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# Data Reference Guide

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Normative basis : CCPs (ICVCM); ICROA Code of Best Practice; CORSIA; ISO 14064-2

Integrations methodological :

- GL-M-001 (REDD core)
- GL-MC-004 (calculation/report)
- GL-MC-004 Leakage Annex ( class→gate )
- GL-MS-002 ( additionality /gates)
- GL-MS-004 (leakage)
- GL-MS-007 (legal/land compliance)
- GL-MS-012 (data/QA/QC)
- GL-MS-011 (national requirements/Art. 6)

Co- benefits : Assessed based on the CCB (Climate, Community & Biodiversity Standards)

GREENLINE CARBONSAT  
September 2025

## Document Information

GREENLINE CARBONSAT – Metodologia – GL-MS-004

1

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1.1	Purpose and Scope .....	5
1.2	Rule for accepting sources (mandatory): .....	5
1.3	Cross-cutting scope .....	6
1.4	Fundamental principles: .....	6
2.	Principles and Hierarchy of Sources .....	8
2.1	Hierarchy of trustworthiness (order of precedence) .....	8
2.2	Minimum requirements per dataset (mandatory) .....	8
2.3	Formats, standards and conventions .....	9
2.4	Traceability and provenance .....	9
2.5	Consistency, cross-validation and conflict resolution .....	9
2.6	Restrictions and prohibitions .....	10
3.	Global Data Catalog .....	12
3.1	Remote Sensing (global, official/multilateral) .....	12
3.2	Global normative factors (conversions and constants) .....	13
3.3	Statistics and socio-environmental contexts (support) .....	13
3.4	Rules for using the Global Catalog .....	14
4.	Country Packs .....	15
4.1	Structure and purpose .....	15
4.2	Country Pack Template (standard structure) .....	15
4.3	Country Pack: Brazil (SBCE) .....	16
4.4	Regulatory Requirements (SBCE and Art. 6) .....	17
5.	Metadata and Provenance .....	18
5.1	Minimum metadata schema (mandatory) .....	18
5.2	Provenance (minimum pipeline) .....	19
5.3	Changelog and versioning (required) .....	20
5.4	Publication and access (metadata vs. data) .....	20
5.5	Licenses and compliance .....	21
5.6	Reproducibility and validation .....	21
6.	Data Quality .....	22
6.1	QA/QC Criteria (minimum requirements) .....	23
6.2	Shoring and thresholds (FTC) .....	23
6.3	Decision matrix (issue / condition / withhold) .....	24

---

6.4	Independent Sampling and Rechecking .....	24
6.5	Handling gaps and conflicts .....	25
6.6	Update rules per cycle .....	25
7.	Final Provisions .....	27
7.1	Validity and entry into force (prospective) .....	27
7.2	Precedence and conflicts .....	27
7.3	Roles and responsibilities .....	27
7.4	Depreciation and exceptions .....	28
7.5	Relationship with the Greenline Carbonsat .....	28
Appendix I — Global Data Catalog (Master Table) .....		29
Annex II — Country Pack Template (Standard Structure) .....		31
Annex III — Metadata Scheme (Operational Model) .....		32
Annex V — Country Pack: Brazil (SBCE) .....		33
V.1	Official Sources and Registries (Brazil) .....	33
V.2	Regulatory Requirements (SBCE and Art. 6) .....	34
V.3	Metafields Art. 6/CA (Greenline Registration) .....	34

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## 1. Introduction

### 1.1 Purpose and Scope

This guide is the normative data repository for all Greenline methodologies. Carbonsat .

Its goal is to standardize sources, formats, and quality rules that feed into the methodological modules, avoiding duplication, ensuring digital traceability, and guaranteeing consistency, auditability, and alignment with international standards.

### 1.2 Rule for accepting sources (mandatory):

- Only those [documents] will be accepted for use in Greenline methodologies. Carbonsat , the data sources explicitly listed in this **GL-GR-010** (Global Catalog and Country Packs).
- Any source not listed in this document will not be accepted.
- The inclusion of new fonts requires a formal proposal to update GL-GR-010 and prospective entry into force (applicable only to future cycles), with registration of version, URI and hash .
- Exclusivity : use only sources listed on GL-GR-010 / Country Pack or Include via *fast-track* from 010

The **GL-GR-010** is structured in two layers:

- Global: consolidates multilateral sources (e.g., NASA, ESA, USGS, IPCC, FAO, UNDP, World Bank), normative parameters (e.g., IPCC factor 0.47; 36-month historical window), and metadata standards applicable to all projects.
- Country Packs: national add-ons, with registrations and requirements specific to each country (e.g., CAR, SIGEF, RGI and SBCE requirements in Brazil).

### 1.3 Cross-cutting scope

GL -**GR-010** serves as a mandatory reference for the following methodologies and modules:

- GL-M-001 (REDD core, global and regional data requirements);
- GL-MC-004 (calculation and report, including AGB→C and CO<sub>2</sub>eT conversions );
- Leakage Annex of GL-MC-004 (definition of classes and gates by usage/coverage data);
- GL-MS-002 (additionality and emission governance, with deforestation and pressure data);
- leakage assessment , with spatial/temporal windows and buffers);
- GL-MS-007 (legal and land compliance, use of official registers);
- GL-MS-012 (data quality assessment, scoring and FTC);
- GL-MS-011 (national integration and requirements of Art. 6, including corresponding adjustments).

### 1.4 Fundamental principles:

- Integrity — exclusive use of public, official, and auditable data (and listed in GL-GR-010).
- Reproducibility — datasets with explicit URI, version, hash , and license.
- Transparency — publication of metadata (not necessarily raw data), in accordance with licenses.
- Forward-looking update — revisions to **GL-GR-010** apply only to future cycles, with version control.

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### *Captions and Abbreviations*

- *AGB — Above-Ground Biomass .*
- *CO<sub>2</sub>eT — Equivalent CO<sub>2</sub> stock ( ex-post based on preserved stock).*
- *FTC — Technical Confidence Factor.*
- *URI — Uniform Resource Identifier (unique resource identifier).*
- *Hash — Digital signature for traceability of files/ datasets .*
- *QA/QC — Quality Assurance / Quality Control .*
- *VVB — Validation & Verification Body (validation and verification entity).*
- *OAG — Audit and Guarantee Body.*
- *SBCE — Brazilian Emissions Trading System.*
- *CA — Corresponding Adjustment (corresponding adjustment).*
- *FPIC/CLPI — Free, Prior and Informed Consent.*
- *KYC/KYB — Know Your Customer / Know Your Business.*
- *AML/ABC — Anti-Money Laundering / Anti-Bribery and Corruption.*

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## 2. Principles and Hierarchy of Sources

### 2.1 Hierarchy of trustworthiness ( order of precedence)

- Level 1 — Official/Multilateral: NASA, ESA, USGS, IPCC, FAO, World Bank, UNDP and equivalents.
- Level 2 — Official national bodies: federal/state/municipal agencies and registrars with public faith (e.g., INPE, IBGE, RGI, SIGEF, SICAR).
- Level 3 — Peer-reviewed academic journals: databases and articles with peer review and complete metadata.
- Level 4 — Other auditable sources: only when listed in this GL-GR-010 and with explicit technical justification.
- Application rule: In case of conflict between datasets , the highest level in the hierarchy prevails, and in case of a tie, the most recent dataset (same production methodology) prevails. If the conflict persists, usage is conditional on the cycle according to the governance of GL-MS-002.

### 2.2 Requirements minimums by dataset (required)

- Identification and access: dataset name , public URI, version, hash (integrity), license, and issuing authority.
- Essential metadata: collection/processing dates (ISO 8601), geographic scope, spatial/temporal resolution, production method, and stated limitations.
- Persistent identifier (if any): PID/DOI for scientific traceability.
- Reproducibility: description of the transformation chain (provenance), parameters and, when applicable, reference to scripts/masks.
- Legal compliance: full respect for usage licenses, personal data, and legal confidentiality (where applicable).

## 2.3 Formats , standards and conventions

- Tabular formats and data interchange: CSV, JSON.
- Geospatial: GeoJSON , COG (Cloud- Optimized GeoTIFF ), STAC (catalog), WMS/WFS.
- Reference system: EPSG:4326 (WGS84) standard CRS or indicate the CRS used, with documented reprojection .
- Units and notation: ha , km<sup>2</sup>, tCO<sub>2</sub>e ; decimal separator “.” and no thousands separator.
- Time stamp: UTC, ISO 8601 format.
- Naming convention: a stable convention for files, layers, and columns, avoiding ambiguity.

## 2.4 Traceability and provenance

- Changelog by dataset : version ( semver ), date, assignee, change description, hash before/after.
- Minimum pipeline: source → transformations → output; key parameters must be registered.
- Evidence of integrity: hash verification and independent sampling (VVB/OAG) on the metadata trail.

## 2.5 Consistency , validation crusade and conflict resolution

- checks : integrity (no critical gaps), consistency (between sources/times), completeness (required fields), and accuracy (tolerances defined in **GL-MC-004** ).
- Cross-validation: when applicable, compare sources of the same level (e.g., PRODES × MapBiomass ) and record the technical decision.
- Unresolved conflicts: apply hierarchy (2.1) and/or condition usage in the cycle ( **GL-MS-002** ).

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## 2.6 Restrictions and prohibitions

- Field inventory is not used for CO<sub>2</sub>eT calculation (for comparison purposes only).
- Fonts not listed in GL-GR-010 (Global Catalog / Country Packs) will not be accepted.
- Private or non-auditable data is prohibited.
- Resampling /manipulation without a documented method and complete metadata is prohibited.
- Fonts not listed in GL-GR-010 (Global Catalog or applicable Country Pack) will not be accepted. Inclusions only via formal proposal (Section 2.7), with prospective entry.

## 2.7 Update and change control

- Additions/changes to sources are only accepted via a formal proposal to update this **GL-GR-010** .
- Prospective entry into force: changes apply only to future cycles.
- Depreciation: Obsolete datasets are marked as deprecated , while maintaining the history and reference to the replacement.

For new sources officials ( global) or national ) with impact In critical cases , a fast-track inclusion process may be adopted . in this GL-GR-010, maintaining prospective entry into the cycle regulatory current and URI/ version /hash record .

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## 2.8 Interoperability with Greenline methodologies

- GL-M-001 / GL-MC-004: consume normative factors and standard remote series.
- GL-MS-002 / GL-MS-004: utilize land use/coverage and deforestation series according to the Global/Country Catalog.
- GL-MS-007: Requires official registrations and enrollments listed in the corresponding Country Pack.
- GL-MS-012: QA/QC and FTC elements are derived from the requirements and metadata defined in this section.

### *Captions and Abbreviations*

- *CRS — Coordinate Reference System (coordinate reference system).*
- *EPSG:4326 — WGS84 (latitude/longitude).*
- *COG — Cloud- Optimized GeoTIFF.*
- *STAC — SpatioTemporal Asset Catalog*
- *PID/DOI — Persistent Identifier / Digital Object Identifier .*
- *ISO 8601 — International standard for date/time.*
- *UTC — Coordinated Universal Time.*
- *Semver — Semantic versioning ( major.minor.patch ).*

### 3. Global Data Catalog

#### 3.1 Sensing Remote ( global , official / multilateral )

The datasets listed below represent the main global sources of remote sensing data, used as standardized inputs across all...

Code	Dataset	Authority	URI	Frequency	Usage (Module)
G-01	Landsat ( Collection 2)	USGS	<a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a>	Monthly/Yearly	M-001; MS-002; MS-004
G-02	Sentinel-2 (Level-2A)	ESA ( Copernicus )	<a href="https://dataspace.copernicus.eu/">https://dataspace.copernicus.eu/</a>	Monthly	M-001; MS-002; MS-004
G-03	GEDI LiDAR (L2/L4)	NASA	<a href="https://gedi.umd.edu/data/">https://gedi.umd.edu/data/</a>	Annual	M-001 (forest structure)
G-04	MODIS (global indices)	NASA	<a href="https://modis.gsfc.nasa.gov/data/">https://modis.gsfc.nasa.gov/data/</a>	Monthly	Time series (support)
G-05	Copernicus WorldCover	ESA	<a href="https://worldcover2020.esa.int/">https://worldcover2020.esa.int/</a>	Annual	Auxiliary layer for use/coverage
G-06	Copernicus Global Land Service	ESA	<a href="https://land.copernicus.eu/global">https://land.copernicus.eu/global</a>	Monthly/Yearly	Biophysical layers (support)
G-07	Global Surface Water	JRC (EU)	<a href="https://global-surface-water.appspot.com/">https://global-surface-water.appspot.com/</a>	Annual	Support for pressure analysis
G-12	NASA FIRMS (Active Fire)	NASA	<a href="https://firms.modaps.eosdis.nasa.gov/">https://firms.modaps.eosdis.nasa.gov/</a>	Daily	Risk support (MS-002/MS-004)
G-13	GFED – Global Fire Emissions Database	NASA/ partners	<a href="https://www.globalfiredata.org/">https://www.globalfiredata.org/</a>	Annual	Risk support (MS-002/MS-004)

### 3.2 Global normative factors (conversions and constants)

Table of accepted technical factors, established by the IPCC guidelines and used in calculations by **GL-MC-004**.

Code	Factor/Constant	Authority	URI	Frequency	Usage (Module)
F-01	AGB → C = 0.47 (Tier 1)	IPCC	<a href="https://www.ipcc-nggip.iges.or.jp/public/2006gl/">https://www.ipcc-nggip.iges.or.jp/public/2006gl/</a>	Fixed	MC-004 (biomass conversion)
F-02	IPCC Guidelines 2006/2019	IPCC	<a href="https://www.ipcc-nggip.iges.or.jp">https://www.ipcc-nggip.iges.or.jp</a>	Periodic reviews	CO <sub>2</sub> eT calculation )

### 3.3 Statistics and socio-environmental contexts (support)

Global reference sources for socioeconomic context and complementary project analyses.

Code	Dataset	Authority	URI	Frequency	Usage (Module)
S-01	FAOSTAT	FAO	<a href="https://www.fao.org/faostat/">https://www.fao.org/faostat/</a>	Annual	Global context of land use
S-02	World Development Indicators	World Bank	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>	Annual	Global socioeconomic
S-03	Human Development Reports	UNDP	<a href="https://hdr.undp.org/data-center">https://hdr.undp.org/data-center</a>	Annual	Human development indicators

### 3.4 Rules for using the Global Catalog

Summary of the regulatory rules applicable to the use of any dataset listed in this section.

Rule	Description
Single reference	Modules exclusively consume the resources listed in this section; procedures are described in the methodologies.
Priorities and conflicts	In case of disagreements, the hierarchy of Section 2 prevails.
Version control	Register the URI, version, hash , and license; changes only apply to future cycles.
Exclusivity	Only datasets listed in GL-GR-010 (Global or Country Packs) are accepted; others will not be accepted.
Remissions	This 010 refers to: GL-MC-004 (calculations), GL-MS-002 ( gates ), GL-MS-004 ( leakage ), GL-MS-005 ( VVBs ), GL-MS-011 (Art. 6/CA), GL-MS-012 (QA/QC/FTC), GL-MS-003 ( co-benefits /CCB).

#### Captions and Abbreviations

- *LiDAR — Light Detection and Ranging (laser sensing).*
- *MODIS — Moderate Resolution Imaging Spectroradiometer .*
- *WDI — World Development Indicators .*
- *HDR — Human Development Reports.*
- *URI — Uniform Resource Identifier (unique resource identifier).*

## 4. Country Packs

### 4.1 Structure and purpose

Country *Packs* complement the Global Catalog with mandatory national data and registries. They serve to ensure local regulatory compliance (land tenure, environmental, socioeconomic) and integrate Greenline methodologies into the legal context of each country.

### 4.2 Country Pack Template (standard structure)

Summary: Minimum required completion template for all countries.

Field	Description
Country	Official name of the country
Land Sources	Property registries and records (e.g., RGI, SIGEF, SNCI)
Environmental Sources	Federal/state environmental agencies; national inventories
Regulators	Ministries, national agencies, official registries
Socioeconomic Registrations	National statistical institutes (e.g., IBGE)
Specific Requirements	Corresponding adjustments (CA), CLPI, local licenses
Public Metadata	URI, hash , and changelog published in the Greenline Registry. Carbonsat

### 4.3 Country Pack: Brazil (SBCE)

Summary: List of official sources and specific regulatory requirements for Brazil, with emphasis on SBCE and Art. 6.

Category	Official Source	URI	Usage (Module)
Land/Registry	RGI (Registry Offices) / CNJ	<a href="https://www.registradores.org.br/">https://www.registradores.org.br/</a>	MS-007 (ownership), MS-011
Georeferencing	SIGEF (INCRA)	<a href="https://sigef.incra.gov.br/">https://sigef.incra.gov.br/</a>	MS-007 (perimeter)
Environmental Registry	SICAR (CAR)	<a href="https://www.car.gov.br/">https://www.car.gov.br/</a>	MS-007 (status/ overlaps)
National Statistics	IBGE	<a href="https://www.ibge.gov.br/">https://www.ibge.gov.br/</a>	Socioeconomic context (M-001, MS-002)
Federal Environmental	IBAMA	<a href="https://www.gov.br/ibama">https://www.gov.br/ibama</a>	MS-007 (licenses/embargoes)
Land Use/Cover	MapBiomias	<a href="https://mapbiomas.org/">https://mapbiomas.org/</a>	M-001, MS-002, MS-004
Deforestation (annual)	INPE PRODES	<a href="https://prodes.inpe.br/">https://prodes.inpe.br/</a>	MS-002 (historical series)
Alerts (almost real)	INPE DETER	<a href="https://terrabrasilis.dpi.inpe.br/">https://terrabrasilis.dpi.inpe.br/</a>	MS-002, MS-004
Satellite Series	USGS/NASA/ESA	<a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a> ; <a href="https://dataspace.copernicus.eu/">https://dataspace.copernicus.eu/</a>	M-001, MS-002, MS-004

#### 4.4 Regulatory Requirements (SBCE and Art. 6)

Summary: Main national obligations applicable to carbon credit eligibility in Brazil.

Requirement	Description	Module/Record
Law 15.042/2024	Legal framework of SBCE and guidelines for registration and ownership.	Greenline Registration
Resolution 19/2025	Registration and interoperability procedures with CA.	MS-011; SCJ-GC (MS-007)
Corresponding Adjustment (CA)	Specific fields and metadata for international interoperability.	Greenline Registration

#### Captions and Abbreviations

- *RGI — General Real Estate Registry.*
- *SIGEF — Land Management System (INCRA).*
- *SICAR — National System of Rural Environmental Registration.*
- *IBGE — Brazilian Institute of Geography and Statistics.*
- *IBAMA — Brazilian Institute of Environment and Renewable Natural Resources.*
- *PRODES/DETER — INPE's Deforestation Monitoring Programs.*
- *MapBiomass — A collaborative platform for mapping land use/land cover.*
- *SBCE — Brazilian Emissions Trading System.*
- *CA — Corresponding Adjustment (corresponding adjustment).*

## 5. Metadata and Provenance

### 5.1 Scheme Minimum metadata ( required)

Summary: fields that **everyone** The dataset must present the following characteristics to be accepted in the methodologies (see Section 2 and the exclusivity rule).

Field	Description	Type/Format	Mandatory	Example
dataset	Dataset name	Text	Yes	Sentinel-2 Level-2A
authority	Issuing authority	Text	Yes	ESA
uri	Public access link	URL	Yes	<a href="https://dataspace.copernicus.eu/">https://dataspace.copernicus.eu/</a>
version	Declared version	Semver /Text	Yes	2025.1
date	Update date	ISO 8601 (UTC)	Yes	2025-09-30T00:00:00Z
license	License to use	Text/URL	Yes	CC-BY 4.0
hash	Integrity signature	SHA-256	Yes	9f2a...c1e
crs	Reference system	EPSG	Yes	EPSG: 4326
spatial_resolution	Spatial resolution	Number/unit.	Optional	10 m
temporal_resolution	Temporal resolution	Text	Optional	Monthly
coverage	Geographic extent	Bounding box	Yes	Brazil (-74...-34; -34...6)
method	Method/process	Text	Yes	Atmospheric correction
limitations	Stated limitations	Text	Yes	Cloud cover
pid_doi	Persistent identifier	DOI/PID	Optional	doi:10.5281/ zenodo ...
maintainer	Responsible person/contact	Text	Yes	ESA Data Team

Field	Description	Type/Format	Mandatory	Example
uncertainty_value	Numerical value of uncertainty (90% CI)	%	Yes	8%
uncertainty_method	Uncertainty calculation method	Text	Yes	Bootstrap sampling
confidence_level	Confidence level adopted	%	Yes	90%

**Normative note :** You metadata defined in this section they are mandatory for all Gate decisions (GL-MS-002 ) and checks independent (GL-MS-005); all evidence he must have a valid URI and hash according to this GL-GR-010.

## 5.2 Provenance ( minimum pipeline )

Summary: to record the data **transformation chain , ensuring reproducibility and auditability.**

Stage	Description	Artifacts/Parameters	Registered Hash	Responsible
Origin	Original source as per Global Catalog/Country Pack	URI/version/license	Yes	Issuing authority
Ingestion	Verifiable download/mirroring	Tool/time	Yes	Project operation
Transformation	Reprojection , clipping, masking, calculation	Scripts/ masks / params	Yes	Project operation
Exit	File/output for use	Format/CRS/version	Yes	Project operation
Publishing metadata	Metafield registration in Carbonsat	Fields of 5.1	N/A	Greenline Carbonsat

### 5.3 Changelog and versioning ( required )

Summary: each dataset should have a **change history with semantic** versioning .

Field	Description
version	New version ( without version )
previous_version	Previous version
date	Date/time (UTC, ISO 8601)
change_type	major / minor / patch
description	What changed (data, mask, script, parameter)
affected_artifacts	URIs / files affected
before_hash / after_hash	Previous and new hash
approver	Who approved the change?

Semver rules :

- major: change that affects interpretation/comparability;
- minor : compatible addition;
- Patch: a correction without logical impact.

### 5.4 Publication and access (metadata vs. data)

Summary: **Metadata is public** ; raw data follows the source's license.

Item	Rule
Metadata	Publish all fields from section 5.1 in the Greenline Registry. Carbonsat
Raw data	Access according to license/source; when restricted, maintain reference/URI.
Evidence	Store hashes , scripts, and ingestion/transformation records.
Update	Valid only for future cycles (prospective entry).

### 5.5 Licenses and compliance

Summary: Data usage **must** respect source licenses and restrictions.

Requirement	Description
Explicit license	Specify the license and, if applicable, the URL of the legal text.
Permitted use	Confirm compatible purpose (research/derivatives/commercial)
Attribution	Cite authority as per license terms.
Sensitive data	Treat in accordance with local laws; avoid personal data.
Audit	Provide evidence of compliance on demand (VVB/OAG)

### 5.6 Reproducibility and validation

Summary: ensure that third parties **can reproduce** the result with the same inputs and parameters.

Requirement	Description
Scripts/Masks	Deposit/reference used versions (or package hash )
Parameters	Record key values (e.g., thresholds , buffers, dates)
Environment	Describe relevant dependencies (e.g., GDAL/version)
Cross-validation	When applicable, compare equivalent sources and record the decision.
Independent sampling	Allow VVB/OAG rechecking based on hashes and metadata.

*This guide is mandatory for Gate decisions (GL-MS-002) and verifications (GL-MS-005); all evidence he must to have a registered URI and hash .*

#### *Captions and Abbreviations*

- *PID/DOI — Persistent Identifier / Digital Object Identifier .*
- *Semver — Semantic versioning ( major.minor.patch ) .*
- *UTC — Coordinated Universal Time.*
- *ISO 8601 — International date/time standard.*
- *SHA-256 — Cryptographic hash algorithm .*
- *GDAL — Geospatial Data Abstraction Library.*

## **6. Data Quality**

## 6.1 QA/QC criteria ( minimum) mandatory )

Summary: quality criteria that **everyone** The dataset must meet the requirements to be accepted in the methodologies (link to GL-MS-012).

Criterion	Definition	How to check	Minimum evidence
Integrity	Absence of gaps/corrupted files	Hash verification / record counting	Hash SHA-256; intake log
Consistency	Temporal/spatial coherence and coherence between sources	Comparison between versions and sources of the same level.	Cross-validation report
Completeness	Presence of all required fields (Section 5.1)	Metadata checklist	Signed checklist
Current Affairs	Historical window within the normative period	ISO 8601 (UTC) date verification	Date field in metadata
Precision	Errors within the tolerances defined in GL-MC-004	Documented mask tests/ thresholds	Test parameters + outputs
License/Compliance	Use in accordance with the license and applicable laws.	Terms/license check	License link/file

## 6.2 Shoring and thresholds (FTC)

Summary: Data quality feeds into the **Technical Confidence Factor (TCF)** , published per cycle; the **minimum TCF threshold** is defined in **GL-MS-012** .

Dimension	Typical indicators	Source/Section	Treatment
Dataset quality	Integrity, consistency, completeness, timeliness, accuracy	6.1 / 5.1	Partial score (MS-012)
Traceability	URI, version, hash , changelog / provenance	5.1 / 5.2 / 5.3	Partial score (MS-012)
Convergence of sources	Cross-validation between peer-reviewed sources	2.5	Score adjustment
Compliance/License	Terms of use, restrictions and attribution	5.5	Eligibility factor
Replicability	Scripts/masks, parameters, environment	5.6	Partial score (MS-012)

*Note: The FTC formula, weights, and **FTC\_min** value are standardized by GL-MS-012 and published by cycle .*

### 6.3 Decision matrix (issue / condition / withhold)

Abstract: Decision regarding dataset usage in the cycle, based on FTC and QA/QC flags (linked to GL-MS-002).

Condition	Decision	Actions required	Remission
$FTC \geq FTC\_min$ and no critical flags	Issue	Proceed; register metadata in Carbonsat	MS-012 / MS-002
$FTC \geq FTC\_min$ with moderate flags	Condition	Mitigate flags; record justification; reprocess if necessary.	MS-012 / MS-002
$FTC < FTC\_min$ or critical flags	Retain	Replace dataset , fix pipeline, and reopen validation.	MS-012 / MS-002

*Note : THE Application of the Decision Matrix It depends on the publication of the metadata. minimum ( Section 5); without valid URI/hash , the dataset must be ' retained ' according to GL-MS-002.*

### 6.4 Independent sampling and rechecking

Summary: Sample verification by **VVB/OAG** to confirm integrity and metadata trail.

Sample type	Objective	Who executes	Periodicity/definition
Technique (data)	Recalculate hashes , check metadata and outputs.	VVB / OAG	Defined in MS-012 and contract
Procedural (pipeline)	Check provenance, scripts, and parameters.	VVB / OAG	Per cycle, as per audit plan.
Crusade (sources)	Compare equivalent sources	VVB / OAG	Where applicable (2.5)

## 6.5 Addressing gaps and conflicts

Summary: Regulatory actions to address data gaps or discrepancies between sources.

Situation	Action	Evidence
Specific gap	Apply documented mask/estimate; mark in changelog	Parameters and rationale
Conflicting sources (same level)	Cross-validation; recording technical decisions	Decision report
Conflicting sources (different levels)	Apply hierarchy (Section 2.1)	Reference to sources
Unsolvable conflict in the cycle	Condition or retain as per 6.3	Resolution recorded

## 6.6 Cycle update rules

Summary: Change control with **forward-looking entry** and transparent logging.

Event	Rule	Applicability
Inclusion of source	Formal proposal and update of GL-GR-010	Future cycles
Relevant change	Mark major/ minor /patch in changelog	According to impact
Dataset depreciation	Mark as deprecated and indicate a replacement.	Based on the published version
Correction without impact	patch; maintain comparability	Current cycle

#### *Captions and Abbreviations*

- *FTC — Technical Confidence Factor.*
- *FTC\_min — Minimum FTC threshold (defined in GL-MS-012).*
- *VVB — Validation & Verification Body.*
- *OAG — Audit and Guarantee Body.*
- *SHA-256 — Cryptographic hash algorithm .*
- *UTC / ISO 8601 — Time/date standards.*
- *Semver — Semantic versioning ( major.minor.patch ).*

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## 7. Provisions Finals

### 7.1 Validity and entry into force (prospective)

- Changes to this **GL-GR-010** apply only to future issuance/validation cycles.
- Ongoing projects remain governed by the version published at the beginning of the cycle (cycle immutability).

### 7.2 Precedence and conflicts

- In the event of a conflict between Global rules and Country Pack rules, the Country Pack prevails with regard to national regulatory requirements.
- In the event of a conflict between **GL-GR-010** and sectoral methodologies ( **M-001, MS-002, MS-004, MS-007, MS-012, MS-011** ), the specific rule of the module within its technical scope prevails; 010 remains the exclusive reference for sources and metadata.

### 7.3 Roles and responsibilities

- Greenline Carbonsat : Global Catalog maintenance, metadata publication, and version control.
- Country Editors (by country): updating Country Packs and checking with national regulators.
- GLI – Greenline Institute : co-benefits only opt-in ( **GL-MS-003** ); no operational responsibility for core/compliance data.
- VVB/OAG: independent verification according to 5 and 6 (QA/QC, provenance and sampling).
- GL-MS-005 ( VVBs ): establishes criteria for accreditation, rotation, and sanctions; this 010 depends on MS-005 to ensure independence in verification.

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## 7.4 Depreciation and exceptions

- Obsolete datasets are marked as deprecated with an indication of the replacement and transition window.
- Requests for exceptions based on the use of unlisted fonts will not be accepted; the alternative is to submit a proposal for inclusion and await prospective entry (see 2.7 and acceptance rule 1.2).

## 7.5 Relationship with the Greenline Carbonsat Registry

- Metadata (Section 5.1) is published in the Registry; raw data follows the license/source.
- Fields Art. 6/CA (when applicable) are maintained as per **MS-011** and the corresponding Country Pack.

*The Greenline Carbonsat Registry publishes, for cycle , the metadata defined in Section 5 and the FTC, Leakage, and SCJ-GC indices when applicable , with hash and version .*

### *Captions and Abbreviations*

- *Country Editors* — Responsible for curating the Country Pack.
- *Deprecated* — An obsolete resource with a replacement indicated.
- *Greenline Registration Carbonsat* — Public repository for metadata and version control.

## Appendix I – Global Data Catalog (Master Table)

Summary: List of official/multilateral global datasets and accepted normative factors. This table is the single data reference for all Greenline methodologies. Carbonsat .

Code	Dataset / Factor	Authority	URI	Frequency	Usage (Module)
G-01	Landsat (Collection 2)	USGS	<a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a>	Monthly/Yearly	M-001; MS-002; MS-004
G-02	Sentinel-2 (Level-2A)	ESA (Copernicus)	<a href="https://dataspace.copernicus.eu/">https://dataspace.copernicus.eu/</a>	Monthly	M-001; MS-002; MS-004
G-03	GEDI LiDAR (L2/L4)	NASA	<a href="https://gedi.umd.edu/data/">https://gedi.umd.edu/data/</a>	Annual	M-001 (forest structure)
G-04	MODIS (global indices)	NASA	<a href="https://modis.gsfc.nasa.gov/data/">https://modis.gsfc.nasa.gov/data/</a>	Monthly	Time series (support)
G-05	Copernicus WorldCover	ESA	<a href="https://worldcover2020.esa.int/">https://worldcover2020.esa.int/</a>	Annual	Auxiliary layer for use/coverage
G-06	Copernicus Global Land Service	ESA	<a href="https://land.copernicus.eu/global">https://land.copernicus.eu/global</a>	Monthly/Yearly	Biophysical layers (support)
G-07	Global Surface Water	JRC (EU)	<a href="https://global-surface-water.appspot.com/">https://global-surface-water.appspot.com/</a>	Annual	Support for pressure analysis
G-08	IPCC Guidelines (Tier 1 – 0.47 AGB→C)	IPCC	<a href="https://www.ipcc-nggip.iges.or.jp/public/2006gl/">https://www.ipcc-nggip.iges.or.jp/public/2006gl/</a>	Fixed	MC-004 (conversions)
G-09	FAOSTAT	FAO	<a href="https://www.fao.org/faostat/">https://www.fao.org/faostat/</a>	Annual	Global context

Code	Dataset / Factor	Authority	URI	Frequency	Usage (Module)
G-10	World Development Indicators	World Bank	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>	Annual	Global socioeconomic
G-11	Human Development Reports	UNDP	<a href="https://hdr.undp.org/data-center">https://hdr.undp.org/data-center</a>	Annual	Socio-environmental indicators

#### *Captions and Abbreviations*

- *USGS — United States Geological Survey .*
- *ESA — European Space Agency .*
- *NASA — National Aeronautics and Space Administration .*
- *JRC — Joint Research Centre (European Commission).*
- *IPCC — Intergovernmental Panel on Climate Change .*
- *FAO — Food and Agriculture Organization .*
- *UNDP — United Nations Development Program .*

## Appendix II — Country Pack Template (Standard Structure)

Summary: Minimum model for completing official national sources and regulatory requirements by country.

Field	Description	Example of completion
Country	Official name of the country	Brazil
Land Sources	Official domain registrations and records	RGI/Notary Offices; SIGEF/INCRA; SNCI
Environmental Sources	Federal/state environmental agencies; national inventories	IBAMA; State Secretariats
Regulators	Ministries, national agencies, official registries	MMA; MAPA; SBCE
Socioeconomic Registrations	National statistical institutes	IBGE
Specific Requirements	Art. 6/CA; CLPI/FPIC; environmental licenses	SBCE – Resolution 19/2025
Public Metadata	Publication in the Greenline Registry Carbonsat	URI, version, hash , changelog

### Captions and Abbreviations

- *RGI — General Real Estate Registry.*
- *SIGEF — Land Management System (INCRA).*
- *SNCI — National System for Certification of Rural Properties.*
- *IBAMA — Brazilian Institute of Environment and Renewable Natural Resources.*
- *MMA — Ministry of the Environment.*
- *MAPA — Ministry of Agriculture and Livestock.*

## Annex III — Metadata Scheme (Operational Model)

Summary: Minimum accepted metadata fields and reference JSON model.

Field	Description	Type/Format	Mandatory	Example
dataset	Dataset name	Text	Yes	Sentinel-2 Level-2A
authority	Issuing authority	Text	Yes	ESA
uri	Public access link	URL	Yes	<a href="https://dataspace.copernicus.eu/">https://dataspace.copernicus.eu/</a>
version	Declared version	Semver /Text	Yes	2025.1
date	Update date	ISO 8601 (UTC)	Yes	2025-09-30T00:00:00Z
license	License to use	Text/URL	Yes	CC-BY 4.0
hash	Integrity signature	SHA-256	Yes	9f2a...c1e
crs	Reference system	EPSG	Yes	EPSG: 4326
spatial_resolution	Spatial resolution	Number/unit.	Optional	10 m
temporal_resolution	Temporal resolution	Text	Optional	Monthly
coverage	Geographic extent	Bounding box	Yes	Brazil (-74...-34; -34...6)
method	Method/process	Text	Yes	L2A; atmospheric correction
limitations	Stated limitations	Text	Yes	Cloud cover
pid_doi	Persistent identifier	DOI/PID	Optional	doi:10.5281/ zenodo ...
maintainer	Responsible person/contact	Text	Yes	ESA Data Team

### Captions and Abbreviations

- *EPSG — European Petroleum Survey Group (CRS pattern).*
- *ISO 8601 — International standard for date/time.*
- *SHA-256 — Cryptographic hash algorithm .*
- *DOI/PID — Digital Object Identifier / Persistent Identifier .*

## Annex V — Country Pack: Brazil (SBCE)

Summary: Official national sources and mandatory regulatory requirements in Brazil, aligned with SBCE and Art. 6.

### V.1 Official Sources and Registries (Brazil)

Category	Official Source	URI	Usage (Module)
Land/Registry	RGI (Registry Offices)/CNJ	<a href="https://www.registradores.org.br/">https://www.registradores.org.br/</a>	MS-007; MS-011
Georeferencing	SIGEF (INCRA)	<a href="https://sigef.incra.gov.br/">https://sigef.incra.gov.br/</a>	MS-007
Environmental Registry	SICAR (CAR)	<a href="https://www.car.gov.br/">https://www.car.gov.br/</a>	MS-007
National Statistics	IBGE	<a href="https://www.ibge.gov.br/">https://www.ibge.gov.br/</a>	M-001; MS-002
Federal Environmental	IBAMA	<a href="https://www.gov.br/ibama">https://www.gov.br/ibama</a>	MS-007
Land Use/Cover	MapBiomias	<a href="https://mapbiomas.org/">https://mapbiomas.org/</a>	M-001; MS-002; MS-004
Deforestation (annual)	INPE PRODES	<a href="https://prodes.inpe.br/">https://prodes.inpe.br/</a>	MS-002
Alerts (almost real)	INPE DETER	<a href="https://terrabrasilis.dpi.inpe.br/">https://terrabrasilis.dpi.inpe.br/</a>	MS-002; MS-004
Satellite Series	USGS / NASA / ESA	<a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a> ; <a href="https://dataspace.copernicus.eu/">https://dataspace.copernicus.eu/</a>	M-001; MS-002; MS-004

## V.2 Requirements Regulatory (SBCE and Art. 6)

Requirement	Description	Module/Record
Law 15.042/2024	Legal framework of SBCE (registration and ownership)	Greenline Registration
Resolution 19/2025	Registration and interoperability procedures with CA.	MS-011; SCJ-GC (MS-007)
Corresponding Adjustment (CA)	Metafields required for international interoperability	Greenline Registration

## V.3 Metafields Art. 6/CA ( Greenline Registration )

Field	Description	Type	Mandatory
ca_status	Corresponding adjustment status	Enum (pending/issued/not_applicable )	Yes
ca_reference	Official reference (act/document)	Text/URI	When applicable
ca_country_code	Country of adjustment	ISO-3166 Alpha-2	Yes
ca_timestamp	Date/time of registration	ISO 8601 (UTC)	Yes

### Captions and Abbreviations

- *SICAR — National System of Rural Environmental Registration.*
- *CNJ — National Council of Justice.*
- *INPE — National Institute for Space Research.*
- *SBCE — Brazilian Emissions Trading System.*
- *Greenline Legal Compliance Seal Carbonsat.*
- *ISO-3166 — International standard for country codes.*