

Technical Quality

Principles 1–5: Verifiability, FAIR standards, provenance, methodology, and temporal persistence.

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P01 — Verifiability by Design

SCD-P01 · Principle 1 of 10
Verifiability by Design
“If it cannot be checked, it does not count.”
Technical Layer

Definition

Every metric in a climate claim must be independently verifiable by any third party — including AI agents — without requiring permission, credentials, or manual intervention from the originating organisation. Verification must be possible from the primary source data alone.

Rationale

The EU Green Claims Directive (2024/825, enforcement September 2026) bans environmental claims that cannot be substantiated with publicly accessible evidence. AI audit tools already scan public data continuously; unverifiable claims are either invisible or automatically flagged as greenwashing. In 2026, verifiability is not a differentiator — it is the minimum floor for market credibility.

Implementation Steps

1. Map every reported metric to its primary data source (satellite, government dataset, sensor).
2. Ensure the source is publicly accessible without authentication.
3. Document the verification pathway: source ? method ? aggregation ? reported figure.
4. Test: ask an independent analyst to verify your top 5 climate claims using only public data.
5. Resolve any metric that cannot be independently verified before publication.

Compliance Checklist

	Criterion	What it means
?	Metric-to-source mapping exists	Every reported figure has a documented primary source.
?	Sources are publicly accessible	No login or permission required to access primary sources.
?	Verification pathway documented	Steps to reproduce any metric from scratch are written down.
?	AI scan performed	Climate TRACE / GFW / EDGAR check confirms the org is findable.

Regulatory References

- EU Directive 2024/825 (Green Claims / EmpCo) — Art. 5, 6
- IPCC AR6 Working Group III — Chapter 2 (Emissions Methodologies)
- ISSB IFRS S2 — Para. 63 (Disclosure verification)

Recommended Tools and Platforms

Climate TRACE Global Forest Watch EDGAR (EU JRC) Copernicus / ESA

Keywords

verifiability greenwashing EU Green Claims Directive AI audit ESG verification

Related Principles: [SCD-P02](#) · [SCD-P03](#) · [SCD-P07](#)

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P02 — FAIR Data Standards

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FAIR Data Standards
“Findable. Accessible. Interoperable. Reusable.”
Technical Layer

Definition

Climate data must conform to FAIR principles: Findable (machine-readable metadata, persistent identifiers such as DOIs or stable URLs), Accessible (open API or public download, no authentication required), Interoperable (standard open formats: JSON-LD, GeoJSON, CSV, NetCDF), and Reusable (explicit open licence, fully documented provenance).

Rationale

FAIR compliance is a prerequisite for integration into global platforms (Climate TRACE, GFW, EDGAR) and for citation in ISSB S2 and EU CSRD disclosures. Data that is not FAIR cannot contribute to the AI-driven due-diligence economy. The 'From FAIR to FAIR²' framework (Frontiers, 2025) extends FAIR to also require machine-actionability — data that an AI agent can not only read but act upon.

Implementation Steps

1. Assign a persistent identifier (DOI or stable public URL) to every dataset.
2. Publish data in at least one open format: JSON, CSV, GeoJSON, or NetCDF.
3. Add schema.org or DataCatalog markup to all public data pages.
4. Declare a Creative Commons or equivalent open licence on every dataset.
5. Register datasets with a public catalogue (CKAN, DataCite, or national open data portal).

Compliance Checklist

	Criterion	What it means
?	Persistent identifiers assigned	Every dataset has a DOI or stable URL that will not change.
?	Open format export available	Data downloadable as JSON, CSV, or GeoJSON without login.
?	schema.org markup present	Dataset metadata is readable by Google Dataset Search and AI agents.

	Criterion	What it means
?	Licence declared	Explicit open licence (CC-BY 4.0 recommended) on every dataset.

Regulatory References

- FAIR Data Principles — Wilkinson et al., Scientific Data (2016)
- EU CSRD — Art. 8 Digital Tagging & Machine-Readable Reporting
- ISSB IFRS S2 — Appendix A (Definitions, data quality)

Recommended Tools and Platforms

schema.org DataCite CKAN Zenodo OpenAire

Keywords

FAIR principles open data interoperability schema.org machine-readable data catalogue

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P03 — Full Provenance Traceability

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Full Provenance Traceability
“Without provenance, a number is a narrative.”
Technical Layer

Definition

The complete chain of custody — from raw sensor or satellite observation to reported metric — must be documented and auditable. Required provenance fields: instrument ID, satellite scene ID and overpass timestamp, calibration method and version, analyst name and organisation, processing software version, and all transformations applied including unit conversions and spatial aggregations.

Rationale

Carbon credit verification under Verra VM0042 (2026) and CBAM third-party verification (EU 2023/956) both require proof that figures derive from primary instruments, not secondary aggregations of uncertain origin. Digital MRV (dMRV) standards from the Planet2050 × BioCarbon Working Group (2025) identify broken provenance as the leading cause of carbon credit invalidation.

Implementation Steps

1. For each reported metric, create a provenance record with: source instrument, timestamp, analyst, methodology version, and transformations applied.
2. Store provenance records in a format that is exportable and machine-readable (JSON-LD recommended).
3. Link provenance records to the reported metric via persistent identifier.
4. Implement versioning: when methodology changes, create a new version record — never overwrite.
5. For satellite-derived data: record scene ID, sensor, orbit number, cloud cover, and NDVI delta.

Compliance Checklist

	Criterion	What it means
?	Instrument/source documented	Every metric traces to a named instrument or dataset version.

	Criterion	What it means
?	Timestamps recorded in UTC	All events use ISO 8601 UTC timestamps.
?	Analyst/author attributed	Name and organisation of every analyst is recorded.
?	Methodology version pinned	Specific version of methodology used is recorded, not just the name.

Regulatory References

- Verra VM0042 Methodology (2026 update) — Section 5 (MRV requirements)
- CBAM Regulation EU 2023/956 — Art. 10 (Embedded emissions calculation)
- dMRV Working Group — Planet2050 × BioCarbon (2025)

Recommended Tools and Platforms

ESA Sentinel-2 scene IDs NASA Landsat overpass metadata IDEAM Colombia GFW GLAD Lab

Keywords

provenance chain of custody MRV dMRV carbon verification Verra CBAM

Related Principles: [SCD-P01](#) · [SCD-P04](#) · [SCD-P05](#)
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P04 — Methodological Sovereignty

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Methodological Sovereignty
“You own your data only if you own your method.”
Technical Layer

Definition

An organisation possesses genuine data sovereignty only if it also controls its methodology. Methodology must be: (a) documented in writing by the organisation, (b) aligned to a public standard (IPCC AR6, GRI 305, ISSB S2, Verra VM0042), and (c) reproducible by a qualified third party without reference to any vendor system. If the methodology belongs to a vendor, the organisation is 'controlled' at best.

Rationale

Vendors change pricing, pivot strategy, or cease operations. Organisations that outsource methodology without documentation lose all historical comparability overnight when a vendor changes its models. This is a form of retroactive data sovereignty collapse. The World Bank Sovereign Climate Reporting Framework (2022) and Cambridge Core Data & Policy Journal (2024) both identify methodology lock-in as the primary long-term risk in climate data infrastructure.

Implementation Steps

1. Write your own methodology document — not a reference to a vendor's documentation.
2. Anchor every calculation to a specific section of a public standard (e.g. IPCC AR6 WG3 §2.3).
3. Have the methodology reviewed by an independent expert at least once per year.
4. When vendors update their models, log the change and restate historical figures if material.
5. Store the methodology document in your own systems, not exclusively on a vendor platform.

Compliance Checklist

	Criterion	What it means
?	Own methodology document exists	A document you wrote describes how each metric is calculated.

	Criterion	What it means
?	Anchored to public standard	Each calculation references a specific section of IPCC AR6 / GRI / ISSB.
?	Independently reproducible	A qualified analyst could reproduce your results using only your document.
?	Vendor-change log maintained	Changes to vendor models that affect your figures are documented.

Regulatory References

- IPCC AR6 — Annex II (Methodologies for GHG inventories)
- GRI 305 (Emissions) — 2016, mandatory methodology disclosure
- World Bank — Sovereign Climate and Nature Reporting Framework (2022)

Recommended Tools and Platforms

GHG Protocol Corporate Standard IPCC Emission Factor Database (EFDB) GRI 305 reporting tool

Keywords

methodology sovereignty vendor lock-in GRI 305 IPCC AR6 carbon accounting reproducibility

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P05 — Temporal Persistence and Baseline Integrity

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Temporal Persistence and Baseline Integrity
“A result without a baseline is a claim without evidence.”
Technical Layer

Definition

Sovereign climate data requires: (a) a documented, defensible baseline established before intervention begins; (b) historical data that is permanently owned and accessible regardless of vendor relationships; and (c) consistent methodology applied longitudinally — or, where methodology changes, an explicit reconciliation of the historical series to the new methodology.

Rationale

Investors and regulators need longitudinal data to assess whether impact is improving over time. A single-year snapshot without a consistent baseline is commercially and legally worthless for bond verification, carbon credit issuance, or ISSB S2 reporting. CEPAL's Sustainable Bonds LAC analysis (2024) found that the absence of defensible baselines is the primary reason LATAM green bonds cannot demonstrate impact at renewal.

Implementation Steps

1. Define and document your baseline before any intervention — not retroactively.
2. Store at least 3 years of historical data in systems you own and control.
3. When changing providers, negotiate full historical data export as a contractual condition.
4. Apply ISSB S2's transition provisions: restate comparatives when methodology changes.
5. Conduct an annual baseline review to confirm it remains defensible against current standards.

Compliance Checklist

	Criterion	What it means
?	Baseline documented pre-intervention	Baseline was set before the activity it measures, with date stamp.
?	3+ years of history owned	Historical data is in your own systems, not exclusively with a vendor.

	Criterion	What it means
?	Methodology consistent or reconciled	Any methodology changes are logged with impact on historical figures.
?	Annual baseline review conducted	Baseline reviewed annually against current IPCC / GRI standards.

Regulatory References

- ISSB IFRS S2 — Para. 22–28 (Transition provisions and comparatives)
- CEPAL — Sustainable Bonds LAC: Decade of Growth 2014–2024
- GRI 305-1 (Scope 1 GHG) — Section 3.3 (Base year recalculation policy)

Recommended Tools and Platforms

EDGAR time series GFW Hansen dataset v1.11+ IDEAM national GHG inventory series

Keywords

baseline temporal consistency historical data GHG inventory bond verification ISSB S2

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