

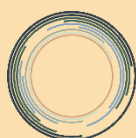
Accounting Guidelines for Impacts on Land Use and the Environment (AGILE)

STEP

3

MEASURE, SET
& DISCLOSE

LAND



SCIENCE BASED
TARGETS NETWORK

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Acknowledgments

This guidance was developed by the Science Based Targets Network's Land Hub as a contribution to the Science Based Targets Network (SBTN), which aims to transform economic systems and protect the global commons—our air, water, land, biodiversity, and ocean. SBTN unites more than 80 non-governmental organizations (NGOs), business associations, and consultancies to collectively define what is necessary to do “enough” to stay within Earth's limits and meet society's needs.

In partnership with SBTN, the Land Hub is a collaboration between World Wildlife Fund (WWF) (Craig Beatty co-lead, Cristóbal Loyola), Conservation International (Jordan Rogan co-lead, Alex Zvoleff), The Nature Conservancy (Lyndsey Dowell), World Resources Institute (WRI) (Elise Mazur), and the Food and Land Use Coalition/Systemiq (Scarlett Benson, Marco Daldoss Pirri). The objective of the SBTN Land Hub is to develop and promote a methodology that will allow companies to set, track, and measure progress on quantifiable targets that are representative of the progress required in land systems to sustain nature and people. The Land Hub is responsible for developing the technical content of these targets for inclusion in SBTN's multi-stakeholder, multi-year initiative to provide companies with comprehensive science-based targets for nature.

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ATTRIBUTION

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DISCLAIMER

Please keep the following disclaimers in mind:

- 1) The scope of these guidelines is confined to SBTN Step 3: Measure, Set, & Disclose of the five-step SBTN framework. Step 4: Act and Step 5: Track will be addressed in later versions of SBTN guidance.
- 2) These guidelines are intended to direct voluntary corporate actions in line with company commitments to science-based targets for nature and do not represent a regulatory framework.
- 3) The guidelines are written in technical language; the primary audience of this document should have the technical knowledge necessary to engage with this content.

Chapter 1. Introduction

This chapter provides an introduction to and overview of the Accounting Guidelines for Impacts on Land Use and the Environment (“the guidelines”).

Section	Description
1.0	Overview
1.1	Structure of AGILE
1.2	Use of the guidelines and intended audience
1.3	Relationship with other standards and guidance, such as the Greenhouse Gas Protocol and the Accountability Framework initiative
1.4	Supporting calculation tools and resources
1.5	AGILE development process

1.0. Overview

The Accounting Guidelines for Impacts on Land Use and the Environment (AGILE) provides corporate-level accounting methods for land-based impacts associated with companies’ direct operations and upstream value chain activities. These guidelines have been developed to assist companies in developing a robust and consistent approach to calculating their impacts on land, as associated with land use change, land area and quality, and landscape engagement activities.

Within the context of SBTN’s Land targets, the guidelines support the development of baselines and measurement of footprints for each target. Specifically, the guidelines provide methods for companies to measure the following impact categories:

- Land use change (deforestation and conversion)
- Land area and quality
 - Land footprint
 - Natural land cover
 - Soil organic carbon
 - Soil erosion
 - Terrestrial acidification
- Landscape engagement

In addition, the guidelines provide methods for companies to measure improvements from the implementation of select response options.

A central methodological innovation is the introduction of Land Environmental Assessment Factors (LEAFs) and ecoregion thresholds as the framework underpinning the land quality component of the Working Land Regeneration and Restoration target. LEAFs are numerical factors derived from lifecycle assessment characterization factors and are adapted to ensure direct comparability with ecoregion thresholds, enabling companies to assess how their production practices relate to the ecological limits of the ecoregions in which they operate. These guidelines set out the methods for

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calculating LEAF-based baselines and comparing them against applicable ecoregion thresholds for soil organic carbon, soil erosion, and terrestrial acidification.

The guidelines complement the measurement of climate-related impacts by assessing wider, non-greenhouse gas (GHG) impacts on land use and emissions. The broader set of actions these methods motivate include the reduction and management of acidifying emissions, erosion control, and other actions that support species and ecosystem integrity, including at a landscape scale.

Critically, these methods expand the focus beyond forests to include all terrestrial ecosystems (e.g., grasslands, wetlands, and shrublands), in particular, in terms of how they relate to the worked lands (e.g., cropland, rangeland, pasture, and managed forest) that facilitate the production of goods used by companies and consumers.

1.1. Structure of AGILE

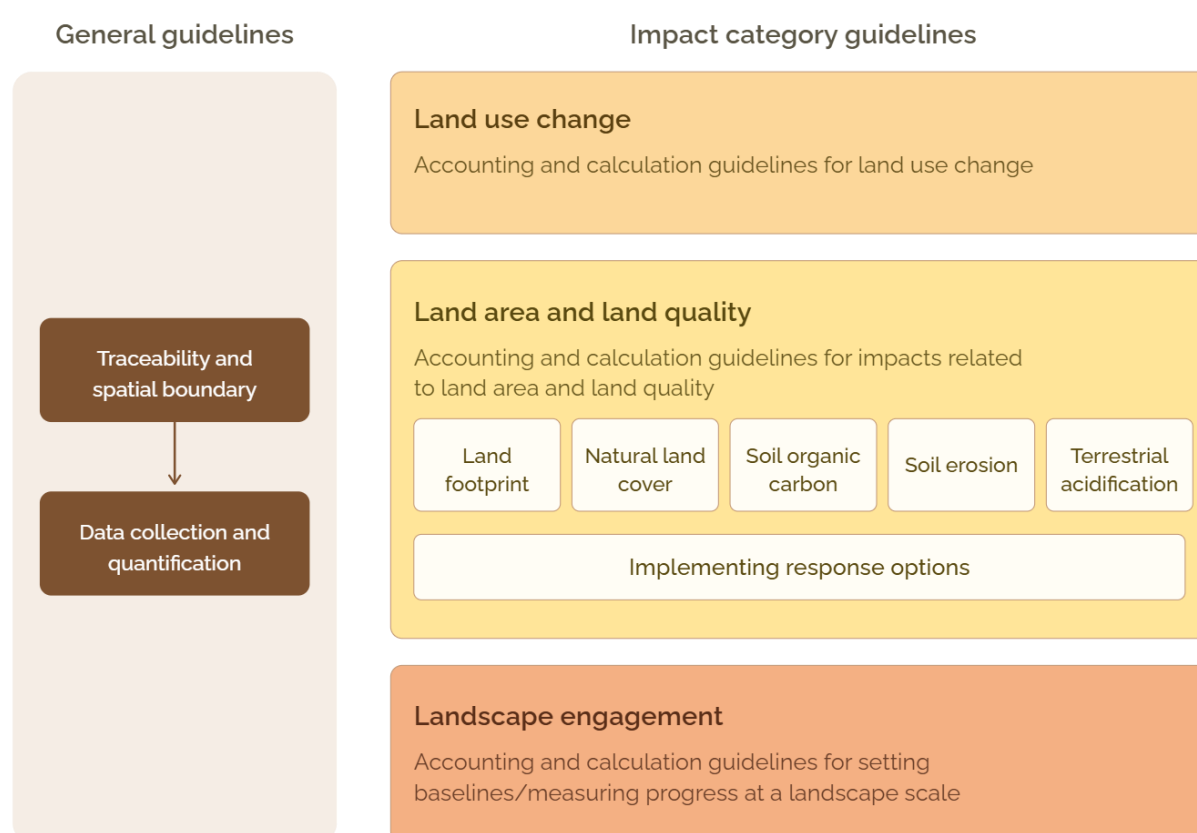


Figure 1: Structure of the Accounting Guidelines for Impacts on Land Use and the Environment (AGILE).

1.2. Use of the guidelines and intended audience

The guidelines can be used by any organization, of any size, that has land sector activities within its operations or value chain.

The guidelines can be used by companies to calculate their land impacts for the purposes of setting land targets in line with the SBTN's [Step 3: Land Technical Guidance V2](#) (hereafter “the Land Technical Guidance V2”).

1.3. Relationship with other standards and guidance

SBTN's *Step 3: Measure, Set, & Disclose: Land V1* and the Land Technical Guidance V2, and the Greenhouse Gas Protocol Land Sector and Removals Standard (2026) provide the foundation for the development of these guidelines. The guidelines build on these documents by providing additional methodological guidance for non-GHG land-based impacts. Requirement and recommendation numbers cited in these guidelines (e.g., Requirement T2.29) refer to the Land Technical Guidance V2. Specifically, the guidelines align with the GHG Protocol Land Sector and Removals Standard (LSRS) recommendations, requirements, and guidance on the following:

- Traceability and spatial boundaries (Chapter 2)
- Data collection and quantification (Chapter 3)
- Accounting for land use change at an area level and allocation of impacts (Chapter 4)
- Calculating land footprint (Chapter 5)
- Calculating soil carbon stock changes (Chapter 5)

Throughout these guidelines, recommendations, requirements, and guidance have been included and adapted from the GHG Protocol LSRS V1.1 (2026).

References to the GHG Protocol LSRS throughout these guidelines reflect the published Land Sector and Removals Standard, Version 1.1 (June 2026).

Additionally, the guidelines build on, and align with, SBTN Step 1 and 2 guidance, by providing more detailed requirements and recommendations for companies to measure their land impacts. Companies that use precise data to describe their impacts in Step 1 may be able to use this information to satisfy some of the requirements outlined in the guidelines. Table 1 provides a high-level summary of data input requirements for companies under SBTN Step 1 and Step 2, as well as data input requirements for the guidelines. For full details on data requirements, please refer directly to Step 1 and Step 2, and the relevant chapter in the guidelines.

The guidelines also draw on Accountability Framework initiative (AFi) guidance, particularly in relation to guidance on conversion and deforestation, as well as additional research from the literature and input from expert stakeholders.

The intention of aligning to and referencing existing guidance from the GHG Protocol (GHGP) and Accountability Framework initiative, and others, is to provide consistency in approaches and to reduce unnecessary burden, where possible, on companies and individuals carrying out this work. The guidelines also complement the SBTi Corporate Net-Zero Standard (CNZS V2) by addressing nature-related land impacts not covered by GHG accounting alone.

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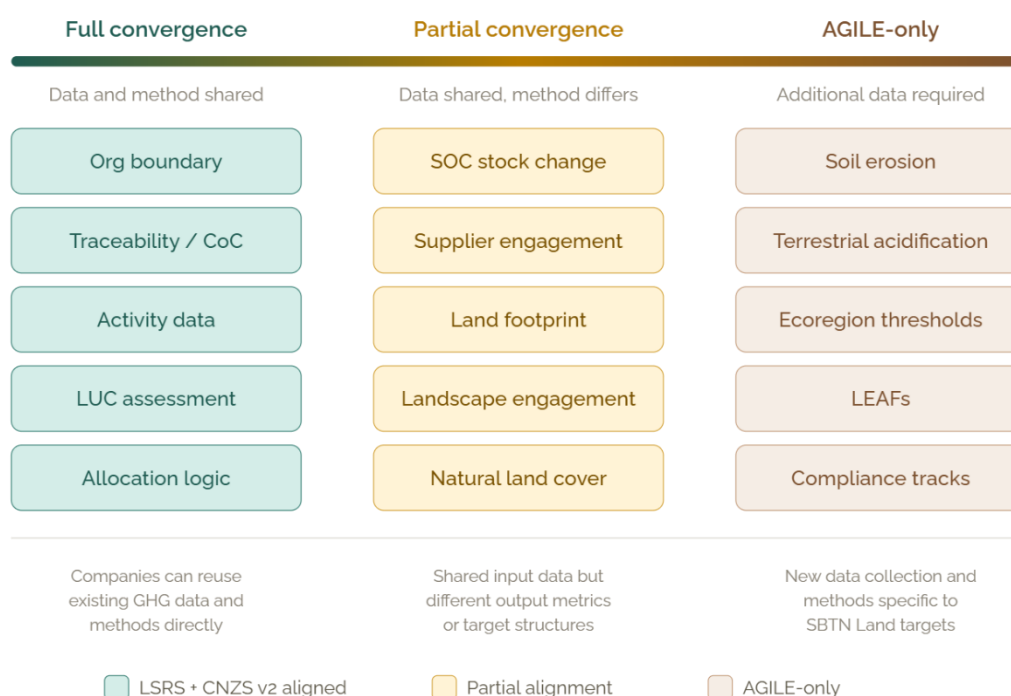


Figure 2: Climate–nature convergence spectrum. Methods and requirements positioned by degree of alignment with the GHG Protocol LSRS and SBTi CNZS V2.

Where climate and nature frameworks converge

Companies setting SBTN's Land targets alongside SBTi climate targets will find overlap in several foundational steps. The three consolidation approaches for defining the organizational boundary—financial control, operational control, and equity share—are shared across the GHG Protocol (GHGP), LSRS, and SBTN. Companies that have already defined an organizational boundary for SBTi targets are recommended to use the same approach for SBTN, provided it covers economic activities for which SBTN target-setting methods are applicable; where it does not, SBTN Step 1 guidance requires companies to redefine their boundary to ensure the broadest applicable coverage (SBTN Step 1, V1.2). The chain-of-custody models, traceability hierarchy, and spatial boundary definitions are drawn from the same normative basis as the LSRS (ISEAL Alliance, 2025; ISO 22095:2020). Activity data collected for GHGP scope 3 emissions accounting—i.e., production volumes, sourcing origins, yield factors, and supplier engagement records—serve as direct inputs for AGILE land footprint, land use change, and soil carbon calculations. Where a company has already calculated land use change (LUC) emissions under the LSRS or SBTi Forest, Land, and Agriculture (FLAG), the same spatial assessment produces the conversion area data needed for SBTN's No Conversion target. The convergence spectrum (Figure 2) maps each AGILE method and requirement by its degree of alignment with the LSRS and CNZS V2, from fully shared data and methods, on the left, to AGILE-specific requirements, on the right.

Where climate and nature frameworks differ

SBTN's Landscape Engagement target is mandatory for companies with material land impacts. The SBTi CNZS V2 Ongoing Emissions Responsibility (OER) framework is voluntary and does not count toward scope 1–3 reduction targets. Landscape-scale interventions may generate dual

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recognition—Landscape Engagement target compliance for nature and OER contribution for climate—where the intervention meets the integrity criteria of both frameworks.

However, the incentive structures are asymmetric: The Landscape Engagement target is required for SBTN validation; OER is optional reputational signaling. Companies should not expect landscape investments made for the Landscape Engagement target to automatically generate recognition under CNZS V2.

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Table 1: High-level data input requirements for SBTN Step 1 and Step 2, and the guidelines.

Value chain stage	SBTN Step 1	SBTN Step 2	Accounting Guidelines for Impacts on Land Use and the Environment					
			Land use change	Land footprint	Natural land cover	Soil organic carbon and soil erosion	Terrestrial acidification	Landscape engagement
Direct operations	List of all directly owned or operated sites, locations, and the activity or product/commodity involved; locations of main off-site activities and the activity involved	Long list of pressure and state of nature estimates per operational site, output from Step 1	Location of all sites where conversion-driving commodities are produced (ha) Areas converted after cutoff date (ha)	Volumes of commodities produced by production location (metric tons) Data on operational sites where commodities are produced (ha)	Location of all production units in direct operations (ha)	Land use and duration by location (ha*yr)	Ammonia (NH ₃), nitrogen oxides (NO _x), and sulfur dioxide (SO ₂) emissions (kg) Location of emission sources (e.g., ecoregion) Land footprint (ha)	Location of prioritized landscapes for engagement Selected landscape-level metrics
Upstream	List of procurement (commodities/goods and activities) paired with known or expected sourcing	Long list of pressure and state of nature estimates per procurement	Sourcing area and volumes of conversion-driving commodities	Volumes of commodities purchased (metric tons)	(Optional) Companies can follow the direct operations	(Optional) Companies can follow the direct operations	(Optional) Companies can follow the direct operations	Location of prioritized landscapes

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	location, and volume for each category	or activity, output from Step 1	purchased (ha and metric tons or equivalent from each area) (Optional) Production unit (ha)	Yield of each product purchased (metric tons per ha per yr)	approach if they have the requisite traceability and data	approach if they have the requisite traceability and data	approach if they have the requisite traceability and data	for engagement Selected landscape- level metrics
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1.4. Supporting calculation tools and resources

Alongside the Land Technical Guidance V2 and these guidelines, SBTN provides guidance on supporting tools and resources for companies to set land targets. Key supporting tools and data resources include, but are not limited to, the following: the SBTN Natural Lands Map (for natural land cover and conversion accounting); the Land Environmental Assessment Factors (LEAFs) maps and lookup tables and ecoregion thresholds; the Integrated Biodiversity Assessment Tool (IBAT) for biodiversity risk screening; the WWF Biodiversity Risk Filter; the Dinerstein et al. (2017) ecoregion classification dataset; and the WRI Aqueduct and WWF Water Risk Filter for water-related landscape assessments. The guidance will detail how to evaluate tools and resources within the context of the land target implementation process and specific private sector archetypes.

1.5. AGILE development process

AGILE provides an important starting point for the development of accounting and calculation guidelines for target setting around land-based impacts on nature. The guidelines may be updated in future iterations to respond to the latest developments in accounting and target-setting methodologies, new scientific approaches, and where changes can be made to support increased and more effective corporate action.

SBTN adheres to a broad and inclusive multi-stakeholder engagement process as part of the development of the guidelines. In December 2024, the SBTN Land Hub conducted an expert stakeholder review of the draft guidelines. Following this review process, the guidelines were updated ahead of public consultation in April 2025.

SBTN would like to thank those stakeholders for their valuable feedback and insights throughout the development of the guidelines.

Chapter 2. Traceability and spatial boundaries

This chapter provides guidance on traceability and outlines the spatial boundaries covered in the guidelines.

Section	Description
2.0	Overview provides high-level guidance on traceability and spatial boundaries, including principles for selecting the appropriate scale of analysis and traceability in line with the GHG Protocol
2.1	Traceability and spatial boundaries provides guidance on the type of traceability and spatial boundaries considered in the guidelines
2.2	Spatial and statistical data needs based on traceability and spatial boundaries summarizes the guidelines' requirements and recommendations on the use of spatial and statistical data, depending on companies' traceability and spatial boundaries

2.0. Overview

Depending on the impact category and company position within the value chain, the level of traceability and data specificity will vary. Companies can define the relevant spatial boundaries based on their organizational boundary (as defined in SBTN Step 1: Assess) and the traceability they have within their value chain.

The level of traceability and associated spatial boundary is context-specific, based on the type of land management system producing the goods or services and the reporting company's position in the value chain. In line with the GHG Protocol LSRS, companies should select the scale of analysis and level of traceability that enables the following:

- The most accurate, precise accounting for land impacts in the specific context.
- The most credible allocation for land impacts.
- The most effective and efficient way to improve land management practices and foster collaborative action and investment for reducing land impacts within value chains. Where possible, SBTN encourages companies to support or directly participate in targeted, impactful, and credible landscape initiatives to minimize trade-offs, deliver positive environmental and social co-benefits, and support the connectivity of natural and restored lands.

In line with the GHG Protocol LSRS, when engaging with value chain partners, companies should ensure equity and acknowledge the rights of landholders by obtaining free, prior, informed consent (FPIC), providing fair compensation, and following best practices. Additional guidance is available through [SBTN Stakeholder Engagement Guidance](#), the [Food and Agriculture Organization](#), the [United Nations General comment No. 26 \(2022\) on Land and Economic, Social and Cultural Rights](#), and the [United Nations Guiding Principles on Business and Human Rights](#).

Where climate and nature frameworks converge

The chain-of-custody model definitions used in these guidelines — Identity Preservation, Segregation, Controlled Blending, and Mass Balance — are drawn from the same normative basis as the GHG Protocol LSRS (2026, Table 5.2), the ISEAL Alliance (2025) Chain of Custody Models and Definitions Guidance, and ISO 22095:2020. Companies that have already mapped their physical traceability to establish scope 3 spatial boundaries under LSRS can reuse those mappings directly for AGILE.

The traceability level achieved determines both which LSRS land use change calculation approach applies, being direct land use change (dLUC), jurisdictional direct land use change (jdLUC), or statistical land use change, and which level of granularity is available in terms of AGILE Land Environmental Assessment Factors (LEAFs) — from country level to ecoregion level.

Where climate and nature frameworks converge

The SBTi CNZS V2 introduces activity pools as spatial units for aggregated scope 3 performance assessment. Where a company's AGILE sourcing area or sourcing region overlaps geographically with a CNZS V2 activity pool, the traceability data gathered for SBTN's Land targets — production unit identification, supplier mapping, volume tracking — may also support the CNZS V2 requirement to demonstrate performance at activity pool level. This correspondence is not formally established by either framework, but companies designing supplier engagement programs across both obligations can look for opportunities to structure them to serve both, reducing the cost of parallel compliance.

Where frameworks differ

Although the traceability architecture is shared between AGILE and LSRS, the downstream consequences differ. Under LSRS, traceability level determines which LUC calculation approach applies (dLUC, jdLUC, or sLUC). Under AGILE, traceability level determines the precision of available LEAFs (country to ecoregion).

Additionally, the GHG Protocol LSRS (2026) specifies that mass balance must operate within the same country and sourcing region — a condition that is stricter than AGILE's current formulation of "defined spatial boundary."

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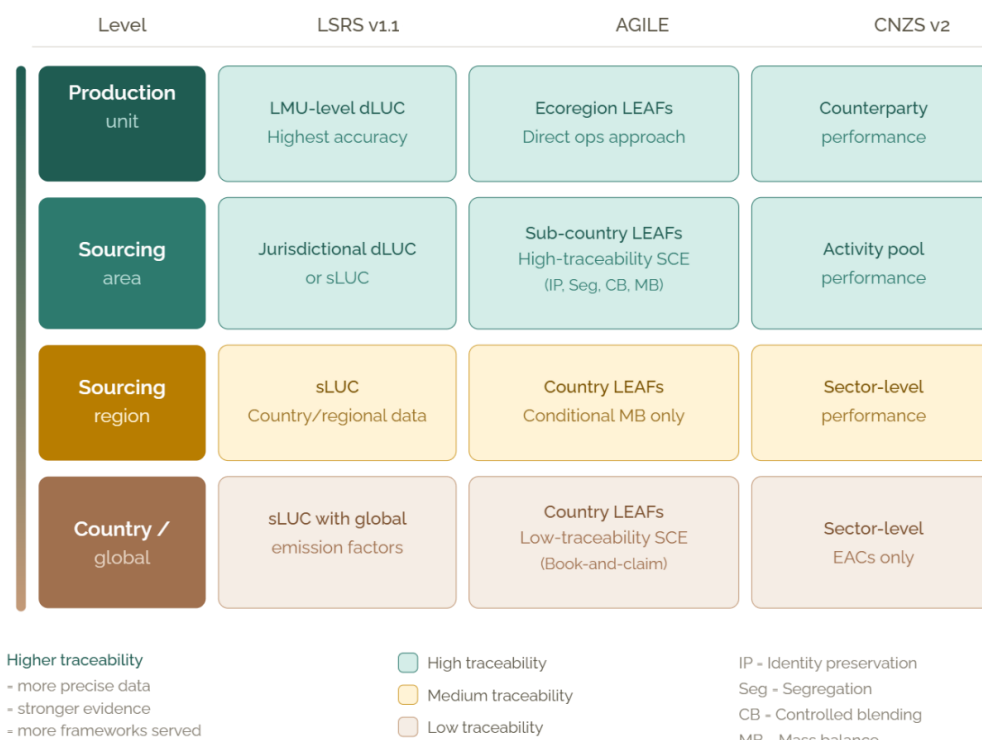


Figure Z - Traceability ladder — what each level unlocks under LSRS v1.1, AGILE, and CNZS v2

Figure 3: Traceability ladder. What each traceability level unlocks under LSRS V1.1, AGILE, and CNZS V2. LMU (Land Management Unit), dLUC (direct land use change), sLUC (statistical land use change), LEAF (land environmental assessment factor), SCE (supply chain engagement), EAC (environmental attribute certificate).

2.1. Traceability and spatial boundaries

The ability to accurately account for land impacts associated with a company's activities depends on their traceability to the relevant lands and activities in their direct operations and value chain. For these guidelines, traceability to a relevant spatial boundary can be defined by physical traceability as summarized below (adapted from the GHG Protocol LSRS). The level of traceability also determines which Land Environmental Assessment Factors (LEAFs) are applicable; LEAFs are available at their original raster resolution, and ecoregion, sub-country, and country averages ([Land Technical Guidance V2 data](#)). For companies assessing natural land cover under Scale 2 (production units smaller than 1 km²), data collection must address two nested spatial scales: the production unit boundary and the surrounding 1 km² landscape context (see Section 5.2).

- **Physical traceability** is when a company has the ability to identify, track, and collect information on activities (e.g., activity data or emission or removals factors) related to material flows of goods and services in its value chain, across its upstream and downstream processes and products.
- For sourcing companies, traceability may be facilitated by internal company systems, business-to-business disclosure by suppliers, third-party certification programs, or other methods for attaching information about origins to product or commodity volumes. Traceability to the production unit of origin (see Table 2) is preferable in most cases and allows for the highest level of supply chain control and the most precise land impact accounting (adapted from the Accountability Framework initiative, 2022).

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These guidelines consider the following spatial boundaries: global, national, sourcing area (including subnational jurisdiction), and production unit, as summarized in Table 2.

Table 2: Spatial boundaries, listed in order from coarse to finer resolution data (adapted from the GHG Protocol LSRS).

Spatial boundary	Level of traceability
Global	No knowledge of region of origin
Country	Known country of origin A predefined, spatially explicit area based on a political boundary where commodities or derived products are sourced from. This includes political boundaries based on a country of origin.
Sourcing area	Known sourcing area (subnational jurisdiction level) A predefined, spatially explicit area to at least subnational jurisdiction level (e.g., municipality, state, province) where commodities or derived products are sourced from.
	Known sourcing area (first collection point or processing facility) A predefined, spatially explicit area that supplies a commodity 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 supplying commodities.
Production unit	Known production units of origin A plantation, farm, ranch, forest management unit, or production site. This includes all plots used for agriculture or forestry that are under one management, located in the same general area, and share the same means of production. It also includes natural ecosystems, infrastructure, and other land within or associated with the plantation, farm, ranch, site, or forest management unit (adapted from the Accountability Framework initiative, 2024a). See Figure 4 below.

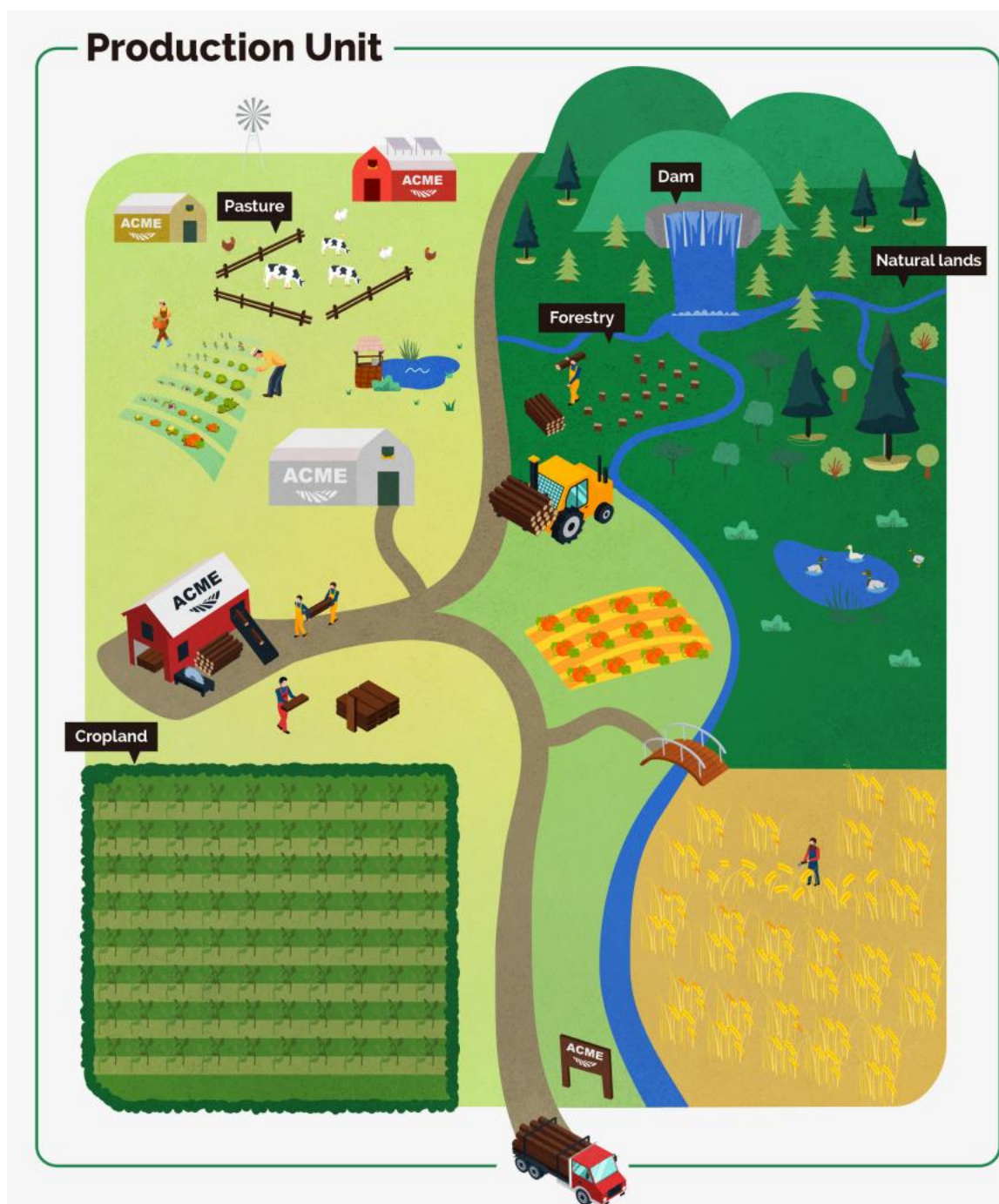


Figure 4: Illustration of the SBTN definition of a production unit.

Under the guidelines, the most granular spatial boundary permitted is the production unit, as defined in Table 2. In line with the Accountability Framework initiative, a production unit can be a contiguous land area (regardless of any internal subdivisions) or a group of plots interspersed with other land units in the same area or landscape and under the same management.

Farms and other production units may consist of multiple plots or fields under common ownership and management. The calculation of land impacts should be assessed at the level of the entire production unit. In the example provided in Figure 5, the farm and its products cannot be considered

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deforestation-free since the farm is actively engaged in deforestation on Plot 2 (Accountability Framework initiative, 2024a).

Assessment at the production unit level seeks to avoid potential challenges associated with accounting at a smaller scale, such as at the plot or field level. For example, when accounting at the sub-farm level, products could be classified as being deforestation-free when there is new or ongoing deforestation being conducted on the same farm, by the same owner or operator, using the same workers and equipment (Accountability Framework initiative, 2024a).

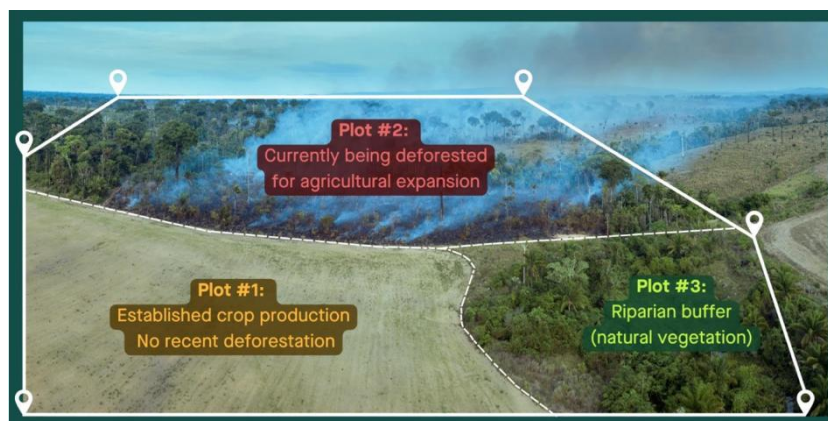


Figure 5: Example of an assessment of deforestation at the production unit level (adapted from the Accountability Framework initiative, 2024a).

2.2. Spatial and statistical data needs based on traceability and spatial boundaries

The guidelines provide requirements and recommendations for spatial and statistical data specific to each impact category (detailed in Chapters 5–7), depending on a company’s position within the value chain and its level of traceability to a particular spatial boundary.

Companies adopting statistical approaches to calculate their land impacts must ensure that data used to calculate such impacts relate to comparable lands, sourcing areas, and commodities produced or sourced. When using statistical data, companies should use the most spatially explicit data available for each commodity or product produced or sourced—for example, sourcing data relating to lands within the same sourcing region or jurisdictional boundary producing the commodity sourced by the reporting company. Companies should ensure the exclusion of data relating to, for example, lands incapable of producing the relevant commodity, lands with harvest restrictions, and lands with other protective statuses.

Companies using the guidelines to set SBTN’s Land targets that are unable to source relevant statistical data to meet these requirements must provide a clear explanation of this in their target submission, outlining data gaps, rationale for using the selected data, and future actions to close data gaps.

Chapter 3. Data collection and quantification

The appropriate use of data and methods is critical to ensure a robust calculation of land impacts. This chapter provides guidance on data collection and quantification. Guidance is based on the GHG Protocol LSRS and SBTN guidance. For further information please see the GHG Protocol LSRS, SBTN [Step 1 guidance](#), and [SBTN Data and Tool Criteria](#).

Section	Description
3.0	Data collection provides data collection principles
3.1	Quantification methods introduces the two broad methods of quantification: Direct measurement Calculation—including activity-based, model-based, and remote sensing-based approaches
3.2	Data types provides an overview of data types, covering primary and secondary data
3.3	Supply chain traceability provides an overview of supply chain traceability
3.4	Data selection provides considerations to companies for selecting either primary or secondary data
3.5	Data quality provides guidance and criteria for companies to use when assessing data quality
3.6	Method selection outlines the advantages and disadvantages of quantification approaches, provides key considerations for method selection, and provides examples of data types for each quantification method
3.7	Allocation introduces the concept of allocation (mass and economic) and includes a decision tree for companies
3.8	Recalculating the baseline summarizes the circumstances under which companies need to recalculate their baselines
3.9	Method application and reporting guidelines provides general method application and reporting guidelines for companies

3.0. Data collection

The traceability level achieved determines the precision of Land Environmental Assessment Factors (LEAFs) available for land quality baseline calculations (see Section 5.3). Companies are encouraged to observe the following guidance (adapted from the GHG Protocol LSRS):

- Aim for higher accuracy data and methods.
- Evaluate data quality and improve their inventory over time.
- Where allocation is required, adopt the most appropriate method (e.g., physical or economic) to partition impacts across commodities or derived products.
- Adopt a conservative/precautionary approach when selecting and applying methods and data.

3.1. Quantification methods

There are two approaches to quantifying impacts generated by a company's value chain activities, both of which are applicable to direct operations and upstream activities:

- **Direct measurement** involves monitoring changes through direct observation or sampling. This can include repeated measurements in specific areas, data analysis, and quality control procedures. Remote sensing may also be used, though it often requires calibration with ground data.
- **Calculation** uses empirical, process-based, or other models to calculate land impacts or indicators.

A hybrid approach can combine both methods, using direct measurements to refine or calibrate models for more accurate assessments. Table 3 provides a description and examples of different quantification methods.

Table 3: Description of quantification types and approaches (adapted from the GHG Protocol LSRS, 2026).

Quantification	Quantification approach	Description of relevant methods	Examples
Direct measurement	Measurement-based approaches	Methods that directly quantify carbon stock changes using monitoring of GHG fluxes, mass balance, or stoichiometry. Direct measurements of combustion emissions, such as NO _x , NH ₃ , and SO ₂ .	Use of a gas analyzer to measure SO ₂ emissions
Calculation	Activity-based calculation approaches	Methods that multiply activity data by a LEAF, emissions factor, or carbon stock change factor to determine emissions of carbon stock changes, respectively, for a given process.	LEAFs; LCA database-derived emissions factors
	Model-based calculation approaches	Methods that use mathematical modeling techniques to estimate changes in land quality indicators, including soil erosion, SOC, or acidification emissions, resulting from land management changes.	RothC model for soil carbon; RUSLE for soil erosion
	Remote sensing-based calculation approaches	Data collection methods that use satellite or aerial data on land activities and estimate carbon stock changes or soil erosion, which are then combined with direct measurements, activity-based approaches, or modeling approaches.	LiDAR; satellite deforestation monitoring

3.2. Data types

Data are classified as either primary data or secondary data as follows:

- **Primary data:** Data from specific activities within a company's operations, production unit, or value chain (e.g., site-specific data). Primary data can be based on measurements, models, or other methods, and are not necessarily generated by the reporting company.
- **Secondary data:** Data that are not from specific activities within a company's operations or value chain (e.g., proxy, regional average data, or country statistics).

For example, soil samples collected from land the company sources from represent primary data, but measurements from similar land in the same region that the company does not source from would be defined as secondary data. While data can be classified as either primary or secondary, the calculation methods might require a mixture of both data types, resulting in a hybrid calculation (GHG Protocol LSRS, 2026). For example, to calculate land footprint associated with purchased wheat, companies may use primary data, in terms of volumes of wheat purchased, and multiply this volume by average yield data sourced from national datasets (secondary data) to estimate the hectares of land sourced from.

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The primary and secondary data classification used in these guidelines aligns with the GHG Protocol LSRS (2026, Chapter 6). Activity data collected for GHG inventory purposes — production volumes, sourcing quantities, land areas by commodity — can serve as direct inputs to AGILE land footprint calculations (Section 5.1) and land quality baseline assessments (Section 5.3). Companies already maintaining activity data for GHG Protocol reporting can reuse this data infrastructure without duplication for land impact accounting under AGILE.

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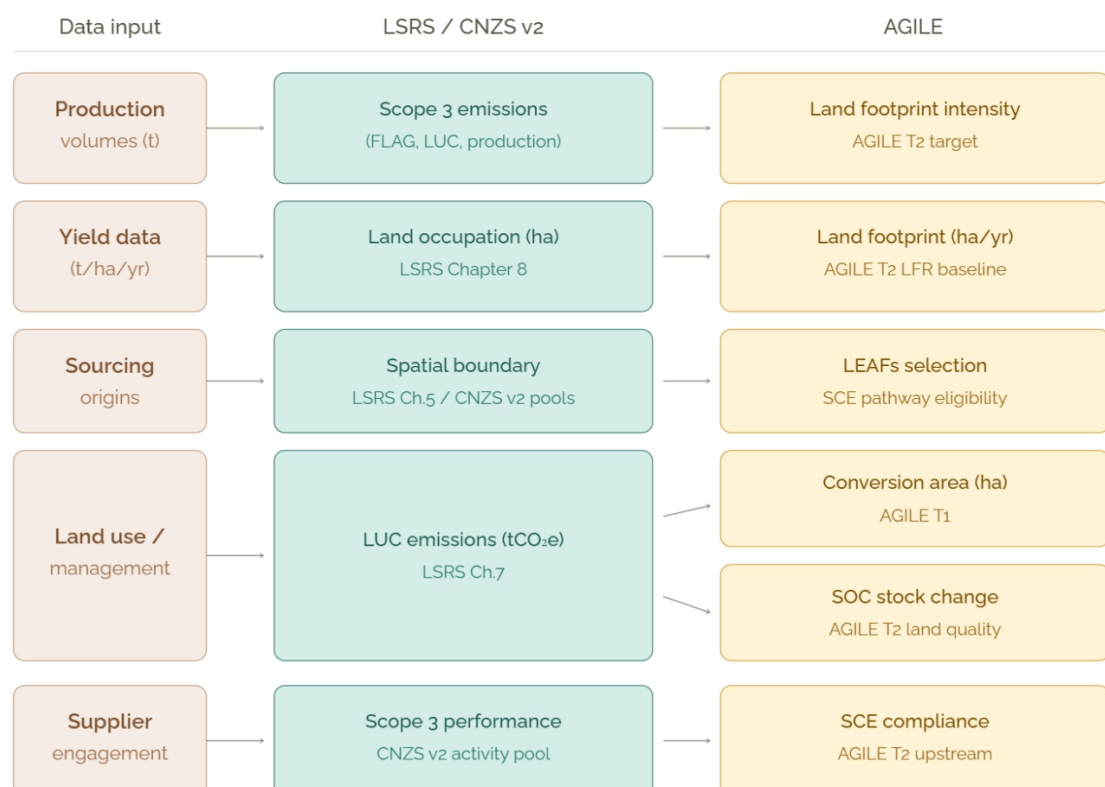


Figure 6: Data reuse map. Common data inputs and the framework calculations they serve.

A data management plan can help to document data sources, collection protocols, and data quality (GHG Protocol LSRS, 2026). Primary data reflect a company’s activities more accurately but can be harder to obtain. Secondary data are easier to access but may not capture company-specific changes or improvements. Over time, better traceability can improve the availability and quality of primary data, offering more accurate, location-specific insights.

3.3. Supply chain traceability

From a supply chain perspective, primary data are categorized based on a supplier’s position relative to the reporting company in the supply chain. Primary data from a Tier 1 supplier refers to primary data that come from the company directly supplying the reporting company. Primary data from a Tier 2 supplier refers to primary data that come from a company that supplies the reporting company’s Tier 1 suppliers, and so on, tracing back to the original producer of the raw materials.

Improving traceability across supplier tiers allows companies to gather more reliable primary data. If a supplier cannot provide the required data, companies may still obtain relevant information about practices, locations, and conditions to improve estimates. When the supplier is unknown, companies can use secondary data as commodity average statistics and location productions to work through the Land Technical Guidance V2, while still working to improve value chain traceability and supplier data quality (GHG Protocol LSRS, 2026).

3.4. Data selection

Data collection efforts will vary depending on the sector, company location within the value chain and the level of traceability available. Companies should aim to improve traceability by gathering more

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primary data to meet their specific goal. To maximize resource efficiency, companies should prioritize collecting primary data and using higher quality methods where the biggest impacts and opportunities exist. For the guidelines, the collection of primary data should be prioritized by producers based on land area and volumes of commodities sourced, with special focus on conversion-driving commodities in the high-impact commodity list.

3.5. Data quality

Companies should evaluate quality when considering data collection, including:

- Relevance for application in the methods.
- Appropriate spatial and temporal resolution.
- Recognition as authoritative and accurate.

These criteria will assist companies in identifying the highest quality data and tools available for their specific purpose, selecting the most representative, complete, and reliable sources available. Table 4 outlines the data and tool criteria that can be applied to assess quality.

Table 4: SBTN Data and Tool Criteria (adapted from SBTN, 2023).

Characteristic	Description
Relevance	Appropriate for application in the SBTN methodology and for use in answering the relevant question within the methods.
Representative	Tools and data should represent the production unit being analyzed as closely as possible, considering geography, production, and ecological and social context. For example, data describing the production of soybeans in the Brazilian Cerrado should come from that specific location, rather than describing soybeans produced in the United States.
Spatial and temporal resolution	The spatial and temporal resolution of the data used are appropriate to the analysis context and their eventual use in decision-making.
Resource stability and preservation	Active effort to maintain long-term persistence and preservation of datasets (minimum of five years after publication) with stable persistent identifiers (e.g., links, DOI, etc.).
Accessibility	Data must be readily accessible online. Free access is preferred, but paid tools are acceptable when they contain data which are uniquely fit for purpose.
Interpretability	Data/tool outputs are interpretable with sufficient guidance (either in the methods or in the tool) to generate appropriate inputs for use in the SBTN methods.
Coverage	Data/tools/approaches should be appropriate for analysis across major subsets of portfolios, corporate footprints, etc. Where possible, data should comprehensively cover the spatial context of the assessment, or facilitate harmonization, aggregation, or summarization as appropriate to the stage of analysis.

Authoritative and Accurate	Data are recognized as authoritative and accurate. They have been through a third-party review process, e.g., peer-review in scientific literature, reviewed by peers in the gray literature, or come from reputable national or international bodies, such as UN FAO or UK DEFRA, and/or a validation exercise.
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3.6. Method selection

As there are multiple quantification methods available to estimate land impacts, companies should assess their advantages and disadvantages when selecting methods. Table 5 provides a summary of the core quantification approaches.

In line with the GHG Protocol LSRS (2026), when selecting methods, companies should consider the following factors:

- Accuracy, continuity, and uncertainty associated with the quantification approach.
- Relevance of quantification approach and methods to the companies' operations and value chain.
- Technical expertise required to implement the quantification approach.
- Available tools and resources to support quantification.
- Secondary data available for activities relevant to the company.
- Primary data requirements for the selected method.
- Consistency across datasets directly compared over time.

Table 5: Advantages and disadvantages of quantification approaches (adapted from the GHG Protocol LSRS, 2026).

Quantification approaches	Advantages	Disadvantages
Activity-based	Simple methods to apply. Able to represent most common land management practices.	Might be unable to represent specific or novel land management practice changes. Contains large uncertainty in estimates.
Model-based	Able to represent a wider range of land management practices, depending on model design and calibration. Able to estimate specific production unit or sourcing area impacts through incorporation of primary data.	Requires detailed technical expertise to implement. Requires direct measurements to calibrate to site-specific or management-specific conditions.
Remote sensing-based	Able to represent a range of land management practices, depending on model design and calibration. Provides spatially explicit estimates that are more geographically representative. Can improve the accuracy of management activities.	Requires detailed technical expertise to implement. Requires direct measurements to calibrate to site-specific or management-specific conditions.

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	Reduces the cost of data collection.	
Measurement-based	Able to capture impact of all land management practices.	Can be costly and/or labor-intensive. Requires site-specific data collection.

Data requirements vary by quantification method and can be an important consideration when selecting methods to quantify land impacts (GHG Protocol LSRS, 2026). Table 6 provides an overview of data types needed to estimate land impacts by quantification method.

Table 6: Examples of data types by quantification method and data type (adapted from the GHG Protocol LSRS, 2026).

Quantification approaches	Data type	Example activity data and/or inputs
Activity-based	Primary data	Product quantity or land area by known sourcing areas
	Secondary data	Product quantity by unknown sourcing areas or country of origin
Model-based	Primary data	Production- or supplier-specific input data from known sourcing areas
	Secondary data	Input data based on average practices within the country or sourcing area
Remote sensing-based	Primary data	Remote sensing data in known sourcing areas
	Secondary data	Remote sensing data from known countries of origin or sourcing area
Measurement-based	Primary data	Land use and stratification on known production unit or sourcing areas
	Secondary data	N/A (direct measurements always primary data)

3.7. Allocation

In the context of the guidelines, allocation is needed when one system produces several outputs—such as commodities and services, or land uses—but data or land indicators are quantified for the entire system. In such instances, the total impacts from the common process need to be allocated among the multiple outputs. Allocation is not necessary if a system produces only one output or impacts from producing each output are separately quantified (GHG Protocol LSRS, 2026).

Allocation is typically required where co-products are produced (e.g., livestock farming for meat and leather) or where companies sourcing products do not have access to sufficient data from the producer or supplier to calculate impacts. Allocation is especially relevant when communicating impacts or emission factors to other actors in the supply chain.

The most appropriate allocation method for a given activity depends on individual circumstances. Different allocation methods may yield significantly different results. Specific guidance on allocation for land use change is provided separately in Chapter 4.

In line with the GHG Protocol LSRS, companies should seek comparable allocation methods with other companies in similar value chains and should ensure that consistent allocation methods are used for each system within a value chain to avoid overcounting or undercounting total impacts. Companies should consider the following decision tree:

1. Avoid allocation, if possible;
2. Align with legislative requirements;
3. Align with sectoral recommendations;
4. Consider physical allocation (e.g., based on mass, volume, energy content) when appropriate;
5. Consider economic allocation (e.g., based on the market value of co-products) or other allocation (e.g., based on the land area–time needed to produce co-products).

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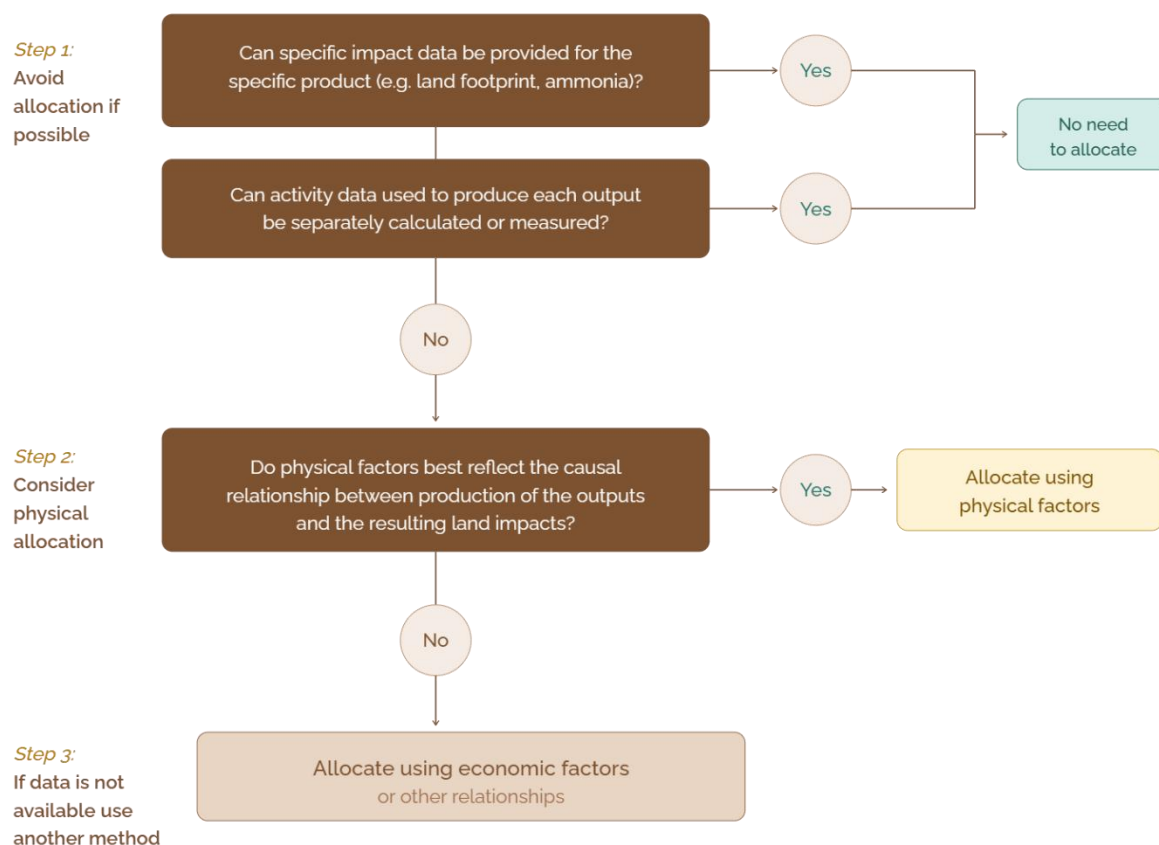


Figure 7: Decision tree for selecting an allocation approach (adapted from GHG Protocol Scope 3 Standard, 2011).

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The allocation decision tree in Figure 7 is adapted from the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard. The same decision logic —avoid allocation where possible by collecting product-level data and applying physical allocation before economic allocation where allocation is unavoidable—applies when partitioning land impacts across co-products in the same way as when partitioning GHG emissions.

Companies that have already resolved allocation for their FLAG or scope 3 inventory are recommended to keep the same allocation method, provided the allocation basis is documented and applied consistently across the value chain. Note that for sLUC allocation at the sourcing area level, the GHG Protocol LSRS (2026) requires the product expansion allocation method as the default, with the shared responsibility method permitted only with justification (LSRS Section 7.3).

Companies should avoid or minimize allocation by collecting more detailed data, for example, by obtaining product-level impact data from suppliers (GHG Protocol, 2011). Where allocation cannot be avoided, the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them.

- **Physical allocation** distributes impact to a product, or land use, based on a physical attribute, such as mass, volume, or energy. For example, a company produces the same amount of two crops of similar economic value in a single production unit and measures soil erosion for the whole production unit. Using physical allocation, 50% of the soil erosion is assigned to each crop.

Physical allocation

Allocated land impact = (Mass of product purchased [e.g., mass of meat purchased] / total mass of product produced [e.g., total livestock biomass]) x Total land impact

Where physical relationship alone cannot be established or used as the basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them, for example, in proportion to the economic value of the products.

- **Economic allocation** attributes impact based on the price of a product relative to the price of all products from a given supplier. For example, a company measures soil erosion for a whole production unit where it produces equal amounts of two crops: a cash crop, which generates 99% of income from sales, and a cover crop, which generates 1% of income from sales. A total of 99% of the soil erosion is allocated to the cash crop, while the remaining 1% is allocated to the cover crop.

Note: As outlined in the GHG Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard companies should use economic allocation with caution as it may yield inaccurate results, particularly when price changes significantly or frequently over time, companies pay different prices, or prices are not well correlated with underlying physical properties and environmental impacts (e.g., for luxury goods, products with high brand value, and products whose price reflects high research and development, marketing, or other costs outside of production).

Economic allocation

$$\text{Allocated land impact} = (\text{Market value of product purchased} / \text{total market value of product produced}) \times \text{Total land impact}$$

Companies that have a choice between multiple methods of allocation for a given commodity or derived product should evaluate each method to determine the range of possible results before selecting a single method (e.g., by conducting a sensitivity analysis) (GHG Protocol LSRS, 2026). For more information on physical and economic allocation, please refer to Chapter 8 of the GHG Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard and the GHG Protocol LSRS (2026).

3.8. Recalculating the baseline

Following the GHG Protocol LSRS (2026), recalculation is required when the following changes occur and have a significant impact on the land indicator being calculated:

- Structural changes in the reporting organization, such as mergers, acquisitions, divestments, outsourcing, and insourcing.
- Changes in calculation methods, improvements in data accuracy, or discovery of significant errors. Under the GHG Protocol LSRS (2026), this includes changes in LUC calculation data and methods. Companies shall also re-baseline when there is a change in the LUC calculation approach (e.g., between sLUC and dLUC) or in the data used within the approach (e.g., from non-spatialized to spatialized crop statistics) for a given product by sourcing jurisdiction.
- Changes in the categories or activities included in the inventory.

For companies using these guidelines to set SBTN's Land targets, recalculations must also take place based on any new versions of the Land Technical Guidance V2. In line with current SBTN claims guidance, companies must use the latest version of methods and tools approved by SBTN. Submissions for validation that use previous versions of the tools or methods can only be submitted for validation within six months of the publication of the revised method or tool.

3.9. Method application and reporting guidelines

Companies should apply the following guidelines to calculate and report land impacts:

- Consistent application of accounting methods for each impact category.
- Report direct operations and upstream value chain impacts separately for each impact category.
- Disclose the data sources, methods, and assumptions used to quantify land impacts.
- For organizational purposes, companies may divide their impact category reporting by type of land use (e.g., cropland and pastureland), commodities/products produced or sourced, location, ecoregion, and/or production unit.
- When defining the spatial boundary for direct operations, define the spatial boundary as lands owned or controlled by the reporting company based on the consolidation approach they have selected.
- When defining the rest of the value chain, define the spatial boundary in line with the value chain stages (as defined in SBTN Step 1: Assess) relevant to the reporting companies' activities and the company's level of traceability to known lands or regions.

Chapter 4. Land use change

This chapter provides guidance on accounting for deforestation and conversion, and is structured as follows:

Section	Guidelines
4.0	Defining land use change in the context of the guidelines and in alignment with the Accountability Framework initiative and the GHG Protocol
4.1	Overview of accounting for conversion of natural ecosystems Guidance is differentiated between producers, site owners and operators, and companies sourcing conversion-driving commodities
4.2	Set cutoff dates provides guidance on setting cutoff dates for land conversion
4.3	Data requirements outlines the data requirements for companies at different stages of the value chain covering: Producers and site owners/operators Sourcing from producers or first point of aggregation Sourcing downstream from first point of aggregation
4.4	Using the SBTN Natural Lands Map introduces the SBTN Natural Lands Map and provides guidance on how to use it to account for conversion of natural ecosystems for companies with access to spatial data
4.5	Measure and account for conversion of natural ecosystems for companies with: Traceability to the production unit level Traceability to the sourcing area level
4.6	Further guidance on statistical approaches to measure and account for conversion of natural ecosystems

4.0. Defining land use change

For the purposes of these guidelines, land use change is defined as including conversion and deforestation and uses the following definitions, which are adapted from the Accountability Framework initiative (2024b):

Conversion is defined as the loss of a natural ecosystem as a result of its replacement with agriculture or another land use, or due to a profound and sustained change in a natural ecosystem's composition, structure, or function.

- Deforestation is one form of conversion (conversion of natural forests).
- Conversion includes severe and sustained degradation or the introduction of management practices that result in a profound and sustained change in the ecosystem's composition, structure, or function.
- Changes to natural ecosystems that meet this definition are considered conversion, regardless of whether or not they are legal.

Degradation

Degradation refers to changes within a natural ecosystem that significantly and negatively affect its composition, structure, and/or function and reduce the ecosystem's capacity to supply products, support biodiversity, and/or deliver ecosystem services.

Deforestation is defined as the loss of natural forest as a result of (i) conversion to agriculture or other non-forest land use; (ii) conversion to a tree plantation; or (iii) severe and sustained degradation.

- This definition pertains to no-deforestation supply chains that generally focus on preventing conversion of natural forests.
- Severe and sustained degradation constitutes deforestation even if the land is not subsequently used for a non-forest land use.
- Loss of natural forest that meets this definition is considered to be deforestation, regardless of whether or not it is legal.
- The Accountability Framework initiative's definition of deforestation signifies "gross deforestation" of natural forest where "gross" is used in the sense of "total; aggregate; without deduction for reforestation or other offset."

Inclusion of waste and residues: Companies using the guidelines to set a No Conversion of Natural Ecosystems ("No Conversion") target—in order to identify whether waste and residues from the inputs to, processing of, or manufacturing of conversion-driving commodities must be included in scope of the target—must follow the below hierarchy. Volumes of waste and residues used in such processes will be included based on the following:

1. Compliance with existing national or relevant jurisdictional legislation defining what constitutes waste and residues.
2. Alignment with sectoral best practices on the inclusion of waste and residues.

If either option is unclear or unavailable, waste and residue must be included when the product is classified as waste and/or residue and has an economic value.

Remediation of post-cutoff conversion: Companies are recommended to contribute to the remediation of any conversion of natural ecosystems that has occurred after the cutoff date on production units within their direct operations or supply chain. Remediation may include ecological restoration of converted areas, compensation through equivalent restoration elsewhere within the same ecoregion, or financial contributions to verified restoration programs. The Land Technical Guidance V2 provides conceptual guidance on remediation approaches (**Recommendation T1.4**).

4.1. Overview of accounting for conversion of natural ecosystems

Companies using these guidelines to set a No Conversion target need to demonstrate the compliance of conversion-driving commodities with target requirements (e.g., portion of volumes that can be proven to be deforestation- and conversion-free [DCF]). The Land Technical Guidance V2 provides

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four compliance pathways through which companies may demonstrate that commodity volumes meet no-conversion requirements: (1) production-unit tracing, where the company traces commodity volumes to mapped production units and demonstrates no conversion since the cutoff date; (2) intermediate supplier control, where intermediate suppliers provide evidence of no-conversion compliance for volumes they supply; (3) assurance or certification, where a recognized third-party certification scheme with chain of custody provides no-conversion assurance; and (4) jurisdiction or landscape pathway, where compliance is demonstrated at the jurisdictional or landscape level. For full details on each pathway, please see the Land Technical Guidance V2.

For volumes of conversion-driving commodities whose DCF status is unknown, companies will measure and account for land use change by following the guidelines outlined in this chapter, which have been adapted from the Accountability Framework initiative's guidance on the topic in Section 4.5 "Measure and account for conversion of natural ecosystems."

These guidelines are structured based on a company's position within the value chain. They are separated into producers, site owners and site operators, and sourcing of goods or services that lead to natural ecosystem conversion (conversion-driving commodities listed in the high-impact commodity list).

To calculate the baseline, producers, site owners, and site operators shall:

- Map production units and other operational areas and locate them within the Natural Lands Map.
- Consulting the Natural Lands Map and other sources of land cover change, determine if LUC has occurred between the cutoff year and the target-setting year.
-

Those engaged in sourcing conversion-driving commodities shall:

- Map the value chain and identify the origin of volumes of all material conversion-driving commodities to the production unit or sourcing area.
 - Disaggregate volumes per commodity and per traceability level and link to production unit, sourcing area/subnational level of origin.
- Account for the percentage of commodity volumes in compliance with deforestation- and conversion-free requirements.
- Calculate the percentage of commodity volumes in compliance with deforestation- and conversion-free requirements.
- For volumes that are not yet traceable to a production unit or sourcing area, engage the supply chain to enhance traceability and increase the percentage of volumes in compliance with deforestation- and conversion-free requirements, in line with traceability requirements (see the Land Technical Guidance V2, Section 1).

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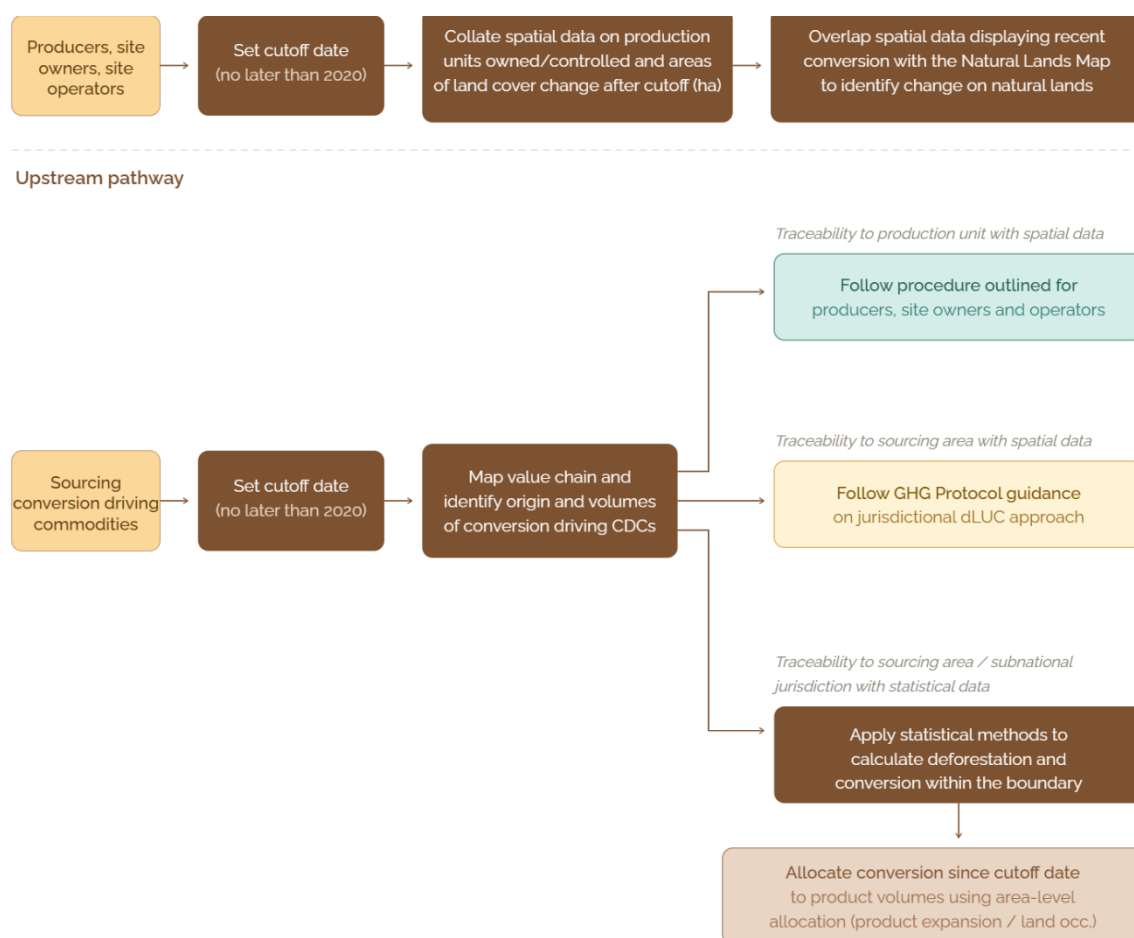


Figure 8: Overview of steps to calculate conversion of natural ecosystems for producers, site owners and site operators, and companies sourcing conversion-driving commodities.

4.2. Cutoff dates

To assess whether land conversion has occurred, land use change events are considered over an assessment period lasting from a cutoff date until the present. For companies setting a No Conversion target, the cutoff date provides a baseline; after this date, any conversion of natural ecosystems on a given production unit renders the materials produced on that production unit non-compliant with a No Conversion target.

Companies setting a No Conversion target must use cutoff dates no later than 2020 as the reference for assessing conversion of natural ecosystems (forests and non-forests). Where other cutoff dates earlier than 2020 exist, companies should use those earlier dates. Companies that have already set a cutoff date earlier than 2020 must use that earlier date or provide justification to SBTN for changing it.

As recommended by the Accountability Framework initiative (2022, 2023), cutoff dates should align with existing sectoral or regional cutoff dates where they exist, such as the Amazon Soy Moratorium, and cutoff dates associated with certification should not be later than 2020.

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Distinction between cutoff dates and target dates

The Land Technical Guidance V2 distinguishes between cutoff dates and target dates. Cutoff dates (no later than 2020) establish the temporal baseline; any conversion of natural ecosystems after the cutoff date renders production unit volumes non-compliant. Target dates define the point by which a company commits to achieving full compliance with the No Conversion target across its operations and supply chain. The Land Technical Guidance V2 provides flexibility for companies that cannot meet an immediate compliance deadline, by allowing them to identify and commit to a target date within a defined window (**Requirement T1.3**). The applicable target dates by value chain segment and ecosystem type are as follows:

- **Direct operations:** Zero conversion from the earliest post-2025 date achievable and, in any case, within two years of target validation;
- **Upstream sourcing—forests:** 100% of sourced volumes of conversion-driving commodities verified as deforestation- and conversion-free by no later than 2030;
- **Upstream sourcing—all ecosystems:** 100% of sourced volumes of conversion-driving commodities verified as deforestation- and conversion-free by no later than 2030.

Companies should publish their target date per value chain segment and disclose the rationale and pathway where the preferred target date cannot be met. Companies are also recommended to publish quantitative annual interim milestones demonstrating year-on-year progress toward full DCF status (**Recommendation T1.2**).

Cutoff dates versus assessment period

Land use change emissions accounting and target setting (guided by the GHG Protocol and SBTi FLAG, respectively) require companies to measure land use change and corresponding emissions based on a retrospective assessment period of 20 years or longer, starting from the reporting year and looking back in time.

If products have a crop cycle or rotation period greater than 20 years, the assessment period should be at least as long as the crop rotation period. The length of the assessment period reflects the average time that it takes for soil carbon stocks to reach a new equilibrium following land use or conversion and takes into consideration diverse land use change trajectories.

The GHG Protocol and SBTi FLAG guidance allow for flexibility in the approach used to allocate the total land use change emissions over the assessment period. Under the GHG Protocol LSRS (2026), companies shall allocate LUC emissions using linear amortization as the default. Equal amortization is permitted only in the specific circumstance of jurisdictional dLUC (jdLUC) scenario B, with justification (LSRS Requirement 10, Table 7.1). See the GHG Protocol LSRS (2026) for more details.

The longer time frame included in land use change emissions for GHG accounting is based on how long emissions from ecosystem conversion remain in the global emissions budget. However, this calculation does not provide guidance on when that land conversion should stop, only the length of time that emissions must be reflected in the GHG inventory.

The 2020 cutoff in the guidelines and the No Conversion target act independently of this GHG accounting guidance and provide a cutoff date for conversion of natural ecosystems aligned with the Kunming–Montreal Global Biodiversity Framework.

4.3. Data requirements

To account for conversion of natural ecosystems, companies need to collect data on the following:

- Location and delineated area of production units of conversion-driving commodities that they own or manage (see definitions for ownership in SBTN Step 1 method and conversion-driving commodities in SBTN's High-Impact Commodity List).
- Operational site areas (e.g., farms, mines, retail locations, infrastructure, and construction sites) that they own or manage.
- Geographic origin and volumes of conversion-driving commodities in their supply chains at the production unit level or sourcing area level.
 - When the origin of all commodities is not yet known at this scale, companies must disclose the volumes of each commodity known only at the country-level resolution. Companies must also disclose the volumes of each commodity of unknown origin. Companies setting a No Conversion target must include these volumes in the upstream target boundary..
- Producers, site owners, site operators, and companies sourcing raw conversion-driving commodities from producers or from the first point of aggregation, as well as those sourcing downstream from the first point of aggregation, must specify the amount of natural ecosystem conversion that occurred after the company's cutoff date on sites it owns or manages, on production units known to be in its supply chains, or in sourcing areas from which it sources commodity volumes.
- For companies setting a No Conversion target, the data structure needed requires traceability of conversion-driving commodities to at least the subnational jurisdiction level.

Detailed data requirements for producers, site owners, and site operators

- All production units and operational sites demarcated by georeferenced boundaries (i.e., polygons), with the exception of small sites (less than 10 ha), for which one point coordinate near the center of production is sufficient.
- Around this point coordinate, a circular buffer with a 12.75-ha area (200 m radius) must be drawn to identify potential conversion occurring within the buffer. Should conversion events be detected in this buffer area, further assessment will be required to identify the real extent of conversion linked to the direct operations of the company.
- Companies are required to account for conversion post-cutoff date(s) for their direct operations.

Detailed data requirements for companies sourcing conversion-driving commodities

- Volumes of conversion-driving commodities (SBTN's High-Impact Commodity List):
 - Disaggregated per commodity and per traceability level and linked to production unit or sourcing area of origin, if former not available.
 - Volumes that cannot be traced to at least subnational level.

AND/OR

- Volumes physically certified using a scheme that delivers no-conversion assurance based on physical chain-of-custody systems.

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Certification schemes

For companies setting a No Conversion target, the use of certification schemes will depend on their ability to provide evidence that the certification scheme, through a chain-of-custody system, demonstrates both deforestation- and conversion-free status with reasonable assurance.

To date, it is not possible for SBTN to evaluate and approve any certification schemes that may or may not provide such assurance. As such, companies wishing to use certifications as proof of no conversion, including deforestation-free, must submit this evidence to SBTN as part of the target validation process.

Preliminary guidance for certifications that demonstrate such assurance for deforestation- and conversion-free assessments has been provided in the Accountability Framework initiative and the CDP (2024) *Time for Transparency: Deforestation- and conversion-free supply chains* report. It is expected that certification schemes will evolve over time in alignment with SBTN standards and regulatory drivers as adoption increases.

For companies using these guidelines to set a No Conversion target, please refer to the Land Technical Guidance V2 for information on how to assess compliance with target requirements by target dates.

Table 7: Specific data needs for calculating conversion of natural ecosystems.

Requirement	Stage of the value chain	Data type	Unit	Spatial data requirements (Georeferenced polygons of production units or sourcing areas)
Required	Producers and site owners/operators	Location of all sites where conversion-driving commodities are produced	Hectares	Required
		Areas converted after cutoff date	Hectares	Required
	Sourcing from producers or first point of aggregation	Sourcing area and volumes of conversion-driving commodities purchased	Hectares and metric tons or equivalent from each area	Recommended

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	Sourcing downstream from first point of aggregation	Sourcing area and volumes of conversion-driving commodities purchased	Hectares and metric tons or equivalent from each area	Recommended
Recommended	Sourcing from producers or first point of aggregation	Production unit	Hectares	Recommended
	Sourcing downstream from first point of aggregation	Production unit	Hectares	Recommended

4.4. Using the SBTN Natural Lands Map

The SBTN Natural Lands Map is used to:

- Estimate natural ecosystem conversion since 2020 associated with a company's operations or the commodity volumes in its supply chains.
- Provide the data necessary for companies to operationalize a 2020 cutoff for no-conversion calculations.

Please note that the SBTN Natural Lands Map can only be used for 2020 cutoff dates. Where other cutoff dates earlier than 2020 exist, companies should use those earlier dates. Companies that have already set a cutoff date earlier than 2020 must use that earlier date or provide justification to SBTN for changing it.

Details on how to access and use the SBTN Natural Lands Map are included in Annex 1.

In this process, preventing conversion of natural ecosystems starts with defining natural lands and estimating where they exist by delineating them on a map.

Natural ecosystems are defined in line with the Accountability Framework initiative's definition of a natural ecosystem as "one that substantially resembles—in terms of species composition, structure, and ecological function—what would be found in a given area in the absence of major human impacts" and can include managed ecosystems, as well as degraded ecosystems that are expected to regenerate either naturally or through management (Accountability Framework initiative, 2024).

According to this definition, SBTN maintains that natural ecosystems include:

- Largely "pristine" natural ecosystems that have not been subject to major human impacts in recent history.
- Regenerated natural ecosystems that were subject to major impacts in the past (for instance, through agriculture, livestock raising, tree plantations, or intensive logging) but where the main causes of impacts have ceased or diminished, and the ecosystem has attained species composition, structure, and ecological function similar to prior or other contemporary natural ecosystems.
- Managed natural ecosystems, including many ecosystems that could be referred to as "semi-natural," where much of the ecosystem's composition, structure, and ecological function are

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present; this includes managed natural forests, as well as native grasslands or rangelands that are, or have historically been, grazed by livestock.

- Natural ecosystems that have been partially degraded by anthropogenic or natural causes (e.g., harvesting, fire, climate change, invasive species, or others) but where the land has not been converted to another use and where much of the ecosystem's composition, structure, and ecological function remain present or are expected to regenerate naturally or by management for ecological restoration.

While natural forests are, of course, part of natural ecosystems, a detailed forest definition is also provided by the Accountability Framework initiative:

- Forests are defined as “land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or other land use” (Accountability Framework initiative, 2024).
- Natural forests are defined as possessing “many or most of the characteristics of a forest native to the given site, including species composition, structure, and ecological function.”

Natural forests include primary forests, regenerated second-growth forests, managed natural forests, and forests that have been partially degraded but still retain their composition, structure, and ecological function, or are expected to regenerate naturally or by management for ecological restoration. Natural forest and tree plantations are mutually exclusive (Accountability Framework initiative, 2024).

The Accountability Framework initiative's conversion definition is also used in anticipation of utilizing the SBTN Natural Lands Map as a baseline for future monitoring purposes. This definition includes changes to another land use or profound change to composition, structure, or function (Accountability Framework initiative, 2024). Such changes are considered ecosystem conversion, regardless of whether or not they are legal.

In the context of these guidelines, the SBTN Natural Lands Map is not intended to:

- Contain time series data that may be useful for monitoring conversion.
- Quantify the area of natural and non-natural lands due to known overestimation of natural lands.
- Supplant existing research and biophysical mapping and analysis on ecosystem science.
- Define ecosystems and/or working lands.
- Be used to assess the quality of ecosystems, including value for biodiversity.
- Represent an unbiased map of natural lands; the conservative approach used overestimates the extent of natural lands, and while remote sensing data, on which the map is based, can provide powerful insights, additional field work should be used to check/confirm the accuracy of the map and to understand local dynamics.

To develop this map, the approach for identifying natural lands across the globe has been to combine the best available global spatial data on land cover/land use into a single harmonized map at a 30-meter resolution. The land cover data best for distinguishing between natural and non-natural land covers have been assessed and selected, using additional data where necessary (see [Natural Lands Map](#) technical documentation).

Where available, regional data from 2020 were incorporated and prioritized to ensure optimal reflection of local and regional knowledge in the map.

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When using these guidelines, if it becomes clear that the representation of natural or non-natural land indicated by the SBTN Natural Lands Map is inconsistent with local realities, please contact SBTN.

The Accountability Framework initiative's definition of natural ecosystems has been operationalized to natural lands based on existing land cover/land use data in the SBTN Natural Lands Map, which is described in Table 1 in the [technical documentation](#). Table 8 in the technical documentation shows the final map classes and their definitions, as not all parts of the Accountability Framework initiative definitions are currently mappable. Specific data and methods used are described in Section 2.2 and 2.3 of the [technical documentation](#).

In the absence of specific definitions for ecosystems outside of forests from the Accountability Framework initiative, the SBTN Natural Lands Map is built on other definitions from available data. Natural grasslands are defined by identifying areas of short vegetation (<5 meters) that are not cultivated, cropland, or tree crops using Land and Carbon Lab's Global Pasture Watch (GPW). Cultivated grasslands include areas where grasses and other forage plants have been intentionally planted and are actively managed, and areas that are heavily managed for human-directed uses, such as grazing livestock.

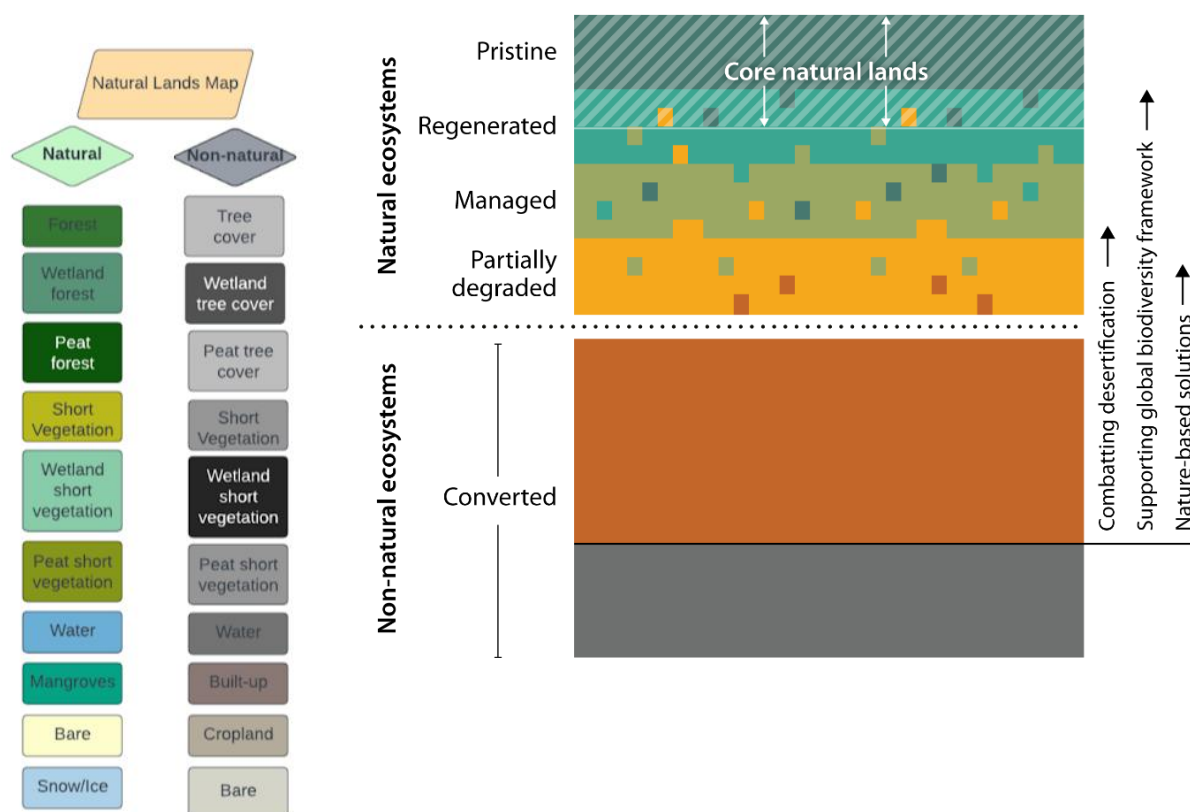


Figure 9: Land cover classes of the SBTN Natural Lands Map and the classification categories of natural ecosystems.

Note: This figure outlines the range of what is considered “natural” for inclusion in the SBTN Natural Lands Map. Core natural lands are a priority designation within natural lands. Here, they are indicated as primarily pristine or regenerated ecosystems, though the data in the Map may also identify core natural lands within managed or partially degraded ecosystems.

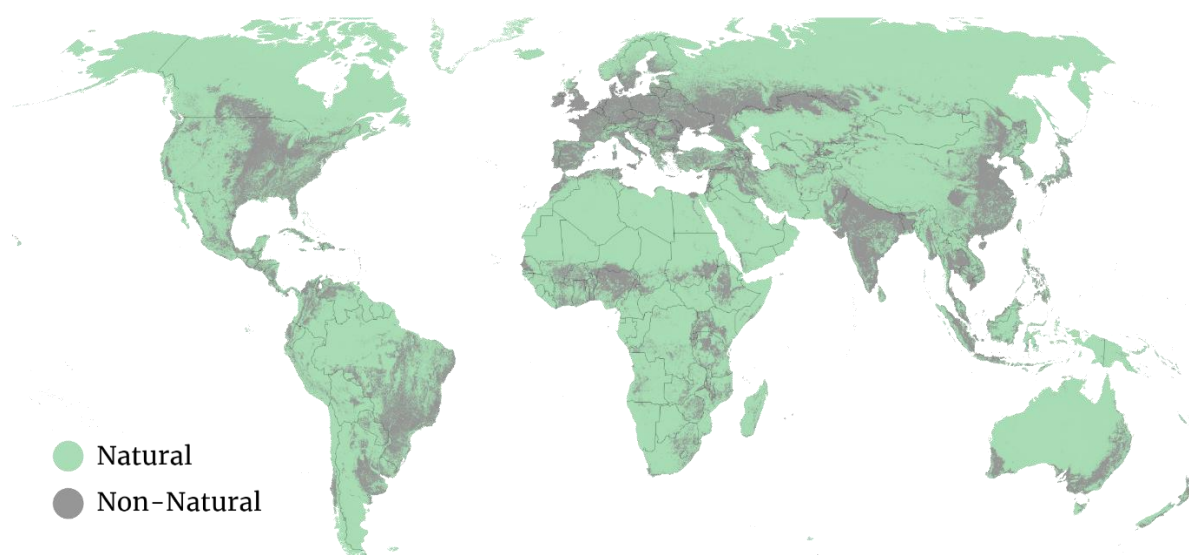


Figure 9: The SBTN Natural Lands Map.

Note: There are no data on the glaciers of Greenland. The global scale of the map obscures data at a smaller scale, meaning that areas that look entirely natural or non-natural at the global level will likely have significantly more diversity in classification at a 30-meter resolution of the map. View and interact with the SBTN Natural Lands Map via the [technical documentation](#) and the following link: <https://wri-datalab.earthengine.app/view/sbtn-natural-lands>

Table 8: Examples of ecosystem types that may be included under the map's natural land cover classes.¹

Natural land cover class	Class definition	Ecosystem examples
Forest	Areas with tree cover greater than or equal to 5 meters in height spanning more than 0.5 hectares, excluding planted trees	Rainforests, dry forests, montane rainforests, heath forests, temperate forests, boreal forests, woodlands, some types of savannas
Short vegetation	Areas of land with vegetation shorter than 5 meters, including areas of land dominated by grass or shrubs, but excluding areas with cultivated grasslands	Grasslands, shrublands, heathlands, steppes, vegetated deserts and semi-deserts, some types of savannas
Wetlands	Transitional ecosystems with saturated soil that can be inundated by water either seasonally or permanently and can be covered by short vegetation or trees	Peatland, mangrove, inland, coastal, saline, freshwater, brackish

¹ For a full description of land cover classes, please see Table 8 in the technical documentation of the Natural Lands Map.

Water	Surface water present for 20% or more of the year, where water is the dominant class	Rivers, lakes, coastal inlets, bays, lagoons
Snow/ice	Areas covered by permanent snow or ice	Glaciers, perennial snowfields
Bare land	Areas with exposed rock, soil, or sand with less than 10% vegetated cover	Sparsely vegetated deserts, lava flows, screes, alpine rocky outcrops, sandy shorelines

Note: The ecosystem examples included in this table do not represent an exhaustive list of all ecosystems included within each land cover class but rather are illustrative examples of some types of ecosystems that may be included. Land cover classes are defined based on the biophysical presence and coverage of certain types of vegetation or landforms, and thus a similar type of ecosystem in different regions may fall into different land cover classes depending on the biophysical characteristics present. In cases where local data were incorporated, SBTN adopted the local definition of the land cover; therefore, there may be inconsistencies in how land cover classes are defined (e.g., tree height threshold for forests).

4.5. Measure and account for conversion of natural ecosystems

This section provides guidance on how companies must or should account for conversion. It has been informed by and adapted from the Accountability Framework initiative's guidance.

The term "land use change" (LUC) is kept here in alignment with the GHG Protocol's accounting guidance but is synonymous with "conversion" and "terrestrial ecosystem change."

Where climate and nature frameworks converge

AGILE's land use change accounting is designed to be compatible with the GHG Protocol LSRS (2026, Chapter 7) and SBTi FLAG. The same assessment period (20 years or the cultivation cycle, if longer) and the same dLUC, jdLUC, and sLUC calculation framework applies; it has been adapted in AGILE for area-based outputs (hectares of conversion) rather than emissions outputs (t CO₂e). Note that cutoff dates serve different purposes in each framework: under the LSRS, the cutoff date defines the start of the retrospective LUC emissions assessment period; under the No Conversion target, it defines the date after which any conversion renders production unit volumes non-compliant with a no-conversion commitment.

Companies that calculate LUC emissions under LSRS or FLAG simultaneously generate the conversion area data needed for the No Conversion of Natural Ecosystems target. The same spatial assessment—applied to the same lands, over the same time period—produces two distinct outputs: LUC emissions in t CO₂e for climate reporting and area of conversion in hectares for the No Conversion target. This ensures concrete "assess once, report twice" efficiency for companies with concurrent climate and nature target obligations.

Where frameworks differ

The No Conversion of Natural Ecosystems target goes beyond retrospective LUC emissions accounting. It requires a forward-looking no-conversion commitment in that companies must

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demonstrate that natural ecosystem conversion will not occur on production units linked to their supply chain after the applicable cutoff date. LUC emissions accounting tells companies what happened; for No Conversion target compliance, companies must demonstrate what will not happen.

Additionally, the GHG Protocol LSRS (2026) requires linear amortization as the default method for allocating LUC emissions over the assessment period; equal amortization is permitted only for jurisdictional dLUC (jdLUC) scenario B with justification. Companies should not treat the two methods as interchangeable.

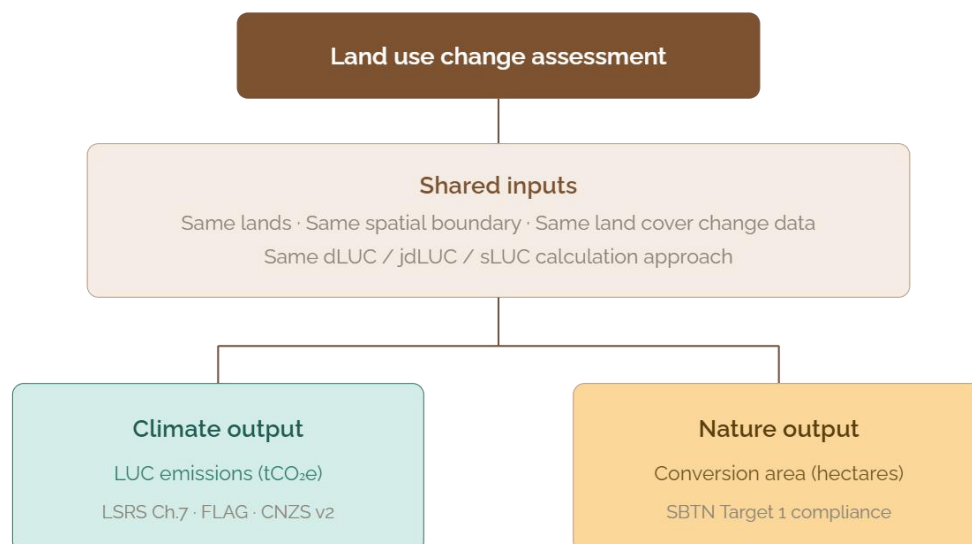


Figure 10: Dual-purpose LUC assessment. One spatial assessment produces climate emissions (t CO₂e) and nature conversion area (hectares).

To effectively progress toward the achievement of targets to end deforestation and conversion from operations and supply chains, companies must measure and account for land use change in credible and consistent ways. This process is also key to accounting for land use change emissions when setting SBTi FLAG targets. After completing the accounting exercise, companies will then use the SBTN Natural Lands Map to understand which portion of land use change constitutes conversion of natural ecosystems.

SBTN recommends that companies account for conversion on an annual basis to demonstrate either compliance with target requirements or to understand the exposure to conversion or conversion risk associated with their sourcing from a given area. Companies should not allocate conversion from a year for which the company does not yet have supply chain data. For instance, if the company has supply chain information on sourced volumes up to 2021, then only conversion between 2020 and 2021 should be allocated to those volumes if the company has used 2020 as the cutoff date. Further guidance on measuring and accounting for conversion is provided in Section 4.6 for companies that do not have sufficient data to calculate conversion associated with sourcing on an annual basis.

Companies can account for conversion using two methods, which are outlined in the sections below:

- Assessment at the production unit level, which requires full traceability and spatial data.
- Assessment at the sourcing area level, which requires traceability to at least the subnational level.

4.5.1. Land use change—scale

Land use change may be assessed based on production unit-level information for direct operations and/or estimated based on the attribution of land use change occurring at the sourcing area level for upstream activities. The parallel processes for calculating land use change emissions are called direct land use change (dLUC) and statistical land use change (sLUC), respectively (see the GHG Protocol LSRS [2026] for further information).

Note: There is one additional approach for calculating land use change emissions at the sourcing area level: the jurisdictional dLUC (jdLUC) approach, provided in the GHG Protocol LSRS. The LSRS recognizes the use of spatially explicit statistical data within the sLUC approach only as a transitional case when moving from sLUC to jdLUC (LSRS Section 7.3). Companies with the requisite data assessing land use change at the sourcing area level can alternatively follow the jdLUC approach in line with the GHG Protocol LSRS (2026). Companies will need to adapt these methods to calculate the area of conversion attributable to their sourcing to align with SBTN requirements.

Determining the appropriate scale of analysis will largely depend on the ability of the company to trace products through the supply chain to their origin, as well as the extent to which that origin is associated with a risk of deforestation or ecosystem conversion, and the appropriate scale of management given the production and sourcing context.

The guidelines recognize that full traceability to production units is not always available and that, in some contexts, a sourcing area or jurisdiction may be the most relevant scale for managing land use change risks. As such, the guidelines provide methods for estimating land use change at different traceability levels.

There are three primary scales at which land use change can be assessed:

- 1) **Traceability to the production unit of origin**
 - This means that companies can trace commodity volumes to specific mapped production units (e.g., farms, ranches, mines, fields, plantations, and forest management units).
 - The Accountability Framework initiative defines a production unit as a discrete land area on which a producer cultivates crops, manages timber, or raises livestock. In the context of this guidance, the understanding of production units is expanded to the extraction sites of the hard commodities listed in SBTN's High-Impact Commodity List (also see Chapter 2 for a definition of "production unit").
- 2) **Traceability to the sourcing area**
 - This means that products are traceable to a known area or region where the material was produced or extracted but that the specific production unit of origin is not known.
 - Sourcing area-level boundaries could include a sourcing radius from a first point of collection or processing facility (e.g., a radius from an oil palm mill), a defined production landscape (e.g., the area covered by a smallholder cooperative), or a subnational jurisdiction (e.g., municipality).
- 3) **Limited or no current traceability**
 - This means that products can currently only be traced to a country of origin or that the origin of products is unknown.
 - Where there is limited or no current traceability, companies setting a No Conversion target should address these volumes through the supply chain engagement approach. Companies should simultaneously pursue improved traceability to enable place-based target setting over time.

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Table 9: Appropriate measures of land use change.

Level of traceability and monitoring	Position in the supply chain	Unit of analysis	Accounting metrics and methods for deforestation and conversion (disaggregated by commodity)
Production unit	Own operations	Own farms and/or plantations	Hectares of deforestation or conversion in operations since cutoff date % of total hectares owned or managed that this represents
	Supply chain	Known supply chain farms/plantations	Hectares of deforestation or conversion on production units in supply chain since cutoff date % of total hectares on known farms that this represents
Sourcing area	Supply chain	Known sourcing (e.g., mill sourcing radius, production landscapes, or subnational jurisdictions)	Hectares of natural ecosystem conversion in sourcing areas since cutoff date that may be attributed to the company
Limited or no traceability	Supply chain	Country of origin	Volume of materials (and proportion of total) sourced from each country*
		Unknown origin	Volume of materials (and proportion of total) sourced for which region is unknown*

*Where there is limited to no traceability, hectares of deforestation and conversion cannot be estimated. Source: Accountability Framework initiative (2022)

4.5.2. Land use change—at production unit level

Monitoring conversion at the level of production units (e.g., farms, plantations, and forest management units) provides the greatest degree of precision about the impact of company operations and supply chains and is the best way to determine whether products or sites are linked to recent deforestation or conversion.

When accounting for deforestation and conversion at the site level, all conversion in the production unit that has occurred since the cutoff date must be included, regardless of the current use of that land (i.e., whether it is used to produce the commodity of interest, to produce another commodity, has not yet been used to produce a commodity, or is not currently being used for production).

Accounting for land use change at the production unit level requires known and mapped locations for the given production units. Production units should be demarcated by georeferenced boundaries (i.e.,

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polygons), with the exception of small sites (e.g., less than 10 ha), for which one point coordinate at the geographic center of the production and a circular buffer around that point, representing 10 hectares, will be sufficient. The same approach, described here for production units, can be used for project sites (e.g., mining sites and construction sites).

The role of any given company in monitoring and accounting for land use change at the production unit level may differ depending on its position(s) in the supply chain.

- **Upstream supply chain actors** (i.e., producers, primary processors, and traders with visibility to the production unit) are in a position to monitor on-the-ground conditions. They should directly monitor and document land use change and furnish downstream buyers with information about deforestation and conversion associated with the products being sold.
- **Downstream companies** that purchase commodities or derived products may assess recent deforestation and conversion at the production unit level by gathering data collected by their suppliers, monitoring known production units directly using spatially explicit remote sensing data, or using third-party certification schemes with chain-of-custody models that provide traceability to origin.

Companies should apply the following steps to account for land use change at the scale of the production unit

1. Identify the spatial boundaries of production units owned or managed by the company or known to produce materials in a company's supply chain using spatial data, as outlined in Section 4.3.
2. Identify land cover change that has occurred within the spatial boundary since the cutoff date. For 2020 cutoff dates, companies may use the SBTN Natural Lands Map to identify whether land cover change occurred on natural lands. Deforestation and conversion identified since the cutoff date should be reported through the appropriate indicators (see the Land Technical Guidance V2).
3. If there has been no deforestation or conversion on a production unit since the cutoff date, then product volumes from that production unit may be considered deforestation-/conversion-free.

4.5.3. Land use change—at the sourcing area level

It is sometimes not possible or appropriate to assess conversion of natural ecosystems at the scale of specific production units in a company's supply chain. In these cases, supply chain deforestation/conversion may be accounted for at the scale of a sourcing area in which production units are located.

Depending on the location, production context, and commodity, a sourcing area may be the supply shed of a processing facility (such as a radius surrounding a palm oil mill), a production landscape (such as the area encompassing a smallholder cooperative), or a subnational jurisdiction.

Assessments at an area level serve as a proxy for direct land use change. By providing an estimate of land use change potentially allocated to a given product, sLUC also inherently considers a certain amount of indirect land use change, since pressure by expansion of one commodity may lead to land use change for another commodity (see Section 4.5 of the Accountability Framework initiative's [2022] guidance).

When land use change may be assessed at the sourcing area level

Accounting for deforestation and conversion associated with commodities at the scale of a sourcing area may be appropriate in a range of circumstances, including when:

- Downstream companies do not have physical traceability to the production unit level and may therefore need to monitor land use change at the sourcing area level as the best available option. In this case, the sourcing area should be the smallest geographic area from which commodity volume is known to originate, and companies should also take steps to increase the traceability of these volumes.
- A sourcing area is the most relevant scale for managing deforestation and conversion risks, for example, where:
 - Upstream companies, such as primary processors, source commodity volumes from a specified radius or supply shed around their facilities without maintaining long-term buying relationships with specific producers.
 - Companies source from smallholder producers whose materials are aggregated at the level of a co-op or collection point and where further traceability is not possible.
- Companies source from jurisdictions or landscapes where it can be shown that there has been no or negligible recent conversion. In these cases, companies may find it cost-effective to monitor deforestation/conversion at the level of such areas. Doing so requires regular monitoring to assess or confirm the risk status of these jurisdictions and identify any changes in risk status.

Methods to allocate land use change in a sourcing area to commodity volumes

There are many approaches to allocating area-level data on land use change to commodity volumes sourced from that area, and improved data and methodologies are rapidly being developed. All such methods utilize remote sensing data repeated over the relevant time frames, as well as statistics about production and land use in the area.

Land use change included in the allocation process

When allocating land use change to specific commodity volumes at an area level, all land use change related to agriculture and animal husbandry, forestry, and hard commodities must be included in the analysis where relevant. Consideration of all commodity-related land use change allows companies and others to best account for varied land use change trajectories or indirect land use change pressures, providing an appropriately conservative approach to allocation.

Time frame of land use change included in the allocation process

When accounting for deforestation and conversion, the cutoff date should be used to calculate the land use change to be allocated, as outlined in Section 4.2.

Allocation approaches

The GHG Protocol provides two approaches for allocating land use change in a given area:

- Allocation based on product expansion (default first choice).
- Allocation based on land occupation.

The table below provides a summary description of these two approaches.

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Table 10: Adapted GHG Protocol LSRS approaches to allocation of land use change at the sourcing area level.

Basis for allocation	Method	Data needs specific to allocation approach	Data needs common to both allocation approaches
Relative product expansion <i>Referred to as “product expansion allocation method” by the GHG Protocol. Required as the default under LSRS V1.1 for sLUC; shared responsibility only permitted with justification (LSRS Section 7.3)</i>	Allocate recent land use change across products based on the relative area of expansion for each product	Total expansion of production area in the jurisdiction since cutoff date Expansion of production area for commodity of interest since cutoff date	Area of land use change in sourcing area Deforestation/conversion occurred since cutoff date Quantity of commodity of interest produced in the area Quantity of commodity of interest sourced by the company from the area
Relative land occupation <i>Referred to as “shared responsibility allocation method” by the GHG Protocol. Only permitted under LSRS V1.1 with justification of the specific circumstance (as defined in LSRS Section 7.3)</i>	Allocate recent land use change across products based on the relative land area occupied by each product	Total land area in sourcing area Amount of land area used for the production of commodity of interest in sourcing area	

Other allocation methods may be used if they meet the above criterion of considering related land use change in the sourcing area. In particular, when commodities represent a relatively small component of land use in an area, other more context-specific approaches may be warranted.

Allocation approaches based on product-specific conversion —those which only consider land use change on land currently used for the production of a given commodity—may not effectively account for land use change trajectories in a sourcing area and therefore may not be credible. Such product-specific conversion approaches were not adopted in the published GHG Protocol Land Sector and Removals Standard, Version 1.1 (2026), and the spatial sLUC approach is not included as an eligible calculation method in the LSRS.

As noted in Section 4.5.1, an additional approach is included in the GHG Protocol LSRS (2026): the jurisdictional, or jdLUC, approach. The jdLUC approach reflects an intermediate level of accuracy and accounts for land use change on attributable productive lands in a jurisdiction or sourcing region. The jdLUC approach should be used where companies have spatial data on products sourced at the relevant sourcing area.

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In all cases, the method and data sources used to allocate land use change to products within a sourcing area *must* be clearly disclosed as forest or non-forest conversion and ideally disaggregated by ecosystem, where possible, using the [IUCN Global Ecosystem Typology](#).

Companies should apply the following steps to account for land use change at the sourcing area level

1. Select an appropriate spatial boundary based on the physical traceability of the product to a given area, for example, a sourcing region or subnational jurisdiction.
Companies setting SBTN's Land targets must use the first administrative division below the national scale or better spatial resolution.

2. To account for deforestation and conversion, use suitable data products to identify all areas within the spatial boundary where land use has changed from a natural ecosystem since the cutoff date.

3. Allocate deforestation and conversion identified since the cutoff date to product volumes using one of the approaches referenced in Table 10 or a similar credible method.

Deforestation/conversion footprint should be reported through appropriate indicators (see the Land Technical Guidance V2, Section 1), along with information on allocation methods and data sources.

If no land use change is identified within a given sourcing area, then volumes sourced from that area may be considered deforestation-/conversion-free.

4.6. Further guidance on statistical approaches to measure and account for conversion of natural ecosystems

For companies adopting the sLUC approach, in order to appropriately account for conversion attributable to sourced commodities, the following data are required:

- Annual supply chain data
- Annual dataset to identify all areas within the spatial boundary where land use has changed from a natural ecosystem
- Ability to allocate deforestation and conversion to a given commodity in a given sourcing area on an annual basis

Without these data, challenges arise which may lead to significant overestimation or underestimation of conversion attributable to a company's sourcing.

An example that illustrates some of the challenges companies may face using the sLUC method without annual data are provided below.

When assessing conversion using statistical data, if companies cannot calculate attributable conversion annually, SBTN recommends companies calculate the total volumes of sourced conversion-driving commodities and identify conversion events that occurred within the sourcing

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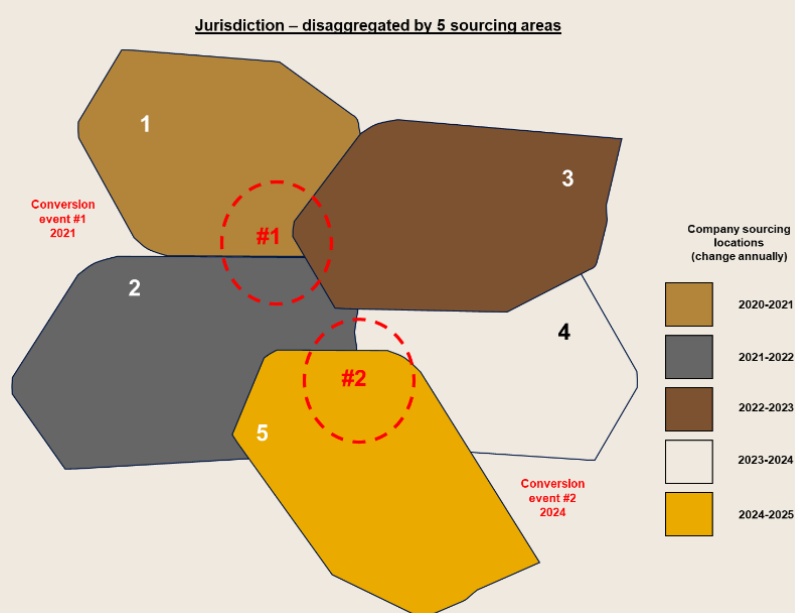
jurisdiction. Some of this land use change may not be attributable to their sourced volumes and, as such, companies may disclose that volumes are sourced from jurisdictions “at risk of deforestation and conversion.”

Example

A company sources conversion-driving commodities and has traceability to the sourcing area. The company changes its sourcing area on an annual basis, as illustrated in the figure below. There have been two conversion events in the jurisdiction, in 2021 and 2024. Based on the company's sourcing, attributable conversion to the sourced commodity is as follows:

Portion of conversion event #1 in Area 2

Portion of conversion event #2 in Area 5



Scenarios 1 and 2 demonstrate the challenges of calculating conversion without annual data.

Scenario 1

Method: The company assesses conversion in 2025 using supply chain data from 2022 to 2023, and land use change data from 2020 to 2023.

Calculated conversion: Volumes sourced from Area 3 are associated with a portion of conversion event #1 in Area 3.

Result: Incorrect calculation —portion of conversion event #1 in Area 3 not attributable to company.

Scenario 2

Method: The company performs the assessment in 2025 using supply chain data from 2021 to 2022 and from 2024 to 2025, and land use change data from 2020 to 2025.

Calculated conversion: Volumes sourced from Area 2 linked with both conversion events #1 and #2. The volumes sourced from Area 5 are associated with conversion event #2.

Result: Overestimation of conversion —portion of conversion event #2 in Area 2 not attributable to company sourcing.

Scenario 3

Method: The company assesses conversion using annual supply chain data from 2020 to 2025, and land use change data from 2020 to 2025.

Calculated conversion: Volumes sourced from Area 2 are associated with a portion of conversion event #1 and volumes sourced from Area 5 are associated with a portion of conversion event #2.

Result: Correct calculation.

Chapter 5. Land area and quality

This chapter focuses on the provision of accounting guidelines to companies, enabling them to calculate the following land area and quality categories, related to the SBTN Working Land Regeneration and Restoration target:

- Land area
 - Land footprint
 - Natural land cover
- Land quality
 - Soil organic carbon
 - Soil erosion
 - Terrestrial acidification

Section	Guidelines
• 5.0	Land area and quality impact categories provides a summary description of each of the land area and quality categories: land footprint; natural land cover; soil organic carbon; soil erosion; terrestrial acidification
• 5.1	Calculation guidelines for land footprint provides the accounting and calculation guidelines for land footprint for producers, site owners and site operators, and purchasing companies with an upstream land footprint
• 5.2	Calculation guidelines for natural land cover provides accounting and calculation guidelines for natural land cover for direct operations. (<i>Optional</i>) Companies can follow the direct operations approach for their upstream value chain if they have the requisite traceability and data
• 5.3	- Calculation guidelines for soil organic carbon, soil erosion, and terrestrial acidification provides the accounting and calculation guidelines for direct operations. (<i>Optional</i>) Companies can follow the direct operations approach for their upstream value chain if they have the requisite traceability and data - The guidelines for calculating land quality categories are split into four approaches: - Activity assessment approach to calculate soil organic carbon and soil erosion impacts for direct operations, which utilizes land environmental assessment factors - Alternative approach to calculate soil organic carbon, which provides an overview of model-based, remote sensing-based, and measurement-based approaches using the stock change accounting method derived from the GHG Protocol LSRS (2026) - Alternative approach to calculate soil erosion, which outlines a method using the Revised Universal Soil Loss Equation (RUSLE) or similar localized models - Activity assessment approach for terrestrial acidification impacts for direct operations, which utilizes characterization factors

5.0. Land area and quality impact categories (related to the SBTN Working Land Regeneration and Restoration target)

- **Land footprint:** Refers to the land owned or controlled by the company or land required to produce the products it sources. Importantly, “land footprint,” or “land occupation,” refers to “working land” used for production in corporate supply chains, not necessarily all land owned or controlled by companies. Land that is not attributable to direct operations or upstream value chain activities is not included and thus reductions or improvements in impact categories are not applied to extensive land holdings held in reserve. These guidelines outline the approach to calculate land footprint in Section 5.1.
- **Natural land cover:** Refers to the proportion of (semi-)natural land present in a landscape. These guidelines provide an approach for companies to calculate natural land cover in their direct operations in Section 5.2.
- **Soil organic carbon (SOC):** Soil organic carbon is carbon stored in soil organic matter and can act as a proxy indicator for a variety of ecosystem services. These guidelines provide methods to calculate soil organic carbon within companies’ land footprints (Section 5.3).
- **Soil erosion:** Erosion can be defined as the wearing away of the land surface by physical forces, such as rainfall, that abrade, detach, and remove soil or geological material from one point on the Earth’s surface to be deposited elsewhere (European Commission, 2020). To mitigate the effects of soil erosion, soil and water conservation strategies are required (European Commission, 2020). The guidelines outline an approach for companies to measure soil erosion associated with their direct operations—focusing on water as the mechanical force—in Section 5.3.
- **Terrestrial acidification:** This is the process by which soil becomes more acidic. It is a change in soil chemical properties (e.g., decrease in soil pH) caused by the inputs and dissociation of compounds with acid-base chemistry, such as oxides of sulfur or nitrogen. The primary pollutants that lead to terrestrial acidification are nitrogen (NH_3 and NO_x) and sulfur (SO_2) emissions (European Environment Agency, 2008). These guidelines outline an approach for companies to measure terrestrial acidification associated with their direct operations in Section 5.3.

5.1. Calculation guidelines for land footprint

The process to calculate a company's land footprint is described in Figure 12.

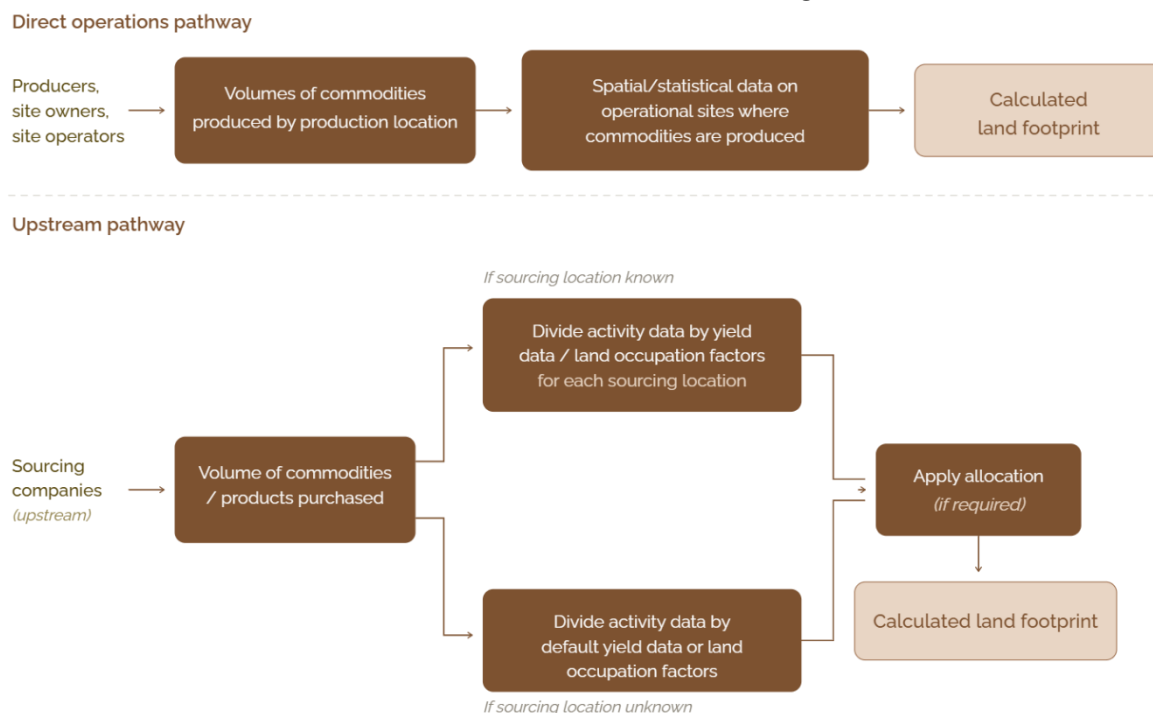


Figure 11: Process for calculating land footprint disaggregated by producers/site owners/operations (direct operations) and sourcing companies (upstream value chain).

5.1.1. Data requirements for calculating land footprint

Table 11: Data requirements for calculating land footprint.

Stage of the value chain relevant to requirement	Data type	Unit	Spatial data requirements (Georeferenced polygons of production units or sourcing areas)
Producers or site owners/operators	Volumes of commodities produced by production location (primary or statistical data)	Metric tons	Recommended
Producers or site owners/operators	Data on operational sites where commodities are produced (spatial or statistical)	Hectares	Recommended

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Sourcing from producers or first point of aggregation	Volumes of commodities purchased (primary or statistical data, differentiated to the extent possible by sourcing location)	Metric tons	Not required
Sourcing from producers or first point of aggregation	Yield of each product purchased (statistical data, matched to the extent possible with the sourcing locations linked to the purchasing volume data above, e.g., national or subnational yield data)	Metric tons per hectare per year	Not required
Sourcing downstream from first point of aggregation	Volumes of commodities purchased (primary or statistical data, differentiated to the extent possible by sourcing location)	Metric tons	Not required
Sourcing downstream from first point of aggregation	Yield of each product purchased (statistical data, matched to the extent possible with the sourcing locations linked to the purchasing volume data above, e.g., national or subnational yield data)	Metric tons per hectare per year	Not required

For companies with access to statistical data, land footprint can be calculated by using yields in t/ha/year to convert from metric tons of product to hectares, or, alternatively, by using land occupation factors—essentially the reciprocal of yields (e.g., square meter -year per kg [m²a/kg])—from LCA databases. Companies may refer to the [SBTN Tool Library](#) and the GHG Protocol LSRS (2026) for lists of tools and databases that include yields and/or land occupation factors.

Reuse of land footprint data from GHG emissions calculations

If the company has already calculated GHG emissions associated with its land-based operations (scope 1) and/or value chain activities (scope 3), in line with reporting via the GHG Protocol and/or target setting via SBTi, the company's activity data are already likely well organized for the purposes of calculating the associated land footprint. The company may even be able to calculate land footprint using the same environmental database that it used to calculate GHG emissions (e.g., ecoinvent).

5.1.2. Allocation

In instances where the land area sourced from is known, and it is known that multiple commodities are produced on that land area each year, an allocation approach may be needed. Please refer to Chapter 3 for guidance on selecting an appropriate allocation approach.

5.1.3. Calculating land footprint

Spatial approach

When using spatial data, companies should sum the hectares in all their active production areas to estimate total land footprint.

Statistical approach

- **Producers or site owners/operators (direct operations):** Statistical (non-spatial) data on quantities of commodities produced, and statistical or spatial data allowing for calculation of total surface area of working lands producing those commodities.
- **Sourcing companies (upstream value chain):** Statistical (non-spatial) data on quantities of commodities or derived products sourced, locations (e.g., countries and/or subnational jurisdictions), if known, and yield of each product for each location.

For companies using statistical data to estimate total land footprint, the general approach is to divide activity data (e.g., production in metric tons) by yield factors (e.g., metric tons per hectare) to estimate the amount of land required annually, as demonstrated below (GHG Protocol LSRS, 2026). In this case, companies should sum all estimates across all products to obtain their complete land footprint inventory.

Where climate and nature frameworks converge

Land footprint calculated under AGILE—measured in hectares per year, derived from activity data divided by yield factors—uses the same underlying data and quantification approach as the LSRS “land occupation” metric (LSRS, Chapter 8). The GHG Protocol LSRS (2026) requires companies to report land occupation disaggregated by land use category; AGILE extends this by requiring companies to set intensity-based land footprint reduction targets under the Working Land Regeneration and Restoration target.

Companies already reporting land occupation under LSRS have the data foundation needed for an SBTN T2 land footprint reduction baseline.

Where frameworks differ

CNZS V2 does not require land footprint reporting or reduction targets. Land footprint reduction under the Working Land Regeneration and Restoration target is a nature-only metric. Companies cannot claim climate target credit for land footprint intensity improvements achieved through SBTN.

Land footprint for products (adapted from the GHG Protocol LSRS, 2026)

$$\text{Land footprint for products (ha)} = \frac{\text{Quantity of product produced or purchased (t)}}{\text{Yield of that product (t/ha)}}$$

Where:

ha = Hectares

t = Metric tons

For food, feed, and energy feedstocks, global and national average yields can be accessed from online data repositories, such as FAOSTAT or LCA databases or meta-analyses (e.g., Poore and Nemecek, 2018; GHG Protocol LSRS, 2026). More specific yield information covering regional, national, or production unit levels can also be used.

When using statistical data, following the GHG Protocol LSRS (2026) guidance, companies should use the most spatially explicit data available for each commodity produced or purchased, and seek to improve traceability and data quality over time. For further details please refer to the GHG Protocol LSRS (2026) on accounting for land footprint.

If a product's origin is not yet known, a default assumption (e.g., production assumed to be from the same world region as company headquarters) may be used to select the appropriate yield data if well justified to SBTN.

When estimating land footprint of purchased mixed products, such as products containing multiple commodities, companies should try to back-calculate the amounts of raw products for the purpose of estimating land footprint by using product formulation, recipe data, or other reasonable assumptions (e.g., categorizing each mixed product according to its primary ingredient or its top three ingredients). When estimating land footprint using statistical data, emphasis should be given to the land footprint related to products containing high-impact commodities.

Note on waste and residual products: If a company purchases residual products (i.e., by-products from other value chains), then the company should use an allocation method to estimate the land footprint of the purchased residual product. If a company sources, and does not purchase, a product that is truly a waste product, meaning it has no market value, then it can be excluded from the land footprint.

Note on non-timber forest products: Where a company produces or sources non-timber forest products in land classified in FAOSTAT as forest, then those volumes can be excluded from the land footprint calculation. This is in recognition of the role that low-impact harvesting of non-timber forest products can have in bringing economic value to standing forests.

5.2. Calculation guidelines for natural land cover

This section provides guidelines for calculating natural land cover within direct operations. Companies can optionally follow the direct operations approach for their upstream value chain if they have the requisite traceability and data.

Calculating natural land cover follows a similar process to calculating land use change, using the SBTN Natural Lands Map in Chapter 4. The SBTN Natural Lands Map's definition of "natural land" includes "semi-natural land." As such, calculations of the percentage of natural land using the SBTN Natural Lands Map will inherently calculate the percentage of natural and semi-natural land combined.

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The Natural Land Cover target is applicable to all companies required to set the Working Land Regeneration and Restoration target, which meet the scope and applicability conditions set out in the Land Technical Guidance V2 (**Requirement T2.7**). There are two applicable spatial pathways, which are determined by the area of each production unit. The applicable pathway governs how baseline natural land cover is calculated and how the target threshold of 25% per km² is assessed. Three compliance tracks are then available to accommodate different operational and landscape realities.

5.2.1. Data requirements

Table 12: Summary data requirements for natural land cover.

Stage of the value chain	Data type	Unit	Spatial data requirements	Applicable pathway
Direct operations	Location and delineated area of all production units	Hectares	Georeferenced point or polygon data of production units (required)	Both
Direct operations	Area of each production unit	km ²	Required to determine pathway assignment	Both
Direct operations (Pathway 2 only)	Landscape-scale natural land cover up to 1 km ²	%	Calculated from SBTN Natural Lands Map or equivalent data source	Pathway 2
Upstream (optional)	Location and delineated area of upstream production units	Hectares	Georeferenced point or polygon data (if following direct operations approach upstream)	Both

Companies are required to utilize spatial data (points or polygons) of each production unit in their direct operations (**Requirement T2.8**). If these data are not immediately available, companies should collect them prior to setting the Natural Land Cover target.

5.2.2. Using the SBTN Natural Lands Map

Details on using the SBTN Natural Lands Map are provided in Chapter 4 and Annex 1. The map will enable companies to identify natural and semi-natural ecosystems within and around their production units.

The SBTN Natural Lands Map can only provide natural land cover data from 2020. As such, the choice of base year must be no earlier than 2020 (**Requirement T2.9**). The base year does not need to align with the cutoff date(s) used as the reference for assessing conversion of natural ecosystems under the No Conversion target.

If a company possesses spatial natural land cover data of higher resolution or accuracy than the SBTN Natural Lands Map can provide (i.e., 30-meter resolution), or dating more recently than 2020, these data may be used instead to calculate baseline natural land cover under either pathway, provided these data are publicly available (**Recommendation T2.6**).

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The SBTN Natural Lands Map may overestimate the area of natural land in some regions. As better data becomes available, it is possible that the original calculation of natural land area could change. Companies should seek to improve the quality of the land cover data they collect over time (**Recommendation T2.7**).

5.2.3. Determining the applicable spatial pathway

The approach to calculating baseline natural land cover is determined by the area of each production unit (**Requirement T2.12**). Two spatial pathways apply:

- Pathway 1 applies to production units with an area equal to or greater than 1 km².
- Pathway 2 applies to production units with an area less than 1 km².

Where a company has a mix of production unit sizes across its direct operations, Pathway 1 and Pathway 2 should each be applied to the production units to which they respectively apply.

5.2.4. Accounting for natural land cover—Pathway 1 (production units $\geq$ 1 km²)

Where a production unit has an area equal to or greater than 1 km², the spatial resolution of the SBTN Natural Lands Map is sufficient to characterize the distribution of natural and semi-natural land cover within the production unit boundary.

The following step-by-step approach provides the method for companies to calculate baseline natural land cover under Pathway 1 (**Requirement T2.13**).

- **Step A.** Demarcate production units by georeferenced boundaries. Within each production unit, identify the center point. This center point marks the center of a grid comprised of 1 km² grid cells.
- **Step B.** Once the grid is generated, identify each grid cell covered by at least 50% of the production unit polygon. This is the scope of the assessment of natural land cover for the production unit.
- **Step C.** For each 1 km² grid cell covered by at least 50% of the production unit polygon, calculate the natural land cover by calculating the proportion of pixels from the SBTN Natural Lands Map (1 pixel = 30 × 30 m) within the 1 km² grid cell that are classified as natural land.
- **Step D.** Repeat for each 1 km² grid cell covered by at least 50% of the production unit polygon to calculate the proportion of natural land cover for all cells in scope.

To determine the representative percentage (%) of natural land cover per km² for each production unit, calculate the average natural land cover values across the 1 km² grid cells covered by the production unit polygon. This constitutes the production unit natural land cover baseline under Pathway 1.

5.2.5. Accounting for natural land cover—Pathway 2 (production units $<$ 1 km²)

Where a production unit has an area of less than 1 km², assessment of natural land cover at the production unit boundary alone is insufficient to characterize the ecological context in which that production unit is situated. A small production unit may fall entirely within a highly managed matrix where conditions within the boundary do not reflect the broader landscape or, conversely, within a naturally functioning landscape where the production unit itself appears degraded. To account for this, companies should assess natural land cover at two nested spatial scales (**Requirement T2.15**):

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- **Scale 1—The 1 km² landscape scale:** The proportion of natural and semi-natural land cover within a 1 km² spatial unit associated with the production unit, assessed using the SBTN Natural Lands Map or equivalent data source.
- **Scale 2—The production unit scale:** The proportion of natural and semi-natural land cover within the production unit boundary itself, assessed using the SBTN Natural Lands Map or equivalent data source.

Both assessments together constitute the production unit natural land cover baseline under Pathway 2.

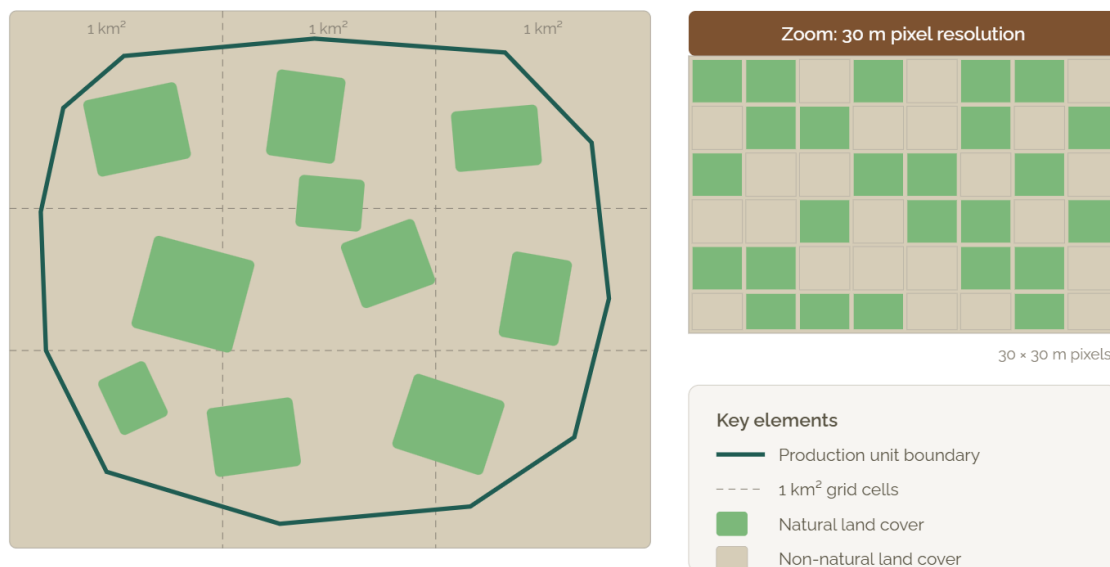
The following step-by-step approach provides the method for companies to calculate baseline natural land cover under Pathway 2.

- **Step A.** Demarcate the production unit by georeferenced boundaries (point or polygon). Identify the 1 km² grid cell within which the production unit is located. Where a production unit falls across two or more 1 km² grid cells, assign the production unit to the grid cell containing the largest portion of its area.
- **Step B.** Calculate the landscape-scale natural land cover (Scale 1). For the 1 km² grid cell identified in Step A, calculate the proportion of SBTN Natural Lands Map pixels (1 pixel = 30 × 30 m) classified as natural land, using the same pixel-counting method described in Section 5.2.4, Steps C–D. This constitutes the landscape-scale natural land cover (NLC) baseline.
- **Step C.** Calculate the production unit-scale natural land cover (Scale 2). Within the production unit boundary itself, calculate the proportion of SBTN Natural Lands Map pixels classified as natural land. This constitutes the production unit-scale NLC baseline.
- **Step D.** Set independent targets at each scale. The 25% per km² threshold applies independently at both the landscape scale and the production unit scale. Where natural land cover is below 25% at either or both scales, the company should set a target to increase NLC to at least 25% at that scale by the target year. Where NLC is at or above 25% at both scales, the company should set a maintenance target at the baseline value.

Where natural and semi-natural land cover is below 25% at both scales, companies are encouraged to develop a phased implementation strategy addressing both scales over the target period, focusing near-term actions within the production unit and extending medium-to-long-term engagement to the broader landscape context, for example, through the Landscape Engagement target (**Recommendation T2.5**).

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Pathway 1 · Production unit $\geq 1 \text{ km}^2$



Assessment scope: NLC assessed directly within the production unit boundary.
 At $\geq 1 \text{ km}^2$, the 30 m spatial resolution of the SBTN Natural Lands Map is sufficient to characterise the distribution of natural and semi-natural land cover within the boundary.
 Grid cells covered by $\geq 50\%$ of the production unit polygon define the assessment scope.

Pathway 2 · Production unit $< 1 \text{ km}^2$



Where a production unit has an area of less than 1 km^2 , assessment of NLC at the production unit boundary alone is insufficient to characterise the ecological context. Companies must assess NLC at two nested spatial scales: the 1 km^2 landscape context surrounding the production unit, and the production unit itself.

Figure 12: Natural land cover assessment: Pathway 1 ($\geq 1 \text{ km}^2$) and Pathway 2 ($< 1 \text{ km}^2$).

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To accommodate companies operating in different operational and supply chain realities, three compliance tracks are available for implementing the Natural Land Cover target. Track A is the default expectation. Tracks B and C are available where the qualifying conditions are met and documented. The applicable track(s) should be identified and disclosed at target submission and updated at each annual reporting date.

The Land Technical Guidance V2 (Annex 5a) sets out the full scenario guidance for selecting tracks based on production unit and 1 km² grid cell NLC relative to the 25% threshold.

5.2.5.1. Track A—Production-unit compliance (default)

Track A is the default compliance route for all production units in scope. Under Track A, the NLC target is met by achieving or maintaining natural and semi-natural land cover at or above 25% per km² within the production unit boundary (Pathway 1) or at both the production unit and 1 km² landscape scales (Pathway 2), verified against the baseline assessed through the SBTN Natural Lands Map and documented using equivalent data to show change or maintenance at each reporting date.

Accounting under Track A. Companies should report the NLC percentage for each in-scope production unit at the relevant spatial scale(s) at each annual reporting date, using the same calculation method used to establish the baseline. The reported value is compared against the baseline to determine whether the target is being met (maintenance) or progress is being made toward the target (increase).

5.2.5.2. Track B—Landscape-scale compliance (contextual alternative)

Track B is available where a company can demonstrate that achieving 25% NLC at the production unit or 1 km² grid scale under Track A would create a significant risk of supply displacement leading to land use change elsewhere.

Under Track B, NLC target requirements can be met by:

- (i) Best-effort NLC improvement within the production unit; and
- (ii) A validated Landscape Engagement target in a landscape connected to the in-scope production units, with NLC improvement as a defined and measurable goal. Annual disclosure of the landscape's NLC is required.

Accounting under Track B. Companies electing Track B should report both the production-unit-level NLC (as under Track A) and the landscape-level NLC annually, using consistent methodology. The landscape boundary and initiative should be documented at target submission and aligned with the Landscape Engagement Roadmap described in Chapter 6 and the Land Technical Guidance V2, Annex 7.

5.2.5.3. Track C—Practice-based compliance

Track C is available where spatial data cannot yet detect the resulting habitat change. This may occur where, for example, increased NLC cover comes from sub-pixel features (e.g., field margins below 30 m width) or where land use type misclassification in the underlying data layers prevents accurate spatial detection.

Under Track C, practice changes can meet NLC target requirements provided they satisfy three conditions:

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- Documented causal pathway:** a documented causal pathway from the practice to the establishment, retention, or recovery of (semi-)natural habitat, grounded in peer-reviewed evidence or nationally or internationally recognized standards and practices.
- Additionality:** the practice represents a change from the management baseline at the target-setting date.
- Spatial attribution:** the practice is georeferenced to the production unit in scope.

Illustrative eligible practices include permanent uncultivated field margins, hedgerow planting or restoration, wetland feature creation or restoration, semi-natural grassland conversion, agroforestry integration, and rewilding of marginal parcels. The Land Technical Guidance V2, Annex 5a, provides the full list and detailed specifications for each.

Accounting under Track C. Companies electing Track C for one or more production units should submit the following at annual reporting:

- Practice register:** practice type, georeferenced location, area or linear extent, establishment date, management commitment period, and the agri-environmental standard or peer-reviewed source substantiating the causal pathway.
- NLC-equivalent area:** using a nationally recognized conversion factor where available or a disclosed conservative methodology reviewed at validation.
- Detection gap statement:** explaining why the SBTN Natural Lands Map does not yet register the practice change.
- Maintenance confirmation:** annual confirmation that the practice is maintained.

Companies electing Track C should commit to spatial verification using a specified data source within a maximum of five years from practice establishment. After five years, spatial verification is required or the practice is reclassified as insufficient for NLC compliance purposes. Practices reversed before spatial verification is achieved are treated retroactively as if no Track C credit had been earned, and the trajectory record is adjusted accordingly.

5.2.6. Scenario-track selection matrix

The four scenarios arising from the combination of production unit NLC and 1 km² grid cell NLC relative to the 25% threshold are summarized below. For Pathway 1 (production units ≥ 1 km²), assessment is at the production unit scale only, and the grid column does not apply. For Pathway 2 (production units < 1 km²), both scales apply, and the full matrix logic governs track selection.

Table 13: Natural Land Cover target Scenario-Track Selection Matrix.

Scenario	PU NLC	Grid NLC	Track A (Spatial)	Track B (Landscape)	Track C (Practice)	Priority
1	$\geq 25\%$	$\geq 25\%$	Maintenance (required)	Optional (supplementary)	Optional (supplementary)	Lowest
2	$\geq 25\%$	$< 25\%$	Maintenance at PU (required)	Improvement (recommended)	Optional (supplementary)	Low-medium
3	$< 25\%$	$\geq 25\%$	Improvement (required)	Optional (supplementary)	Improvement (required if Track A unfeasible)	Medium

4	< 25%	< 25%	Improvement (required)	Improvement (recommended)	Improvement (required if Track A unfeasible)	Highest
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For Scenarios 1–2, companies are encouraged to assess opportunities to enhance ecological connectivity between NLC elements within and beyond the production unit.

For Scenario 4, Track B is strongly recommended. Track C is required when Track A is not feasible, and heightened scrutiny at validation should be expected.

5.3. Calculation guidelines for soil organic carbon, soil erosion, and terrestrial acidification

This section provides guidelines for calculating land quality baselines and setting Land Quality targets for direct operations. Companies can optionally follow the direct operations approach for their upstream value chain if they have the requisite traceability and spatial data; otherwise, upstream land quality impacts should be addressed through the Landscape Engagement target and the sector materiality requirements set out in the Land Technical Guidance V2, Table 6.

Where climate and nature frameworks converge

The soil organic carbon stock change accounting method used in these guidelines is derived from the GHG Protocol LSRS (2026) stock change accounting framework (LSRS Chapter 9). Companies calculating land management net biogenic CO₂ emissions under LSRS—which is based on changes in soil carbon stocks across land-based carbon pools—are working with the same underlying SOC data that AGILE requires for land quality baselines and target setting under the Working Land Regeneration and Restoration target.

The quantification methods and input data (land use type, management practice, soil classification, climate zone) are shared; the output units differ, with t CO₂e used for LSRS climate reporting and SOC stock in metric tons C/ha used for AGILE land quality assessment.

Where frameworks differ

Soil erosion and terrestrial acidification are AGILE-only indicators with no counterpart in the GHG Protocol LSRS or CNZS V2. Companies must collect additional data for these indicators—USLE/RUSLE parameters for erosion, NH₃/NO_x/SO₂ emission factors for acidification—which lie outside standard GHG inventory data collection. Companies calculating acidification emissions may already have collected the required data, as main sources include combustion of fossil fuels and application of fertilizers.

Land Quality targets address three impact categories:

- Soil organic carbon (SOC): soil organic carbon stock (t C/ha).
- Soil erosion: rate of soil loss due to water erosion (t soil/ha/yr).
- Terrestrial acidification: rate of nitrogen and sulfur deposition driving soil acidification, expressed in kg SO₂-eq.

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Land Quality targets are set at the production unit level with reference to ecoregion thresholds, using the Dinerstein et al. (2017) ecoregion classification.

5.3.1. Data requirements

To calculate land quality baselines, companies need to collect the following data. The level of spatial granularity at which Land Environmental Assessment Factors (LEAF)s are applied increases with traceability; thresholds are always expressed at the ecoregion level.

Table 14: Summary data requirements for land quality.

Stage of the value chain	Data type	Unit	Notes
Direct operations	Ecoregion location of production units	-	Required to look up ecoregion threshold and LEAF values
Direct operations	Land use type(s) per production unit	ISIC classification / AGILE land use typology	Required to select the applicable LEAF for SOC and soil erosion
Direct operations	Area per land use type per production unit	ha × yr	Time period of land use required for SOC and soil erosion calculation
Direct operations	Nitrogen and sulfur emissions per production unit	kg NH ₃ , kg NO _x , kg SO ₂	Required for terrestrial acidification; may be estimated from activity data and emission factors
Direct operations	Ecoregion threshold and ecoregion baseline	t C/ha (SOC); t/ha/yr (soil erosion); kg SO ₂ -eq (terrestrial acidification)	Identified reference dataset (Land Technical Guidance V2 data) once ecoregion is identified
Direct operations	Production unit LEAF value	t C/ha (SOC); t/ha/yr (soil erosion)	Identified reference dataset (Land Technical Guidance V2 data) once ecoregion is identified

Companies are required to identify the ISIC sector classification(s) applicable to each production unit prior to calculating land quality baselines (**Requirement T2.7**). This determines which land quality categories are in scope for target setting.

5.3.2. Using Land Environmental Assessment Factors (LEAFs), ecoregion thresholds, and baselines

Land Environmental Assessment Factors (LEAFs) are numerical factors that translate corporate emissions and land uses into land quality indicator values. They are derived from lifecycle assessment characterization factors but have been adapted to be directly comparable with ecoregion thresholds, enabling companies to assess how their production practices relate to the ecological limits of the ecoregions in which they operate or source from.

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LEAFs are available at different levels of spatial granularity—raster, ecoregion, sub-country, and country—to support companies with varying levels of traceability and data accessibility. Higher traceability to production unit or ecoregion level produces more precise baseline values.

Ecoregion thresholds represent the level of each land quality indicator at which there is an indication that its relationship with predicted ecosystem stability may shift markedly, at times abruptly. Thresholds are defined at the ecoregion level using a combined machine-learning and changepoint modeling framework integrating global datasets. A 10% buffer distance from each threshold value is used to inform target values, ensuring that targets are set at a safe distance from thresholds, used to represent critical ecological limits (Land Technical Guidance V2, Annex 3). The full threshold dataset is included in the [Land Technical Guidance V2 data](#).

For each production unit, companies use the ecoregion in which that unit is situated as the spatial reference for identifying both the applicable LEAF values and the applicable ecoregion threshold and baseline (**Requirement T2.30**). Where a production unit spans more than one ecoregion, the ecoregion encompassing the largest portion of the production unit should be selected.

5.3.3. Calculating production unit baseline land quality indicators

Baseline land quality values are calculated at the production unit level for each applicable land quality category. The approach differs by indicator.

Soil organic carbon and soil erosion

For SOC and soil erosion, the baseline value is determined by identifying the LEAF corresponding to the production unit's land use type and ecoregion. For SOC, the LEAF represents the estimated SOC in 2030 or another selected target year in t C/ha. For soil erosion, it represents the annual soil erosion rate (t soil/ha/yr).

Companies should follow the three-step approach below to calculate the SOC and soil erosion baseline for each production unit (**Requirement T2.29**).

- **Step 1. Collect inventory data.** Identify the location(s), land use type(s), and area (ha) and duration of land use (yr) of each production unit.
- **Step 2. Select the applicable LEAFs.** Using the ecoregion identified for each production unit, look up the corresponding LEAF for each land use. Ecoregion-level data should be preferred where available; country- or sub-country-level data may be used where ecoregion-level data are unavailable.
- **Step 3. Calculate the production unit baseline.** For production units with multiple land use types, calculate a weighted average LEAF value proportional to the respective areas and use duration of each land use type. For single land use production units, the LEAF represents the production unit baseline.

Terrestrial acidification.

The production unit baseline for terrestrial acidification is calculated by multiplying the mass of annual acidifying emissions (kg NH₃, NO_x, and SO₂) from the production unit by the corresponding LEAF (kg SO₂-eq/kg) for each gas for the appropriate ecoregion, country, or sub-country. The results are summed across pollutants to produce a total terrestrial acidification potential in kg SO₂-eq (**Requirement T2.29**).

Acidifying emissions estimations start with collecting data on nitrogen (NH₃ and NO_x) and sulfur (SO₂) emissions from each production unit. These may be estimated from activity data (fuel consumption, fertilizer application, livestock numbers) using EMEP/EEA Guidebook emission factors or equivalent nationally recognized sources.

Note that for the purposes of ecoregion threshold comparison, terrestrial acidification thresholds in the Land Technical Guidance V2 are expressed in terms of total nitrogen deposition (NH_3 and NO_x) at the ecoregion level, whereas the production unit baseline calculated in Steps 1–3 above is expressed in $\text{kg SO}_2\text{-eq}$. Ecoregional thresholds have been translated into $\text{kg SO}_2\text{-equivalent}$ per hectare and can be found in the Land Technical Guidance V2 data.

5.3.4. Amalgamated Production Units (APUs)

Where a company has more than five production units within the same ISIC category in a single ecoregion, these may be amalgamated for the purposes of land quality target setting (**Recommendation T2.17**). Primary land quality data must still be collected for each individual production unit, but baseline values may be averaged across the set of amalgamated units to produce an amalgamated production unit baseline.

The procedure for setting targets at the APU level mirrors the production unit-level approach: the amalgamated production unit baseline is compared to the relevant ecoregion threshold following the same prioritization logic set out in Section 5.3.8.

5.3.5. Polygon-based LEAF calculations

Companies with GIS capabilities and data at the polygon level for either production or sourcing units can choose to calculate their own LEAFs by using the raster available at their original resolution for each land indicator and calculating their own spatial statistics. Raster can be found [here](#).

5.3.6. Alternative approaches to calculating production units' SOC

Companies with access to model-based, remote sensing-based, or field measurement-based stock change data may use alternative approaches to calculate SOC, provided the methods used are compatible with SOC stock factors and the GHG Protocol Land Sector and Removals Standard (LSRS) stock change accounting framework. SOC LEAFs are future looking, as they predict a SOC stock based on current land use and land management practices. Alternative SOC approaches should also be future looking and either predict SOC stocks for their particular location, land use, and land management, or provide enough data to show trends in SOC stock throughout the years.

Alternative approaches include:

- Model-based approaches: including the RothC model and equivalent dynamic SOC models.
- Remote sensing-based approaches: using Earth observation data to estimate SOC stocks, provided the method is independently validated.
- Measurement-based approaches: direct soil sampling to 30 cm depth, following recognized sampling and analytical protocols.
- Hybrid approaches: a mix of the previous approaches.

Where an alternative SOC approach is used, companies should disclose the method applied, the data source, and any significant differences from the LEAF-derived baseline value.

5.3.7. Alternative approaches to calculating production units' soil erosion

Companies with access to the requisite input data may calculate soil erosion using RUSLE directly, applying locally calibrated R, K, LS, C, and P factors, or locally derived models to calculate soil erosion. This may improve accuracy where local land management practices or topography differ significantly from the global-average factor values underlying the LEAF soil erosion rates.

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When using alternative approaches to calculate soil erosion, companies should disclose the method applied, the data source, and any significant differences from the LEAF-derived baseline value.

5.3.8. Determining ecoregion baselines

Once production unit baselines have been calculated, companies will prioritize which production units to set targets for based on the level at which ecoregion thresholds have been exceeded, i.e., the ecoregion level or the production unit level.

The ecoregion baseline is the ecoregion-level average value for each land quality category derived from the most current available global datasets. Companies determine the ecoregion baseline for their production units in the same way as their thresholds—by simply identifying which ecoregions they are located in and consulting the [Land Technical Guidance V2 data](#).

Chapter 6. Landscape engagement

6.0. Overview

This chapter provides accounting and calculation guidelines for companies setting a Landscape Engagement target. It covers guidance on how to select indicators and metrics for baselining and measuring progress at the landscape level (Section 6.1); how to establish and maintain the baseline condition of selected landscapes (Section 6.2); how to measure and report progress against selected metrics (Section 6.3); and data quality and consistency requirements for landscape-level reporting (Section 6.4).

6.1. Selecting metrics to establish baseline and measuring progress at a landscape level

For companies setting a Landscape Engagement target, the Land Technical Guidance V2 outlines the approach for identifying and prioritizing landscapes for engagement (Land Technical Guidance V2, Section 3.2.1). These guidelines address the subsequent step and cover information on how to select metrics, establish baselines, and measure progress within the selected landscape(s).

Companies seeking to engage in landscape initiatives should work collaboratively with the initiative's stakeholders to define a baseline and measure progress based on selected ecological and social metrics. Selected metrics should reflect the baseline and performance at the landscape level, be identified through multi-stakeholder collaboration, and provide direct or proxy information about progress toward the defined goals and targets of the landscape initiative.

Several commonly used landscape assessment frameworks are available to support companies in the identification and measurement of landscape metrics, including the LandScale Assessment Framework, the Restoration Opportunities Assessment Methodology (ROAM), and the Landscape Reporting Framework from the Consumer Goods Forum. The list of potential metrics outlined in Table 15 below has been compiled from these frameworks and from the Convention on Biological Diversity's (CBD) Global Biodiversity Framework monitoring guidance.

6.1.1. Metric selection criteria

In line with ISEAL (2022) guidance, metrics selected to assess performance improvements should measure the status or trends in a specific sustainability outcome; be standardized and applied consistently to facilitate comparability of findings over time and to support aggregation of data from multiple actors in a landscape; align with existing landscape or jurisdictional metrics; be sensitive enough to detect relevant changes from a baseline state; be consistent with SMART (specific, measurable, attainable, relevant, and time-bound) guidelines; be cost-efficient and not overly complex; and be defined in quantitative terms but supplemented by qualitative information when appropriate.

Companies may structure their metric suite into three tiers: a core set of metrics broadly applicable across landscapes (see Table 15) or the frameworks listed above; landscape-specific metrics relevant to the particular ecological or socioeconomic context; and locally defined metrics identified by stakeholders, based on what they determine is important to them.

A key addition in the Land Technical Guidance V2 is the inclusion of impact-based metrics covered under the Land Quality target (soil organic carbon, soil erosion, and terrestrial acidification). Where these indicators are material to the company's operations or supply chains in the landscape, they

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should be included in the metric suite. Calculation of baseline values for these metrics follows the methods outlined in Chapter 5 for these guidelines, applying ecoregional baselines rather than production unit baselines.

6.1.2. Potential metrics for ecological and social conditions

Table 15 below provides a non-exhaustive list of potential metrics for ecological and social conditions compiled from the previously mentioned initiatives and documents.

Table 15: List of potential metrics for ecological and social conditions. Non-exhaustive; adapted from the Land Technical Guidance V2, Table 15.

Indicator Number	Description
Ecosystem Indicators	
1.1	Proportion of target boundary land area under productive and sustainable land management.
1.2	Total area (ha) within the engaged landscape(s) of natural lands converted since 2020 (SBTN Natural Lands Map).
1.3	Total area (ha) under restoration in the landscape.
1.4	Coverage (% of total landscape area) of protected areas and other effective conservation measures (OECMs).
1.5	Total area (ha) and percentage (%) of natural ecosystems in the landscape that are currently degraded.
1.6	Biodiversity risk assessment including dependencies and impacts using WWF's Biodiversity Risk Filter.
1.7	Water risk assessment using the WWF Water Risk Filter or WRI Aqueduct.
1.8	Species threat abatement and restoration (STAR) score at the landscape scale (freely available for 5 km ² resolution data).
1.9	STAR score at the landscape scale (finer resolution data through an IBAT subscription).
1.10	Services provided by ecosystems or an assessment of critical natural assets.
1.11	Total climate regulation services provided by ecosystems by ecosystem type (System of Environmental Economic Accounts).
1.12	Species Population Abundance (IND9): number and proportion of species meeting Entry/Standard/Advanced-Level trigger criteria.
1.13	Soil organic carbon—metric tons C/yr.
1.14	Soil erosion—tons of soil loss per ha/yr.
1.15	Terrestrial acidification and eutrophication—kg SO ₂ -eq.
1.16	Natural land cover % per km ² .
Governance Indicators	
2.1	Number of stakeholder groups involved (e.g., local communities, producers, government, Indigenous Peoples).
2.2	Type of governance implemented—full, equitable, inclusive, effective, and gender-responsive representation and participation in decision-making.
2.3	Number of unresolved land and resource conflicts or grievances, and area of land (ha) subject to such conflicts.
2.4	User-defined metric(s) on access and use rights for key natural resources in the landscape.
2.5	Proportion of total adult population with secure tenure rights to land, by gender and type of tenure.

Health and Wellbeing Indicators	
3.1	Percentage (%) of female and male population living below the local poverty line (or earning <\$1.90/day).
3.2	Percentage (%) of girls and boys who are undernourished.
3.3	Percentage (%) of households without electricity.
3.4	Number of farmers realizing additional benefits and income streams.
3.5	Percentage (%) of households without access to safe drinking water within a 15 - minute walk from home.

6.2. Establishing the baseline condition of selected landscapes

Companies must establish the performance baseline of the landscape based on selected metrics and indicators. This provides the reference point against which progress will be measured throughout the target period. Calculating baseline information is not required before target validation but is necessary to demonstrate progress at annual reporting.

Sustainability scope. The indicators and metrics included in the baseline must correspond to the sustainability goals and targets of the landscape initiative, as identified through the multi-stakeholder process. Where land quality indicators (SOC, soil erosion, terrestrial acidification) are included, the methods outlined in Chapter 5 of these guidelines apply, with the spatial boundary set at the landscape or jurisdictional scale rather than the production unit scale.

Geographic scope. The baseline must be aligned with the landscape or jurisdictional boundary established at target submission. Where relevant datasets are only available at other scales (e.g., national or subnational), performance should be extrapolated to the landscape scale where possible, with the extrapolation method disclosed.

Date of baseline. The baseline must represent the condition at a defined point in time, documented at target submission. This date is the reference against which all subsequent annual reporting is compared.

Consistency of data. The datasets used in the baseline assessment should be updated and available over time, enabling consistent year-on-year comparison. Changes in data source or methodology require restatement of the baseline and disclosure of the reason for the change.

Reconciling multiple baselines. Where multiple baselines exist at different scales within the landscape, the company should document each source, the scale at which it applies, and the method used to reconcile them to a single landscape-level baseline value.

Primary vs. secondary data. Where primary data are available from within the landscape initiative (e.g., field surveys, satellite-derived time series commissioned by the initiative), they should be preferred over secondary or globally derived datasets. Where secondary data are used, the data source, resolution, date, and any known limitations should be disclosed.

6.3. Measuring and reporting progress

At each annual reporting date, companies should report the current value of each selected metric against the baseline established at target submission, enabling a comparison of change over time for each metric and indicator.

Annual reporting parameters. For each selected metric, companies should report the current value at the landscape scale; the baseline value; the direction and magnitude of change since baseline; the data source and methodology used; and any material changes in data source or methodology since the previous reporting date.

Progress assessment. In the early years of a target period, companies may supplement outcome-based metrics with activity-based metrics that demonstrate the scale and type of interventions being implemented, provided these are linked to the selected outcome metrics through a documented causal pathway. Activity-based metrics do not substitute for outcome reporting but provide supporting context, particularly for Scenario 2 and Scenario 3 initiatives under the V2 roadmap framework.

Scenario context. The scenario applicable to the landscape initiative (Scenario 1, 2, or 3, as determined through the self-assessment described in the Land Technical Guidance V2, Section 3.2.2) governs the documentation requirements at each annual reporting date. For the scenario-differentiated roadmap requirements, companies should refer to the Land Technical Guidance V2, Annex 7 (Landscape Engagement Roadmap). These accounting guidelines address the metric calculation and baselining requirements only.

Landscape footprint coverage disclosure. Companies should report the percentage of the estimated land impact area footprint that each landscape initiative is estimated to cover at each annual reporting date, and track and disclose changes in land footprint related to those initiatives over time.

6.4. Data quality and consistency requirements

The following data quality requirements apply to landscape-level accounting under these guidelines.

Minimum data quality. For each metric, the data source, spatial resolution, temporal coverage, and method of aggregation to the landscape scale must be documented. Where a globally derived or secondary data source is used, the company should disclose whether a higher-quality primary or locally derived source was considered and why it was not used.

Consistency across reporting periods. The same data source and methodology should be used across all reporting periods unless a documented improvement in data quality justifies a change. Where a methodology change occurs, the baseline and all prior reported values should be restated using the new methodology, and the restated series published alongside the original.

Independent verification. For landscape initiatives meeting the criteria for Scenario 1 (all four criteria met), the baseline assessment and time series of results should be validated by an entity with some degree of independence from those involved in conducting the assessment and the landscape initiative, consistent with Criterion 4 of the four key criteria (Land Technical Guidance V2, Section 3.2.2).

Recognized frameworks. Companies using the LandScale Assessment Framework or another recognized framework as the basis for metric selection and baselining may use the data quality standards established by that framework as the reference for these guidelines, provided the framework's requirements meet or exceed the minimum requirements above. The framework used should be disclosed at target submission.

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Glossary

- Allocation**—The process of partitioning environmental impacts from a single facility, process, production unit, or other system, among its various outputs and/or land uses (aligned with the GHG Protocol LSRS, 2026). In the context of SBTN target setting, allocation may also refer to the assignment of a company's share of effort toward impact mitigation.
- APUs**—Amalgamating Production Units. Grouping of individual production units into a single unit for the purposes of land quality target setting. APUs must be located within the same ecoregion.
- AR3T**—Action framework covering actions to Avoid future impacts, Reduce current impacts, Regenerate, and Restore ecosystems, and Transform the systems in which companies are embedded.
- Avoid**—Prevent impact from happening in the first place; eliminate impact entirely.
- Bare land**—Areas with exposed rock, soil, or sand with less than 10% vegetated cover.
- Baseline**—Value of impacts (on nature) or state (of nature) against which an actor's targets are assessed in a particular year. An ecoregion baseline is based on the ecoregion-level average value for each land quality category (soil organic carbon, soil erosion, terrestrial acidification) using the most current available global datasets. A production unit baseline is the value calculated for the company's specific production unit using these guidelines.
- Biodiversity**—The variability among living organisms from all sources, including *inter alia*, terrestrial, marine, and other aquatic ecosystems and the ecological complexes to which they belong; this includes diversity within species, between species, and of ecosystems ([Convention on Biological Diversity \(CBD\) 1992, Article 2](#)).
- Characterization factor**—Numerical factors that translate elementary flows (e.g., land use, water consumption, emissions) into potential environmental impacts. Characterization factors are calculated through characterization models, which can differ in terms of scope, complexity, impact pathways, data used, and unit of measurement ([ISO 14044](#)).

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Composition of an ecosystem—This refers to the biotic constitution of ecosystems—i.e., the pattern of the makeup of species communities and the interactions between them. It refers to the identity and variety of life present.

Conversion—The change of a natural ecosystem to another land use or a profound change in a natural ecosystem's species composition, structure, or function. Deforestation is one form of conversion (conversion of natural forests). Conversion includes severe degradation or the introduction of management practices that result in substantial and sustained change in the ecosystem's former species composition, structure, or function. Changes to natural ecosystems that meet this definition are considered to be conversion, regardless of whether or not they are legal.

Compliance track—One of three pathways available to companies for achieving the Natural Land Cover target at production unit level, i.e., Track A (production unit compliance, the default), Track B (landscape-scale compliance), or Track C (practice-based compliance). The applicable track must be identified and disclosed at target submission.

Core natural lands—Places with acknowledged ecological importance that require immediate action to prevent conversion due to existing legislation and/or initiatives; extinction/collapse risk, irreplaceability, or natural uniqueness; maintenance of natural ecosystem contiguity or intactness; or the provision of critical natural assets or contributions to people. Includes areas identified through the IFC PS6 environmental assessment process as “Critical Habitat” or “High Conservation Value” areas, Key Biodiversity Areas (KBAs) and Protected Areas (all classes), as identified in the Integrated Biodiversity Assessment Tool (IBAT), and areas identified as “likely” Critical Habitat in the UNEP-WCMC (2017) Global Critical Habitat Screening Layer.

Cutoff dates—Cutoff dates provide a baseline for the No Conversion target. After this date, any conversion of natural ecosystems on a given production unit renders the materials produced on that production unit non-compliant with an SBTN No Conversion target.

Degradation—Changes within a natural ecosystem that significantly and negatively affect its species composition, structure, and/or function, and reduce the ecosystem's capacity to supply products, support biodiversity, and/or deliver ecosystem services. Degradation may be considered conversion if it is on a large scale and progressive, or enduring; alters ecosystem composition, structure, and function to the extent that regeneration to a previous state is unlikely; or leads to a change in land use (e.g., to agriculture or other use that is not a natural forest or other natural ecosystem) ([AFI, 2024](#)).

Direct operations—All activities and sites (e.g., buildings, farms, mines, retail stores) over which the enterprise has operational or financial control. This includes majority-owned subsidiaries.

Downstream—This covers all activities that are linked to the sale of products and services produced by the company setting targets. This includes the use and reuse of the product and its end-of-life management, including recovery, recycling, and final disposal.

DPSIR Causal Framework—Describes causal relationships in social-ecological systems between driver (D), pressure (P), state (S), impact (I), and response (R) indicators.

Ecological/habitat connectivity—The degree to which the landscape facilitates the movement of organisms (animals, plant reproductive structures, pollen, pollinators, spores, etc.) and other environmentally important resources (e.g., nutrients and moisture) between similar habitats. Connectivity is hampered by fragmentation (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [[IPBES](#)]).

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Ecosystem—A dynamic complex of plant, animal, and microorganism communities and the non-living environment interacting as a functional unit. Within this definition, the term “unit” relies on the identification of a distinct function, as well as a “dynamic” grouping of biotic and abiotic factors. When using an ecosystem approach to conservation, the CBD suggests that an ecosystem can refer to any functioning unit, regardless of scale. Thus, the term is not necessarily synonymous with “biome” or “ecological zone,” and is better determined by the problem that is being addressed.

Ecosystem condition—The quality of an ecosystem measured by its abiotic and biotic characteristics. Condition is assessed by an ecosystem’s composition, structure, and function, which, in turn, underpins the ecological integrity of the ecosystem and supports its capacity to supply ecosystem services on an ongoing basis ([UN System of Environmental Economic Accounting \[SEEA\], 2021—Ecosystem Accounting: Final Draft](#)).

Ecosystem function—The flow of energy and materials through the biotic and abiotic components of an ecosystem. This includes many processes, such as biomass production, trophic transfer through plants and animals, nutrient cycling, water dynamics, and heat transfer ([IPBES](#)).

Ecosystem integrity—Encompasses the full complexity of an ecosystem, including its physical, biological, and functional components, together with their interactions. It is measured against a “natural” (i.e., current potential) reference level, and describes the extent to which the composition, structure, and function of an ecosystem fall within their natural range of variation.

Ecoregion—A biogeographic unit defined following the Dinerstein et al. (2017) ecoregion classification. Ecoregions represent large areas of land with distinct natural communities and environmental conditions. Within the SBTN’s Land targets, ecoregions represent the spatial unit at which thresholds are defined and against which production unit baselines are compared.

Elementary flow—A material, energy, or resource entering, or being used in, a system under study, sourced from the environment without previous human transformation (e.g., water, iron, coal, crude oil), or leaving the system and being released into the environment without subsequent human transformation (e.g., CO₂, noise emissions, wastes discarded in nature) ([ISO 14044](#)).

Embedded or highly embedded commodities—Volumes of high-impact commodities that are incorporated into value-added products at varying degrees of processing. Relevant to the No Conversion of Natural Ecosystems target for determining the scope of no-conversion commitments across the value chain.

FLAG—The Forest, Land, and Agriculture (FLAG) sectors—usually in reference to the Science Based Targets initiative’s FLAG Guidance.

Forests—Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. This definition does not include land that is predominantly under agricultural or other land use ([Food and Agriculture Organization \[FAO\]](#)).

Free, prior, and informed consent (FPIC)—Free, prior, and informed consent (FPIC) is a specific right that pertains to Indigenous Peoples and is recognized under the United Nations Declaration on the Rights of Indigenous Peoples. FPIC is a mechanism that safeguards the individual and collective rights of indigenous and tribal peoples, including their land and resource rights and their right to self-determination. The minimum conditions that are required to secure consent stipulate that it must be “free” from all forms of coercion, undue influence, or pressure, that it is provided “prior” to a decision or action being taken that affects individual and collective human rights, and that it is offered on the basis that affected peoples are “informed” of their rights and the impacts of decisions or actions on those rights. FPIC is

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considered to be an ongoing process of negotiation, subject to initial consent. To obtain FPIC, “consent” must be secured through an agreed process of good faith consultation and cooperation with indigenous and tribal peoples, carried out through their own representative institutions. The process should be grounded in the recognition that the indigenous or tribal peoples are customary landowners. FPIC is not only a question of process but also of outcome, and is obtained when terms are fully respectful of land, resource, and other implicated rights ([FAO \(2016\): Free Prior and Informed Consent – An indigenous peoples’ right and a good practice for local communities](#)).

GBF—Final text of the Kunming–Montreal Global Biodiversity Framework.

GHGP—Greenhouse Gas Protocol.

Goal—In global (e.g., UN) sustainability framings, a high-level statement of ambition, including a time frame. Example: By 2030, ensure healthy lives and promote wellbeing for all at all ages ([Sustainable Development Goal \[SDG\] 3](#)).

High-impact commodities—Raw and value-added materials used in economic activities that are known to have material links to the key drivers of biodiversity loss, resource depletion, and ecosystem degradation. Activities associated with high-impact commodities include the following: extraction of these commodities (e.g., mining, farming), clearing of lands for extraction, processing of commodities (into refined or value-added forms), manufacturing commodities into complex products (with additional inputs), distribution of commodities, and the procurement of commodities (in their raw, value-added, or final form). For more information, please see SBTN Step 1 guidance.

Impacts—These can be positive or negative contributions of a company or other actor toward the state of nature, including pollution of air, water, or soil; fragmentation or disruption of ecosystems and habitats for nonhuman species; and alteration of ecosystem processes.

IFC—International Finance Corporation. Referenced under Performance Standard 6, which provides guidance on critical habitat screening relevant to the MICE pathway under the No Conversion of Natural Ecosystems target.

Impact category—Environmental issue of concern.

Impacts on nature—A change in the state of nature, which may result in changes to the capacity of nature to provide value to business and society, and/or instrumental, relational, and intrinsic value ([Taskforce on Nature-Related Financial Disclosures \[TNFD\]](#)).

Indicator—A measurable entity related to a specific information need, such as the state of nature, change in a pressure, progress toward a target, or association between two or more variables. Example: Red List Index (SDG Target 15.5; Aichi Target 12).

ISIC—International Standard Industrial Classification of All Economic Activities. Used in the Working Land Regeneration and Restoration target to identify sector-specific land use types and associated production practices for land quality assessment.

Land cover—The observed physical and biological cover of Earth’s land.

Land Environmental Assessment Factors (LEAFs)—Numerical factors that translate companies’ activities—including operations, products, and service purchases—into environmental indicator states and impacts using elementary flows from the company inventory. LEAFs are derived from lifecycle assessment characterization factors and have been adapted for direct comparability with ecoregion thresholds. LEAFs are available at different levels of spatial

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granularity depending on the indicator (10 km–20 km pixels) and regional averages (ecoregion, country, sub-country).

Land footprint/land occupation—A company’s land footprint, known in life cycle assessment terms as “land occupation,” is defined for these guidelines as the amount of agricultural land (cropland and land under permanent meadows and pastures) required per year to produce the products produced or sourced by a company, reported in hectares per year. Importantly, “land footprint” or “land occupation” for the purpose of these guidelines refers to “working lands” used for production in corporate supply chains, not necessarily all land owned or controlled by companies. Land that is not attributable to direct operations or upstream value chain activities is not included.

Land footprint intensity—The reciprocal of yield, referring to the land area required per unit of product output. Used in the Working Land Regeneration and Restoration target to calculate intensity-based land footprint reduction targets.

Landscape—A socioecological system that consists of natural and/or human-modified ecosystems, and which is influenced by distinct ecological, historical, economic, and sociocultural processes and activities. For the purposes of this guidance, the “landscape” is the area in which a landscape approach is being implemented. In ideal cases, the landscape will have been defined through a broad stakeholder-led process during which a company may begin its participation. This may not always be the case for areas that are relevant for companies. In these cases, a more prescriptive approach to landscape identification may be required. In such a scenario, it may be possible to utilize water basin boundaries identified through the SBTN Freshwater target methodology or through SBTN’s Step 2: Interpret & Prioritize process.

Landscape approach—Collaboration of stakeholders within a defined natural or social geography, such as watershed, biome, or company sourcing area. This approach seeks to reconcile competing social, economic, and environmental goals through “integrated landscape management”—a multi-stakeholder approach that builds consensus across different sectors with or without government entities.

Land use—All the arrangements, activities, and inputs undertaken in a certain land cover type (a set of human actions) or the social and economic purposes for which land is managed (e.g., grazing, timber extraction, conservation).

Land use change—Land uses can change over time due to both natural and anthropogenic causes. Such changes can be represented by land use change categories (e.g., forest land converted to cropland). Where the land use category remains the same but the land use subcategory changes—for example, conversion from a primary forest (natural forest) to a plantation forest (planted forest)—this should be accounted for as land use change.

Life cycle assessment—Compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle ([ISO 14044](#)).

Life cycle impact assessment—Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product ([ISO 14044](#)).

Measurement—The process of collecting data for baseline setting, monitoring, and reporting.

Materiality—The significance of an entity’s impacts or dependencies on nature, as determined through SBTN Step 1a: Materiality Screening. Materiality determines which targets a company is required to set.

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Maturity Matrix—An assessment tool used in the Landscape Engagement target to evaluate the readiness and governance quality of a landscape initiative. The matrix classifies initiatives into three scenarios based on their alignment with key criteria, informing the scope and content of the Landscape Engagement Roadmap.

Monitoring—Tracking progress toward targets.

Natural ecosystem—An ecosystem that substantially resembles—in terms of species composition, structure, and ecological function—what would be found in a given area in the absence of major human impacts. This includes human-managed ecosystems where much of the natural species composition, structure, and ecological function are present. The term incorporates the following definitions:

- Largely “pristine” natural ecosystems that have not been subject to major human impacts in recent history;
- Regenerated natural ecosystems that were subject to major impacts in the past (for instance, through agriculture, livestock raising, tree plantations, or intensive logging) but where the main causes of impact have ceased or greatly diminished, and the ecosystem has attained species composition, structure, and ecological function similar to prior or other contemporary natural ecosystems;
- Managed natural ecosystems, including many ecosystems that could be referred to as “semi-natural,” where much of the ecosystem’s composition, structure, and ecological function are present—this includes managed natural forests, as well as native grasslands or rangelands that are, or have historically been, grazed by livestock;
- Natural ecosystems that have been partially degraded by anthropogenic or natural causes (e.g., harvesting, fire, climate change, invasive species, or others) but where the land has not been converted to another use and where much of the ecosystem’s composition, structure, and ecological function remain present or are expected to regenerate naturally or by management for ecological restoration ([AFi, 2024](#)).

Nature—The diversity of living organisms, including people, and their interactions with each other and their environment. This perspective emphasizes the deep connection between ecological and human wellbeing.

Natural forests—Natural forests possess many or most of the characteristics of a forest native to a given site, including species composition, structure, and ecological function.

NCPs—Nature’s contributions to people (also known as “ecosystem services”). All the beneficial and detrimental contributions that we obtain from and with nature (IPBES 2019, 26). In general, NCPs are categorized as material NCPs (e.g., wild-harvested foods), regulating NCPs, which govern biophysical processes (e.g., carbon storage, flood regulation), and nonmaterial NCPs, which provide cultural services. In total, the different categories of NCP recognized by IPBES are habitat creation and maintenance (NCP 1); pollination and dispersal of seeds and other propagules (NCP 2); regulation of air quality (NCP 3); regulation of climate (NCP 4); regulation of ocean acidification (NCP 5); regulation of freshwater quantity, location, and timing (NCP 6); regulation of freshwater and coastal water quality (NCP 7); formation, protection, and decontamination of soils and sediments (NCP 8); regulation of hazards and extreme events (NCP 9); regulation of detrimental organisms and biological processes (NCP 10); energy (NCP 11); food and feed (NCP 12); materials and assistance (NCP 13); medicinal, biochemical, and genetic resources (NCP 14); learning and inspiration (NCP 15); physical and psychological experiences (NCP 16); supporting identities (NCP 17); maintenance of options (NCP 18).

Nature loss—The loss and/or decline of the state of nature.

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Nature positive—A high-level goal and concept describing a future state of nature (e.g., biodiversity, nature’s contributions to people) that is greater than the current state.

NH₃—Ammonia.

NO_x—Nitrogen oxides.

Physical traceability—The ability of a company to identify, track, and collect information on activities (e.g., activity data, or emission or removals factors) related to material flows of goods and services in its value chain, across its upstream and downstream processes and products.

Pressures—A human activity that directly or indirectly degrades nature. According to IPBES, five key pressures contribute most to the loss of nature globally: land and sea use change; direct exploitation of organisms; climate change; pollution; and invasion of alien species. While SBTN generally follows IPBES definitions for these categories, SBTN takes a slightly broader conceptualization of “direct exploitation” to include both biotic and abiotic resources, such as water use. We thus use the term “resource exploitation.”

Primary data—Data from specific activities within a company’s operations or value chain (e.g., site-specific data). Primary data can be based on measurements, models, or other methods and are not necessarily generated by the reporting company (GHG Protocol LSRS, 2026).

Production unit—A plantation, farm, ranch, or forest management unit, or production site. This includes all plots used for agriculture or forestry that are under one management, located in the same general area, and share the same means of production. It also includes natural ecosystems, infrastructure, and other land within or associated with the plantation, farm, ranch, site, or forest management unit (adapted from the AFi). For the Natural Land Cover target, production units are classified by area: Pathway 1 applies to production units with an area equal to or greater than 1 km²; Pathway 2 applies to production units with an area less than 1 km².

Reduce—Minimizing impacts from a previous baseline value without eliminating them entirely.

Regenerate—Actions designed within the context of existing land uses to increase the biophysical function and/or ecological productivity of an ecosystem or its components, often with a focus on specific nature’s contributions to people (e.g., in terms of carbon sequestration, food production, and increased nitrogen and phosphorus retention in regenerative agriculture) (adapted from FOLU, 2019).

Reporting—Preparation of a formal written document typically connected to desired objectives, outcomes, or outputs, such as those connected to targets and goals.

Restore—Initiate or accelerate the recovery of an ecosystem with respect to its health, integrity, and sustainability with a focus on permanent changes in state (adapted from the Society of Ecological Restoration).

Response option—An action that a company could take to improve the state of nature on land, which would likely be reflected in the indicator used to measure progress on its targets.

SBTi—Science Based Targets initiative.

SBTN—Science Based Targets Network.

Science-based targets—Measurable, actionable, and time-bound objectives, based on the best available science, that allow actors to align activities with Earth’s limits and societal sustainability goals.

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Secondary data—Data originally collected and published for another purpose or a different assessment, e.g., derived from modeled or proxy-level data.

Short vegetation—Areas of land with vegetation shorter than 5 meters, which can include areas of land dominated by grass or shrubs.

Site(s)—Operational locations within a company’s value chain/spheres of control and influence (including direct operations). Sites can include operations from any phase of a product’s life cycle, from extractive operations (e.g., mines), material processing (e.g., mills), production facilities (e.g., factories), logistics facilities (e.g., warehouses), wholesale and retail (e.g., stores), and recycling/end of life (e.g., material recovery).

Snow/ice—Areas covered by permanent snow or ice.

SO₂—Sulfur dioxide.

Stakeholder engagement—Stakeholder engagement involves interactive processes of engagement with relevant stakeholders through, for example, meetings, hearings, or consultation proceedings. Effective stakeholder engagement is characterized by two-way communication and depends on the good faith of the participants on both sides ([TNFD, 2023](#)).

Stakeholders—Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively ([TNFD, 2023](#)).

State of nature indicators—State of nature indicators describe the general conditions of nature in physical, chemical, or biological terms. These indicators change in response to pressures. Throughout the target-setting methodology, SBTN utilizes the DPSIR causal framework. Important state indicators in the SBTN methods include water availability, terrestrial ecosystem intactness, net primary productivity, soil organic carbon content, water quality, and ecosystem extent or connectivity.²

Supplier engagement approach—An alternative upstream pathway under the Working Land Regeneration and Restoration target available to companies that cannot set place-based upstream targets due to insufficient location data. The approach requires companies to increase the coverage of material commodity supply aligned, or in the process of aligning, with ecoregional thresholds, using traceability-differentiated evidence pathways based on the Step 2c: enabling targets guidance.

States—Unless otherwise specified, SBTN uses the term “state” to mean “state of nature” in three key categories: species (abundance and extinction risk), ecosystems (extent, integrity, and connectivity), and nature’s contributions to people.

Structure of an ecosystem—This comprises the three-dimensional aspect of ecosystems—the biotic and abiotic elements that form the heterogeneous matrix supporting composition and functioning. Structure is dependent on habitat area, intactness, and fragmentation.

Target—In global (e.g., UN) sustainability framings, a more specific quantitative objective, usually nested under a goal, with a defined measurement and an associated indicator. Example: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity (Aichi Target 8).

² Terminology note: While SBTN uses the term “state” in alignment with the DPSIR framework, other initiatives, such as TNFD and the Capitals Coalition, use the term “changes in natural capital” to describe these same factors within the causal chain of environmental change.

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Target boundary—The corporate scope of the target, specific to each issue area. The target boundary may be defined in terms of the value chain segment covered (direct operations or upstream), as well as the specific locations, products, brands, etc., that will be in focus in a given time period. A company shall not be required to set a Working Land Regeneration and Restoration sub-target for a given segment where that segment accounts for less than 5% of the company's total estimated impact for the relevant land quality indicator or land area metric, assessed across direct operations and upstream combined.

Target dates—Target dates refer to the time by which companies must achieve their Land targets.

Threatened ecosystems—Ecosystems classified as Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) according to the IUCN Red List of Ecosystems. Relevant to the No Conversion of Natural Ecosystems target as an additional criterion for identifying areas of ecological importance where no conversion should occur.

Threshold—A point along an environmental gradient at which the relationship between an indicator and an ecosystem property changes markedly, including discontinuous responses or changes in the rate or form of response. In the context of SBTN's Land targets, thresholds are defined at the ecoregion level for key land system indicators (soil organic carbon, soil erosion, terrestrial acidification) in relation to ecosystem stability. They inform the ambition of target setting in these ecosystem quality indicators by identifying where a non-linear, sometimes abrupt, change is detected in the indicator's relationship with a derived ecosystem stability metric. A 10% buffer distance from threshold values is integrated to ensure that targets are set at a safe distance from threshold points. See the Land Technical Guidance V2, Annex 3, for further details. The threshold of the Natural Land Cover target was derived using a different methodology than the ecoregion thresholds (See Mohamed et al. 2024).

Transform—Actions contributing to system-wide change, notably the drivers of nature loss, e.g., through technological, economic, institutional, and social factors and changes in underlying values and behaviors (adapted from the Intergovernmental Panel on Climate Change [IPCC] and IPBES 2019).

Unit process—The smallest (least aggregated) unit in a production system, for which input and output data are quantified ([OpenLCA 2 manual](#)).

Upstream—This covers all activities associated with suppliers, e.g., production or cultivation, sourcing of commodities of goods, and transportation of commodities to manufacturing facilities.

Validation—An independent process involving expert review to ensure the target meets required criteria and methods of science-based targets.

Value chain—Production of “economic value” along a series of activities, sites, and entities. The value chain can be divided into three “segments”: upstream, direct operations, and downstream. Each of these segments involves places where economic activities managed or relied on by the company occur. Most value chain frameworks cover a suite of activities, starting with the raw materials and extending through to end-of-life management, that (a) supply or add value to raw materials and intermediate products to produce final products for the marketplace, and (b) are involved in the use and end-of-life management of these products.

Verification—An independent third-party confirmation of (a) baseline values of a target indicator (e.g., a company's water or GHG inventory), and/or (b) progress made toward achieving the target.

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Water—Surface water that is present for 20% or more of the year, excluding wetlands.

Wetlands—Transitional ecosystems with saturated soil, which may be inundated by water, either seasonally or permanently, and may be covered by short vegetation or trees.

Working lands—Human-modified lands, including farms, forests, rangelands, and infrastructure, that are managed to provide goods and services.

Yield—Intensity of production per unit of land area. Yield is defined as the amount of product produced in a year divided by the amount of land occupied by that product. For crops, it refers to the amount produced divided by the harvested area. For livestock products, it refers to the amount produced divided by the total area needed for livestock production (both to house animals and produce crop- and/or pasture-based animal feeds).

Annexes

Annex 1. How to consult the SBTN Natural Lands Map

How to use the map to calculate conversion of natural ecosystems after 2020

This section provides guidance on how a company can consult the SBTN Natural Lands Map to calculate conversion of natural ecosystems based on direct measurements or statistical calculation of conversion. There are different prerequisites and associated pathways for companies at different stages of supply chains.

Producers and project site owners and operators

Producers and project site owners/operators are required to collect data (as per Table 7) on their production units and recent conversion or land use change occurring after the 2020 baseline year.

With the data collected, companies can overlap the spatial data displaying recent conversion with the map. The map will allow a company to identify whether the conversion that occurred is of natural ecosystems or other non-natural land.

Sourcing from producers or the first point of aggregation

Companies sourcing commodities and products driving conversion from producers or from the first point of aggregation are required to collect data (as per Table 7) on production units or sourcing areas.

When accounting directly for conversion through a production unit's spatial data, companies can consult the map following the same procedure used by producers.

For a given sourcing area, all conversion attributable to a production unit can be assessed through the map to determine hectares of natural ecosystems converted.

Companies using data on sourcing areas must follow the accounting guidance for estimating the area converted using statistical land use change methods. For a given sourcing area, data on conversion must be retrieved. Allocation methods presented in the accounting guidance must be used to allocate responsibility of land use change to a given company.

Companies that have sourcing information only to subnational jurisdiction will use statistical land use change to estimate conversion.

Sourcing downstream from the first point of aggregation

Companies who are sourcing commodities or products driving conversion downstream from the first point of aggregation are required to collect data (as per Table 7).

For volumes traceable to production units, companies can consult the map using the same procedure defined for producers, site owners, and operators.

For volumes traceable to sourcing areas, companies can follow the same procedure outlined for sourcing from producers or the first point of aggregation.

For volumes that are not yet traceable and/or highly transformed, companies cannot use the map to assess and quantify conversion of natural ecosystems.

Annex 2. Calculation guidelines for response options

There are two ways in which companies can capture the impact of implementing a response option in their inventory, both based on an activity assessment approach:

- **The change is reflected in their inventory:** Companies can modify an inventory in three ways.
 - Change in the amount of applied unit processes: This involves modifying the original data given in the inventory for a certain unit process. This could result in changes in the extent of land use (in hectares), the amount of fertilizer applied, or fuel emissions from machinery or vehicles. For example, in “reduced tillage” there should be a reduction in the inventory linked with tillage, which might lead to reduced acidification emissions due to fossil fuel combustion from machinery.
 - Addition/removal of unit processes involved within the baseline inventory: Depending on the response option, there could be a change in unit processes compared to the baseline practice. For example, going from full tillage to no tillage would lead to the removal of the tillage unit process, eliminating fossil fuel acidifying emissions completely from this source.
 - Change in elementary flow: For some response options, a change in the land use type or intensity (e.g., from grassland, intensive, to grassland, extensive), or gas emissions will occur due to a response option.
 - **The change is reflected in the LEAF:** In the LEAF matching step, companies change factors to account for the response option. The change is applied in two potential ways:
 - To reflect inventory changes: When there is a change in inventory that could be related to land use intensity change, the matching LEAF should be used for impact quantification of the response option. For example, a company could go from soybean, traditional tillage, to soybean, reduced tillage. In this case, the company should change the land use intensity category and calculate the new impact based on the new LEAF.
 - To measure the improvement in quality: This approach aims to quantify the potential improvement in environmental quality by considering regional differences when there is not an exact LEAF match for different land management types. This would require shifting to the next, smaller factor within the same land use type.
 - For example, consider an agricultural production in Argentina, where the initial practice matches with “*occupation, arable/annual, irrigated.*” The company implements a response option that improves SOC and soil erosion but cannot directly quantify the improvement of both categories. To measure the impact of the response option, the “*occupation, annual, non-irrigated, intensive*” and “*arable, irrigated, extensive*” LEAFs should be applied—as summarized in the table below.
 - Since LEAFs are spatially explicit, the change in applied factors for each response option needs to be specific to the location of the activity.
 - For some regions and land uses, however, LEAFs might be the same due to data or modeling limitations. Therefore, while the literature suggests that there could be an improvement, this may not always be quantifiable using LEAFs.
- The guidelines encourage companies to implement more precise methods and data where possible to capture the impact of implementing response options and only to use this calculation approach as a last resort.³

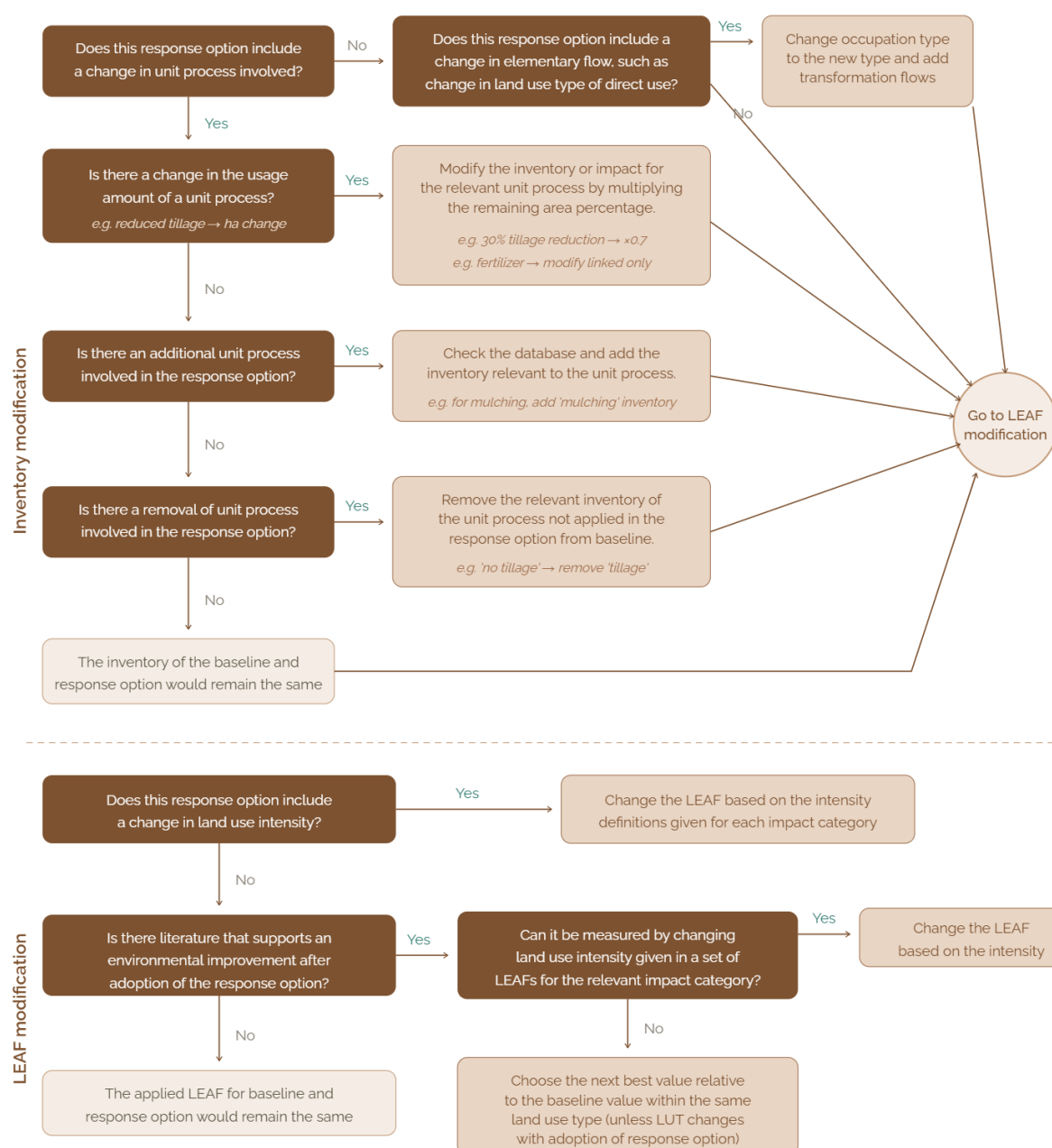
³ **Note for consultation:** The SBTN Land Hub is working to develop examples of improvements for selected commodities and regions. A complete assessment of all combinations is not currently feasible. As such, the SBTN Land Hub is working to develop guidelines for companies to complete this assessment to calculate improvements where appropriate data exists.

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Example of change in applied LEAF: response option assessment for “alley cropping”

Soil organic carbon baseline	Soil organic carbon—response option	Soil erosion baseline	Soil erosion—response option
Annual, irrigated	Annual, non-irrigated	Arable, irrigated, intensive	Arable, irrigated, extensive

An accompanying decision framework has been developed to support companies to calculate the change in impact associated with each response option.



Decision tree for calculating the impact from the implementation of response options.

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Draft list of response options

#	Category	Name	Description	Relevant impact category	LEAF or inventory change
1	Biochar	Biochar soil application	Biochar is obtained by pyrolyzing biomass and is, by definition, applied in a way that avoids its rapid oxidation to CO ₂ . Its use in agriculture relates to animal feeding, manure treatment (e.g., as an additive for bedding, composting, storage, or anaerobic digestion), fertilizer manufacturing, or direct soil application. Since the feedstock carbon represents photosynthetically fixed CO ₂ from the atmosphere, producing and applying biochar is essentially a CO ₂ removal (CDR) technology—a technology which has a high technology readiness level.	Acidification	Inventory
				SOC	LEAF
				Yield	Inventory
2	Natural Forest Management	Reduced impact logging	Practices that avoid damage to non-commercial trees.	Occupation	LEAF
3	Improved Plantations	Extension of logging rotation	Extension of logging rotation lengths to maximize yield while increasing average landscape carbon stocks.	Occupation	LEAF
				Acidification	Inventory
				Yield	Inventory
4	Improved Plantations	Multi-species plantation systems	In experimental and natural systems, more diverse plant communities often have higher primary productivity. This can be due to complementarity between different species, which can use resources more effectively together, or a higher likelihood of more productive species being present.	Occupation	LEAF
				Acidification	Inventory
				Erosion	LEAF
				Yield	Inventory
5	Fire Management	Advance fire control practices in	Advance fire control practices in tropical moist forests, such as fire breaks between pasture and forest edges.	Occupation	LEAF
				Acidification	Inventory

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		tropical moist forests			
6	Conservation Agriculture	Cover crops in fallow periods	Increased carbon sequestration in agricultural soils occurs when additional crops are planted in the periods when the main crop is not growing. The use of legume crops leads to decreased emissions from fertilizer manufacturing, as a result of reduced inorganic fertilizer use.	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
7	Conservation Agriculture	Reduced tillage	Increased sequestration in agricultural soils by adopting reduced practices in croplands.	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
8	Conservation Agriculture	Zero tillage	Increased sequestration in agricultural soils by adopting no-till practices in croplands.	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
9	Agroforestry	Windbreaks	Increasing the quantity of trees in croplands by introducing windbreaks (also called shelterbelts), alley cropping, and farmer-managed natural regeneration (FMNR).	SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
10	Agroforestry	Alley cropping	Alley cropping is defined as the planting of rows of trees and/or shrubs to create alleys within which agricultural or horticultural crops are produced. The trees may include valuable hardwood veneer or lumber species; fruit, nut, or other	Occupation	Both
				Acidification	Inventory
				SOC	LEAF

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			specialty crop trees/shrubs; or desirable softwood species for wood fiber production.	Erosion	LEAF
				Yield	Inventory
11	Agroforestry	Farmer-managed natural regeneration	Farmer-managed natural regeneration (FMNR) is a low-cost land restoration technique used to build resilience to climate extremes and combat poverty and hunger among subsistence farmers by increasing food and timber production. Developed in 1983 in Niger, FMNR is a form of coppicing and pollarding, which draws on traditional practices and is sensitive to local variations. In FMNR systems, farmers protect and manage the growth of trees and shrubs that regenerate naturally in their fields from root stock or from seeds dispersed through animal manure. FMNR is a simple, low-cost method for farmers to increase the number of trees in their fields.	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
12	Grazing	Legumes in pastures	Increased sequestration in soils as a result of sowing legumes in planted pastures; restricted to areas where this would result in net sequestration. This also includes, where relevant, avoided emissions related to fertilizer application to pastures.	Acidification	Inventory
				SOC	LEAF
13	Grazing	Grazing optimization	Increased soil sequestration by increasing grazing in locations that are understocked and decreasing grazing in locations that are overstocked.	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
14	Grazing	Management of vegetation/ Forage improvement	This includes using improved grass varieties/sward composition and deep-rooting grasses for increased productivity and nutrient management.	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
				Acidification	Inventory

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15	Cropland Nutrient Management	Rice residue incorporation	Crop residues are a rich source of plant nutrients, which can be released in soil through microbial decomposition. As a result, returning crop residue to the soil, rather than burning it, helps to improve several soil quality parameters. The long-term sustainability of rice–wheat cropping systems (RWCS) requires robust interventions, such as the recycling of rice straw (RS) to improve soil health and minimize environmental impacts.	SOC	LEAF
				Yield	Inventory
16	Improved Rice Cultivation	Fertilizer management	Application of plant nutrients in optimum quantities, in the right proportions, and at the right times for a specific crop's needs and agroclimatic conditions.	Occupation	LEAF
				Acidification	Inventory
				Yield	Inventory
17	Grassland Restoration	Grassland restoration	Increased sequestration from restoring cropland to grassland areas with limitations on agricultural production; this can be grassland or shrubland, depending on where those systems occurred historically.	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
18	Agroforestry	Silvopasture	Trees in grazing land.	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
19	Land Management	Crop rotation	Crop rotations are planned sequences of crops over time on the same field. Rotating crops provides productivity benefits by improving soil nutrient levels and breaking crop pest cycles. Farmers may also choose to rotate crops to reduce their production risk through diversification or to manage scarce resources, such as labor, during planting and harvesting periods.	Occupation	Inventory
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory

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20	Land Management	Perennial cropping systems	Perennial crops are defined by their ability to be harvested multiple times throughout their lifespan and to stay alive for more than two years before needing to be replanted. Perennial grains may contribute to reducing erosion, avoiding carbon losses, and reducing nutrient losses to water. Perennial grains can also capture nutrients deeper in soil when they are scarce, thereby reducing farm costs and increasing the effectiveness of agricultural grain crops.	Occupation	Both
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
21	Cropland Nutrient Management	Nitrification inhibitors	An inhibitor is a compound added to a nitrogen-based fertilizer to reduce losses when the fertilizer is applied to the crop. By extending the time the active nitrogen component of the fertilizer remains in the soil, as either urea-N or ammonium-N, an inhibitor can improve nitrogen use efficiency (NUE) and reduce environmental emissions. Two main types of inhibitor are added to nitrogen fertilizers: a) urease inhibitors (UI), which inhibit the hydrolytic action of the urease enzyme on urea, and b) nitrification inhibitors (NI), which inhibit the biological oxidation of ammonium to nitrate.	Occupation	LEAF
				Acidification	Inventory
				Yield	Inventory
22	Conservation Agriculture	Strip tillage	Strip tillage is defined by the Conservation Technology Information Centre (CTIC) as a modification to a direct drilling system where disturbance of less than one third of the total field is cultivated (Reeder, 2000). Crop residue is removed from the cultivated strips and placed between rows with the seed then drilled into the strips, either in spring or autumn.	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
23	Land Management	Shade-cover system	Shade influences the microclimate of cocoa blocks through its effect on the wind, relative humidity, and the amount of solar radiation received by the cocoa trees. The micro-climate, in turn, influences the incidence of pests and diseases (Smithsonian Institute, Federation of Cocoa Commerce).	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
		Revegetation		Occupation	LEAF

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24	Land Management		Planting of vegetation cover to reduce erosion by wind and water (Rainforest Alliance).	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
25	Land Management	Contour farming	Farming with row patterns that run horizontally around the hill as opposed to up and down the hill (USDA).	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
26	Land Management	Terracing	Terracing of steep areas to reduce erosion by wind and water (Rainforest Alliance).	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
27	Land Management	Intercropping crops with varied root depths	Planting multiple crops with different rooting depths and soil uses to enhance soil quality and health (Rainforest Alliance).	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory
28	Improved Forest Management	Silviculture/silvopasture	Controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society—for applications such as wildlife habitat, timber, water resources, and restoration—on a sustainable basis. Silviculture practices include thinning, harvesting, planting, pruning, prescribed burning, and site preparation (USDA).	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF

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29	Improved Forest Management	Maintain forest habitat composition	Maintain forest habitat components and stand structures as would be expected from naturally occurring processes (FSC).	Occupation	LEAF
				Acidification	Inventory
				SOC	Inventory
				Erosion	LEAF
				Yield	Inventory
30	Improved Forest Management	Silvopasture	Practice of integrating trees, forage, and the grazing of domesticated animals in a mutually beneficial way. This practice utilizes the principles of managed grazing (USDA, TNC).	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
31	Improved Forest Management	Range plantings (trees, grasses)	Establishment of adapted perennial or self-sustaining vegetation, such as grasses, forbs, legumes, shrubs and trees, to restore the original plant community, reduce erosion, improve water quality, and increase carbon sequestration, among other benefits (NRCS, TNC).	Occupation	LEAF
				Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
32	Grazing	Forage improvement	Planting of native grasses and other forage plants that reduce enteric emissions in grazing cattle in grazing lands.	Occupation	LEAF
				Acidification	Inventory
				Erosion	LEAF
33	Grazing	Integrated pest management	IPM is a sustainable, science-based, decision-making process that combines biological, cultural, physical, and chemical tools to identify, manage, and reduce risk from pests. This approach employs pest management tools and strategies in a way that minimizes overall economic, health, and environmental risks.	Occupation	LEAF
				Acidification	Inventory
34	Grazing		Managing grazing and/or browsing animals through a rotational or mob grazing system where animals are moved to fresh pasture frequently enough to allow	Occupation	LEAF
				Acidification	Inventory

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		Managed/ prescribed grazing	pastures time to recover, e.g., adaptive multi-paddock (AMP) grazing (TNC, USDA).	SOC	LEAF
				Erosion	LEAF
35	Land Management	Integrated pest management	IPM is a sustainable, science-based, decision-making process that combines biological, cultural, physical, and chemical tools to identify, manage and reduce risk from pests. This approach employs pest management tools and strategies in a way that minimizes overall economic, health, and environmental risks.	Occupation	LEAF
				Acidification	Inventory
36	Land Management	Hedgerow planting	Dense woody vegetation planted in a linear design to provide food and shelter for wildlife, protect water quality, and create a field boundary (NRCS).	Acidification	Inventory
				Erosion	LEAF
				Yield	Inventory
37	Land Management	Maintaining field margins	A strip of permanent, non-crop vegetation established at the edge or around the perimeter of a field. Establishing field margins helps to manage harmful insect populations by providing habitat for their natural predators and thereby reduces the need for pesticide applications (NRCS).	Acidification	Inventory
				Erosion	LEAF
38	Improved Rice Cultivation	Rice stubble	Rice stubble and straw are managed in a sustainable way to mitigate greenhouse gas emissions, minimize environmental impacts, and improve soil quality. Rice stubble is i) not burned, and ii) allowed sufficient time (at least 3 weeks) for aerobic decomposition before wetting.	Acidification	Inventory
				SOC	LEAF
				Yield	Inventory
39	Quarry Management	Quarry rehabilitation	Biodiversity management approaches and rehabilitation programs enable cement and concrete companies to become more nature positive by helping to restore degraded habitats and recover species at new quarry and plant sites. Management of temporary habitats is also important for supporting biodiversity during the quarry's operational phase and helping to maintain species populations, allowing for a more rapid recovery come restoration.	Occupation	LEAF
				SOC	LEAF
				Erosion	Inventory
40	Quarry Management		Biodiversity management approaches and rehabilitation programs enable cement and concrete companies to become more nature positive by helping to restore	Occupation	LEAF
				Acidification	Inventory

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		Biodiversity management plans	degraded habitats and recover species at new quarry and plant sites. Management of temporary habitats is also important for supporting biodiversity during the quarry's operational phase and helping to maintain species populations, allowing for a more rapid recovery come restoration.	SOC	LEAF
				Erosion	Inventory
41	Conservation Agriculture	Mulching	Mulching is a crucial agronomic practice involving the application of materials to the soil surface. This technique conserves water by enhancing the soil's water infiltration capacity, reducing soil erosion, and minimizing surface runoff. Mulching also increases topsoil temperature and fertility, alters microbial biomass, and improves soil quality, which, in turn, enhances seed germination, root production, and plant development, leading to higher crop yields, even with low water input. Additionally, mulching boosts enzyme activity in the soil, creating favorable conditions for plant metabolism, while also suppressing weed infestation and reducing weed density and biomass.	Acidification	Inventory
				SOC	LEAF
				Erosion	LEAF
				Yield	Inventory



**SCIENCE BASED
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