.
- **Avoidance of double counting**: How they avoided double counting of removals with other companies at similar tiers of the value chain in scope 3.
- **Monitoring plan**: Systems and procedures for long-term monitoring of carbon pools corresponding to reported scope 1 and/or scope 3 removals, including the length of the monitoring period and monitoring frequency.

See Section 13.2.2 for additional details on reporting requirements for land management CO_2 removals.

See Section 14.2.2 for additional details on reporting requirements for removals with geologic storage.

12.3 Recommendations and options

Accounting for gross CO_2 removals

If net removals are reported under the "removals" accounting category, gross removals **may** be separately reported as well in the "gross CO_2 fluxes" category, as:

- "Gross biogenic land CO_2 removals," disaggregated by scope 1 and scope 3 gross removals for each scope 3 category
- "Gross technological CO_2 removals," disaggregated by scope 1 and scope 3 gross removals for each scope 3 category

If gross removals are reported, companies **should** clearly distinguish net removals (reported under the "removals" accounting category) from gross removals (reported under the "gross CO_2 fluxes" category) and ensure that net and gross removals are not aggregated or double counted (see Requirement 31).

Data quality–related removals recommendations

Data specific to sinks and pools:

- If secondary data (e.g., industry average, regional average, or proxy data) are used to complement calculations using empirical data specific to the sinks and pools where carbon is stored, any secondary data used **should** be technologically, temporally, and geographically representative, as well as based on peer-reviewed scientific literature, government statistics, or reports published by international institutions confirming the estimated value and associated uncertainty over multiple studies.

Uncertainty:

- Companies **should** use sampling approaches that ensure statistically significant estimates of carbon stock changes.
- Companies **should** select conservative values from a confidence interval.
- Companies **should** document all causes of uncertainties that are likely to be addressed through a quantitative uncertainty analysis, such as random errors based on the variability inherent to a system, sample size of data collection, random errors from measurement techniques or calibration, and random components of uncertainty obtained from expert judgment. This includes documenting if some causes of uncertainties have not been included and the steps taken to reduce the uncertainty.

Refer to the Guidance (Chapter 6) for additional information on evaluating data quality and uncertainty.

Accurate estimation of removals in the first year they are reported

In the first year that removals from a given carbon pool (i.e., land or geologic reservoir) are reported in the inventory, companies **should** obtain measurements or calibrate models to ensure that estimates are representative of that carbon pool in the initial year.

Reporting recommendations

Companies **should** report:

- Information on the expected duration of carbon storage (expected length of time the removals are expected to remain stored in carbon pools) for scope 1 and scope 3 removals.
- Total carbon stock or CO_2 stored in carbon pools, separately reported by carbon pool category and separate from the physical GHG inventory, in the reporting year, in the base year/period, and in all years between the base year/period and the reporting year for which carbon stocks are measured (to provide additional transparency over time on reported net changes in carbon stocks).

Options to help manage permanence

Monitoring periods: Companies **may** define a series of consecutive, sequential time intervals for ongoing monitoring to implement Requirement 23:

- This optional approach is a means of implementing the permanence requirements by dividing ongoing monitoring into discrete time periods, specified through monitoring plans that are renewed over time. Monitoring periods **shall** be consecutive and sequential, such that carbon is monitored across all years. For example, a company can implement a series of one-year, five-year, or ten-year monitoring periods that are renewed over time.
- The length of the monitoring period and monitoring frequency within that period **should** be based on the nature of the product (e.g., the rotation period of a crop rotation that produces multiple crops versus one year for an annual crop that is not part of a crop rotation system). *For land management CO_2 removals, see also "Sampling" in Requirement 21.LMR.*
- At the end of a monitoring period, a company **may** renew or implement a new monitoring period to ensure continued ongoing storage monitoring of the carbon pool, or stop monitoring the carbon pool and assume previously reported removals are emitted and report net CO_2 emissions or reversals from the carbon pool.

- Companies **should** align the monitoring period with the reserve accounting policy if the company pursues the reserve approach option (described below).
- Monitoring **should** occur in any year that a target is met to verify target achievement.

Collaborative monitoring approaches: For scope 3 removals accounting, ongoing storage monitoring **may** be managed by a single entity (e.g., the land manager, geologic storage operator, or downstream company) or multiple entities (e.g., a supply chain coalition) to facilitate the exchange of monitoring information, standardize data, and increase efficiencies between all relevant companies and partners in the value chain.

Reserve approach: For target setting and tracking, companies **may** use a reserve approach (or "buffer pool") as a risk management tool to help implement the requirement to account for losses of stored carbon on an annual basis, which **shall** be separately reported from the GHG inventory, when determining progress toward and achievement of removals targets. If used, companies **shall** develop and report a reserve accounting policy that recognizes the following:

- Removals included in the reserve account must meet the removals requirements.
- Removals included in the reserve account cannot be double counted with removals reported in the GHG inventory or with GHG credits.
- The annual contribution to the reserve account and any risk assessment used to inform the share of annual removals are specified.
- Removals in the reserve account can be drawn down in a given reporting year to counterbalance reversals of previously reported removals on an annual basis, including determining target progress/achievement, only if the reserve account remains positive.
- Removals in the reporting company's reserve account are specific to that company and **may not** be pooled across companies (though such accounts may be managed by a third party).
- Any restrictions on which removals from the reserve account can be used to counterbalance reversals of previously reported removals are specified. Companies **should** include the following restrictions:
  - Time limits (e.g., only counterbalance reversals using removals that occurred within the previous five years of the reversal event)
  - Geographic limits (e.g., only counterbalance reversals using removals that occurred within the same sourcing region as the reversal)
  - Carbon storage limits (e.g., only counterbalance reversals using removals with similar types of carbon storage, such as using recent soil carbon removals to compensate for soil carbon reversals)

See Section 17.4.1 in the *Guidance* for additional details. Target-setting programs **may** provide additional guidance on how to implement a reserve approach.

Endnotes

1 Matthews et al. 2009.

2 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

CHAPTER 13.

Land management CO_2 removals

This chapter provides requirements and guidance on accounting for removals from carbon stock changes due to land management activities across agricultural land uses, from both a scope 1 and scope 3 perspective.

13.1 Overview

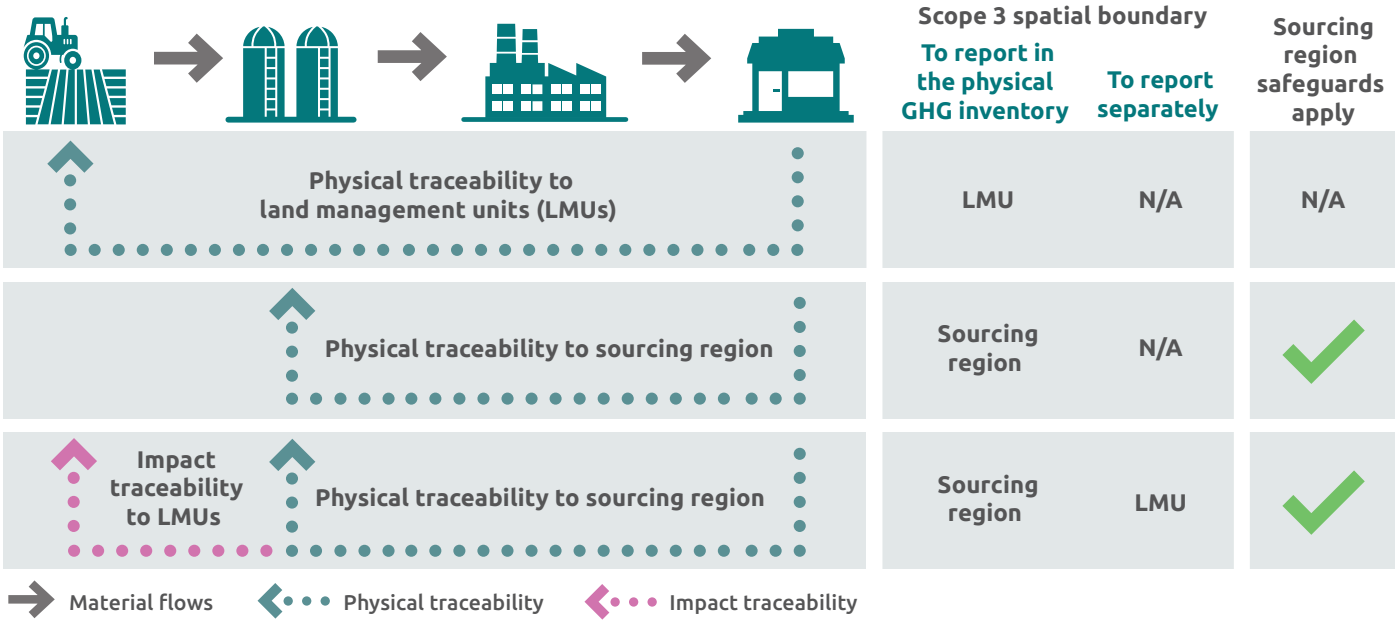
Land management CO_2 removals are net CO_2 removals resulting from net increases to carbon stored in land-based carbon pools (biomass, dead organic matter, and soil carbon pools) due to ongoing land management practices. All land management CO_2 removals are from biological sinks.

Accounting for agricultural land management CO_2 removals is subject to the CO_2 removal requirements provided in Chapter 12. Additionally, the following requirements must be met:

- Land management CO_2 removals are calculated using a stock-change accounting approach. Companies are required to estimate the net land carbon stock change for all required carbon pools. GHG inventories are designed to account only for direct anthropogenic impacts on land carbon stocks. All changes in land carbon stocks on existing productive agricultural land are considered anthropogenic (Requirement 19.LMR).
- Companies downstream from production (e.g., food processors, consumer goods companies, or retailers) must meet a certain level of traceability to identify the specific lands where carbon is stored (Figure 13.1, and Requirement 20.LMR).
    - Traceability to the LMU-level is not always possible due to information availability or supply chain time and space dynamics. Removals can be accounted for at the sourcing region level, provided that appropriate safeguards are met to ensure accuracy and mitigate double counting risks (see "sourcing region safeguards" in specific cases of Requirement 20.LMR below).
- Accounting for land management CO_2 removals requires data specific to the land carbon pools where the CO_2 is stored, either through regular measurements, calibrated modeling, or hybrid approaches (see Requirement 21.LMR).
- To ensure removed CO_2 remains stored, companies must have an ongoing monitoring plan to detect any future losses of stored carbon that may return to the atmosphere (see Requirement 23.LMR).

When land use change results in removals, companies first account for gross land use change emissions associated with any carbon stock decreases due to land use change following Requirement 10, and then may separately account for any annual land management CO_2 removals due to carbon stock increases of the subsequent land use in the year they occur.

Figure 13.1 Removals with traceability to the sourcing region vs. the land management unit



13.2 Requirements

13.2.1 Accounting requirements

Note: Refer to Chapter 12 for general removals requirements.

REQUIREMENT 19.LMR:

Land management CO_2 removals accounting

If companies account for and report land management CO_2 removals on productive agricultural lands in their GHG inventory, they **shall** meet the following requirements:

- **Accounting approach**: Companies **shall** account for and report land management CO_2 removals based on annual or annualized net land carbon stock gains occurring in the reporting year using stock-change accounting methods.
  - Companies **may** account for cropland carbon stock changes using monitoring frequencies at timescales that reflect the relevant crop rotation or crop cultivation cycle, if data quality requirements are met (see Requirement 21.LMR). See Section 9.4.3 in the Guidance for additional details.
- **Spatial boundaries**: Companies **shall** account for net land carbon stock changes from land management activities on all agricultural land in their scope 1 spatial boundary. Scope 3 land management CO_2 removals **shall** only be quantified using a sourcing region, land management unit or harvested area scope 3 spatial boundary.
  - See Requirement 5 and Requirement 14 to define the scope 1 and scope 3 spatial boundaries.
  - See Requirement 20.LMR for traceability requirements.

- **Carbon pools and land uses**: Companies **shall** account for the net land carbon stock change (rather than assuming no carbon stock change) for the carbon pools required in Requirement 14.
- **Anthropogenic impacts on agricultural land**: All changes in land carbon stocks on productive agricultural land in the reporting year are considered anthropogenic. Companies **shall** fully account for all net land carbon stock changes on all agricultural lands in the reporting year, including changes due to degradation and carbon stock losses from fires, storms, and other natural disturbances.

REQUIREMENT 20.LMR:
Scope 3 land management CO_2 removals (LMR) traceability and sourcing region safeguards

If companies account for and report scope 3 land management CO_2 removals on productive agricultural lands in their physical GHG inventory, they **shall** meet the following requirements:

- **Spatial boundary**: Companies **shall** define a sourcing region, land management unit, or harvested area scope 3 spatial boundary, which requires one of the following levels of traceability:
  - physical traceability to the LMU(s) where the carbon is stored;
  - physical traceability to the sourcing region where the carbon is stored; or
  - physical traceability to the sourcing region, and impact traceability to the LMU(s) where the carbon is stored (subject to Requirement 8).
- **Sourcing region traceability**: For companies defining physical traceability to a sourcing region, they **shall** establish physical traceability to the first point of aggregation or first processing facility in the sourcing region, or multiple first points of aggregation or processing facilities in close proximity that have overlapping sourcing areas to determine a single sourcing region covering the total area for all facilities.

Specific cases

REQUIREMENT 20.1.LMR:
Sourcing region safeguards

If companies only have traceability to a sourcing region, they **shall** ensure the following safeguards are met to report land management CO_2 removals:

- **Same spatial boundary for emissions and removals**: To satisfy this safeguard, companies are required to follow Requirement 5 (“same boundary across accounting categories”).
- **Attributable productive lands**: To satisfy this safeguard, companies are required to follow Requirement 6. The sourcing radius from the first point of aggregation or first processing facility (or multiple first collection points in close proximity that have overlapping sourcing areas used to determine a single sourcing region covering the total area for all facilities), or other methods used to determine the sourcing region boundary **should** be spatially explicit and reflect documented raw material transport distances to the first point of aggregation.
- **Same allocation method**: Companies are required to follow Requirement 9 (“same allocation methods across metrics”); see the *Guidance* for details.
- **Capturing variability**: Sampling or inventory approaches for direct measurements of net carbon stock changes in sourcing regions or data used to calibrate remote sensing–based or model-based approaches

shall be based on a sampling scheme and sufficient sample size that is representative of the variation due to both natural factors (e.g., climate, vegetation, soil type, topography, etc.) and management factors (e.g., plantation forest age classes, prescribed fire management, cropping systems, tillage practices, etc.) throughout all attributable productive lands included in the sourcing region.

- **Conservative assumptions**: To satisfy this safeguard, companies are required to follow the reporting requirements in Section 12.2.2; see the *Guidance* for details.
- **Avoiding double counting**: To satisfy this safeguard, companies are required to follow Requirement 22; see the *Guidance* for details. For an example of how to implement this requirement, see "right to report" option in Section 13.3 below.
- **Reversal accounting**: To satisfy this safeguard, companies are required to follow Requirement 23; see the *Guidance* for details.
- **Separate reporting by spatial scale**: If a company has different levels of traceability for different products and both LMU-level and sourcing region–level spatial boundaries are used to account for land management CO_2 removals, the removals accounted for at each spatial scale **shall** be reported separately.
- **Transparency of claims**: Companies **shall** disclose information on the data and spatial boundaries used to determine the sourcing region boundary and estimate land management CO_2 removals within the sourcing region.

REQUIREMENT 21.LMR:
Data quality for land management CO_2 removals

If companies account for and report land management CO_2 removals on productive agricultural lands in their GHG inventory, they **shall** meet the following requirements:

- **Data specific to sinks and pools**: Companies **shall** account for and report land management net CO_2 removals only if the net carbon stock changes are accounted for using empirical data specific to the land carbon pools where the carbon is stored in the reporting company's operations or value chain.
- **Sampling**: Companies **shall** resample using consistent methods at least every five years to estimate carbon stock changes using measurement-based approaches or to calibrate model-based or remote sensing–based approaches.

*Note: **Requirement 22** appears in Chapter 12; Requirement 22 is a general removals requirement that applies to accounting for both land management CO_2 removals and CO_2 removals with geologic storage.*

REQUIREMENT 23.LMR:

Permanence for land management CO_2 removals

If companies account for and report land management CO_2 removals in their GHG inventory, they **shall** adhere to the permanence principle by meeting the following requirements:

- **Ongoing storage monitoring**: Companies **shall** account for and report land management net CO_2 removals only if ongoing storage monitoring is documented in a land management plan or monitoring plan and implemented to ensure carbon remains stored in the landscape, and they can detect losses of stored carbon in relevant land-based carbon pools.
- **Losses of stored carbon**: Companies **shall** account for and report net land carbon stock losses of previously reported land management net CO_2 removals in the year the losses occur, as either:
  - "Land management net biogenic CO_2 emissions," if the carbon pools are within the inventory boundary in the reporting year; or
  - "Reversals of land management CO_2 removals," if the carbon pools are no longer within the inventory boundary in the reporting year.

If companies lose the ability to monitor land carbon stocks associated with previously reported removals or if the monitoring plan is not renewed, companies **shall** assume previously reported removals are emitted and report reversals from land-based storage.

13.2.2 Reporting requirements

Reporting requirements for land management CO_2 removals

If companies account for and report "land management CO_2 removals" in their physical GHG inventory, they **shall** disclose the following information in their GHG report:

- **Spatial boundary**: The selected scope 3 spatial boundary for land management CO_2 removals and verifiable evidence justifying how the boundary aligns with the "recommended considerations to determine the level of traceability and the scope 3 spatial boundary" in Section 5.3.
  - **Demonstrate improvement**: Evidence that demonstrates improvement over time towards the most appropriate scope 3 spatial boundary and level of traceability for the given production system, and any planned improvements.
  - **Proximate and adjacent non-productive lands**: If companies define a land management unit scope 3 spatial boundary and choose to include proximate and adjacent non-productive lands within that boundary (see Requirement 7), they **shall** provide evidence that demonstrates the requirements are met.
- **Carbon pools and land uses**: The specific land carbon pools included in their analysis of net carbon stock changes, including when "no carbon stock change" is assumed for a particular carbon pool and land use.
- **Sourcing region safeguards**: If applicable, a description of how each of the sourcing region safeguards was met, including necessary data and supporting information.
- **Sampling**: Description of sampling methods and frequency of resampling.

13.3 Recommendations and options

Ongoing storage monitoring plan

The monitoring plan **should** include spatial boundaries; methods used to estimate carbon stock changes; the sampling approach to achieve representative estimates of land carbon stock changes, land carbon pools included; frequency of monitoring and resampling; and data quality control procedures.

The monitoring plan **should** be documented in one of the following resources:

- The land management plan for a given LMU or sourcing region.
- A monitoring plan or program developed by the reporting company, supply chain coalition, or third-party with relevant expertise.

"Right to report"

A documented "right to report" is one approach companies **may** apply to account for and report scope 3 removals from a particular LMU or to consistently track scope 3 emissions from a given LMU over time. This approach may help prevent double counting with GHG credits when setting targets; help prevent double counting with other companies at the same tiers of the value chain; ensure free, prior, informed consent is provided by landowners or managers; and provide documentation of traceability.

- When establishing a "right to report," it is the landowner's or land manager's decision about:
  - Which GHG programs or systems (if any) the removals are accounted for; and
  - Whom within a given GHG program or system can account for the removals (e.g., downstream companies in the value chain of products they sell, GHG credit purchasers, etc.).
- To achieve the "right to report" to account for scope 3 emission reductions or removals from a particular LMU, the reporting company **should** have documented consent from the landowner, land manager, or their proxy. This includes those who represent the owner or land managers, such as—but not limited to—cooperatives, community-based organizations, and so on.
- The "right to report" **should** include the allocation method used to account for emissions, removals, and other metrics.
- Where the "right to report" is provided by the landowner or operator to a customer of its products or supply chain initiatives, that "right to report" **may** cascade through the supply chain (i.e., it can be double counted vertically across the different tiers from one shared value chain but not horizontally among the same tier from different value chains).
- The "right to report" documentation could provide evidence for impact traceability where downstream companies do not have physical traceability to an LMU or sourcing region, following Requirement 8.

CHAPTER 14.

CO_2 removals and CO_2 capture with geologic storage

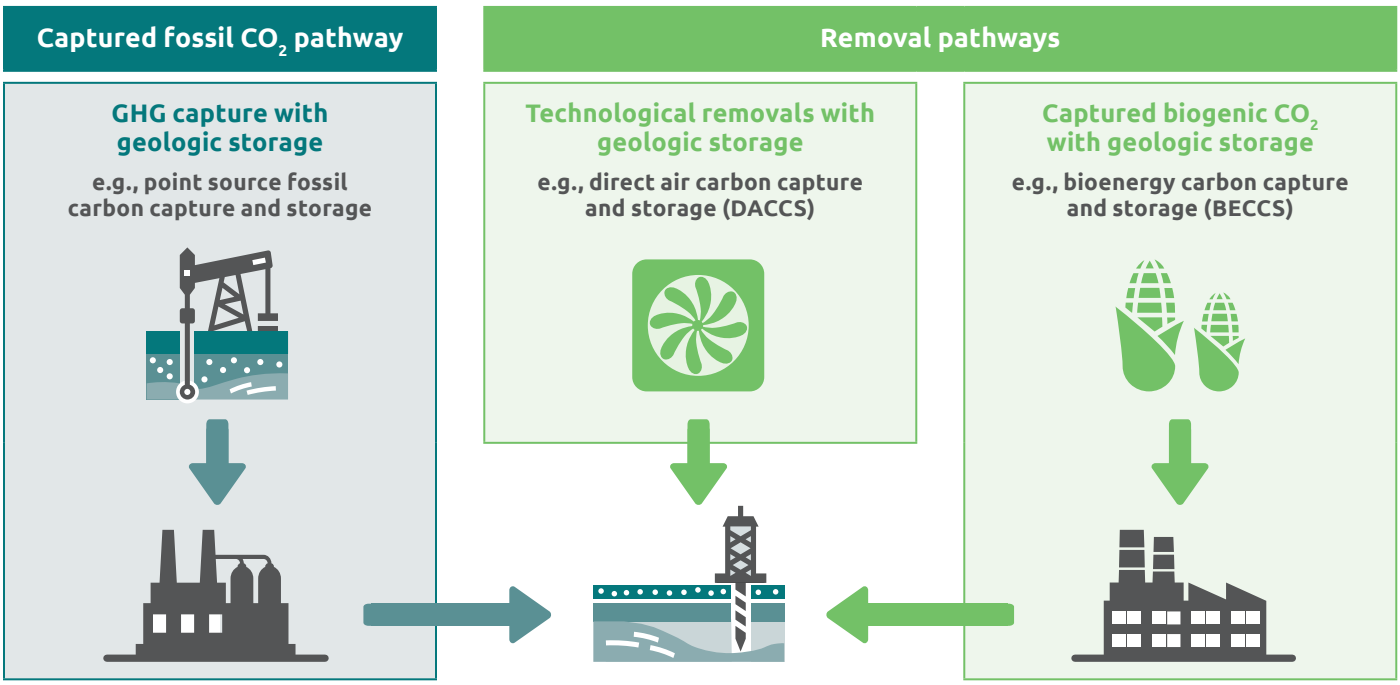
This chapter provides requirements on accounting for CO_2 removals and CO_2 capture with carbon storage in geologic reservoirs from both a scope 1 and scope 3 perspective.

14.1 Overview

A geologic storage pathway refers to the consecutive and interlinked stages associated with the acquisition and storage of carbon in geologic reservoirs. CO_2 stored in geologic reservoirs can derive from two types of pathways (Figure 14.1):

- **Captured CO_2**: CO_2 collected at a source (preventing an emission) and that continues to be stored in a non-atmospheric carbon pool. In this case, companies do not need to account for those emissions in the relevant scope if they meet the geologic storage requirements, but this is not accounted for and reported as a removal.
- **Removal**: CO_2 removed directly from the atmosphere with technologies (e.g., direct air capture), or via biogenic CO_2 capture (e.g., bioenergy with carbon capture and storage). These can be accounted for and reported as removals with geologic storage. Net removals with geologic storage are net CO_2 removals resulting from annual net increases to carbon stored in geologic carbon pools from carbon derived from biological or technological CO_2 sinks.[1]

Figure 14.1 Illustration of geologic storage pathways



CO_2 removals with geologic storage and CO_2 capture with geologic storage are subject to the CO_2 removal requirements provided in Chapter 12. Additionally, they must meet the following requirements:

- Companies are required to account for all cradle-to-grave life cycle GHG emissions, land use, and land carbon leakage (where required) associated with the geologic storage pathway (see Requirement 19.GS).
- Companies need to have traceability from the point of CO_2 capture to the injection site (see Requirement 20.GS).
- Companies need to comply with the data quality criteria (see Requirement 21.GS).
- While many geologic reservoirs can store carbon on millennial timescales, ongoing monitoring needs to be met to ensure any CO_2 losses from the reservoir are detected and accounted for (see Requirement 23.GS).
- For captured biogenic CO_2 with geologic storage, companies must account and report for all life cycle GHG emissions related to the attributed land, and demonstrate that there are no significant land use change emissions (see Requirement 25).

14.2 Requirements

14.2.1 Accounting requirements

Note: Refer to Chapter 12 for general removals requirements.

REQUIREMENT 19.GS:

Removals and CO_2 capture with geologic storage (GS) accounting[1]

If companies account for and report removals with geologic storage or CO_2 capture with geologic storage in their GHG inventory, they **shall** meet the following requirements:

- **Life cycle GHG emissions**: Companies **shall** account for all life cycle GHG emissions that occur throughout the geologic storage pathway (i.e., cradle to grave).
  - This includes GHG emissions, land use, and land carbon leakage (where required) from the product life cycle(s) associated with the stored CO_2 or carbon, and report them in the corresponding reporting category in scope 1, scope 2, and/or scope 3.
  - **Enhanced oil and gas recovery**: For geologic storage pathways with enhanced oil and gas recovery, companies **shall** account for all downstream GHG emissions associated with the extraction, processing, transportation, distribution, storage, and use (i.e., combustion) of oil, natural gas, or other hydrocarbons produced from the geologic reservoir and report such emissions in scope 1, scope 2, and/or scope 3.
- **Operational boundary**: To report scope 1 net removals with geologic storage when no single entity owns or controls both the sink and the pool of the CO_2 removals, the multiple entities involved in the geologic removal and storage pathway **shall** develop a contractual agreement which specifies:
  - The ownership (rights) of the CO_2 sinks and pools and resulting removals with geologic storage, and the responsibility (obligations) for the GHG sources and resulting emissions (including any losses of stored carbon) across the entire geologic removal and storage pathway; and
  - Which single entity, among the companies that own or control the sink, transportation, or the pool, accounts for the removals as scope 1, or specify how the scope 1 removals will be apportioned between the companies, and mechanisms to avoid double counting.

- In such cases, a single tonne of CO_2 removal with geologic storage **shall** not be reported by more than one entity under scope 1.
- The contractual agreement **should** include only the companies that could account for the removal in their scope 1, following the consolidation approach selected.
- The contractual agreement **should** be between, at a minimum, the party that captures the CO_2 (either through technological removal processes or resulting from the oxidation of the molecular carbon content of biogenic materials) and the party that stores the CO_2 in a geologic reservoir. Land managers and landowners are not required to be included in such contractual agreements if those land managers and landowners will not report such removals with geologic storage.
- The contractual agreement is not an instrument to transfer the scope 1 removal to an entity outside (i.e., that does not own or control a part) of the removal and storage pathway.

REQUIREMENT 20.GS:
Scope 3 geologic storage traceability

If companies account for and report scope 3 removals with geologic storage or CO_2 capture with geologic storage in their GHG inventory, they **shall** account for and report net removals with geologic storage (or no emissions associated with CO_2 capture with geologic storage) only if they have physical traceability (following Requirement 8)[2] to the entity (or entities) capturing the CO_2 received at the injection site or geologic storage hub system, and the entity (or entities) operating the CO_2 injection site(s) and geologic storage reservoir(s).

REQUIREMENT 21.GS:
Data quality for geologic storage

If companies account for and report removals with geologic storage or CO_2 capture with geologic storage in their GHG inventory, they **shall** meet the following requirements:

- **Data specific to sinks and pools**: Companies **shall** account for and report net removals with geologic storage (or no emissions associated with CO_2 capture with geologic storage) only if net CO_2 removals with geologic storage, CO_2 capture with geologic storage, and life cycle GHG emissions for the CO_2 stored in the geologic reservoir(s) are accounted for using data specific to the CO_2 injection site(s), geologic storage reservoir(s), and CO_2 inputs into the geologic storage reservoir(s).
- **Uncertainty**: Companies **shall** account for and report net removals with geologic storage (or no emissions associated with CO_2 capture with geologic storage) only if they provide quantitative uncertainty estimates.

*Note: **Requirement 22** appears in Chapter 12; Requirement 22 is a general removals requirement that applies to accounting for both land management CO_2 removals and CO_2 removals with geologic storage.*

REQUIREMENT 23.GS:
Permanence for geologic storage

If companies account for and report removals with geologic storage or CO_2 capture with geologic storage in their GHG inventory, they **shall** adhere to the permanence principle by meeting the following requirements:

- **Ongoing storage monitoring**: Companies **shall** account for and report net removals with geologic storage (or no emissions associated with CO_2 capture with geologic storage) only if ongoing storage monitoring is

documented in a monitoring plan to ensure carbon remains stored in geologic reservoirs and the company can detect losses of stored carbon from relevant geologic carbon pools.

- **Losses of stored carbon**: Companies **shall** account for net geologic carbon stock losses of previously reported net removals or captured CO_2 with geologic storage in the year the losses occur, as either:
  - **Fossil fuel and industrial emissions**, if the carbon pools are part of the GHG inventory boundary in the reporting year; or
  - **Reversals** from geologic storage, if the carbon pools are no longer in the GHG inventory boundary in the reporting year.

If companies lose the ability to monitor geologic carbon stocks associated with previously reported removals, companies **shall** assume previously reported removals are emitted and report reversals from geologic storage.

*Note: **Requirement 24** appears in Chapter 15 and does not apply to geologic storage.*

REQUIREMENT 25:
Land accounting for biogenic carbon storage in geologic reservoirs[3]

If companies account for and report captured biogenic CO_2 with geologic storage associated with agricultural products in their GHG inventory, they **shall** meet the following requirements:

- **Life cycle GHG emissions, land use, and leakage**: Companies **shall** account for all life cycle GHG emissions, land use, and land carbon leakage (where required) on lands where the biogenic CO_2 or carbon is sourced from, including land use change emissions, the annual net land carbon stock change, and land management production emissions.
- **No significant LUC emissions**: Companies **shall** demonstrate that there are no significant land use change emissions attributable to the biogenic materials.
  - Definition of "not significant": If land use change emissions are reported, but less than 5 percent of the sourcing area (i.e., jurisdiction, sourcing region, or LMU) has experienced land use change, this criterion is met.
  - If any non-significant LUC emissions attributable to the biogenic materials occur, they **shall** be subtracted from the CO_2 or carbon added to the geologic or product carbon pool. These LUC emissions are counted as land emissions in the inventory and cannot be accounted for as removals with geologic storage or as product carbon storage. The portion of removals that did not generate LUC emissions can still be reported as removals.
  - Companies **may** use evidence from regulatory programs, certification programs, sustainability programs, or other mechanisms as a basis for providing information on biogenic product sourcing to determine land carbon stock changes related to this requirement. Such mechanisms **should** include quantitative information on land use change and land carbon stock changes, or proof that levels of land carbon stocks and sinks are maintained or strengthened over the long term (e.g., biomass sustainability certification, compliance with regulations or jurisdictional programs verified by national authorities, or independent third-party assurance fulfilling at a minimum ISAE 3000 limited assurance engagement).

This requirement does not apply to biogenic CO_2 or carbon associated with waste materials, following the recommendation on allocating upstream GHG emissions from waste in Section 6.3 (i.e., companies do not need to allocate any upstream GHG emissions to waste materials with no economic value).

14.2.2 Reporting requirements

Reporting requirements for geologic storage

If companies account for and report removals with geologic storage or CO_2 capture with geologic storage in their physical GHG inventory, they **shall** report:

- **Life cycle GHG emissions**: All life cycle GHG emissions that occur throughout the geologic storage pathway (i.e., cradle to grave), including:
  - Life cycle "fossil fuel and industrial emissions" and "land emissions" attributable to the CO_2 inputs in the relevant "emissions" accounting category and subcategory;
  - Fugitive CO_2 emission or other CO_2 losses to the atmosphere from geologic storage in the "gross CO_2 emissions from geologic storage" accounting category under "gross CO_2 fluxes," separately from the physical GHG inventory; and
  - Net carbon losses from geologic reservoirs that are still within the inventory boundary in the "fossil fuel and industrial emissions" accounting category in the physical GHG inventory (following Requirement 23.GS on losses of stored carbon).
- **Removals** with geologic storage that meet the removals requirements under "removals" in the physical GHG inventory. Where data allows, companies **should** further disaggregate captured biogenic CO_2 from other technological CO_2 removals and report under the "captured biogenic CO_2 with geologic storage" and "technological CO_2 removals with geologic storage" accounting subcategories, respectively.
- **CO_2 capture:** CO_2 capture with geologic storage that meets the geologic storage requirements is not reported as emissions in the relevant scope.
  - Disclose the amount of CO_2 that is captured and stored in geologic reservoirs that meets the geologic storage requirements.
  - Fossil CO_2 capture that doesn't meet the geologic storage requirement is reported as "fossil fuel and industrial emissions" in the relevant scope.
- **Reversals of CO_2 removals with geologic storage:** Net carbon losses from geologic reservoirs associated with previously reported scope 1 and/or scope 3 removals (no longer in the inventory boundary).
- **Reversals of CO_2 capture with geologic storage:** Net carbon losses from geologic reservoirs associated with previously disclosed captured CO_2 (no longer in the inventory boundary).

Additionally, they **shall** disclose the following information in their GHG report:

- **Operational boundary**: If applicable, description of contractual arrangements that specify which single entity (among the entities that own or control the removal and storage pathway, if more than one) accounts for removals as scope 1, including information on allocation of CO_2 related risks and obligations and avoidance of double counting of scope 1 removals between all entities in the geologic removal and storage value chain.

Companies accounting for and reporting "captured biogenic CO_2 with geologic storage" in their physical GHG inventory **shall** disclose the following information in their GHG report:

- **No significant LUC emissions**: Justification that there are no significant land use change emissions attributable to the biogenic materials the CO_2 is captured from.

- **Land use** associated with the biogenic materials the CO_2 is captured from in the "land occupation" accounting subcategory under "land use," separately from the physical GHG inventory.
- **Land carbon leakage** associated with the biogenic materials the CO_2 is captured from, if relevant, in the "land carbon leakage" accounting category, separately from the physical GHG inventory.

14.3 Recommendations

Data specific to sinks and pools

Geophysical data, well data, and reservoir properties data **should** be collected for evaluation of the geologic storage reservoir.

Ongoing storage monitoring plan

The monitoring plan **should** include a site characterization, description of how the operations at the geologic reservoir and monitoring comply with applicable regulations, methods used to detect any fugitive CO_2 emissions, frequency of monitoring, and data quality control procedures.

- Where regulations include provisions for the transfer of liabilities associated with geologically stored CO_2 to the state and the geologic storage operator demonstrates that storage is permanent without risk of CO_2 losses from the reservoir, the date and condition of the transfer of liabilities **should** be clarified, and post-closure monitoring **may** follow regulatory guidance.

CO_2 custody transfer disclosure recommendation

For CO_2 inputs to geologic reservoirs, companies **should** report the net amount of CO_2 (in tonnes) at each custody transfer, where the net amount is the difference between CO_2 inputs and outputs, corrected by any changes in composition of the CO_2 stream, if applicable.

Endnotes

1 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

2 See Chapter 5 for definitions of physical traceability and impact traceability.

3 This requirement is currently only applicable to geologic storage of biogenic carbon from agricultural products. Requirements for geologic storage of biogenic carbon from forest products are still pending to ensure alignment with the resolution on forest carbon accounting in future versions of this *Standard*.

PART 2 (CONTINUED).
Compile the GHG inventory

PART 2.3
Requirements for companies choosing to report product carbon storage

CHAPTER 15.

Product carbon storage

This chapter provides requirements and recommendations on accounting for the storage of biogenic and TCDR-based carbon that is physically contained in product carbon pools. Product carbon storage is not reported as a removal or emission but instead as a separate and optional category. To account for and report gross CO_2 emissions from biogenic and TCDR-based products associated with removal-and-use pathways, see Chapter 11.

15.1 Overview

Product carbon storage is carbon stored in product carbon pools that is derived from biogenic or technological CO_2 sinks. The product carbon pool refers to the carbon contained in products or materials during the use stage of the product life cycle, including recycling and reuse.[1]

Products that contain biogenic or TCDR-based carbon can keep carbon out of the atmosphere for the duration of the product's lifetime. Therefore, maintaining storage in product carbon pools and preventing its release can help to reduce GHG emissions, depending on the product's durability and end-of-life fate.

The product carbon storage pathway refers to the consecutive and interlinked stages of carbon storage in products, either through biogenic or technological CO_2 removal processes, from raw materials to intermediary and final products during their use stage, including recycling and reuse (Figure 15.1).

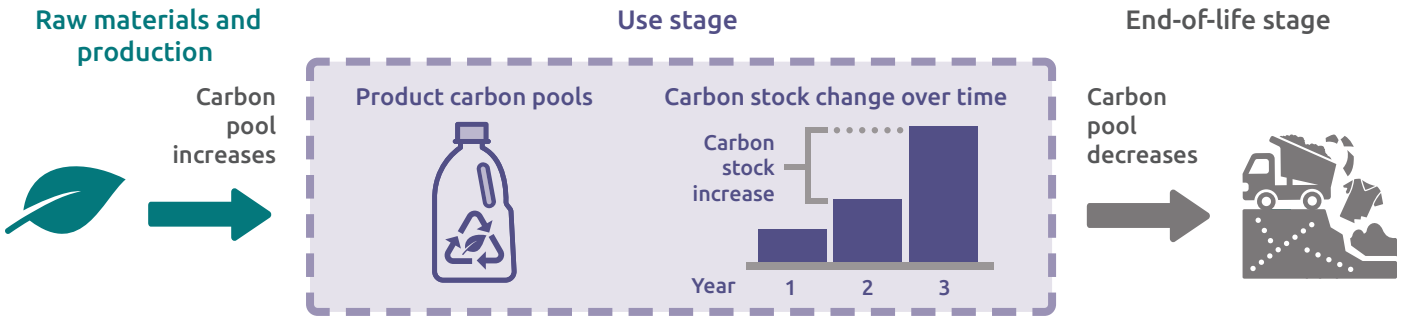
Reporting biogenic and/or TCDR-based product carbon storage is optional. Product carbon storage is reported in a separate "Product carbon storage" category, separately from emissions and removals. With product carbon pools, no single entity controls both sink and storage across the product carbon storage pathway, since products are intended to be used by other entities (including end users) across the value chain. Product carbon storage is therefore not accounted as scope 1 by any entity. Product carbon storage corresponds to scope 3, category 11 (Use of sold products) since product carbon storage occurs during the product use stage. However, product carbon storage is not fungible with emissions or removals in scope 3.

Companies choosing to account for product carbon storage for agricultural or TCDR-based products must meet the following requirements:

- Account for the net product carbon stock change of sold agricultural or TCDR-based products (Requirement 24).

- Ensure that complete product life cycle GHG emissions are accounted for and that no significant land use change emissions are associated with producing the product (Requirement 25.PS).
- Companies **may** separately account for waste carbon stock changes if they seek to account for carbon storage in the end-of-life stage of the product life cycle (Requirement 26). Reporting storage in waste carbon pools is separate and optional.

Figure 15.1. Example of a product carbon storage pathway for bio-based plastics



15.2 Requirements

15.2.1 Accounting requirements

REQUIREMENT 24:

***Product carbon storage accounting*[2]**

If companies choose to account for and report product carbon storage for agricultural or TCDR-based products, they **shall** meet the following requirements:

- **Accounting approach**: Companies **shall** account for the annual net product carbon stock change, using the stock-change accounting approach. The net product carbon stock change **shall** only include biogenic and/or TCDR-based carbon in agricultural or TCDR-based products sold by the reporting company that are in the use stage, which includes recycling and reuse, and that meet Requirement 25.PS.
  - Companies **shall** only report product carbon storage if the total biogenic and/or TCDR-based product carbon stock increases in the reporting year.
- **Data quality**: Companies **shall** account for and report product carbon storage using information regarding the biogenic or TCDR-based carbon content of their sold products, as well as data regarding product lifetime (half-life value), and conversion rates from raw material to intermediate products, final products, and/or recycling and reuse. *See data quality–related product carbon storage recommendations below and Table 15.1 in the Guidance.*
- **Losses of stored carbon**: If the total biogenic and/or TCDR-based product carbon stock decreases in the reporting year (i.e., more carbon leaves the product carbon pool through transfers to the end-of-life stage, where it is combusted or decomposed, than carbon entering the product carbon pool), companies **shall** report negative product carbon storage separately for "biogenic product carbon storage" and "TCDR-based product carbon storage."

REQUIREMENT 25.PS:

Land accounting for agricultural product carbon storage[3]

When estimating net biogenic product carbon stock changes, companies **shall** only include biogenic carbon from agricultural products that meet the requirement for complete life cycle GHG emissions reporting, including land carbon leakage (where required), and no significant land use change emissions (see Requirement 25).

- This requirement does not apply to biogenic CO_2 or carbon associated with waste materials used as an input to the biogenic product, following the recommendation on allocating upstream GHG emissions from waste in Section 6.3 (i.e., companies do not allocate any upstream GHG emissions to waste materials with no economic value).

REQUIREMENT 26:

Waste carbon storage accounting

If companies choose to account for carbon storage in waste carbon pools, such information **shall** meet the following requirements:

- **Waste carbon storage requirements**: If companies choose to report on carbon stock changes of the waste carbon pool, companies **shall** follow the same methods, requirements, and criteria as in Requirement 24, but for biogenic and/or TCDR-based carbon in agricultural or TCDR-based products sold by the reporting company in the end-of-life treatment stage, excluding recycling and reuse. Such carbon in waste carbon pools does not need to meet the land requirement for agricultural product carbon storage Requirement 25.PS.
- **Landfill requirements**: When estimating net waste carbon stock change, companies **shall** only include waste carbon from sanitary landfills where adequate measures are taken to avoid soil and groundwater contamination.
- **Life cycle GHG emissions**: All GHG emissions from the end-of-life treatment of sold products (including emissions from landfills) **shall** be accounted for and reported in scope 3, category 12 in the year that the products are sold. There is no time horizon cut-off, consistent with the GHG Protocol *Scope 3 Standard*.

15.2.2 Reporting requirements

Reporting requirements for product carbon storage[4]

If companies account for and report product carbon storage for agricultural or TCDR-based products, they **shall** report:

- **"Product carbon storage" separately from the physical GHG inventory**: Biogenic or TCDR-based product carbon stock changes **shall** be reported in the "product carbon storage" accounting category separately

from the physical GHG inventory, corresponding to scope 3, category 11 (Use of sold products). Product carbon storage is not fungible with emissions or removals in scope 3.

- **Product carbon storage by sink type:** Product carbon storage that meets the product carbon storage requirements, separately by sink type.
  - Storage of biogenic CO_2 or carbon in product carbon pools in the "biogenic product carbon storage" accounting subcategory under "product carbon storage," separately from the physical GHG inventory.
  - Storage of TCDR-based carbon in product carbon pools in the "TCDR-based product carbon storage" accounting subcategory under "product carbon storage," separately from the physical GHG inventory.

Specific cases

Waste carbon storage:

If companies choose to account for storage in waste carbon pools, companies **shall** report waste carbon stock changes in the "waste carbon storage" accounting category (corresponding to scope 3, category 12, End-of-life treatment of sold products), separately from the physical GHG inventory and the "product carbon storage" accounting category.

15.3 Recommendations

Data quality–related product carbon storage recommendations

Data specific to sinks and product carbon storage: To calculate and report on agricultural and TCDR-based product carbon storage in sold products, companies **should** use empirical data specific to the sinks and product carbon pools where carbon is stored. This includes data regarding product lifetime (half-life value) and conversion rates from raw material to intermediate products and/or final products. See Table 15.1 in the *Guidance* for the recommended data quality hierarchy to account for "product carbon storage."

Ongoing product carbon storage monitoring plan recommendation

Companies **should** implement ongoing storage monitoring of product carbon pools according to monitoring plans designed to obtain information regarding the duration of carbon storage in products sold by the reporting company. For example, a manufacturing company may conduct sampling of their sold products' use stage and end-of-life fate, or could work with supply chain partners to develop monitoring plans across a range of products within the same value chain. Options to help ensure ongoing storage monitoring in dynamic supply chains include:

- Use of digital tracking methods (e.g., through unique identifiers, such as radio frequency identification and near field communication tags)
- Working with supply chain partnerships or engaging in programs to increase the traceability of product carbon pools and build ongoing storage monitoring systems for specific products and geographies
- Developing contracts with suppliers or supply chain coalitions that specify data-sharing agreements to enable ongoing storage monitoring

Endnotes

1 This *Standard* recognizes that carbon stored in landfills exists, but includes it as an optional category of the waste carbon pool outside of the inventory, due to incentives related to landfilling (i.e., there is a consensus that companies should not be encouraged to change their behavior to put more materials into landfills or to set targets to increase carbon stored in landfills).

2 This requirement is currently only applicable to product carbon storage in agricultural products and TCDR-based products. Product carbon storage requirements for forest product carbon storage are still pending to ensure alignment with the resolution on forest carbon accounting in future versions of this *Standard*.

3 This requirement is currently only applicable to agricultural product carbon storage. Land requirements for forest product carbon storage are still pending to ensure alignment with the resolution on forest carbon accounting in future versions of this *Standard*.

4 This requirement is currently only applicable to product carbon storage in agricultural products and TCDR-based products. Reporting requirements for forest product carbon storage are still pending to ensure alignment with the resolution on forest carbon accounting in future versions of this *Standard*.

PART 3.
Act based on the GHG inventory (if applicable)

CHAPTER 16.

Evaluating the impact of actions

This chapter provides requirements and guidance on estimating the GHG impacts of corporate actions using project or intervention accounting methods. This information should be reported outside the physical GHG inventory, within the GHG report, to inform decision-making, provide transparency, and ultimately help maximize a company's net positive impacts on climate change.

If emission reductions or removals from actions are credited for the purpose of transferring GHG claims between entities, companies should refer to Chapter 18 for requirements and guidance on accounting for and reporting on GHG emissions reduction or removal credits. This chapter provides guidance on evaluating the GHG impacts of actions to inform decision-making, rather than crediting.

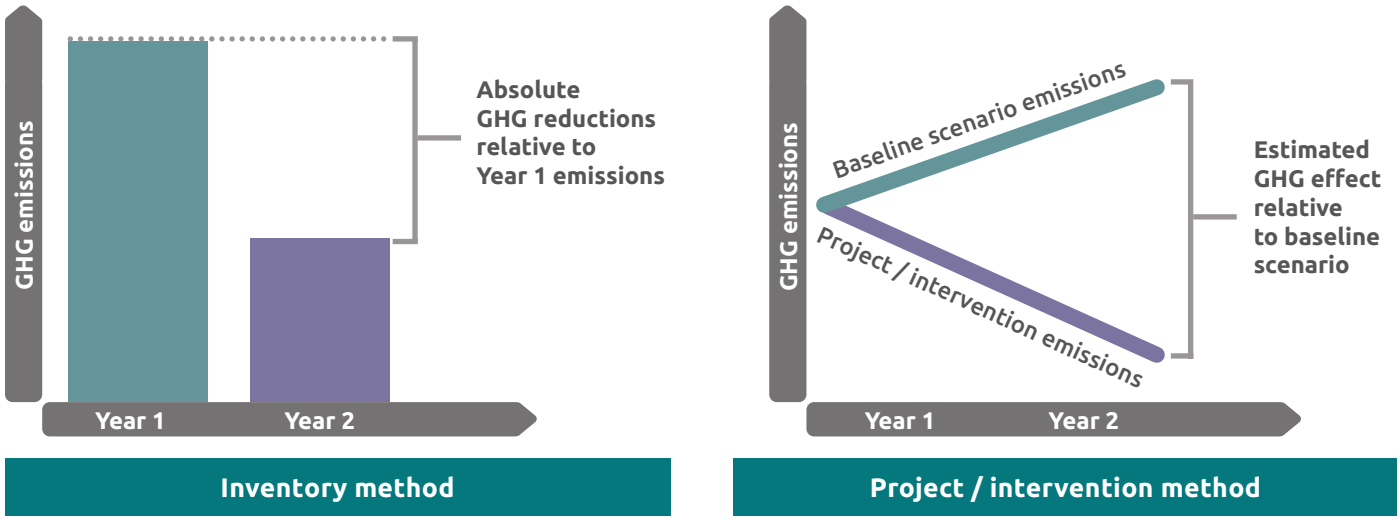
16.1 Overview

The information in a corporate GHG inventory supports many important business goals. However, as companies evaluate the impacts of their actions on climate change, additional information beyond that contained in the inventory is often important to fully inform decision-making. Each major business decision or action has a potential impact on climate change, but the impact of individual decisions or actions can be difficult to ascertain when aggregated in an annual inventory of emissions and removals.

As companies aim to reduce emissions and/or increase removals, evaluating the impacts of individual corporate actions is important to inform decisions. For companies with operations or value chains in the land sector, potential actions include choosing which land-based products, materials, or energy sources to produce or consume, or which strategies, investments, practices, or activities to implement.

While the overall framework of this *Standard* is based on inventory accounting methods, the subject of this chapter is based on project or intervention accounting methods (the difference is illustrated in Figure 16.1).

Figure 16.1 Comparison of inventory and project or intervention accounting methods



16.2 Requirements

16.2.1 Accounting requirements

Note: There are no accounting requirements for this chapter.

16.2.2 Reporting requirements

Reporting methods used to evaluate the GHG impacts of actions[1]

If companies estimate and report the GHG impacts of specific actions separately from the inventory, they **shall** disclose the data sources, methods, and assumptions used to quantify the impact(s) of the evaluated action(s), the assessment boundary, the assessment time period, whether it is an ex ante and/or ex post assessment, and whether the results have been third-party verified.

16.3 Recommendations

Recommended scope for evaluating GHG impacts of actions

All major business decisions and actions have a potential impact on climate change. These impacts can occur within a company's scope 1, scope 2, and scope 3 inventory, as well as beyond the inventory boundary. Companies **should** understand the systemwide impacts of their actions by looking at the potential for avoided emissions, leakage, substitution, and displacement effects, and other impacts of actions that can fall beyond the boundaries of their GHG inventory. In the specific case of land carbon leakage—a negative GHG impact caused by corporate actions that reduce or divert food or feed production on agricultural land—companies are required to account for and report such leakage (see Chapter 8).

When evaluating actions, companies **should** take a full value chain or life cycle perspective to understand whether a given action increases or decreases emissions and removals at different stages of a product's life

cycle and to avoid tradeoffs. For example, companies **should** generally not implement actions that reduce their scope 1 emissions but increase their scope 3 emissions by a larger amount.

To evaluate the impacts of specific actions, companies **should** use project or intervention accounting methods, which estimate the systemwide GHG impacts of an action relative to a counterfactual baseline scenario in which the action did not occur (Figure 16.1). Assessments may be forward-looking (ex ante) and/or backward-looking (ex post). Companies **should** evaluate actions intended to reduce emissions or increase removals, as well as other significant actions the company takes, which may have positive or negative impacts on emissions and removals.

Inform decision-making and disclose GHG impacts of actions

Companies **should** use the results of project or intervention accounting to maximize emission reductions and removals (and minimize emission increases), taking into account systemwide impacts. If companies implement actions that could have potentially significant negative impacts (i.e., increase GHG emissions and/or decrease removals) outside the inventory boundary, companies **should** estimate the GHG impacts resulting from the action using project or intervention accounting methods and report the impacts separately from the GHG inventory in a GHG report.

For further guidance on applying intervention accounting methods, refer to the Guidance (Chapter 16), as well as to the GHG Protocol's The GHG Protocol for Project Accounting (2005) and the Policy and Action Standard (2014).

Endnotes

1 The GHG Protocol's workstream on actions and market instruments will define where to report the impacts of actions in a GHG report and if additional information needs to be disclosed.

CHAPTER 17.

Setting targets and tracking progress

This chapter provides requirements and guidance for companies that choose to set corporate targets for land sector emissions, CO_2 removals, land use and land carbon leakage, gross CO_2 fluxes, product carbon storage, and external compensation (i.e., purchasing and retiring GHG credits) or contribution. This chapter also provides requirements and guidance for setting a base year or base period and tracking progress over time relative to that base year or period.

For companies that participate in target-setting programs that conform with and build on GHG Protocol standards (e.g., Science Based Targets initiative [SBTi]), the target-setting requirements set by those programs take precedence over the target-setting requirements in this chapter.

17.1 Overview

The land sector is critical for global strategies to reach net-zero emissions this century and limit global warming in line with the Paris Agreement goals. Companies that produce or source land-based products, as well as companies that undertake activities that enhance removals from the atmosphere within their operations or value chain, are encouraged to set targets in line with global climate goals and track their performance over time.

GHG programs should set more specific target-setting requirements based on the objectives and scope of their program while building on the foundation of GHG Protocol standards. This includes topics not covered by the GHG Protocol, such as setting the level of a GHG reduction or removal target. GHG programs are also needed to define rules for net targets (refer to Box 17.1 for more information).

This *Standard* contains requirements for companies that choose to set targets or track progress, including:

- Setting separate targets for emissions, removals, and product storage (Requirement 27)
- Establishing a base year or base period and a corresponding recalculation policy for tracking progress (Requirement 28)
- Reporting information about the company's targets (see "Target-setting reporting")
- The necessary reporting information to track progress over time (see "Reporting requirements for tracking progress")

17.2 Requirements

17.2.1 Accounting requirements

REQUIREMENT 27:

Target-setting approaches

If companies choose to set target(s), they **shall** set separate targets as follows:

- **Separate emissions and removals targets**: Companies **shall** set separate targets for emissions, independent of any removals, while optionally setting separate removal targets.
- **Separate product carbon storage targets**: If companies choose to set targets for product carbon storage, product carbon storage targets **shall** be separate from and not included in their emissions, removals, or net targets.[1]

Reversals policy: If companies choose to set removals targets, they **shall** develop a reversals accounting policy that determines how reversals of previously reported removals are accounted towards a company's target.

Adjust values for GHG credits: If companies sell GHG credits from within their organizational boundary that are used as offsets or compensation, or if such credits are issued in the company's value chain, companies **shall** use emissions and removals values adjusted for issued credits in their target boundary when accounting for progress toward a GHG target to avoid double counting. See Chapter 18 and Requirement 30 for further requirements and guidance for preventing double counting of credits.

REQUIREMENT 28:

Setting a base year or base period and tracking progress

Companies **shall** choose a base year or base period and specify their reasons for choosing that particular year or period.

Companies **shall** calculate base year or base period emissions, removals, and other metrics.

Companies **shall** recalculate base year or base period emissions, removals, and other metrics if significant changes (defined using a significance threshold) occur, including the following:

- Structural changes to the reporting company, such as mergers, acquisitions, divestments, outsourcing, and insourcing;
- Changes in calculation methodologies or improvements in data accuracy, including changes in LUC calculation data and methods (see Requirement 10 for details); and/or
- Discovery of significant errors.

Companies **shall** develop a base year or base period recalculation policy that includes the following elements, and apply it in a consistent manner:

- Defines the significance threshold for methodological changes and structural changes to the reporting company that triggers base year recalculations.
- Clearly articulates the basis for each type of change that triggers recalculations.

17.2.2 Reporting requirements

Target-setting reporting

If companies choose to set target(s), they **shall** disclose the following information for each of their selected target(s), as described in Table 17.2 in the *Guidance*:

- Target boundary
- Target type
- Target base year or base period, with justification
- Target commitment year or period, and whether it is a single-year or multi-year target
- Target level
- Progress in reaching the target
- Additional information specific to each target type

See Table 17.2 in the *Guidance* for further reporting details for the following targets:

- Emissions
- Removals
- Targets that include land carbon leakage, if applicable
- Land use
- Gross CO_2 fluxes, if relevant
- Product carbon storage, if relevant
- External compensation and/or contribution targets

Reporting requirements for tracking progress

Companies **shall** disclose the following information to track progress over time:

- **Base year or period and rationale**: The selected base year or period and the rationale for choosing the base year or period.
- **Profiles for emissions, removals, and other metrics over time**: A profile of all metrics reported across all scopes and scope 3 categories that is also consistent with the base year or period recalculation policy.
- **Base year recalculation policy**: A policy including the significance threshold for methodological changes and structural changes to the reporting company that triggers base year recalculations.
- **Other recalculations**: Any recalculations of base year/period levels, including the rationale for recalculation and which assumptions and values were changed, with a comparison of updated values to original values.
- **Context for emissions changes**: Appropriate context for any significant emissions changes that triggered base year emissions recalculation (acquisitions/divestitures, outsourcing/insourcing, changes in reporting boundaries or calculation methodologies, etc.).

17.3 Recommendations and options

Recommended targets and target levels

Companies **should** set targets for all relevant accounting categories in this *Standard*, including:

- Land emissions
- CO_2 removals
- Targets that include land carbon leakage, if applicable
- Land use
- Biogenic product CO_2 emissions
- TCDR-based CO_2 emissions, if relevant
- Product carbon storage, if relevant

The primary goal of corporate targets **should** be emissions reduction, to maintain a focus on reducing emissions to the atmosphere, but removals play an important role in balancing residual GHG emissions. In addition to emission reduction targets, companies **should** also set complementary targets to increase removals.

Companies **should** set target levels aligned with the global need to reduce GHG emissions in line with 1.5°C pathways based on sector and product analyses. Companies **should** set targets with an overall objective of reducing total cumulative GHG emissions, since climate change is driven by total cumulative GHG emissions to the atmosphere.

Companies **should** also set targets to reduce land use (i.e., land occupation expressed as hectares and/or carbon opportunity cost of land use), on an intensity and/or absolute basis, at a level sufficient to avoid contributing to net global agricultural land expansion.

Recommendations for setting targets by target type

Companies **should** set separate targets (i.e., disaggregated targets or sub-targets) as follows:

- Set separate emissions targets for land emissions vs. fossil fuel and industrial emissions.
- Set separate removals targets for land management CO_2 removals and CO_2 removals with geologic storage, if both are relevant to their operations and/or value chain.
- Set separate targets for land use using land occupation expressed as hectares and/or carbon opportunity cost of land use to both optimize land use efficiency and minimize land carbon losses within their operations and value chain.
- Set separate targets by scope.

Companies **may** set targets (absolute and/or intensity) for aggregate reductions in all emissions categories and the carbon opportunity cost of land use.

Companies that produce multiple agricultural products **should** set separate absolute and/or intensity targets for each product type, in order to track progress in reducing emissions and/or land use of each product type over time.

Companies **should** follow the recommendations on setting targets for each target type in Table 17.3 in the *Guidance* and refer to Chapter 17 in the *Guidance* for more details on the above.

Consider additional mitigation action external to the target boundary

In addition to meeting GHG targets across the scope 1, scope 2, and scope 3 inventory, companies **should** invest in external compensation or contributions to achieve additional mitigation outside the target boundary as a supplement to the company's GHG reduction and removal targets, to help reach the global, Paris Agreement–aligned 1.5°C goal.

Options to help manage permanence

If companies choose to set removals targets, they **may** use a reserve approach as a risk management tool to help implement the reversals accounting requirement on an annual basis, including determining progress toward and achievement of removals targets. For discussion on reserve approaches, see Section 12.3.

Box 17.1. Recommendations on net targets to programs, regulators, and companies not participating in target-setting programs

ROLE OF POLICYMAKERS AND PROGRAMS IN SETTING NET TARGETS

Setting rules for net targets is a GHG program or regulatory decision. The GHG Protocol *Accounting and Reporting Standard* is not by itself sufficient for this purpose.

If more than one accounting category is included in a net target boundary, it allows progress in one category to come at the expense of another when determining whether a target has been achieved. Setting rules for net targets is therefore a policy decision. GHG Protocol requires disaggregation of inventory categories in GHG inventory reports, which enables policymakers, regulators, and GHG programs to make policy decisions on fungibility between categories in the context of specific program objectives.

Target-setting programs **may** choose to allow accounting categories to be added or netted within a target boundary to meet specific program objectives.

A program can decide that categories that are conceptually additive should not be fungible. For example, land and non-land emissions are conceptually additive, but a program can decide they are not fungible based on policy objectives. Land management CO_2 removals and CO_2 removals with geologic storage are conceptually additive, but a program can decide that geologic removals are not fungible with land management CO_2 removals. GHG Protocol therefore recommends that companies set separate targets for land and non-land inventory categories, in the absence of additional program rules.

RECOMMENDATIONS TO GHG PROGRAMS OR REGULATORS ON SETTING RULES FOR NET TARGETS

The following are recommendations to GHG programs or regulators if they are setting rules for net targets that include emissions and removals. The list is not exhaustive and should be supplemented by additional program rules. All other requirements and recommendations in this chapter also apply to net targets (including setting separate targets for emissions, accounting for reversals when determining target progress and achievement, etc.).

Companies are encouraged to participate in target-setting programs aligned with the global need to limit cumulative GHG emissions in line with 1.5°C pathways based on sector and product analyses (e.g., SBTi). If the reporting company does not participate in a target-setting program, the following recommendations are also relevant to such companies.

SEPARATE LAND AND NON-LAND TARGETS

- Programs **should** require separate targets for land net targets (for land emissions and land management CO_2 removals) and non-land net targets (for fossil fuel and industrial emissions and CO_2 removals with geologic storage).

NET TARGET BOUNDARY (I.E., WHICH EMISSIONS AND REMOVALS TO INCLUDE IN NET TARGETS)

- Programs **should** require that net targets comprehensively include all GHG emissions and land carbon leakage.
- Programs **should** only allow removals that have an equivalent impact on the climate as the emissions included in the same net target boundary (i.e., only include removals in the net target boundary that store carbon in non-atmospheric carbon pools over a similar lifetime as emissions in the net target boundary remain in the atmosphere) by either:
  - Permanently removing CO_2 from the atmosphere and storing it in non-atmospheric pools for timescales equivalent to the atmospheric lifetime of CO_2 (or for timescales equivalent to the atmospheric lifetime of other residual GHG emissions neutralized by the removal); or
  - Meeting all requirements in Chapter 12 to implement a storage monitoring framework (i.e., Requirements 19–23), to reflect the company's contribution to the global carbon budget and cumulative emissions, which drive long-term temperature change.
- Programs **should** set additional eligibility requirements and limits on the quantity or type of removals allowed in net targets as relevant to the program. For example, programs may limit removals used in net targets to those that:
  - Are scope 1 removals only (rather than scope 3 removals);
  - Meet requirements beyond those included in Chapter 12 (e.g., more specific monitoring, traceability, or data quality requirements); and/or
  - Meet additionality requirements (removals that result from the company's mitigation efforts, rather than removals that would have occurred otherwise).

Box 17.1. Recommendations on net targets to programs, regulators, and companies not participating in target-setting programs (cont.)

- Product storage **should** not be included in company net targets (e.g., net zero targets). Companies **may** set a separate target for product storage.
- Programs that choose to set targets for the carbon opportunity cost of land use **should** consider the following recommendations and options:
  - If programs include the carbon opportunity cost of land use in their targets, they **may** consider deducting annual reductions in carbon opportunity cost intensities that exceed a science-based intensity target level from total emissions for the purpose of tracking progress against emissions targets. See the *Guidance* (Section 17.4) for setting and tracking progress towards COC intensity targets.
  - For programs that choose to set net targets that aggregate emissions and removals with land use expressed as a carbon opportunity cost, there is potential to double count carbon losses as both (direct or statistical) land use change emissions and a change in the carbon opportunity cost of land use. Changes in the carbon opportunity cost of land use can potentially also double count carbon losses and gains that are accounted for in the inventory as land management net biogenic CO_2 emissions or removals (see Chapters 9 and 13, respectively). In such cases, companies **should** deduct any double-counted land emissions and removals from the scope 1 or 3 carbon opportunity cost of land use for target setting and tracking purposes.

REPORTING

For net targets that include emissions and removals, programs **should** require companies to report the information in the "Target-setting reporting" requirement in Section 17.2.2 for net targets and additionally specify the following:

- Which greenhouse gases and scopes of emissions are included (scope 1, scope 2, scope 3, and which scope 3 categories)
- Which scopes of removals are included (scope 1 and/or scope 3)
- What types of removals are included (removals with land-based or geologic storage; and biogenic or technological removals), with justification for their inclusion, and eligibility requirements and limits on the quantity or type of removals allowed in the net targets

INCLUDE LAND CARBON LEAKAGE IN TARGETS UNDER RELEVANT CONDITIONS

If regulations or target-setting programs either set a net emissions target that includes land management CO_2 removals on agricultural lands, and/or set a target that excludes biogenic product CO_2 emissions (e.g., by treating biomass combustion emissions as zero), they **should** include leakage quantification in the relevant target(s).[a]

If companies not participating in target-setting or regulatory programs either set a net emissions target that includes land management CO_2 removals on agricultural lands, and/or set a target that excludes biogenic product CO_2 emissions (e.g., by treating biomass combustion emissions as zero), they **should** include the "total emissions" accounting category that includes land carbon leakage in the relevant target(s).

See Tables 17.2 and 17.3 in the *Guidance* on reporting requirements and recommended elements of targets that include land carbon leakage.

Note: a. If regulations or GHG programs separately specify how the leakage category is applied for the purpose of their regulations or program, companies may report these parallel leakage estimates and use these estimates to comply with the regulation or program, in addition to reporting carbon opportunity cost-based values.

Endnotes

1 This text includes elements that may change to align with the resolution on forest carbon accounting, and therefore target setting, in future versions of this *Standard*. See Box 9.1.

CHAPTER 18.

Accounting for credited emission reductions and removals

This chapter provides requirements on accounting for GHG emission reductions or CO_2 removals that have been credited for the purpose of transferring GHG reduction or removal claims between parties (i.e., companies or other entities). This chapter is applicable if a company is tracking progress toward targets and a GHG credit has been issued within its operations or value chain.

18.1 Overview

This chapter applies to GHG credits in the context of voluntary GHG reporting according to the GHG Protocol, to avoid double counting of progress toward targets. Companies must follow national, international, and/or programmatic accounting rules for credits as part of compliance markets, regulations, GHG programs, and the United Nations Framework Convention on Climate Change (UNFCCC), where they apply.

Credits are quantified and reported differently from emissions and removals included in the GHG inventory. Credits are quantified using project or intervention accounting methods, which measure systemwide GHG impacts relative to counterfactual baseline scenarios or performance benchmarks that represent the conditions most likely to occur in the absence of the activity (see Chapter 16 for details). This is in contrast to inventory accounting, which quantifies GHG emissions and removals relative to those in a base year.

Inventory accounting relative to a base year can be used to demonstrate progress towards targets, within a company's operations or value chain. GHG credits can be used to meet compensation or contribution targets outside of the company's operations or value chain, and as a supplement to meeting scope 1, scope 2, and scope 3 GHG targets. To avoid double counting of progress toward two targets, through both inventory accounting by one company and as a GHG credit toward compensation targets by another company, the company where credits have been issued within their operations or value chain must adjust GHG emissions and removals (separately from the GHG inventory) when tracking progress. At the same time, GHG credits cannot be subtracted from the GHG inventory by the company retiring GHG credits.

Companies must meet the following requirements:

- GHG credits disclosed in the GHG report must follow the quality criteria described below, ideally through a GHG crediting program (Requirement 29).
- Companies for which GHG credits were issued within their operations or value chains must adjust their emissions and/or removals (separately from the GHG inventory) when tracking progress towards targets, to avoid double counting with companies retiring such credits (Requirement 30).
- All companies must disclose how double counting was avoided and report additional information (see "Reporting GHG credits").

18.2 Requirements

18.2.1 Accounting requirements

REQUIREMENT 29:

GHG crediting principles

Companies **shall** ensure that any GHG credits (emission reductions or removals) adhere to the following quality criteria: additionality, credible baseline, monitoring, permanence, leakage mitigation, unique issuance and claiming, independent validation and verification, GHG program governance, and sustainable development benefits and safeguards.

Refer to Chapter 18 in the Guidance for more information on the quality criteria.

REQUIREMENT 30:

Avoid double counting with GHG credits[1]

If companies use their GHG inventory to track progress towards a GHG target, they **shall** meet the following requirements:

- **Avoid double counting**: Companies **shall** not double count a tonne of GHG emission reduction or removal that has been generated in their organizational boundary or value chain with a tonne of GHG emission reduction or removal that has been issued, if the credit is retired and used (or could potentially be used) as an offset or for compensation targets.
  - This requirement applies to scope 1 and scope 3 accounting when using the spatial boundaries of sourcing region, land management unit, or harvested area and data that reflects the emission reduction or removal associated with the GHG credit.
  - Programs and regulations **may** set rules that take precedence over this requirement. Companies **should** follow applicable program rules and regulations.
- **Adjustments for targets for issued GHG credits**: If GHG credits issued within their organizational boundary or value chain have been used as offsets or external compensation, they **shall** adjust emissions and/or removals to factor out such emission reductions or removal enhancements. To do so, companies **shall** separately calculate:
  - **Physical GHG inventory emissions and removals**: Companies **shall** calculate scope 1, 2, and 3 emissions and scope 1 and 3 removals, independent of any issued or retired GHG credits within the company's operations or value chain.
  - **Emissions and removals adjusted for issued GHG credits**: Companies **shall** separately calculate scope 1, 2, and 3 emission values (and scope 1 and 3 removals values, if applicable) that are adjusted for GHG credits issued within the company's operations or value chain, by adding credited emissions reductions to emissions and subtracting credited removals from removals.
  - **Tracking progress toward targets**: Companies **shall** use the emissions and removals values adjusted for issued GHG credits when accounting for progress toward a target following Requirement 27.

Specific cases

REQUIREMENT 30.1:

Inset credits

If applicable, companies **shall** avoid double counting between inset credits used for compensation and the scope 3 inventory.

Refer to Chapter 18 in the Guidance for additional guidance on avoiding double counting between GHG credits and the GHG inventory when the inventory is used for target setting.

18.2.2 Reporting requirements

Reporting GHG credits

Companies **shall** disclose the following information related to GHG credits:

- GHG emission reduction or removal generated from sources or sinks within the company's organizational boundary or value chain that have been issued as a GHG credit
- GHG credits or other instruments retired by the reporting company, if applicable, reported separately from emissions and removals reported in the inventory
- GHG credits used against the reporting company's compensation targets, if applicable, separately from GHG credits used against the reporting company's contribution/financing targets
- Offset/credit quality criteria followed, GHG crediting program used, protocols and quantification methodologies used, scale (jurisdictional or project), country of origin, and other information as relevant to GHG credits reported above
- Whether the credits are emission reduction credits, removal credits, or a combination, with each type reported separately
- Types of credited emission reduction or removal activities/projects
- Non-permanence risks associated with removal credits and mechanisms followed to address permanence
- Vintages and serial numbers of credits issued/retired
- Social and environmental co-benefits of credits, if relevant

Companies that use their GHG inventory to track progress toward targets **shall** report:

- **Physical GHG inventory emissions and removals**: Physical GHG inventory values for scope 1, 2, and 3 emissions, and scope 1 and 3 removals (if applicable), independent of any transactions.
- **Emissions and removals adjusted for issued GHG credits**: Values adjusted for GHG credits issued within the company's operations and value chain, for scope 1, 2, and 3 emissions, and scope 1 and 3 removals (if applicable).

Additionally, such companies **shall** disclose in their GHG report a description of how they avoided double counting with GHG credits.

18.3 Recommendations

GHG crediting principles

Companies **should** refer to GHG programs for additional guidance on quality criteria, such as the Integrity Council for the Voluntary Carbon Market (ICVCM), the Tropical Forest Credit Integrity (TFCI), the Voluntary Carbon Markets Integrity Initiative (VCMI), and SBTi.

Box 18.1 Recommendations for GHG programs and regulators

Programs and regulators **should** set rules and requirements to ensure avoidance of double counting between buyers and sellers, covering both issuance and retirement of credits, if GHG credits are allowed to be used as offsets or compensation for target-setting purposes.

Endnotes

1 The GHG Protocol's workstream on actions and market instruments will define where to report credits in a company's GHG report and specify if additional information needs to be disclosed. The current requirement does not set a precedent for that process.

PART 4.

Obtain assurance and report the GHG inventory

CHAPTER 19.

Assurance

This chapter provides requirements and recommendations on third-party assurance of the GHG inventory. Further discussion of the assurance process is provided in the Guidance.

19.1 Overview

Third-party assurance is recommended for all companies and may be required by regulations or GHG programs. The assurance process provides a level of assurance (i.e., confidence) that the GHG inventory is complete, accurate, consistent, transparent, relevant, and without material misstatements. The assurance process also checks that removals reported in the GHG inventory follow the principles of conservativeness and permanence (defined in Chapter 3).

The outcome of third-party assurance is valuable to the reporting company and its stakeholders, ensuring that all users of the inventory data can make informed decisions based on the inventory results. The transparency and confidence provided through disclosure and assurance provide the basis for informed action and improving the inventory over time.

Companies must disclose if the inventory was third-party assured (see Section 19.2). Refer to Section 19.4 in the *Guidance* for more information on obtaining assurance.

19.2 Requirements

Reporting assurance

Companies **shall** disclose whether third-party assurance was performed, the level of assurance obtained, the relevant competencies of the assurance provider(s), and the opinion issued by the assurance provider. If the GHG report is not third-party assured, companies **shall** disclose and justify why third-party assurance was not obtained.

19.3 Recommendations

Assurance recommendation

Companies **should** seek third-party assurance of the GHG inventory against the *Corporate Standard* and *Scope 3 Standard*, including any land emissions, removals, and other required metrics reported in their GHG inventory against the *Land Sector and Removals Standard*. At a minimum, this **should** be a limited level of assurance.

Box 19.1 Assurance recommendation for GHG regulations and programs

The GHG Protocol provides a voluntary accounting and reporting standard, not a GHG program or regulation. GHG programs, regulators, or other initiatives that adopt the GHG Protocol's standards, including the *Land Sector and Removals Standard*, as a basis for corporate GHG inventory accounting and reporting **should** require third-party assurance of GHG inventories where relevant to meeting program objectives.

A GHG regulation or program **may** require assurance in order to review the GHG inventory for compliance with the requirements and recommendations in GHG Protocol standards and guidance, to ensure the accuracy and completeness of reported data, and to identify opportunities for improvements to data quality and accuracy over time. GHG regulations and programs **may** consider differentiating assurance requirements based on the capacities of entities preparing corporate GHG inventories (e.g., small vs. large enterprises).

CHAPTER 20.

Reporting

This chapter provides requirements and guidance on reporting. The GHG inventory is one required element that must be disclosed in the GHG report. Reporting requirements for each accounting category and topic are found in the other chapters of this Standard. A checklist of all reporting requirements can be found on the GHG Protocol's website.

20.1 Overview

Once the inventory is compiled, a company is required to publicly report the information specified in the reporting requirements included in this *Standard* for the GHG report to be in conformance with this *Standard*.

Companies are required to report results for all required accounting categories (see Requirement 4).

Reporting CO_2 removals is optional, but if removals are reported, then all reporting requirements related to removals must be met (see "Reporting requirements for removals," "Reporting requirements for land management CO_2 removals," and "Reporting requirements for geologic storage" in Section [X].2.2 of Chapters 12, 13, and 14, respectively).

Companies are required to follow disaggregated reporting requirements by accounting subcategory, for scope 1, scope 2 (if relevant), and scope 3 for each scope 3 category, to ensure transparency in the reporting (see Requirement 31). Each of these accounting categories (and subcategories) must be separately reported. In addition, accounting categories included under "additional accounting categories" (see Chapter 4) must be separately reported, which means they cannot be aggregated with emissions and removals and reported within the physical GHG inventory (e.g., companies cannot aggregate gross CO_2 fluxes with emissions and report them in the physical GHG inventory).

If companies additionally choose to report aggregate numbers across accounting categories, they must follow the "additional reporting of aggregate values" requirement (see Requirement 32) and report the "total emissions" category separately from the physical GHG inventory under "additional accounting categories."

20.2 Requirements

The reporting requirement in Chapter 6 sets forth the core reporting requirements. The reporting requirements specific to each accounting category and topic are included in Section [X].2.2 of each corresponding chapter of this *Standard* (e.g., Section 7.2.2 sets forth the reporting requirements for land use change emissions, further detailing the information required in Chapter 6). If Part 3 of this *Standard* is applicable, additional reporting requirements are included in the corresponding chapters.

REQUIREMENT 31:
Disaggregated reporting

Companies **shall** disaggregate the GHG report into:

- **Emissions disaggregated by accounting category and subcategory**:
  - "Fossil fuel and industrial emissions," disaggregated by scope 1, scope 2, and scope 3 emissions for each scope 3 category; and
  - "Land emissions," disaggregated by "land use change emissions," "land management net biogenic CO_2 emissions" and "land management production emissions," and "biogenic product emissions" (following Requirement 17), with each subcategory disaggregated by scope 1, and scope 3 emissions for each scope 3 category.
- **For each accounting subcategory, emissions disaggregated by GHG:**
  - For scope 1 and scope 2 emissions, total emissions disaggregated by each GHG (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3) in tonnes and in tonnes of CO_2 equivalent.
  - For each scope 3 category, total emissions of GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3) in tonnes of CO_2 equivalent.
- **Gross CO_2 fluxes disaggregated by accounting subcategory**:
  - "Biogenic product CO_2 emissions" (required, following Requirement 17), disaggregated by scope 1, scope 2, and scope 3 gross emissions for each scope 3 category.
  - "Gross biogenic land CO_2 emissions" (optional), disaggregated by scope 1, and scope 3 gross emissions for each scope 3 category.
  - "Gross biogenic land CO_2 removals" (optional), disaggregated by scope 1, and scope 3 gross emissions for each scope 3 category.
  - "TCDR-based product CO_2 emissions" (required, if applicable), disaggregated by scope 1, scope 2, and scope 3 gross emissions for each scope 3 category.
  - "Gross CO_2 emissions from geologic storage" (required, if applicable), disaggregated by scope 1, and scope 3 gross emissions for each scope 3 category.
  - "Gross technological CO_2 removals" (optional, if applicable), disaggregated by scope 1, and scope 3 gross removals for each scope 3 category.

Additionally, companies **shall** disclose the following information in their GHG report:

- **Justification for not reporting disaggregated data**: If emissions of a given accounting category comprise a small share of the total GHG inventory (e.g., in the 0 to 20th percentile of total GHG emissions) and disaggregated data are not available for that category, companies **may** use aggregated data and report aggregate emissions by scope 1, scope 2 (if relevant), and scope 3 emissions for each scope 3 category without disaggregated accounting subcategories. In such a case, companies **shall** disclose and justify the use of aggregated data (see "Reporting GHG inventory data and methods" in Section 6.2.2).

If companies account for and report removals in their GHG inventory, they **shall** report:

- **"Removals" separately from "emissions," disaggregated by accounting subcategory**:
  - "Land management CO_2 removals," disaggregated by scope 1, and scope 3 removals for each scope 3 category.

- "Removals with geologic storage," disaggregated by scope 1, and scope 3 removals for each scope 3 category.. Companies **should** disaggregate further into: "captured biogenic CO_2 with geologic storage" and "technological CO_2 removals with geologic storage."

REQUIREMENT 32:

Additional reporting of aggregate values

Disaggregated reporting (Requirement 31) is required for all companies. If companies additionally choose to report a single value that aggregates emissions or nets emissions and removals associated with agricultural land use, this value **shall** include the following accounting categories (and **may** include land management CO_2 removals or captured biogenic CO_2 with geologic storage if reporting a net value):

- Fossil fuel and industrial emissions
- Land emissions
  - Land use change emissions
  - Land management net biogenic CO_2 emissions
  - Land management production emissions
  - Biogenic product emissions (following Requirement 17)
- Land carbon leakage[1]

In such a case, companies **shall** report "total emissions" as an additional accounting category separately from the physical GHG inventory under "additional accounting categories," organized by scope 1, scope 2, and scope 3 for each scope 3 category.

20.3 Recommendations and options

Disaggregated reporting recommendations

In addition to the required disaggregated reporting by accounting subcategory in Requirement 31, if data allow, companies **should** provide the following additional disaggregated reporting of accounting subcategories:

- **Fossil fuel and industrial emissions by accounting subcategories**: "Fossil and industrial emissions" **should** be separately reported by stationary combustion, mobile combustion, process, and fugitive emissions, by scope 1, scope 2, scope 3 emissions for each scope 3 category.
- **Land emissions by product type**: "Land use change emissions," "land management net CO_2 emissions," and "land management production emissions" **should** be separately reported by product type (e.g., crops, animal products, forestry products, bioenergy feedstock, etc.).
- **Scope 3 emissions by GHG**: For each scope 3 category, emissions of GHGs **should** be separately reported by each individual greenhouse gas (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3), in tonnes and in tonnes of CO_2 equivalent.
- Additional recommendations provided within the *Scope 3 Standard.*

Avoiding double counting between leakage and sLUC emissions

If companies choose to aggregate land use change–related accounting categories (e.g., in the "Total emissions" category; see Requirement 32), accounting for land carbon leakage has the potential to result in double counting emissions in cases where the corporate action that caused leakage is also associated with LUC emissions estimated at broader spatial scales using proxy data (i.e., statistical LUC emissions; see Chapter 7). In such cases, companies **should** deduct any double-counted statistical LUC emissions from the "total emissions" accounting category. Double counting is not an issue when adding land carbon leakage and LUC emissions estimated using dLUC metrics.

Recommended additional reporting information

Companies **should** report additional information in their GHG report that is not otherwise recommended by this *Standard* if that information is relevant and applicable to the reporting company and helps to substantiate or interpret other required reporting information. Some additional reporting recommendations are found in Table 20.2 in the *Guidance*.

Sample reporting template

The GHG Protocol provides a sample GHG inventory reporting template to help companies apply the *Land Sector and Removals Standard*. Refer to the GHG Protocol's website for the sample reporting template and additional instructions for how to use the template.

Follow GHG programs and regulations on aggregating accounting categories

Companies **should** follow GHG programs and regulations to determine whether and how to aggregate accounting categories (see Box 17.1 for further discussion). If companies do not participate in GHG programs, they must follow Requirements 31 and 32.

Report format

For public reporting, companies **may** produce a single public report that contains all the required reporting information (as well as all relevant optional reporting information). Alternatively, companies **may** produce a summary of the public report and a full public report that contains all the required information, with a link or reference in the summary report to the publicly available full report.

Additional reporting information

A GHG report **may** also include additional metrics such as performance indicators, intensity ratios, and progress in relation to targets, if relevant and applicable to the reporting company.

Option to report annual changes in the GHG inventory

GHG inventories report the annual absolute GHG emissions, removals, and other metrics related to a company's operations and value chain. Companies tracking progress toward a target **may** report annual changes in emissions, removals, and other metrics by scope 1, scope 2, and scope 3 for each scope 3 category.

If a company reports changes in one accounting category, it **should** report changes in all accounting categories. For example, if a company reports changes in emissions or removals, it **should** also report changes in land use, land carbon leakage, and other additional accounting categories.

Endnotes

1 If regulations or GHG programs separately specify how the leakage category is applied for the purpose of their regulation or program, covered companies may report a parallel "total emissions" quantity in addition to carbon opportunity cost-based values.

Abbreviations

AFi	Accountability Framework Initiative
BECCS	Bioenergy with carbon capture and storage
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COC	Carbon opportunity cost
DACCS	Direct air carbon capture and storage
DCF	Deforestation- and conversion-free
dLUC	Direct land use change
FAO	Food and Agriculture Organization of the United Nations
FLAG	Forest, Land, and Agriculture
GHG	Greenhouse gas
GS	Geologic storage
GWP	Global warming potential
HFCs	Hydrofluorocarbons
ICVCM	Integrity Council for the Voluntary Carbon Market
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LMR	Land management removals
LMU	Land management unit
LO	Land occupation
LUC	Land use change
N_2O	Nitrous oxide
NF_3	Nitrogen trifluoride
NGO	Non-governmental organization
PFCs	Perfluorocarbons
PS	Product carbon storage
SBTi	Science Based Targets initiative
SF_6	Sulfur hexafluoride
sLUC	Statistical land use change
TCDR	Technological carbon dioxide removal
TFCI	Tropical Forest Credit Integrity
UNFCCC	United Nations Framework Convention on Climate Change
VCMI	Voluntary Carbon Markets Integrity Initiative
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

Glossary

Above-ground biomass carbon pool
Carbon in terrestrial living vegetation above the soil.
Note: This includes both woody and herbaceous living vegetation, including stems, stumps, branches, bark, seeds, and foliage.[1]

Accounting
Identifying, quantifying, recording, and classifying GHG emissions, removals, and other related metrics using standardized methods per agreed-upon protocols.

Accounting category
A component of a GHG report that represents a unique impact to the climate resulting from an entity's activities (i.e., emissions, removals, land use, land carbon leakage, gross CO_2 fluxes, product carbon storage, and reversals).
Note: An accounting category may be further disaggregated into accounting subcategories.

Activity data
A quantitative measure of the level of activity related to a source or sink that results in GHG emissions, removals, and/or other impacts.

Additional accounting category
An accounting category that is reported outside of a physical GHG inventory.

Agricultural land
The total of cropland, permanent meadows, and pastures.[2]

Allocation
The process of partitioning GHG emissions, removals, or other metrics from a common facility, process, or other system among its various outputs.

Assurance
A process to determine the level of confidence that the inventory and report are complete, accurate, consistent, transparent, relevant, as well as permanent and conservative for removals, and without material misstatements.

Attributable productive lands
Lands in a sourcing region or jurisdiction that are directly associated with producing a given harvested biogenic material or lands where sold products are used.

Base year
A historic datum (a specific year or an average over multiple years) against which a company's emissions are compared and/or tracked over time.

Base year emissions
GHG emissions in the base year.

Base year recalculation
Recalculation of emissions and removals (if applicable) in the base year to reflect a change in the structure of a company or a change in the GHG accounting methodology used, to ensure data consistency over time.

Below-ground biomass carbon pool
Carbon in the biomass of terrestrial live roots. Fine roots of less than 2 mm in diameter are often excluded because these cannot always be distinguished empirically from soil organic matter or litter.[3]

Biogenic carbon
Carbon in, or derived from, living organisms or biological processes, but not from fossil fuels or other fossilized materials

Biogenic CO_2 emissions
CO_2 emissions from the combustion or biodegradation of biomass, or other losses from biogenic carbon pools to the atmosphere.

Biogenic product
A good or material that contains biogenic carbon during the use stage of the product life cycle.

Biogenic product carbon pool	Biogenic carbon in products or materials during the use stage of the product life cycle.
Biogenic product carbon storage (accounting subcategory)	Annual or annualized changes in carbon stored in biogenic product carbon pools during the use stage of biogenic products associated with the reporting company's value chain.
Biogenic product CO_2 emissions (accounting subcategory)	Gross CO_2 emissions from combustion, biodegradation, or other losses from biogenic product carbon pools to the atmosphere. *Note*: Also referred to as gross biogenic product CO_2 emissions which is an accounting subcategory under gross CO_2 fluxes.
Biogenic product emissions (accounting subcategory)	Gross CH_4, N_2O, and, if applicable, CO_2 emissions from combustion, biodegradation, or other losses from biogenic product carbon pools to the atmosphere. *Note*: Biogenic product emissions is an accounting subcategory under land emissions.
Biological sink	A biological process, primarily photosynthesis, that removes CO_2 from the atmosphere.
Biomass carbon pool	Carbon in terrestrial living organisms, excluding those in soil organic matter. This includes above-ground biomass carbon pools and below-ground biomass carbon pools.
Captured biogenic CO_2 with geologic storage (accounting subcategory)	Net CO_2 removals resulting from annual net increases to carbon stored in geologic carbon pools from carbon derived from biological sinks.
Carbon stock	The mass of carbon contained in a carbon pool at a given time.
Carbon stock change	The difference in carbon stocks between two points in time.
Carbon storage	The process of maintaining CO_2 or carbon in a pool for a period of time.
Chain of custody model	The approach taken to control inputs and outputs, and transfer specified characteristics within the chain of custody system.[4]
CO_2 capture	Collection of CO_2 from a source for storage within a non-atmospheric pool.
CO_2 removals with geologic storage	Net CO_2 removals resulting from annual net increases to carbon stored in geologic carbon pools from carbon derived from biological or technological CO_2 sinks.[5]
COC (carbon opportunity cost) calculation approach	A calculation approach that is used to estimate the total amount of carbon lost from plants and soils on land occupied by agriculture relative to native vegetation, measured in carbon dioxide equivalent (CO_2e).
COC factor	A value that estimates the carbon opportunity cost per unit of activity. *Note*: Such as per tonne of product produced, per hectare, etc., allowing the total COC to be estimated from activity data or land occupation (hectares) data.
COC of land use (accounting subcategory)	The total amount of carbon lost from plants and soils on land occupied by agriculture relative to native vegetation, measured in carbon dioxide equivalent (CO_2e).

Compensation target	A target for achieving mitigation external to the target boundary through purchasing and retiring GHG credits (also called offsets or carbon credits) to compensate for annual or cumulative unabated emissions in the target boundary, if allowed under the relevant target-setting program or target-setting policy.
Confidence interval	The range of possible values, for a specified confidence level, that are expected to contain the true value for the estimate.
Contribution or financing target	A target for contributing to financing GHG mitigation outside the company's target boundary, through financing or purchasing and retiring GHG credits. *Note*: GHG credits are applied against contribution targets (i.e., without using GHG credits as offsets or compensation) or other financial support for climate action.
Co-product	One of multiple products produced by a process or system that has a market value.
Cradle-to-grave emissions	All emissions in a product's life cycle, from material acquisition through to end-of-life.
Cropland	A land use category with productive land used for agricultural cultivation systems, including annual and perennial production systems. *Note*: Cropland includes rice cultivation systems, agroforestry systems where the vegetation structure consistently falls below established forest land thresholds, and land temporarily fallow as part of a cultivation system (e.g., a rotation system).[6]
Dead organic matter (DOM) carbon pool	Carbon in terrestrial non-living organisms or other non-fossil organic compounds, excluding those in soil organic matter. *Note*: Includes dead wood and litter carbon pools.
Dead wood carbon pool	Carbon in non-living woody biomass not contained in litter carbon pools, either standing, lying on the ground, or in the soil. *Note*: Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter (or the diameter specified by the company).[1]
dLUC (direct land use change) calculation approach	A calculation approach used to quantify dLUC emissions that uses primary data. *Note*: An "LMU-level" dLUC approach uses primary data specific to a land management unit (LMU). A "jurisdictional" dLUC approach uses regional or national data of known land uses.
dLUC emissions	Emissions (primarily from carbon stock losses) due to land conversion during the LUC assessment period directly on an area of land with a known land use related to the reporting company's operations or value chain.
Direct measurement	Quantification of GHG emissions or removals, or associated carbon stock changes, using physical direct monitoring or measurement of GHG fluxes.
Emission factor	A value that estimates the quantity of emissions per unit of activity. *Note*: Such as per liter of fuel consumed, per tonne of product produced, etc.
Emissions	The release of GHGs into the atmosphere.
Empirical data	Data based on observation or experience from instrumental (usually monitoring equipment) or manual methods (through counts in a survey or census).[7]

Equal amortization

A method to amortize land use change emissions that occurred in the LUC assessment period across all years in the LUC assessment period, such that the share of land use change emissions assigned to each year is equal.

External compensation

Mitigation external to the target boundary achieved through purchasing and retiring GHG credits (also called offsets or carbon credits) to compensate for annual or cumulative unabated emissions in the target boundary.

Forest land

A land use category with woody vegetation that meets a threshold of tree canopy cover and height. It also includes land uses with a vegetation structure that currently fall below threshold values, but in situ could potentially reach those values.

Note: For example, a forest land threshold could be at least 0.5 hectares with a tree canopy cover of over 10 percent of the area, with trees higher than 5 meters.[8]

Fossil fuel and industrial emissions

The release of GHGs into the atmosphere from sources other than land emissions.

Note: This includes stationary combustion, mobile combustion, fugitive emissions, and process emissions.

Freshwater carbon pool

Carbon in freshwater rivers, lakes, reservoirs, or other inland freshwater bodies in organic or inorganic carbon pools.

Fugitive emissions

Emissions that are not physically controlled but result from the intentional or unintentional releases of GHGs.

Note: Fugitive emissions commonly arise from the production, processing transmission storage and use of fuels and other chemicals, often through joints, seals, packing, gaskets, etc.

Geologic carbon pool

Carbon in geologic formations or inorganic minerals that are not used as products.

Geologic storage pathway

The consecutive and interlinked stages associated with the acquisition and storage of carbon in geologic reservoirs.

GHG credit

A convertible and transferable instrument usually bestowed by a GHG program, representing the reduction, avoidance, or enhanced removal of a specified amount of GHG emissions or CO_2 removals (typically equivalent to one tonne of CO_2), not necessarily used as an offset credit.

Note: The term "carbon credit" refers to any amount of GHG emissions or unit of carbon; it is used interchangeably with 'GHG credit'.

GHG flux (flow)

The transfer of GHGs or their constituent elements between pools, expressed as an amount over a given time.

Note: A GHG flux can be a gross CO_2 flux or a net CO_2 flux.

GHG program

A generic term used to refer to any voluntary or mandatory international, national, sub-national, governmental, or nongovernmental authority that registers, certifies, and/or regulates GHG emissions or removals; or that develops and administers such initiatives, systems, or programs.

GHG report

A document disclosing a company's physical GHG inventory and additional accounting category results, GHG impacts of actions taken by the company, the methods and data used, and any other relevant reporting elements to internal and external stakeholders.

Global Warming Potential (GWP)	A factor describing the time-integrated radiative forcing impact of one unit of a given GHG relative to one unit of CO_2 over a specified time horizon.
Grassland	A land use category with perennial grasses, other non-grass vegetation, and woody vegetation structures below the forest land threshold. *Note*: This land is commonly used for grazing and includes rangelands, savannahs, shrublands, meadows, and pasturelands that are not considered cropland.[6]
Gross biogenic land CO_2 emissions (accounting subcategory)	Gross CO_2 emissions from combustion, biodegradation, or other losses from land-based carbon pools to the atmosphere.
Gross biogenic land CO_2 removals (accounting subcategory)	Gross CO_2 removals from atmospheric CO_2 transferred via biological sinks to land-based carbon pools.
Gross CO_2 emissions	The one-directional release of CO_2 into the atmosphere.
Gross CO_2 emissions from geologic storage (accounting subcategory)	Gross CO_2 emissions from fugitive CO_2 emissions or other CO_2 losses to the atmosphere from a geologic reservoir containing captured and stored CO_2.
Gross CO_2 flux	A one-directional transfer of CO_2 or its constituent carbon from one carbon pool to another. *Note*: A gross CO_2 flux is a type of GHG flux (flow).
Gross CO_2 flux (accounting category)	Gross CO_2 fluxes include gross CO_2 emissions and gross CO_2 removals associated with the biogenic or TCDR carbon cycle.
Gross CO_2 removals	The one directional transfer of CO_2 from the atmosphere to storage within a pool.
Gross technological CO_2 removals (accounting subcategory)	Gross CO_2 removals from atmospheric CO_2 transferred via technological sinks to technological CO_2 removal-based product carbon pools or geologic carbon pools.
Harvested area	A spatially explicit area of productive agricultural land that was harvested at a given time to produce the relevant raw material.
Impact traceability	The ability of a company to identify, track, and collect information on the GHG emission or removal impacts of projects or interventions in the value chain of goods and services purchased or sold by the company, including upstream and downstream processes and products.[9]
Inset credit	Quantified mitigation outcomes (e.g., emission reductions or removals) of projects or broader interventions that are credited for GHG claims to be transferred between entities, and which are generated from projects or interventions occurring inside the reporting company's value chain. *Note*: Credited GHG reductions or removal enhancements are quantified using project or intervention accounting methods.
Intervention accounting	A GHG accounting method that quantifies systemwide GHG impacts of a specific project, action, or intervention on GHG emissions, removals, and/or additional accounting categories relative to a counterfactual baseline scenario that represents the conditions most likely to occur in the absence of the project, action, or intervention. *Note*: Also referred to as "project accounting."
Inventory accounting	Accounting for GHG emissions, removals, and other metrics over time within a defined inventory boundary relative to a historical base year.

Inventory boundary	A conceptual boundary that encompasses the direct and indirect emissions, removals, and other relevant metrics that are included in the inventory. *Note*: This results from the chosen organizational and operational boundaries applied and relevant accounting categories.
Jurisdiction	A predefined, spatially explicit area based on a political or administrative boundary within which biogenic products or raw materials are sourced. *Note*: This includes political boundaries based on a subnational jurisdiction (e.g., state or province), country, or political region (e.g., the European Union) of origin.
Land-based carbon pool	The carbon in terrestrial biomass (including above-ground and below-ground biomass), dead organic matter (including dead wood and litter), and soil carbon pools (including mineral soil organic carbon, organic soil organic carbon, and soil inorganic carbon).
Land carbon leakage (accounting category)	A specific type of leakage, driven by increased demand for agricultural products and a fixed amount of global land, that occurs when corporate actions displace food or feed production to locations beyond the lands in their operations or value chain, leading to agricultural expansion and land use change.
Land carbon leakage boundary	Determines the specific lands included when quantifying land carbon leakage using the carbon opportunity cost (COC) calculation approach.
Land cover	The observed physical and biological cover of the Earth's land.[10]
Land emissions (accounting category)	The release of GHGs into the atmosphere from the land and biogenic products, including the sum of land use change GHG emissions, land management net biogenic CO_2 emissions, land management production GHG emissions, and biogenic product emissions.
Land management CO_2 removals (accounting subcategory)	Net biogenic CO_2 removals resulting from net land carbon stock increases due to ongoing land management practices.[11] All land management CO_2 removals are from biological sinks.
Land management net biogenic CO_2 emissions (accounting subcategory)	Net biogenic CO_2 emissions resulting from net land carbon stock losses due to ongoing land management practices.[11]
Land management production emissions (accounting subcategory)	CH_4, N_2O, and non-biogenic CO_2 emissions due to ongoing land management practices.
Land management unit (LMU)	A predefined, spatially explicit area of a given land use, managed according to a clear set of objectives and according to a single land management plan to produce a given raw material or set of raw materials. An LMU may represent spatially explicit areas such as a farm, field, or plot.
Land occupation (accounting subcategory)	The amount of agricultural land occupied in the reporting year to produce a product, measured in hectares.
Land use	The arrangements, activities, and inputs that people undertake on a certain land parcel.[12]
Land use (accounting category)	An accounting category representing the amount of agricultural land occupied by a company for products it produces or sources. *Note*: Land use can be expressed as land occupation (in hectares) or as the carbon opportunity cost of land use (in CO_2e).

Land use change (LUC)	A transition from one land use category to another, such as from forest to grassland or forest to cropland.
Land use change assessment period	The retrospective time period used to evaluate whether or not land use change occurred.
Land use change emissions (accounting subcategory)	Emissions (primarily from carbon stock losses) due to recent land conversion.
Leakage	A phenomenon that occurs when corporate actions lead to increased emissions and/or decreased removals outside of a company's traditional inventory boundary.
Level of assurance	The degree of confidence that an assurance process is designed to provide to intended users regarding the information in the GHG report. *Note*: GHG assurance is typically conducted at one of two levels reasonable assurance or limited assurance, as defined under ISAE 3000 / ISAE 3410 / ISSA 5000 and ISO 14064-3.
Level of traceability	The point and/or tier in the value chain a company has traceability to in the value chain of goods and services purchased or sold by the company.
Linear amortization	A method to amortize land use change emissions that occurred in the LUC assessment period across all years in the LUC assessment period, such that the share of the land use change emissions assigned to each year decreases annually by a constant amount from the first to the last year of the assessment period. *Note*: The largest share of land use change emissions is assigned to the first year when the land use change event occurred.
Litter carbon pool	Carbon in non-living biomass or other non-fossil organic compounds with a diameter greater than the limit for soil organic matter (suggested 2 mm) and less than 10 cm in diameter for dead wood (or other diameter specified by the company), lying dead, in various states of decomposition above or within the mineral and organic soil. *Note*: Live fine roots above the mineral or organic soil (or less than the minimum diameter limit chosen for below-ground biomass) are included in litter where they cannot be distinguished from it empirically.[13]
Measurement-based calculation approach	A calculation approach that directly quantifies GHG emissions, removals, or associated carbon stock changes, using direct measurement of GHG pools and fluxes.
Mineral soil organic carbon pool	Carbon in soil organic matter that is less than 2 mm in diameter to a specified depth in soil types that are not classified as organic soils. *Note*: Live and dead fine roots that are less than 2 mm in diameter are included with soil organic matter where they cannot be distinguished from it empirically.
Model-based calculation approach	A calculation approach that uses mathematical or computational modeling techniques to estimate emissions, removals, or carbon stock changes, or related metrics from input variables and fixed model parameters calibrated to the specific model applications.
Net CO_2 flux	The difference between CO_2 emissions and removals associated with a given carbon pool or set of carbon pools over a defined period of time.
Ocean carbon pool	Carbon in marine organic or inorganic carbon pools.

Offset credit	Quantified mitigation outcomes (e.g., emission reductions or removals) of projects or broader interventions that are credited for GHG claims to be transferred between entities, and that are generated from projects or interventions occurring outside the reporting company's value chain. *Note*: Credited GHG reductions or removal enhancements are quantified using project or intervention accounting methods.
Operational boundary	The boundary that determines the direct and indirect emissions, removals, and other relevant metrics associated with operations, lands, and other assets owned or controlled by a reporting company.
Organic soil organic carbon pool	Carbon in soil organic matter that is less than 2 mm in diameter to a specified depth in organic soils that have an organic horizon greater than or equal to 10 cm in thickness and have greater than 12–20 percent organic carbon by weight, depending on soil texture and water saturation.[14]
Organizational boundary	The boundaries that determine the operations, lands, and other assets owned or controlled by the reporting company, depending on the chosen consolidation approach.
Other land	Land use category with land that does not otherwise fall into the main land use categories (i.e., forest land, grassland, cropland, wetland, and settlements), including bare soil, rock, and ice.[6]
Physical GHG inventory	An inventory of GHG emissions and removals occurring within the reporting company's operations and value chain using inventory accounting methods, without double counting by the same entity, and independent of any GHG trades such as purchases or sales of allowances, offset credits, and GHG credits.
Physical traceability	The ability of a company to identify, track, and collect information on activities (e.g., activity data or GHG emission or removals factors) related to material flows of goods and services in its value chain, across its upstream and downstream processes and products.
Pool	A physical reservoir or medium where a GHG or its constituent elements are stored.
Primary data	Data obtained from specific activities within a company's operations or value chain (e.g., site-specific data). *Note*: Primary data can be based on direct measurements, models, or other methods and are not necessarily generated by the reporting company.
Product carbon pool	The carbon in products or materials during the use stage of the product life cycle, including recycling and reuse. This includes biogenic and TCDR-based products.
Product carbon stock change	The annual change (occurring in the reporting year) in the total biogenic or TCDR-based carbon stock contained in products sold by the reporting company and that are still in their use stage, including recycling and reuse.
Product carbon storage (accounting category)	Changes in carbon stored in product carbon pools during the use stage of the product life cycle, including recycling and reuse, from carbon derived from biogenic or technological CO_2 sinks.
Product carbon storage pathway	The consecutive and interlinked stages of carbon storage in products, either through photosynthesis from land or through technological CO_2 removal processes, from raw materials to intermediary and final products during their use stage, including recycling and reuse.

Product expansion allocation method	A method used to allocate (i.e., assign responsibility) for statistical land use change (sLUC) emissions to land-based products produced in a given area based on the relative expansion of lands used to produce land-based products in that given area. *Note*: This approach is referred to as the "crop-specific approach" in other methodologies.
Productive land	The physical areas of land used to produce a crop, livestock, animal product, or other biogenic product or service, or multiple products as part of a crop rotation, in the reporting year, or the physical areas of land where a sold product was applied in the reporting year.
Project accounting	see *intervention accounting*.
Remote sensing-based calculation approach	A calculation approach that uses satellite or aerial information to collect activity data to estimate emissions, removals, or carbon stock changes.
Removal	The transfer of a GHG from the atmosphere to storage within a non-atmospheric pool. *Note*: Removals can be from biological or technological sinks.
Removals (accounting category)	The net transfer of CO_2 from the atmosphere to storage within a non-atmospheric pool.
Removals factor	A value that estimates the quantity of removals per unit of activity (e.g., per tonne of product produced), allowing absolute removals to be estimated from activity data.
Reporting	The communication of GHG-related information from or by a reporting company to its intended users. *Note*: Reporting is the act of disclosure. Intended users may include regulators, shareholders, the general public, or specific stakeholder groups, and may be internal or external to the reporting company.
Reversals (accounting category)	An emission from a carbon pool that stores carbon associated with a removal or captured CO_2 that was previously reported by the reporting company, and that is no longer within the inventory boundary.
Scope 1 removals	Removals for which the reporting company owns or controls both the sink (that transfers CO_2 from the atmosphere) and the pool (that stores the CO_2 or carbon).
Scope 1 spatial boundary	The lands owned or controlled by the reporting company based on the selected consolidation approach.
Scope 3 removals	Removals that are a consequence of the activities of the reporting company and occur in the reporting company's value chain, but where the reporting company does not own or control both the sink (that transfers CO_2 from the atmosphere) and the pool (that stores the CO_2 or carbon).
Scope 3 spatial boundary	The lands relevant to the reporting company's value chain activities (i.e., scope 3 category or categories) based on the company's level of traceability to known lands or regions by activity and/or product type.
Secondary data	Data collected that is not from specific activities within a company's operations or value chain. *Note*: Such as proxy or regional average data.

Settlements	A land use category with land developed for infrastructure or human settlements of any size.[15]
Shared responsibility allocation method	A method used to allocate (i.e., assign responsibility) for statistical land use change (sLUC) emissions to land-based products produced in a given area based on the relative total area of attributable productive land used to produce a specific land-based product compared to other products in a given sourcing area.
Significance threshold	A qualitative or quantitative criterion used to define what constitutes a significant structural, methodological, or other change that triggers a recalculation of base year (or base period) emissions, removals, or other metrics.
Significant	When an estimated emission, removal, or other metric's value has a sufficiently large influence on a company's total inventory to be worthy of attention, considering their business goals and the intended uses of inventory data. Note: This can be determined based on its magnitude relative to total emissions, removals, or other metrics in terms of the absolute level, the trend, or the uncertainty.[16]
Sink	A biogenic or technological process, activity, or mechanism that removes greenhouse gases from the atmosphere.
sLUC (statistical land use change) calculation approach	A calculation approach used to calculate sLUC emissions that assigns responsibility for LUC emissions in the relevant boundary to products produced in that region using a statistical proxy. *Note*: Used in situations of incomplete product traceability.
sLUC emissions	Emissions (primarily from carbon stock losses) due to land conversion during the LUC assessment period within a sourcing region or jurisdiction, calculated using the statistical land use change calculation approach.
Soil carbon pool	Carbon in soil minerals and soil organic matter less than 2 mm in diameter. *Note*: This includes mineral soil organic carbon, organic soil organic carbon, and soil inorganic carbon pools.
Soil inorganic carbon pool	Carbon in soil carbonates and other mineral carbon forms in soil.
Source	A process, activity, or mechanism that releases GHGs into the atmosphere.
Sourcing region	A predefined, spatially explicit land area that supplies a given raw material to the first point of aggregation or first processing facility in the value chain. *Note*: Sourcing region boundaries may be defined relative to the tier of the value chain that is inclusive of multiple first points of aggregation or first processing facilities with overlapping areas that supply harvested raw materials.
Spatial boundary	A boundary that determines the specific lands included when quantifying emissions, removals, land use, or gross CO_2 fluxes.
Stock-change accounting	An accounting approach that estimates the net flux of carbon to or from the atmosphere during a time period, based on the net change in carbon stocks in the system at the beginning and end of that period.
Subcategory land use change	A transition where the land use category remains the same, but the land use subcategory changes.

Target base year or period	The base year or period used for defining a GHG target.
Target boundary	A boundary that defines the coverage of a target. *Note*: This includes which GHGs, scopes, accounting categories, sectors, lands, operations, other assets, and activities are covered by a GHG target.
Target commitment year or period	The year or period of time during which emissions, removals, or other metric performance is actually measured against the target level.
Target level	The numerical value of the target, expressed as an absolute value or a percent reduction relative to a value in the target base year or period.
TCDR (technological carbon dioxide removal) carbon cycle	A carbon cycle pathway that includes technological CO_2 removals, transfers of TCDR-based carbon between carbon pools, and TCDR-based CO_2 emissions.
TCDR-based carbon	Carbon derived from TCDR processes.
TCDR-based product	A good or material that contains TCDR-based carbon during the use stage of the product life cycle.
TCDR-based product carbon pool	TCDR-based carbon in products or materials during the use stage of the product life cycle.
TCDR-based product carbon storage (accounting subcategory)	Annual or annualized changes in carbon stored in TCDR-based product carbon pools during the use stage of TCDR-based products associated with the reporting company's value chain.
TCDR-based product CO_2 emissions (accounting subcategory)	Gross CO_2 emissions from the combustion, degradation, or other losses from TCDR-based product carbon pools to the atmosphere. *Note*: Also referred to as gross TCDR-based product CO_2 emissions.
Technological CO_2 removals with geologic storage (accounting subcategory)	Net CO_2 removals resulting from annual net increases to carbon stored in geologic carbon pools from carbon derived from technological sinks.
Technological sink	A mechanical or chemical process that removes CO_2 from the atmosphere or captures biogenic CO_2 from a source, and stores such CO_2 or other forms of carbon derived from CO_2 removals in non-atmospheric carbon pools.
Third-party assurance (external assurance)	Assurance conducted by a person(s) from an organization independent of the entity preparing the GHG report.
Total emissions (accounting category)	The sum of fossil fuel and industrial emissions, land use change emissions, land management net biogenic CO_2 emissions, land management production emissions, biogenic product CH_4 and N_2O emissions, land management CO_2 removals (if relevant), captured biogenic CO_2 with geologic storage (if relevant), and land carbon leakage.
Traceability	The ability of a company to identify, track, and collect information in the value chain of goods and services purchased or sold by the company, including upstream and downstream processes and products.
Traceability system	A set of procedures that allow an entity to track and record how specific materials or products move across entities and are transformed throughout their value chain, from production to processing to end use.

Uncertainty	1. Quantitative definition: A measurement that characterizes the dispersion of values that could reasonably be attributed to a parameter. 2. Qualitative definition: A general and imprecise term that refers to a lack of certainty in data and methodology choices. *Note*: Examples of qualitative uncertainty include descriptions of the application of non-representative factors or methods, incomplete data on sources and sinks, and a lack of transparency.
Waste	An output of a process or system that has no market value.
Waste carbon pool	Carbon contained in landfills or waste materials during their end-of-life stage, excluding recycling and reuse.
Wetlands	A land use category with land that is covered or saturated by water for all or part of the year, and does not otherwise fall into forest land, cropland, grassland, or settlements categories. *Note*: This land use category includes areas of peat extraction, aquaculture ponds, and water reservoirs.[17]
Yield	The amount of agricultural product harvested per unit area of land over a certain time.

Endnotes

1 Adapted from IPCC (2006, vol. 4, chap. 1).

2 FAO 2017. The FAO land use classification is used by the United Nations (UN) System of Environmental and Economic Accounting (SEEA), the UN Framework for the Development of Environmental Statistics (FDES), and the World Census of Agriculture. It is furthermore consistent with the land use classes of the IPCC, used for country reporting to the UNFCCC.

3 Adapted from IPCC (2006, vol. 4, chap. 1).

4 Adapted from ISEAL Alliance (2025).

5 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

6 Adapted from IPCC (2019a, vol. 4, chap. 3).

7 Adapted from IPCC (2019a) definition for "observational data."

8 See IPCC (2019a, vol. 4, chap. 3).

9 For more details, see Requirement 8.

10 Adapted from IPCC (2019a) definition for "land cover."

11 This text includes elements that may change to align with the resolution on forest carbon accounting in future versions of this *Standard*. See Box 9.1.

12 Adapted from FAO (2005).

13 Adapted from IPCC (2006, vol. 4, chap. 1).

14 Adapted from IPCC (2014).

15 Adapted from IPCC (2019a, vol. 4, chap. 3).

16 Adapted from IPCC (2019a) definition for "key category."

17 Adapted from IPCC (2019a, vol. 4, chap. 3).

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Acknowledgments

The GHG Protocol acknowledges the individuals and entities listed below for their time, expertise, and contributions to the development of this *Standard*. Participation in this consensus-based, multi-stakeholder process does not necessarily imply endorsement of the final content of the *Standard*.

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WRI and WBCSD would like to thank the following organizations for their generous financial support: Bezos Earth Fund, La Caisse de dépôt et placement du Québec (CDPQ), Cargill, the Department of Foreign Affairs and Trade of Australia, the Gordon and Betty Moore Foundation, Inter IKEA, Shell, UPS Foundation, and Weyerhaeuser Company.

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