D-CARBONIZE

Methodology note

How we calculate, check and price your emissions.

The rules behind every figure in a D-Carbonize carbon account: boundaries, data, emission factors, quality, uncertainty, the role of AI and experts, and the cost of each reduction measure.

Version
1.0 · November 2026

Applies to
Carbon footprints, trajectories and reduction plans

Contact
info@d-carbonize.eu

About this note

Purpose and scope

This note describes how D-Carbonize builds a company carbon account in Carbon Cockpit, and how reduction measures are costed. It is written for the people who use our figures: management, auditors, customers, banks and public buyers.

It applies to every corporate carbon footprint (Scopes 1, 2 and 3) we calculate, the reports derived from it (GHG Protocol, ISO 14064-1, Bilan Carbone®, CSRD ESRS E1, VSME, CO2 Performance Ladder), reduction trajectories, and reduction plans. Product footprints (ISO 14067) and EPDs (EN 15804+A2) follow the same data and factor rules, with the additional requirements of their own standards.

Where a client's reporting framework sets a stricter rule than this note, the stricter rule applies and is recorded in the boundary note of the engagement.

1 Standards and frameworks
2 Organisational boundaries
3 Operational boundaries
4 Reporting year and base year
5 Activity data
6 Emission factors
7 Scope 2: electricity
8 Specific accounting rules
9 Data quality and uncertainty
10 AI and expert control
11 Review, verification and reporting
12 From tonnes to euros
A Worked example
B Glossary

1

Standards and frameworks

One set of activity data is read through the framework each audience expects. The calculation is done once; the classification changes.

FRAMEWORK	WHAT IT GOVERNS IN OUR WORK	TYPICAL READER
GHG Protocol Corporate Standard, Scope 2 Guidance, Scope 3 Standard	Scopes, boundaries, Scope 2 methods, the 15 Scope 3 categories	Auditors, customers, banks
ISO 14064-1	Structure and documentation of the inventory, so that a third party can verify it	Auditors
Bilan Carbone®	Bilan Carbone categories and reporting. D-Carbonize is Bilan Carbone Conform (BC-C)	Auditors, customers, tenders
SBTi	Criteria for reduction targets and trajectories	Customers, banks
ISO 14067 · ISO 14040/44	Product carbon footprints and life cycle assessments	Customers
EN 15804+A2	LCA and data for construction-product EPDs, verified and published by an independent EPD programme	Customers, tenders
CSRD (ESRS E1) · VSME	Climate disclosures, taken from the same account	Auditors, banks
CO2 Performance Ladder	Handbook 4.0 (Steps) and Handbook 3.1 (Levels). D-Carbonize is an official BENOR partner	Public tenders

2

Organisational boundaries

We consolidate emissions using the **operational control** approach by default: the company reports 100% of the emissions of the entities and sites it operates. If the group already reports under **financial control** or **equity share**, we use that approach instead, for all years and all reports.

Before any data is read, we agree with the client on the entities, sites and activities included, and the reason for each exclusion. The result is a **boundary note**, signed off by the client and kept with the account.

3

Operational boundaries

- **Gases.** All seven Kyoto gases: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3. Refrigerant leaks are included.
- **Scope 1.** Direct emissions from stationary and mobile combustion, processes and fugitive emissions.
- **Scope 2.** Purchased electricity, heat, steam and cooling, reported location-based and market-based (section 7).
- **Scope 3.** All 15 categories of the Scope 3 Standard are screened. Relevant categories are calculated; the others are documented with the reason they are excluded (not applicable, not material, or no data yet with a plan to obtain it).

Bilan Carbone® reports are produced from the same lines. Each line carries both its GHG Protocol scope and category and its Bilan Carbone® category, and the two totals are reconciled line by line.

4

Reporting year and base year

The reporting year is the client's financial or calendar year. The base year is chosen with the client, usually the first year with complete and verifiable data.

Recalculation policy

The base year, and the years in between, are recalculated when one of the following changes total emissions by **5% or more**:

- a structural change: acquisition, divestment, merger, outsourcing or insourcing of an activity;
- a change in calculation method or emission factor source;
- the discovery of a significant error, or of several errors that together reach the threshold.

Errors below the threshold are corrected in the year concerned and shown in the report. Every recalculation is documented: reason, impact in tCO_2e, and years affected. Organic growth or decline never triggers a recalculation.

5

Activity data

We start from what physically happened: kWh, litres, tonnes, kilometres, m^3. Spend in euros is used only when no physical quantity exists, and is replaced as soon as better data is available.

SOURCE	EXAMPLES
Energy	Invoices, meter readings, data from grid operators and suppliers
Transport	Fuel cards, fleet data, freight invoices, carrier reports
Purchases	ERP extracts and purchase ledgers, in quantities where available
Suppliers	Product footprints, EPDs and answers to questionnaires, collected in Carbon Cockpit
Other	Waste reports, travel bookings, commuting surveys, fixed-asset registers

Every line in the account is linked to its source file. Missing data is flagged, not guessed. When a quantity has to be estimated from a proxy (m², km, headcount), the line is labelled as an estimate, with the proxy and its source.

6

Emission factors

Each line uses the most specific factor available, in this order:

LEVEL	FACTOR	USE
1	**Supplier-specific**: the supplier's product footprint or EPD, or the client's own energy contract	Preferred whenever it is available and checked
2	**Product and process averages** from recognised databases, per material, fuel, process and country	Standard case
3	**Physical estimates**: a quantity estimated from a proxy, multiplied by a level 2 factor	Flagged as an estimate
4	**Spend-based**: euros spent × a sector factor	Scope 3 starting point only, flagged, replaced year after year

Databases

Base Empreinte® (ADEME), ecoinvent, INIES, DESNZ and AIB (residual mixes), plus supplier data. The database is chosen for its fit with the line: technology, geography and year.

What is stored with each factor

- Database, version, year and geography;
- unit, and the GWP set: **IPCC AR6, 100-year** values, unless a reporting scheme requires another set, in which case the set is stated;
- who approved the factor, and when.

A database update never silently changes a closed year. New factor versions apply to the open year; applying them to past years is a recalculation (section 4).

7

Scope 2: electricity

Following the GHG Protocol Scope 2 Guidance, both figures are calculated and reported side by side:

- **Location-based**: average emission factor of the grid the site draws from. It is the figure to compare sites and years.

- **Market-based**: factor of the client's contracts. Electricity covered by guarantees of origin that meet the Scope 2 quality criteria counts at the supplier's factor, zero for renewable sources. Electricity without such instruments counts at the **residual mix** of the country (AIB).

The client chooses which of the two drives its targets. That choice is kept from year to year, so that progress against the base year stays comparable.

8

Specific accounting rules

- **Fuels.** Combustion emissions are counted in Scope 1 (or Scope 3 when the vehicle or equipment is not controlled). The production and transport of the fuel itself (well-to-tank) are counted in Scope 3 category 3.
- **Biogenic CO_2.** CO_2 from the combustion of biomass is reported separately from the scopes. CH_4 and N_2O from that combustion are included in the scopes.
- **Offsets.** Carbon credits, if any, are reported apart. They are never deducted from the footprint, which only goes down when emissions do.
- **Refrigerants.** Leaks are calculated from top-ups recorded in maintenance logs; if those are missing, from the installed charge and a leak rate, flagged as an estimate.

9

Data quality and uncertainty

Every line is scored on the five GHG Protocol data-quality criteria:

CRITERION	QUESTION
Technology	Does the factor match the real process or product?
Time	Is the data from the reporting year?
Geography	Is the factor for the right country or grid?
Completeness	Does the data cover all sites and all months?
Reliability	Measured, calculated, or estimated?

Each line then receives an uncertainty, expressed as a ± percentage at 95% confidence. Line uncertainties are combined as independent errors:

$$U(total) = \sqrt{\Sigma\,(tCO_2e(line) \times u(line))^2} \quad \rightarrow \quad \pm\,\% = U(total) \div total$$

The report shows the total with its range, the share of the total uncertainty carried by each line, and the lines to improve first. Appendix A gives a worked example.

10

AI and expert control

What AI does

- Reads invoices, meter files, fuel cards and ledgers as they are
- Extracts quantities, units, periods and sites
- Proposes an emission factor, with its confidence
- Flags gaps, duplicates and unusual values

What our experts do

- Set the boundaries and the Scope 3 screening with the client
- Approve or correct each proposed factor
- Review high-weight and low-confidence lines
- Sign off the results and explain them to the client's teams

Rules. A person approves every factor match: nothing enters the account on AI alone, and every approval is logged with its author and date. Every figure links back to the document line it comes from. Client data stays in the EU and is never used to train AI models.

11

Review, verification and reporting

Before sign-off, results are reviewed with the people who run the sites. We check year-on-year changes above a threshold, ratios per site, per tonne produced and per employee, and lines with low confidence or high weight. Outliers are explained, not smoothed away.

The account is built to be verified by an independent body, with limited or reasonable assurance (ISO 14064-3, ISAE 3410). D-Carbonize does not verify its own work. Auditors can receive read access to Carbon Cockpit or a full export: lines, source files, factors, approvals and change history.

Reports for auditors, customers and tenders, and data for CSRD or VSME, come from the same account. Lines, factors and reports export in open formats.

12

From tonnes to euros

A reduction plan is an investment plan. Each measure is costed with the same traceability as the tonnes, and every assumption is written down and dated.

INDICATOR	DEFINITION
CAPEX	From quotes or reference costs, spread over the measure's lifetime
Savings	Energy and operating costs avoided, at stated prices
Payback	CAPEX divided by yearly savings
€ per tCO_2e	Net yearly cost divided by tonnes avoided. Below zero, the measure pays for itself
Subsidies	Included when the client is eligible, with the scheme named

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€ per tCO₂e = ( CAPEX ÷ lifetime − yearly savings ) ÷ tCO₂e avoided per year
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Measures are ranked on a marginal abatement cost curve (cost per tonne against tonnes avoided). Unless stated otherwise, figures are undiscounted and exclude any carbon price. Each assumption (energy price and its date, lifetime, subsidy) is shown next to the result, so that it can be challenged and changed.

Appendix A

Worked example

Illustrative example The Example company used across our website. Figures are illustrative.

A.1 One line, from the invoice to the report

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Electricity_2025.pdf, Ghent plant: 526,000 kWh × 0.222 kgCO₂e/kWh (Belgian grid, average mix) = 116.8 tCO₂e
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GHG Protocol: Scope 2, purchased electricity, location-based. Bilan Carbone®: Energy. With guarantees of origin meeting the Scope 2 quality criteria, the market-based figure is 0 tCO_2e; both figures are reported.

A.2 Total and uncertainty

LINE	FACTOR TYPE	TCO_2E	± (95%)	SHARE OF ±
Steel sheet	Average factor	132.3	30%	49%
Electricity	Metered	116.8	5%	1%
Natural gas	Metered	112.2	5%	1%
Trucks, outbound	Fuel cards	72.4	5%	<1%
Buildings	Estimate	72.0	50%	40%
Steel profiles	Average factor	45.6	30%	6%
Trucks, inbound	Carrier data	32.2	5%	<1%
Machines	Estimate	18.0	50%	3%
Total		**601**	**± 9%**	**544 – 658**

Improve first: Steel sheet and Buildings carry 89% of the uncertainty. With product footprints from the two steel suppliers (±10%), the total goes from ±9% to about ±7% (560 – 642 tCO_2e).

A.3 One reduction measure

Heat recovery, Ghent plant. Natural gas use: 555,400 kWh × 0.202 $kgCO_2e$/kWh = 112.2 tCO_2e. The measure cuts gas use by 30%: 166.6 MWh and 33.7 tCO_2e a year.

ITEM	VALUE	ASSUMPTION
CAPEX	€35,000	Lifetime 10 years → €3,500 a year
Yearly savings	€7,500	166.6 MWh × €45/MWh (2026 price)
Payback	4.7 years	Undiscounted
Cost per tonne avoided	–119 €/t	(€3,500 – €7,500) ÷ 33.7 t

No carbon price and no subsidy applied. At €60/MWh, savings rise to €10,000, payback falls to 3.5 years, and the cost becomes –193 €/t.

Appendix B

Glossary

Activity data	A physical quantity that causes emissions: kWh, litres, tonnes, km.
Emission factor	The emissions per unit of activity, e.g. kgCO_2e per kWh.
tCO_2e	Tonnes of CO_2 equivalent: all greenhouse gases converted with their 100-year global warming potential.
Location-based / market-based	The two Scope 2 methods: average grid factor, or the factor of the client's contracts.
Residual mix	The grid factor left once all certified renewable electricity has been claimed.
Base year	The reference year against which reductions are measured.
Marginal abatement cost curve	Reduction measures ranked by cost per tonne avoided, with the tonnes each one avoids.
Limited / reasonable assurance	The two levels of independent verification of a footprint.

D-Carbonize · Brussels · info@d-carbonize.eu · d-carbonize.eu
Methodology note, version 1.0, November 2026. This note is reviewed every year and when a reference standard changes. Bilan Carbone® is a registered trademark of the Association pour la transition Bas Carbone (ABC).