



LOW CARBON BUILDING INITIATIVE

LOGISTICS BUILDINGS

New construction scheme v1.0 - 2026

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Towards consistent carbon reporting & targets:
**a common European framework
to decarbonize real estate**

performance ►
completeness ◀



LCBI wishes to thank all European Life Cycle Analysis experts, from the private and public sector, who reviewed, commented on and challenged our methodology.

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1. KEY PRINCIPLES

1. Context

1.1. Carbon accounting context

Greenhouse gas (GHG) emissions are a key metric of climate change.

According to the International Energy Agency (IEA), buildings and construction account for nearly 40%¹ of global energy-related CO₂ emissions, making the sector a critical contributor to climate change and a key focus area for decarbonization efforts. Thus, to achieve carbon neutrality by 2050, all European countries need to reduce the carbon footprint of new, retrofitted, and in-use buildings

Initial efforts by the real-estate industry have focused on reducing operational energy consumption in existing buildings and transitioning to carbon-free energy. However, accurately **measuring carbon emissions at every life-cycle stage**—production, construction, operation, and demolition—is essential for a comprehensive climate impact assessment of buildings. Indeed, it allows us to consider the impact of the construction phase, which can represent, as the energy mix decarbonizes 50% to 80% of a building's emissions over a life cycle of 50 years.

To date, no unified European methodology has enabled consistent assessment and comparison of building carbon footprints. Addressing this, the Low Carbon Building Initiative (LCBI) has developed a unique methodology to measure the carbon footprints of buildings across their entire life cycle, with **limit values**. This methodology and its thresholds are the basis of a low-carbon performance certification for outstanding buildings. The methodology also aligns with major European standards and tools (Taxonomy, Level[s], CREM, RICS).

Acting as a **common language and transparency framework**, this unified European methodology simplifies the quantification and comparison of buildings carbon footprints and facilitates performance benchmarking for all. Such harmonization will provide a powerful signal to the market and help to unlock further private sector investment in low-carbon buildings.

For real-estate players, LCBI is a means to position life-cycle carbon footprint at the core of their strategy. It offers multiple benefits:

- For **project owners**, it functions as a low-carbon design tool, and as a means to highlight exemplary low-carbon buildings.
- For **investors**, LCBI provides access to consistent and reliable data on the whole life-cycle carbon footprint of buildings, serving as a reliable indicator for investment.

LCBI was launched in 2022 by major players in the European real-estate sector alongside the Association Bâtiment Bas Carbone (BBCA²), established in 2015. The **LCBI first focused on newbuilt offices, residential properties, and hotels**, the first scheme was issued in January 2024. Its broader objective is to encompass all real-estate categories, targeting new, retrofit, and in-use buildings, and foster decarbonization of the entire real-estate sector.

¹ IEA, December 2019, *Global Status Report for Buildings and Construction*.

² <https://www.batimentbas carbone.org/>

1.2. Logistics' context

The logistics market currently stands as one of the most dynamic sectors in real estate. According to the CBRE *European Investor Intentions Survey*, logistics is now the leading asset class for investments, capturing 35% of investor appetite in 2024 (up from 21% in 2023), significantly overtaking the office sector (25% in 2024, down from 45% in 2023). Furthermore, over 40% of surveyed investors state they are actively "seeking modern assets located in major consumption hubs".

Beyond this economic momentum and the underlying carbon challenges, the real estate market is undergoing a profound transformation. This shift is driven by a rapidly evolving European and national regulatory framework (such as the EPBD), as well as new reporting and normative standards (including the EU Taxonomy, CSRD, etc.).

Despite these strong market fundamentals and growing environmental imperatives, there is currently no European low-carbon label dedicated specifically to logistics assets. Until now, some companies have taken the initiative to develop their own proprietary low-carbon frameworks to harmonize internal practices. However, investment funds and key industry stakeholders are now expressing a clear demand for a common, standardized framework tailored to the specificities of logistics real estate.

This scheme is the continuation of the LCBI works and focuses on Logistic Assets while accounting for its embedded features. Through its strategic partnership with AFILOG³, LCBI Logistics draws from the entire industry's expertise, and aligns with the portfolio carbon-management tool designed by AFILOG.

³ French professional association specializing in logistics properties

2. Purpose of this initiative

The ambition of LCBI's certification initiative is to drive real-estate players into a dynamic, drastic and measurable reduction of their carbon emissions by:

- Harmonizing practices to measure how buildings contribute to climate change, and ensuring that these assessments are robust and complete throughout the entire life cycle (Whole Life Carbon Assessment, WLCA)—from manufacturing and construction, to operation and end-of-life stages.
- Setting a clear performance pathway based on quantitative targets, while promoting ambitious **low-carbon practices** in the building sector, compatible with both ESG reporting and design processes.
- Recognising buildings that demonstrate outstanding whole-life carbon performance.
- Covering all the main real-estate asset classes, expanding from new built **office, residential, and hotel** typologies, to now **logistic buildings**.
- Aligning with national decarbonization strategies and European climate targets, and building upon compatibilities with European and international frameworks—Level(s), Taxonomy, tools (CRREM) and standards (RICS).

This document results from more than one year of collaborative work of benchmarking, data analysis, and expert reviews from real-estate stakeholders and LCA practitioners. This work was coordinated within a technical committee copiloted by **Elan, Artelia** and **Elioth by Egis**.

3. Scope of application

This first **Logistic buildings** version of the Low Carbon Building Initiative certification is applicable to **new build assets** within ten European countries.

This scheme assesses the whole-life carbon performance of logistic new constructions. It covers emissions associated with the construction, refurbishment, end-of-life stages of the building and energy consumptions⁴.

Storage & warehouse typologies^(A)

- **Unconditioned storage^(B)**
- **Heated storage^(C)**
- **Cold and frozen storage^(D)**

Countries⁵

- | | |
|-----------|------------------|
| ■ Belgium | ■ Luxembourg |
| ■ France | ■ Netherlands |
| ■ Germany | ■ United Kingdom |
| ■ Italy | ■ Spain |
| ■ Poland | ■ Czech Republic |

(A) This scheme covers single and multi-storey warehouses, urban logistics facilities, and cross-docking operations.

(B) Unconditioned storage: Storage areas without permanently installed active heating or mechanical refrigeration systems intended to control indoor temperature. Frost protection systems are not considered permanently installed active heating systems.

(C) Heated storage: Storage areas equipped with a permanently installed active heating system intended to control indoor temperature.

(D) Cold and frozen storage: Storage areas equipped with permanently installed mechanical refrigeration systems whose primary function is to control indoor temperature for the preservation of stored goods.

Additional information is given below to clarify the scope of assessment within the warehouse typology :

To be considered	Out of assessment scope
Construction materials and equipment of building	Freight transport
Construction materials of external works	Vehicle fleets charging
Renewals and maintenance of construction materials	Tenant operations
LCBI energy consumption	Warehousing processes
End of life	Packaging activities, Supply-chain emissions
Office construction material and consumptions (within ≤15% of the reference area)	Furniture linked to warehouse activity
<i>More details on the required scope of calculation on the sections below.</i>	Retrofitting

For construction projects that reuse elements of a pre-existing building onsite, the project may still be considered as a new construction—and therefore be eligible for this certification—if the entire frame and shell is rebuilt (refer to Section 2.4 for more details).

⁴ Also referred to as operational carbon. Emissions arising from logistics activities and process specific consumptions are outside the scope of this methodology, for more information see 3 Operational carbon.

⁵ These countries have been included based on the availability and robustness of the datasets required to establish representative benchmarks

In the case of a mixed-use project, if one or more of the building uses do not fall within the three storage and warehouse typologies listed above, LCBI advises that these areas may be included within the scope of the certification, only if the total reference area (see 1.2) of the other uses **does not exceed 15% of the overall project reference area**. For instance, office areas or any other uses within the logistic building are covered by the certification, provided that their impact is measured and reported consistently within the entire project's indicators, and that these areas do not exceed 15% of the overall project reference area. The LCA practitioner will define which zones are to be included or excluded, provided that the relevant data (embodied, operational, and biogenic) are known and available for the included zones.

Buildings with the same planning permission can be certified jointly, however each building must individually meet the performance requirements.

Where works or facilities are shared between several buildings, the impact of these components on the three indicators (Embodied, Operational, and Biogenic, see 1.1) must be allocated to each building—on the basis of a ratio representative of the use of these facilities. For example, for a heat substation supplying several buildings, the impact ratio to be applied will be based on the power distributed to each building. Alternatively, a ratio based on the reference area (see 1.2) of each building could be applied.

To maintain the overall consistency of the environmental assessment of the building, the chosen assessment scope must be identical for the calculation of the three performance indicators (Embodied Carbon, Operational Carbon, and Biogenic Carbon Storage). Evidence of this consistency shall be documented by the applicants.

For those projects that do not fall within this scope of application (e.g. other building typologies, other countries, existing buildings, etc.), the core principles of the LCBI methodology may still be used to measure, optimise, and report their carbon impacts. However dedicated thresholds will be defined in a future version for the certification to apply to those buildings.

4. Consideration of Activities

In line with **LCBI's mission to promote the decarbonization** of the built environment, the LCBI Logistics certification focuses exclusively on the carbon **performance of the real estate asset**. Its scope covers greenhouse gas emissions associated with the construction of the building, its operational energy use and biogenic carbon storage.

Emissions arising from the activities carried out within the logistics facility are **outside the scope of the certification**. This includes, but is not limited to, freight transportation, vehicle operations, goods handling processes, products and consumables used for operational activities, as well as equipment and processes specific to tenants' operations.

For many logistics facilities, these operational emissions represent the **largest share of the overall greenhouse gas footprint** associated with the activities hosted within the building.

Consequently, **LCBI certification should not be interpreted as an assessment of the carbon performance of the organisations occupying the building**, but solely as an assessment of the environmental performance of the building asset itself.

To obtain a comprehensive understanding of greenhouse gas emissions, LCBI encourages owners, operators and occupiers to complement the certification with an organisation-level greenhouse gas inventory prepared in accordance with recognised methodologies, such as the **GHG Protocol, ISO 14064, ISO 14069**, the French **BEGES** methodology or the **Bilan Carbone®** methodology.

Combining these complementary approaches enables stakeholders to address both the carbon performance of the building asset and the emissions associated with the activities carried out within it, thereby supporting a more comprehensive decarbonisation strategy.

5. The certification process

The certification process requires two distinct submissions, at two stages of the project lifecycle (shown in Figure 1: Application process scheme):

- **Interim LCBI certificate (Optional):** A first audit by an independent, authorized certification body shall be undertaken at the end of the technical design stage and assess the final design of the project before construction work may start. Following the validation of this audit, a provisional LCBI certificate will be delivered. This interim LCBI certificate is optional; the applicant can apply directly for the final LCBI certificate.
- **Final LCBI certificate:** The final certification shall be delivered after practical completion, following a final audit based on post practical completion data. To account for actual performance in use, an optional follow-up certification upgrade within 5 years is also available to include the actual operational emissions in the assessment, potentially leading to a higher performance level based on verified operational emissions data.

The two-step certification process enables carbon performance to be assessed both at the design stage, when key decisions remain actionable, and after project completion, when actual project characteristics can be independently verified.

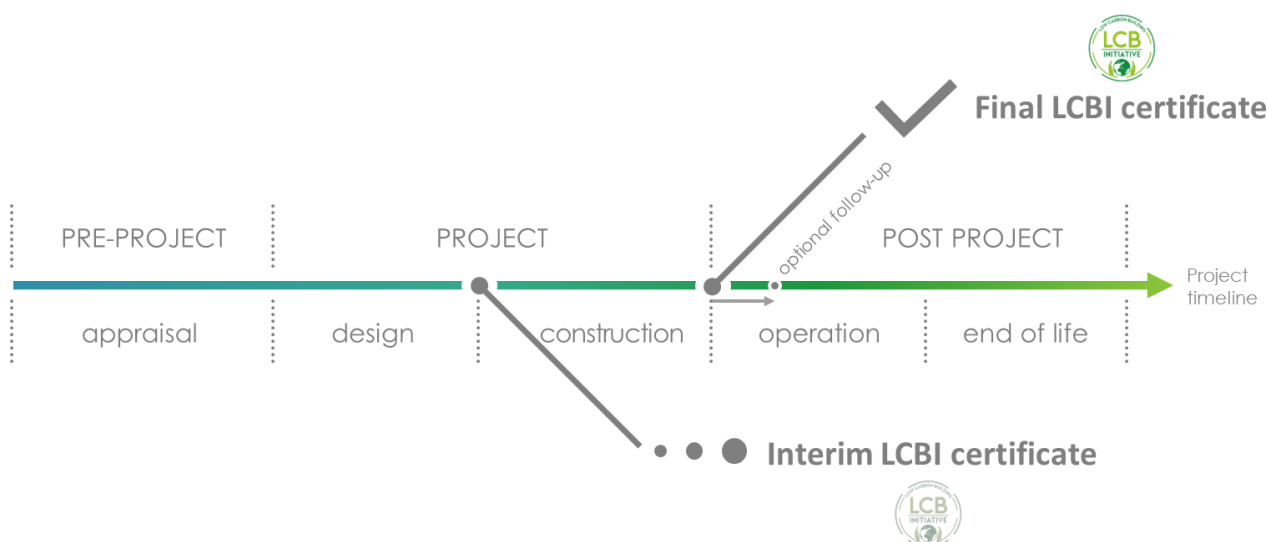
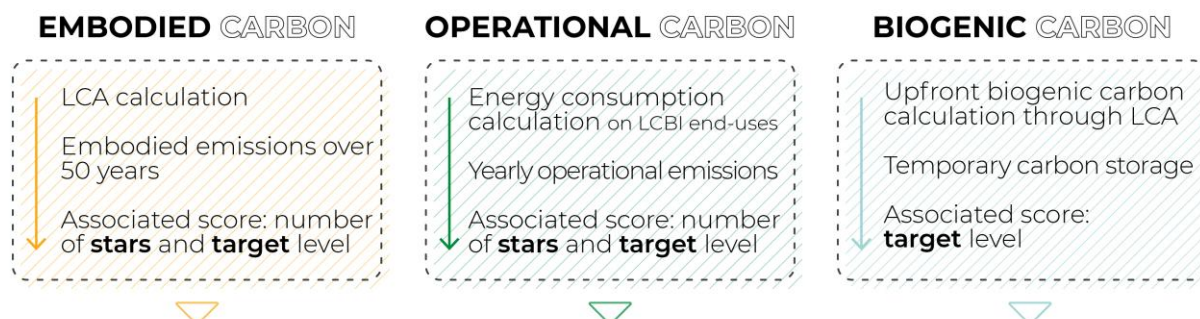


Figure 1: Application process scheme

LCBI Evaluation of carbon



LCBI FINAL RATING

Depending on total number of **stars** and **target** levels, low carbon projects may achieve one of the following levels:

STANDARD

PERFORMANCE

EXCELLENCE

FINAL SCORE CARD

For a reliable comparability between LCBI projects on a consistently complete whole-building scope, lump sums may be added in accordance with the chosen LCA partial scope and energy consumption calculations.

PROJECT EXAMPLE



Figure 2 : Example of a LCBI evaluation reporting

2. METHODOLOGY

1. General methodological framework

The LCBI standard builds upon the core principles of existing European standards and established international frameworks that address the environmental and energy performance of buildings.

The framework is aligned with the following reference standards:

- EN 15978 – Assessment of environmental performance of buildings – Calculation method,
- EN 15804 +A1 and +A2 – Environmental product declarations,
- EN ISO 52000 – Energy performance of buildings – Set of EPB standards.

Additionally, the methodology incorporates best practices from major industry frameworks and initiatives, specifically:

- Level(s) common framework – Macro-objective 1: Greenhouse gas and air pollutant emissions during a building's life cycle,
- RICS – Whole life carbon assessment (WLCA) for the built environment, 2023.

LCBI utilizes these methodologies as a robust foundation while introducing specific benchmarking, requirements, and performance thresholds tailored to logistics assets.

1.1. Performance indicators

The carbon performance of the building is measured through three indicators (*detailed calculation methodologies are provided in the following sections*):

- **Embodied Carbon:** these are fossil and LULUC⁶ greenhouse gas emissions over the entire life cycle of building elements (the sum of stages A1 to B5 and C1 to C4), measured in kgCO₂e/m² of reference area (and kgCO₂e/m³ reported separately) over 50 years.
- **Operational Carbon:** these are the annual greenhouse gas emissions related to the energy consumption of building systems (stage B6 – LCBI end-uses⁷), measured in kgCO₂e/m². year (and kgCO₂e/m³ reported separately). These shall include estimated refrigerant leakages.
- **Biogenic Carbon Storage:** the amount of upfront biogenic carbon stored by bio-based materials in the building, in kgCO₂e/m².

⁶ Land use and land use change, EN 15804+A2.

⁷ See 3.2 Energy usages

1.2. Reference area & internal volume

The results shall be expressed per m² of **IPMS 2 without Component H** (i.e. excluding unenclosed loading docks, internal parking and storage rooms) as defined by the International Property Measurement Standards (IPMS) for industrial buildings⁸. The different Component Areas are detailed in Table 1 : Definition of the LCBI reference area based on IPMS 2 Component Areas (Industrial).

LCBI Reference Area - Industrial

IPMS 2 Component Areas		
[A] Vertical Penetrations	Stairs, lift/elevator shaft and technical penetration whose floor opening and surrounding walls, if any, is more than 0.1m ² ; otherwise remains in the component area where it is found.	
[B] External, internal structural & non-structural elements	Enclosing element of a building, all internal structural walls and columns, and all internal, full-height, permanent walls.	
[C] Technical Services	Plant rooms, lift/elevator motor rooms and maintenance rooms.	
[D] Hygiene Areas	Toilet facilities, cleaners' cupboard, shower rooms and changing rooms.	included
[E] Circulation Areas	This comprises all horizontal circulation areas.	
[F] Amenities	Cafeterias, day-care facilities, fitness areas and prayer rooms.	
[G] Workspace	Includes warehouse, roduction, office, showroom, mezzanine and enclosed loading docks.	
[H] Other Areas	Unenclosed loading docks, internal parking, etc.	excluded

Table 1 : Definition of the LCBI reference area based on IPMS 2 Component Areas (Industrial)

This definition of the reference area has been selected for its similarities with the definitions recommended by RICS, SBTi, and CRREM recommended definitions. Being close to the Gross Internal Floor Area allows consistent results to be expressed and benchmarked, without needing supplementary surveys to be conducted.

This reference area must be used for the calculation of each performance indicator: Embodied Carbon, Operational Carbon and Biogenic Carbon storage. In the remainder of this document, all references to "m²" refer exclusively to this reference area.

As warehouse projects often depend on their internal volume capacity for storage, it is also required to report the total volume of the building as an additional indicator. Projects shall refer to the same standard when calculating this resulting volume (m³), which is defined as the sum of the volumes of the individual spaces. Each space's volume is obtained by multiplying the corresponding IPMS 2 Industrial floor area by the appropriate height⁹: either the **Height** or the **Internal Height** for spaces fitted with a ceiling or suspended ceiling.

For each of the LCBI assessment parts, results will be given both per surface area (m²) and per volume (m³). However, only the surface area results will be taken into account for ratings and final score. Volume result indicators are intended for reporting or asset comparison purposes only.

⁸ IPMS for industrial buildings: <https://ipmsc.org/wp-content/uploads/2018/03/ipms-industrial-buildings-2018.pdf>

2. Embodied carbon

2.1.LCA scope: Building parts and components

The carbon assessments required for the certification process require an exhaustive bill of material quantities corresponding to the different building elements. The division of these building elements into categories is closely based on the classification established by the RICS9, and aims to cover all of a building's main components. Each is divided into smaller groups to provide a reportable breakdown and assess the completeness of the LCA (refer to Table 2).

The LCBI certification process therefore requires detailed and exhaustive material quantities for each of these categories. The completeness and accuracy of these quantities for each individual aspect must be documented and audited as part of the certification process.

This breakdown into categories is designed to be compatible with other assessment frameworks. To fit within the design process, the LCBI approach adopts a stepped assessment that can be undertaken in three successive layers, or macro-lots, of increasing completeness as per Figure 3 : Logistic Embodied macro-lots below.



Figure 3 : Logistic Embodied macro-lots

Each additional layer complements the previous one by incorporating additional building elements to account for an increasing range of building materials. To obtain the associated star, all elements described in the Table 2 below should be modelled in the LCA.

The LCBI rating methodology relies on this increasing coverage to reward efforts towards completeness, while allowing for a partial assessment in response to poor data availability. This approach incentivizes best practices in reporting quantities and accurate impacts for a newbuild asset.

⁹RICS, 2023, *Whole life carbon assessment (WLCA) for the built environment*.

FRAME , SHELL & PARTITIONS, FINISHES ☆☆☆	1.1	Frame	1.1.1	Slabs
			1.1.2	Beams
			1.1.3	Columns
			1.1.4	Walls
			1.1.5	Stairs, ramps and safety guarding
	1.2	Facade	1.2.1	Opaque facade systems
			1.2.2	Glazing systems
			1.2.3	Shading devices
	1.3	Roof	1.3.1	Structural elements
			1.3.2	Roof coverings
	1.4	Internal fittings	1.4.1	Fixed partitions
			1.4.2	Interior acoustic and thermal insulation
			1.4.3	Internal doors
			1.4.4	Raised floor and screed
			1.4.5	Suspended ceilings
			1.4.6	Sanitary fittings
	1.5	Finishes	1.5.1	Floor coverings and finishes
			1.5.2	Wall and ceiling finishes
SITE & EXTERNAL ☆☆☆	2.1	Sub-structure	2.1.1	Foundations and piling
			2.1.2	Basement slabs
			2.1.3	Retaining walls and structural frame
	2.2	External work	2.2.1	External floor surfacing
			2.2.2	Fencing, railings and walls
			2.2.3	External networks
TECHNICAL & SERVICES ☆☆☆	3.1	Heating and hot water	3.1.1	Heating and hot water generation equipment
			3.1.2	Heating and hot water distribution network
			3.1.3	Heating emitters
	3.2	Cooling	3.2.1	Cooling generation equipment
			3.2.2	Cooling distribution network
			3.2.3	Cooling emitters
	3.3	Ventilation system	3.3.1	Air movement
			3.3.2	Air terminals
			3.3.3	Ductwork & ancillaries
	3.4	Sanitary systems	3.4.1	Cold water systems
			3.4.2	Drainage and rainwater
	3.5	Electrical installations	3.5.1	Lighting system
			3.5.2	Onsite electricity generation
			3.5.3	Electricity distribution
	3.6	Other systems	3.6.1	Lifts and escalators
			3.6.2	Firefighting installations
			3.6.3	Telecoms and data installations

Table 2: Minimum assessment criteria for each aspect of Embodied Carbon completeness

2.2. Life-cycle stages and study period

The system boundary follows the "cradle-to-grave" definition of the building life cycle as defined in standard EN 15978. Calculating the whole-life carbon should include each module defined in this standard, corresponding to the carbon emissions associated with the various stages of the building's design life. In its latest version, the EN 15804 +A2 standard confirms that future Environmental Product Data should cover all steps of the life cycle of a product as described below.

The reference study period (RSP) is set to 50 years for Embodied Carbon calculations. While there are minor differences regarding RSP definitions across Europe, most methodologies¹⁰ are using 50-years period, aligning with the EU Level(s) framework guidance. Embodied Carbon is the carbon performance indicator for building materials and technical equipment. It focuses on stages A1 to B5 and C1 to C4 (see Table 3) of the life-cycle stages of all building components (see Table 2: Minimum assessment criteria for each aspect of Embodied Carbon completeness)

Stage B6 (Energy use) is excluded from Embodied Carbon calculations, as it is calculated separately under the Operational Carbon indicator. Currently, stage B7 (Water use) is not included in the LCBI scope.

Module D is **calculated and reported** separately but is not accounted for in the Embodied Carbon indicator of the project. Consequently, the embodied carbon emissions calculated under the LCBI methodology correspond to the sum of the stages A1 to C4 (apart from B6 and B7, see Table 3 below).

LCBI Life Cycle Stages

A - PRODUCT STAGE	B - USE STAGE	C - END OF LIFE
A1: Raw material supply A2: Transport A3: Manufacturing	B1: Use B2: Maintenance B3: Repair B4: Replacement B5: Refurbishment	C1: Demolition C2: Transport C3: Waste processing C4: Disposal
A - CONSTRUCTION PROCESS STAGE		
A4: Transport A5: Construction installation process		
	B6: Operational energy use B7: Operational water use not reported for now	
		D - BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
		D1: Reuse, energy recovery, recycling (reported separately) D2: Exported utilities exiting the system boundary (reported separately, displayed in final score card)

Table 3: Whole Life-Cycle stages and selected LCBI embodied scope

In order to carry out the building LCA, the impacts of each individual building material and equipment must be documented by an Environmental Product Declaration (EPD). **Please refer to Section 1.3 ("Prioritization of the EPD usage") for more details on standards, EPD databases, and the prioritization order.**

When using incomplete environmental data for certain life-cycle stages, LCBI methodology provides a framework for data completion in **Section 1.5 of the APPENDIX**.

The total LCA results for the building shall be expressed in **kgCO₂e/m².50 year**. A result in kgCO₂e/m³ (per m³) **internal building volume must also be reported, to be used for reporting or asset comparison purposes.**

¹⁰ Methodologies using 50 years RSP: RE2020 (France), DGNB (Germany), Danish Green Building Council, Climate Declaration (Finland), Level(s) EU framework. For more information: <https://www.ramboll.com/news/embodied-carbon-and-how-to-tackle-it>.

2.3. Reference service life and replacement

The reference service life of building components is usually estimated by the manufacturer in the EPD. In the absence of an estimation made by the manufacturer or supplier, default service lives (provided in APPENDIX, Section 1.7 Default service lives) must be used.

If these lifespans are shorter than the 50-year reference study period (RSP) of the building, a suitable number of replacements shall be considered. The number of replacements to be accounted for in the LCA must be taken as an integer value such that the product is fully replaced at the end of each lifespan, in accordance with Section 9.3 of EN 15978. No partial replacement on a pro-rata basis for the remaining study period shall be applied. The Embodied Carbon of each product replacement must be allocated to Module B4 of the building LCA.

$$B4_{building\ LCA} = \sum_j B_{4,j} + f_i \left(\frac{RSP}{SL_j} - 1 \right) * ABC_j [kgCO_2e]$$

with:

$B_{4,j}$ – GHG impact of B4 stage of j product EPD (in $kgCO_2e/m^2$)

SL_j – Service Life of j product (in years)

f_i – integer part ceiling function (as opposed to floor function)

ABC_j – Total GHG impact, stages A, B and C of j product EPD, apart from B6 and B7 (in $kgCO_2e/m^2$)

RSP – Reference Study Period (50 years)

For instance, a product impact with a 20-year lifespan will be accounted for three times in the calculation to cover the 50-year building life cycle.

2.4. Circular economy

LCBI aims to promote circular practices at the end-of-life for construction materials and prevent any systematic approach to demolition, incineration, or landfilling. The reuse of building materials avoids the greenhouse gas emissions associated with the production and construction phases of new materials, which represent the largest share of whole-life carbon emissions for most products. LCBI therefore encourages these initiatives by applying a specific calculation rule for the LCA of reused materials. Two different cases may occur:

	Components from a deconstruction site	Structural element from onsite pre-existing building
Type of reused materials	Components removed from a deconstruction site (either from an in-situ or ex-situ demolished/deconstructed building) and reused instead of sourcing virgin materials for an identical use. Examples: raised floors, ceilings, carpets, structural steel beams, sanitary fittings, etc. All components across the four macro-lots (see Table 2: Minimum assessment criteria for each aspect of Embodied Carbon completeness) can theoretically be reused in a new construction project.	When a building pre-exists on the project construction site, some structural elements may be preserved and reused in place without being deconstructed, like foundations, slabs, beams, etc. Since this version of the certification applies exclusively to new buildings, LCBI considers that if any component from the “Frame & Shell” macro-lot is reused in place from the previous super-structure without deconstruction, the project shall fall within a “renovation” typology and therefore not be eligible to this version of the LCBI scheme. Conversely, the reuse of any component of macro-lots “Partition & finishes”, “Site & External”, “Technical & Services” (see Table 2: Minimum assessment criteria for each aspect of Embodied Carbon completeness) falls within the scope of this certification.
Embodied Carbon	The Embodied Carbon of the product stage (modules A1 to A3) of any reused material shall be set to 0. LCBI considers that no additional carbon emissions for the production of the component exist, which falls under the product “first life” Embodied Carbon. The carbon emissions from modules A4, A5, B and C, are calculated in the same way as if virgin materials had been used. As with new materials, the EPD prioritization method applies to reused materials (see 1.3 “Prioritization of the EPD usage”). Thus, if no product-specific EPD is available, generic data shall be used. If the remaining lifespan of the reused material is shorter than the 50-year study period, a replacement must be accounted for in module B4 of the building LCA. It is assumed that the component to be renewed is replaced by an identical component (i.e.: by a reused material with the same lowered carbon impact). The lifespan of a reused material is defined by the EPD data, same as for new materials.	The Embodied Carbon of the product stage (Modules A1 to A3) and the construction process stage (Modules A4 and A5) for these reused components of the macro-lot “Site & External” from the existing building shall be set to 0. The carbon emissions from stages B and C, are calculated following the standard methodology for new materials.

2.5. Demolition of a pre-existing building

When an existing structure pre-exists on the project site, it can either be demolished or recovered through reuse. As a reminder, if the super-structure is entirely reused the project falls within a renovation typology and should be excluded from the current scope of the LCBI certification. If the structure is partially reused, please refer to 2.4. Circular economy (*reuse of structural elements from the pre-existing building*).

Regarding demolished sub-structures and super-structures, carbon emissions associated with the demolition of existing structural elements (from frame, shell, site, and external components) **must be assessed and reported separately from the Embodied Carbon indicator**. In this current version, and in the absence of a common methodological consensus, the carbon impact of demolition is not included in the calculation of Embodied Carbon. It must be estimated using generic environmental data only. Only **end-of-life stage C1 to C4** of all **demolished elements** should be accounted for.

*The following examples illustrate the application of the Embodied Carbon methodology to reuse scenarios **within real estate and logistics projects**:*

Example 1 : Construction on an existing sub-structure

There is a pre-existing building with one sub-structure levels and one super-structure level on the construction site. The super-structure is completely demolished, and the sub-structure level is reused to build a new super-structure above them. In this case, the carbon impact of stages A1-A3 and A4-A5 is set to 0 for the entire reused sub-structure. The carbon impact of the other stages (B and C) will be taken from the manufacturer's specifically updated EPD, if it is available, or from generic data. The carbon impact of the end-of-life (C1-C4) of the demolished super-structure should be estimated using suitable EPDs, but it is not included in the calculation of the Embodied Carbon, it should be reported separately in the Reporting Sheet (see Section 3 Reporting spreadsheet).

Example 2 : Partial reuse of super-structure

There is a pre-existing building with two super-structure levels on the construction site. The first floor of the building is reused, and a new level is constructed above it. **In this case, the project is considered as a renovation and this present certification does not apply.**

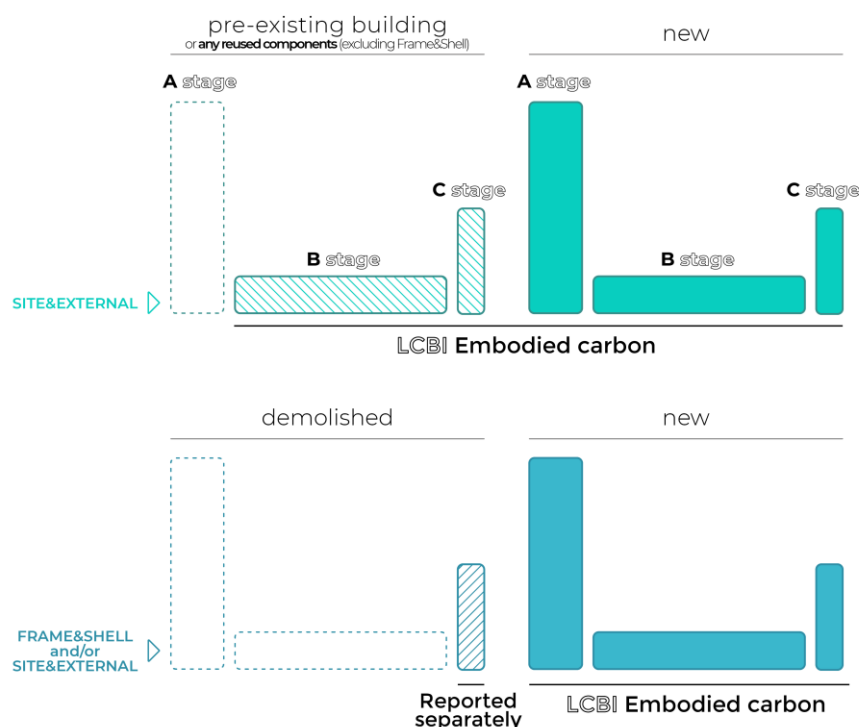


Figure 4: Reuse (2.4) and demolition (2.5) embodied emissions accounting

3. Operational carbon

3.1. Calculation process

Operational Carbon values should be derived from the **final energy consumptions reported in kWh_{F.E.}/m².yr.** These consumption figures must be estimated according to one of the three methodologies below.

To ensure the comparability of results between assessed projects, the reference area applied to the operational consumptions must be the reference area defined by the LCBI (IPMS 2, component H excluded, 1.2). For comparison purposes, the annual final energy use per m³ of internal building volume shall be reported separately as kWh_{F.E.}/m³.yr.

- **☆☆☆ National Calculation Methodologies (NCM):** The majority of national calculation methods are currently based on EN 15603 and its associated standards. It is anticipated that over time these methods will be updated to reflect the new EN ISO 52000 series (EPB Directives¹¹). There will therefore be a transitional period during which either standard may be referred to. However, NCM are only accepted, provided that they cover five mandatory energy usages as per the EPBD & the Level(s) framework. LCBI is aware of the possible discrepancies between NCM and recommends the use of complete Dynamic Energy Simulations (DES) to achieve a more accurate estimation of a project's energy consumption.
- **☆☆☆ Dynamic Energy Simulations (DES)*:** The DES should cover all energy usages (regulated and non-regulated) and be carried out according to the usage scenarios and assumptions for the calculation of the indicator 1.1 (use stage energy performance) of Level(s).
- **☆☆☆ Monitored Consumption (MC):** Alternatively, if the LCBI assessment is carried out after a full consolidated year of building occupation, actual energy consumption (monitored and metered per usage, verified by a commissioning report) may be used.

**The use of a Dynamic Thermal Simulation (DTS) for energy consumption estimation is deemed acceptable only if: thermal loads and heating/cooling demands are computed within the thermal simulation environment; and the conversion of simulated demands into final energy consumption is performed through a post-processing calculation, provided that the following conditions are met:*

- (i) Scope of simulation, it must cover all energy end-uses, using operationally realistic input assumptions (occupancy schedules, occupancy densities, ventilation flow rates, internal heat gains, etc.), rather than standardised regulatory scenarios.*
- (ii) Consistency of assumptions, a detailed and auditable demonstration shall be provided to establish the coherence between the thermal parameters modelled within the DTS (solar and internal gains, envelope heat losses, air flow rates, etc.) and the system-level assumptions applied in the post-processing model.*
- (iii) Transparency and traceability, all input parameters, conversion factors, and intermediate results used in the post-processing calculation shall be explicitly documented and justified, to allow independent verification.*

¹¹ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

3.2. Energy usages

The basic assessment range covers the final energy consumption of the technical systems integrated into the building during its operation, as described in clause 7.4.4.7 of EN 15978. Namely, the annual energy consumed by the five main usages are summarized in Figure 5 below.

A reporting template (see Section 3. LCBI PERFORMANCE EVALUATION - 2.2 Calculation process) should be filled for each type of energy used (electricity, gas, district network, biomass, etc.).

The energy consumption corresponding to generation, distribution and ventilation auxiliaries should be included within the reported consumption of these five usages.

The energy consumption of other technical systems integrated into the building, necessary for the technical and functional performance of the building, shall be declared to achieve the second star rating, and more, of the scope of evaluation (e.g. lifts, escalators, safety and security installations and communication systems, IT and appliances, etc.). However, **process-related energy consumption within logistic zones are excluded**, a more detailed list of uses is to be found Figure 5. Regarding cooled assets (falling under the cold and frozen category), cooling energy consumption is excluded if the equipment is installed by the tenants, provided that no specific provisions or distribution networks were planned during the construction phase.

The following figure describes the different assessment levels and their corresponding star ratings:

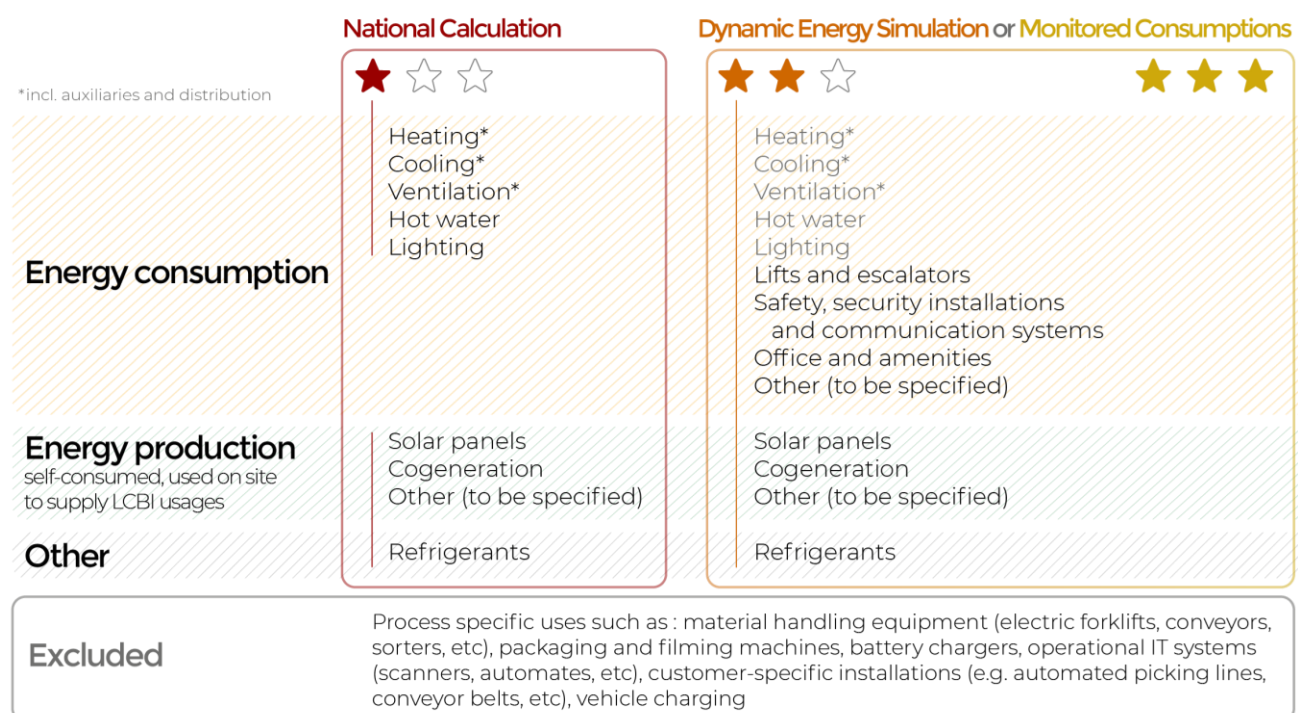


Figure 5: Minimum scope of assessment for Operational carbon

The "Other" category covers energy consumption, or production uses that are not part of the default list. It does not include uses or energy sources from the "Excluded" category.

3.3. Energy emission factors

To unify the calculating method for the carbon intensity of energy in each country (electricity from the national grid or other local production sources), LCBI requires the use of the emission factors provided by the CRREM (Carbon Risk Real Estate Monitor, Risk-Assessment-Tool version 2.07) in the building's year of completion.

To promote exemplary design and operation of the building and to avoid distorting corporate reporting with external energy procurement strategies, the methodology shall rely on location-based emission factors rather than market-based ones. However, LCBI certification allows the use of a justified and documented alternative location-based emission factor for electricity, when different from the CRREM value. As per the second version of CRREM pathways¹², aligned with GHG Protocol and the SBT Initiative, transmission and distribution (T&D) losses shall be excluded from the total emission factor value.

LCBI certification also allows the project to use a custom District Heating emission factor, provided it is justified by official national documents or by official statements from district heating utility providers. Similar to the rule for electricity, if T&D losses are known, these should be excluded from the consumed district heat emission factor.

In both cases, supporting documents should provide **justifications** on the emission factor as of the completion date. Projected or forecasted future emission factors will not be recognised under this version of the methodology.

¹² CRREM, 2023, *From Global emission budgets to decarbonization pathways at property level. (A.2.3) Excluding transmission and distribution (T&D) losses.*

3.4. Local energy production

This certification applies the following method to account for the in-situ renewable energy production:

- **exported energy** shall not be accounted for (e.g. not deducted from the operational use of energy) but reported separately under the D2 LCA stage,
- **self-consumed renewable energy allocated to LCBI-covered energy usages*** must be deducted from the final energy consumption,
- self-consumption share shall be calculated and documented using either a regulatory calculation method or a project-specific methodology derived from the Dynamic Energy Simulation (DES).

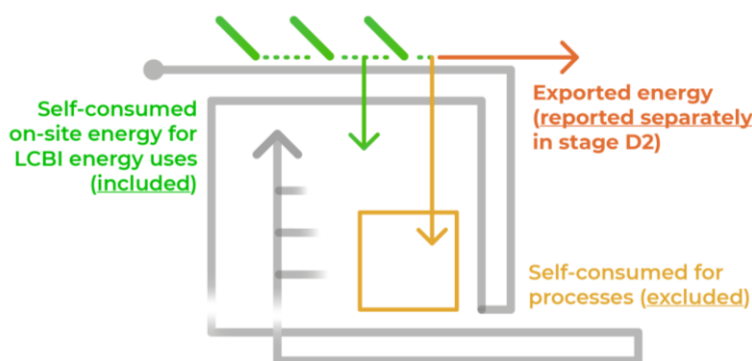


Figure 6 : Energy production contribution to operational carbon

*Where process energy consumption is not included in the metered or declared energy supply, the **entire self-consumed energy** must be deducted from the final energy consumption.

Where process-related energy consumption is **included in both the overall energy supply and the self-consumption pool**, the deductible energy consumption for the LCBI framework must be calculated as follows:

Deductible self consumption

$$= \text{On site energy production} \times \text{Total self consumption} \times \text{LCBI consumption share}$$

Where :

- On site production : on site PV production given in $\text{kWh}_{\text{FE}}/\text{m}^2.\text{yr}$
- Total self-consumption : PV electric self-consumption given in %
- **LCBI consumption share** : percentage of electricity consumption taken into account in the LCBI framework relatively to the total consumption including processes. It is given in percentage (%) and calculated as follow:

$$\text{LCBI consumption share} = \frac{\text{LCBI Electric energy consumptions (kWh}_{\text{FE}}/\text{m}^2.\text{yr})}{(\text{LCBI Electric energy consumptions (kWh}_{\text{FE}}/\text{m}^2.\text{yr}) + \text{Electric processes consumption (kWh}_{\text{FE}}/\text{m}^2.\text{yr}))}$$

Note that the Embodied Carbon of the energy production installation should be reported in the third level of completeness of Embodied Carbon: ★★ Technical & Services, in proportion to the estimated share of on-site generated energy that is self-consumed for LCBI end-uses.

For instance :

- LCBI energy usages: **65 $\text{kWh}_{\text{FE}}/\text{m}^2.\text{yr}$**
- Process usages (electric): **100 $\text{kWh}_{\text{FE}}/\text{m}^2.\text{yr}$**
- On-site PV generation: **87 $\text{kWh}_{\text{FE}}/\text{m}^2.\text{yr}$, of which 70% is self-consumed on-site**

The deductible self-consumed energy attributable to LCBI end-uses is calculated as follows:

$$87 \times 70\% \times 65 / (65 + 100) = 87 \times 0.70 \times 0.394 = 24 \text{ kWh}_{\text{FE}} / \text{m}^2.\text{yr}''$$

This value of 24 $\text{kWh}_{\text{FE}}/\text{m}^2.\text{yr}$ may therefore be deducted from the electricity consumption associated with LCBI usages.

Where there is insufficient reliable data to distinguish self-consumed energy production supplying LCBI-covered uses from excluded process consumption, no energy production shall be accounted for in either Operational or Embodied Carbon.

3.5. Fugitive emissions of refrigerants

Greenhouse gas emitted by refrigerants contained in technical equipment, such as cooling units or heat pumps, can be estimated with B1 and B2 modules from those equipment EPD/PEP. The refrigerant leaks to be considered are those associated with LCBI-covered energy end-uses.

However, if the LCA is not calculated on the Technical & Services macro-lot, or if the equipment EPD/PEP does not take into account refrigerant impacts and leaks, the refrigerant leaks ¹³ should be estimated with the following formula:

$$\text{Operational Carbon}_{\text{Refrigerants}} = R_{\text{Leakage}} \times Ch \times EF_{\text{Refrigerant}}$$

- R_{Leakage} is the annual leakage rate (%/year), this data must be taken from the EPD/PEP or on the equipment's technical data sheet. If this data is unavailable, a conventional leakage rate of 2%/year will be set,
- Ch is the total initial refrigerant charge of the MEP equipment (kg), this data must be taken from the EPD/PEP or on the equipment technical data sheet,
- $EF_{\text{Refrigerant}}$ is the emission factor for the actual type of refrigerant used in the MEP equipment (kgCO₂e/kg), this data must be taken from global warming potential of cooling gases defined by the CRREM (*refer to the LCBI Reporting Sheet for exact values*). If the refrigerant used in the building is not on the list provided by CRREM, the emission factor must be taken from the GWP total life-cycle value of an EPD/PEP covering that refrigerant or documented from an auditable source.

¹³ RICS, 2023, *Whole life carbon assessment (WLCA) for the built environment, 5.2.1 In-use impacts (B1)*.

4. Biogenic carbon storage

The Biogenic Carbon content, which is the carbon stored as a result from photosynthesis and contained in the bio-based materials, is to be estimated for the whole building in kg CO₂e/m². All bio-based components of the building—independently from the scope chosen for Embodied Carbon—should be considered. This value represents the total amount of Biogenic Carbon locked/stored in the building at any time of its operational lifespan; consequently material replacements shall not be factored into this indicator. Depending on the available information in the product EPD, the amount of Biogenic Carbon can be estimated in different ways. In order of priority:

- Option 1 : Biogenic Carbon content in **kgCO₂e**/functional unit is given by the EPD. It can directly be used for reporting.
- Option 2 : Biogenic Carbon content in **kgC**/functional unit is given by the EPD. The value has to be multiplied by 44/12 to be converted in kgCO₂e¹⁴.
- Option 3 : No specific value is given and the EPD is in EN 15804+A2 format. The Biogenic Carbon content should be estimated based on stages **A1 (Raw material supply) from GWP - biogenic**.
- Option 4 : For other EPDs, **only timber products** are eligible to declare a Biogenic Carbon content. In accordance with standard EN 16449, the approximation of 0.45 kgC of stored carbon per 1 kg of wood may be applied.

For a wood product with a density of woody biomass ρ , the Biogenic Carbon content in the total volume of the product V can be approximated using the following simplified formula:

$$\text{Biogenic Carbon Storage} = 44/12 \times 0.45 \times \rho \times V \quad [\text{kg CO}_2\text{e}]$$

Where:

ρ is the density of the wood product (kg/m³)

V is the total volume of the product (m³)

Biogenic Carbon content is usually given for the product functional unit (m², m³, u...). To obtain the total biogenic storage provided to the building, the carbon content value must be multiplied by the corresponding quantity of material.

Please note that the D module (which captures the net benefits of circularity and recycling, amongst other) differs from Biogenic Carbon content. Consequently, Module D data cannot be directly used to calculate the Biogenic Carbon content.

¹⁴ This conversion is due to the atomic weights: 44 kg/mol is the weight of carbon dioxide and 12 kg/mol is the weight of carbon.

3. LCBI PERFORMANCE EVALUATION

1. Embodied carbon

1.1. Key principle

The Embodied Carbon of a project shall be evaluated against a two-dimensional framework (see below), which provides a combined rating of LCA completeness and Carbon performance. This framework requires two inputs: the scope of assessment (quantified by a star ★ rating) and the carbon performance (rated by Targets “T1”, Target 2 “T2” and “T0” for cold/frozen asset type).



Figure 7: 2D Framework explanation on embodied

EMBEDDED _{GWP} (kgCO ₂ e/m ² _50yr):	250	350	400	450	600	675	LUMP SUMS (kgCO ₂ e/m ² _50yr)	TOTAL IMPACT
★ ★ ★ FRAME & SHELL (FS.) + PARTITIONS & FINISHES (PS.) (Load-bearing structural frame, facades, roof) + (Parts of non-load bearing frame, fittings and furnishings)	T ₂	T ₁	T ₀				+250	estimated + lump sum kgCO ₂ e /m ² _50yr
★ ★ ★ FS.PS + SITE & EXTERNAL (SE.) (Foundations, parking facilities, utilities, landscaping)	T ₂		T ₁	T ₀			+200	
★ ★ ★ FS.SE.PS. + TECHNICAL & SERVICES (TS.) (In-built lighting, energy, ventilation, sanitary, systems)	T ₂				T ₁	T ₀		

Figure 8: Embodied carbon framework assessment

1.2.Scope of assessment

As shown in Figure 8, projects are assessed for their Embodied Carbon performance for two metrics, represented by the vertical and horizontal axes of the diagram. Along the vertical axis, the project is given a rating based on the completeness of its LCA, as defined by the LCBI methodology. The wider the coverage of the evaluation, the more accurate the study and therefore the more “completeness” stars the project achieves.

Retained within the Partitions & Finishes (PF) or Technical & Services (TS) sections are all the works that would be required for a usable storage volume to be handed over. If such works are unknown (undetermined tenant works), the project must model the Embodied Carbon impact of a fictional layout compatible with an unconditioned and ambient storage. This estimation must be backed by robust and documented quantities associated with generic data unless contractual specifications for tenants are implemented.

The LCA of a project is deemed complete if each of its building components is described with appropriate environmental data and plausible quantities. For any missing elements or sub-categories where the impact is reported to zero, a robust justification shall be provided.

1.3. Carbon performance

As represented on the horizontal axis in Figure 8, the Embodied Carbon value of a project is evaluated against different thresholds of GWP over 50 years, as calculated by a suitable LCA for the aspect being considered.

Thresholds have been tentatively calibrated to provide a universal framework, valid for all countries until consistent data benchmarks emerge to provide relevant differentiation. Any project can be evaluated using this table, thus obtaining a given performance tier or GWP and a star rating for a given LCA “completeness”.

Performance metrics are determined at the intersection of the GWP performance tier and LCA completeness matrix. This position will be compared to two main targets: “**Target 1**” (T1) and “**Target 2**” (T2).

In addition, a specific embodied carbon target named “Target 0” is available for temperature-controlled buildings requiring enhanced insulation, partitioning, or technical services equipment due to the presence of refrigerated areas. This allowance permits such buildings to exceed the applicable target values by up to 50 kgCO₂e/m² for Scope ★☆☆ and Scope ★★☆, and by up to 75 kgCO₂e/m² for Scope ★★.

The supplementary threshold zone can only be used for logistic assets where all following conditions are met:

- The project explicitly incorporates refrigerated area, and works are part of the construction scope,
- The refrigerated area is at least equal to 30% of the total reference **area** of the building.

T1 is the minimum requirement level to be granted the certification, it is set to 600 kg CO₂e/m² for a full-scope LCA (★★★). This level remains accessible to almost all logistic projects engaged in a low-carbon design philosophy. T2 is for exemplary projects and is set to 450 kg CO₂e/m² for a full-scope LCA. This level requires a focused effort throughout the design of the building.

This rating method has been designed for its flexibility. Further (more stringent) performance indicators (e.g. T3, T4) may be developed in later versions of this framework to follow the required decarbonization pathway and reflect better practices.

Low LCA results can be the result of a genuine low-carbon design; however, these results may be virtually too low as a result of an incomplete partial assessment. The framework outlined by LCBI is driven by the necessity to avoid confusing results and allow for enhanced transparency. LCBI-compliant Embodied Carbon results shall therefore be disclosed in kgCO₂e/m² along with the associated star rating.

For easy and comparable reporting to emerge from the LCBI methodology, “**lump sums**” shall be added to the calculated results when the scope of LCA is incomplete, so that final embodied results cover a complete, consistent evaluation and be used as such in ESG reports and public communications (for further details, see 1.5 Scenarios for completing cradle-to-gate EPDs).

These lump sums are purposely designed as “upper bounds” for each macro-lot to incentivize detailed assessments to be carried out even at an earlier stage. These lump sums do not impact LCBI performance for Embodied Carbon, nor for the final evaluation. Their aim is to obtain a total single value of Embodied Carbon that can be used to fairly compare one project with another on the full LCBI extent of the LCA (★★★).

According to the minimum requirement level values for certification access (T1) on the different scopes and their associated lump sums, all LCBI certification projects emit less than 675 kgCO₂e/m² on the Embodied Carbon on the full LCBI extent of assessment. In other words, these lump sums are designed in such a way that any project eligible for LCBI (even with a lower level of completeness) will not exceed 675 kgCO₂e/m² once all the lump sums are considered for the missing macro-lots.

Example

If the Embodied Carbon of a project is estimated to 275 kgCO₂e/m², ★★☆☆, the candidate shall add the associated lump sum that is equal to 200 kgCO₂e/m² in order to disclose a comparable result on the full assessment. The total impact would be 275 + 200 = 475 kgCO₂e/m², even though performance thresholds (the T1/T2 targets) are applied on the estimated Embodied Carbon of 275 kgCO₂e/m².

2. Operational carbon

2.1.Key principle

LCBI certification also addresses Operational Carbon emissions, which contribute significantly to a building's whole life-cycle carbon footprint. However, establishing a standard framework for energy consumption in Europe is challenging, given the diversity of estimation and measurement methods across countries. Thus, this methodology offers flexibility in reporting and calculating operational emissions. To evaluate projects, a two-dimensional framework, similar to the one defined for the Embodied Carbon framework, is proposed. Figure 9 shows how any project can assess its operational performance according to two metrics: the calculation process and carbon performance.

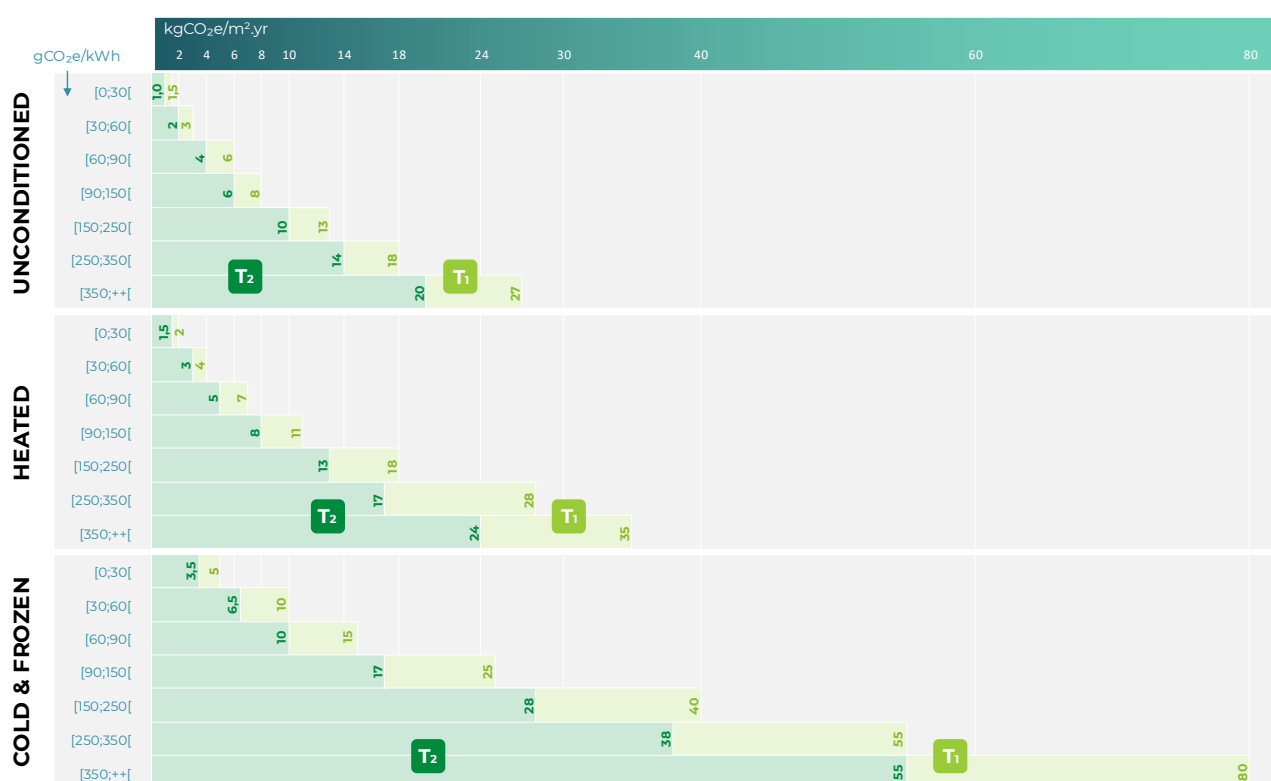


Figure 9: Operational carbon framework assessment

The data in brackets provide the emission factors [gCO₂e/kWh] for the electricity mix of the country where the project is located for the current year.

The graph below shows an example of the distribution of levels based on **emission factors by country in 2026** (according to CRREM).

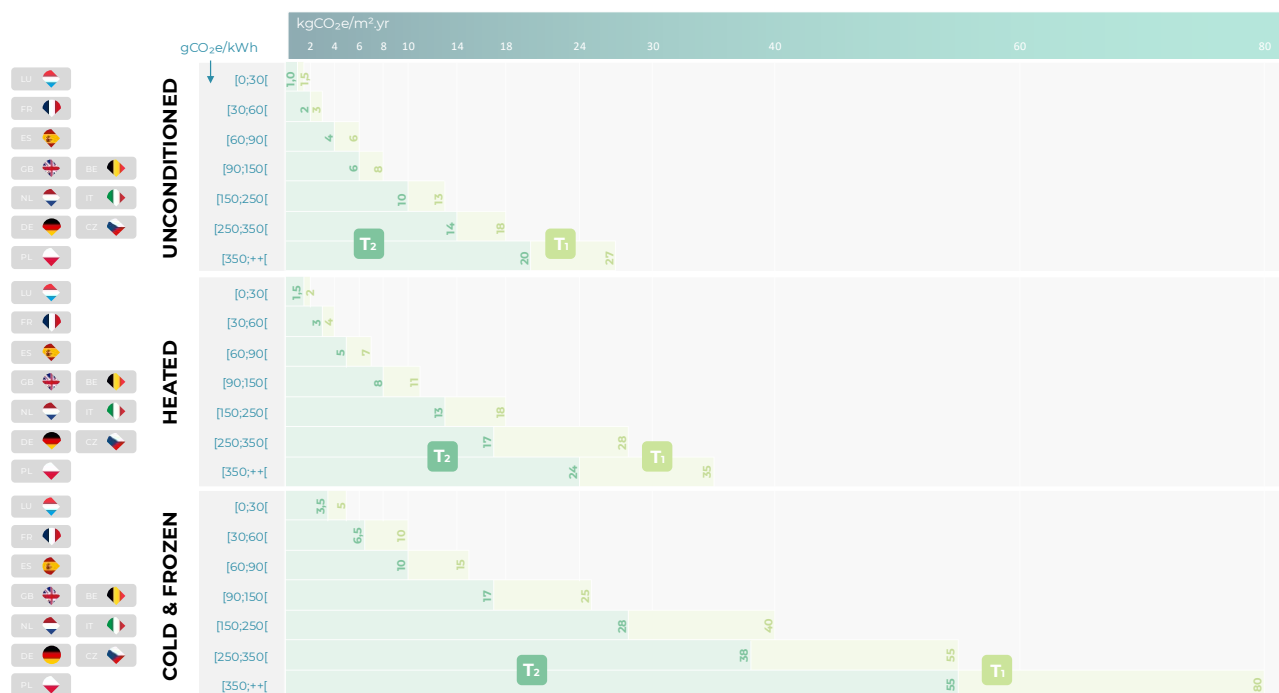


Figure 10 : Example of level distribution based on country-specific emission factors in 2026 (according to CRREM)

2.2. Calculation process

Categories on the vertical axis in Figure 9: Operational carbon framework assessment, represent the thermal conditioning related to the energy consumption assessment.

In warehouses with mixed thermal zones, determining the resulting operational carbon threshold requires the application of a volumetric weighting proportional to each functional zone. The resulting thresholds T_1 and T_2 are defined as the weighted sum of the categorical thresholds, associated with the local emission factor category, according to the relative volumetric fraction of each zone. For the configuration illustrated Figure 11 : Mixed thermal conditioning, resulting operational threshold, the volumetric distribution is as follows: ambient storage (30%), heated zones and other (60%), and cooled zones (10%). The resulting threshold is therefore expressed by the following equations:

$$T(\text{resulting}) = V\% \text{ of ambient} \times T(\text{ambient}) + V\% \text{ of heated \& other} \times T(\text{heated}) + V\% \text{ of cold} \times T(\text{cold})$$

$$T(\text{resulting}) = 0.30 \times T(\text{ambient}) + 0.60 \times T(\text{heated}) + 0.10 \times T(\text{cold})$$

where $V\%$ is the volumetric share of the thermal zone, T_{ambient} , T_{heated} , and T_{cold} respectively denote the applicable thresholds T_1 or T_2 for each thermal treatment type, as determined by the emission factor category of the country concerned.

For more information on the volumetric calculation methodology, clear and internal height, please refer to Section 1.2 Reference area & internal volume.

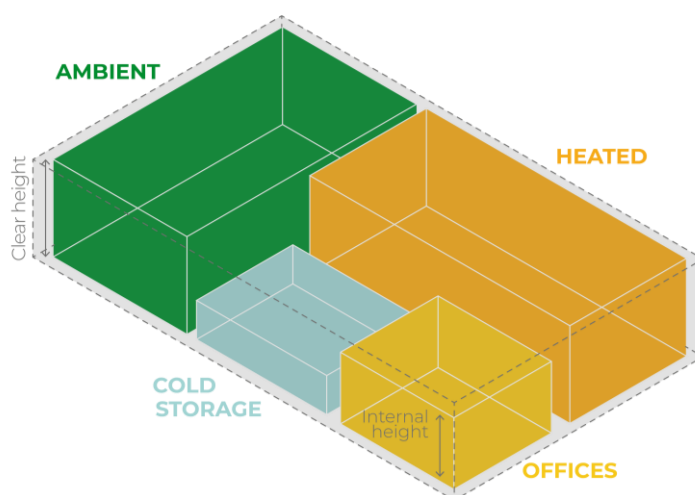


Figure 11 : Mixed thermal conditioning, resulting operational threshold

In addition to this performance evaluation, the methodology rewards the completeness of the energy assessment carried out.

To achieve a one-star rating, projects must, at a minimum, assess the main and mandatory end-uses (heating, cooling, ventilation, hot water, lighting – refer to 3.2) as per the EPB Directives and the Level(s) framework.

A two-star rating can be obtained by providing a DES that thoroughly documents its assumptions and also assesses other non-regulatory uses.

The three-star rating is based on real energy consumption data through monitoring. For instance, in-use performance of buildings could be compared to the LCBI framework for benchmarking purposes, allowing for a potential rating upgrade achieved upon completion. Alternatively, recently delivered new build projects could also request LCBI certification after one or two years of operation.

2.3. Carbon performance

On Figure 9: Operational carbon framework assessment, horizontal axis, total relative final emissions related to operational energy (+ refrigerant gases) are reported annually. The emissions factors are based on CRREM references (v2.07 - default 2026 values) for each country and typology. They evolve alongside CRREM projected pathways of national grid carbon intensity to reduce the, debatable and hardly trackable, user adjustment of emission factors according to local grid decarbonization pathways. However, this principle remains open for adjustments since Level(s) supports the use of prospective emission factors from the EU Reference Scenario 2020 . LCBI also covers carbon intensive district heating networks. For further information, please refer to the 1.8 Section District heating.

As for the Embodied Carbon rating table, both data quality (from regulatory to monitored consumptions) and performance (threshold values) are the criteria driving the achievement of T1 or T2. These targets are set differently from one country to another, depending on the carbon intensity of each country's energy mix.

3. Biogenic carbon storage

Bio-based building materials contain carbon that has been extracted from the atmosphere as CO₂ during their growth. This carbon is eventually re-emitted at the end of life of these materials, mainly as CO₂, CO, and CH₄ depending on the scenario (incineration, landfill, etc.). A “biogenic carbon neutrality” approach is applied to the CO₂ stored in these materials provided they come from sustainable sources, as per EN15804+A2.

From a building industry perspective, provided that their sustainable sourcing can be documented, bio-based materials (especially long lasting, structural ones) temporarily store a significant amount of carbon over a period of 50 years (the conventional life cycle of the building) and potentially longer.

Therefore, a time lag in emissions exists which is considered beneficial in the building sector’s “race towards urgent decarbonization” - it also provides a useful substitute for carbon-intensive materials whose manufacturing processes will take time to fully decarbonize.

In alignment with the Level(s) methodology and EN 15804+A2, and to distinguish it from other methods, LCBI requests that the Biogenic Carbon content of the project is calculated and reported separately from the Embodied Carbon content (refer to Section 3 Biogenic carbon storage). Note that some EPDs in the EN 15804+A1 format do not report Biogenic Carbon separately. The targets for this criterion deliberately promote the use of bio-based materials at the construction stage to maximize value the short- and long-term benefits of the associated carbon storage.

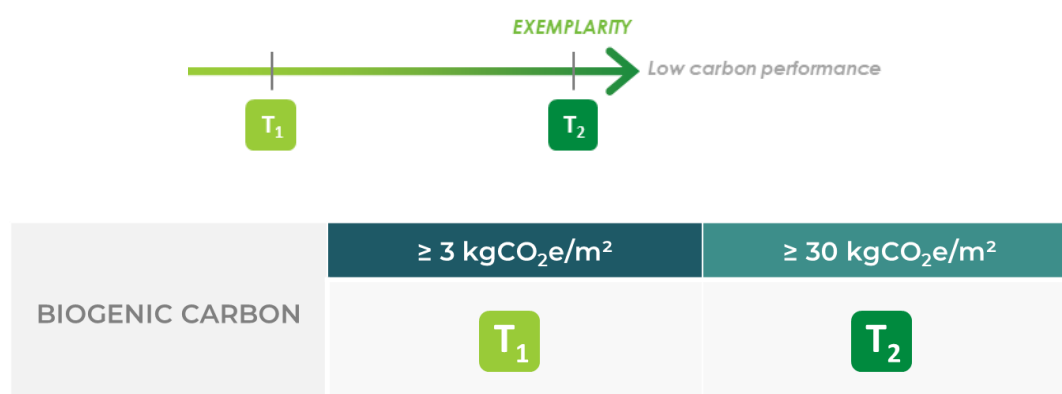


Figure 12: Biogenic carbon assessment

The LCBI Logistics Building framework requires **no minimum Biogenic Carbon Storage content** in order to achieve the LCBI Standard certification.

Threshold T1 is set at 3 kgCO₂e/m² of Biogenic Carbon, which most projects can achieve with external bio-based elements and/or common finishing materials in offices areas (such as composite wood raised floors, wooden doors, bio-based insulation, parquet, etc.).

Threshold T2 is set at 30 kgCO₂e/m² of Biogenic Carbon, which is tailored for warehouses implementing timber roof frame or wooden structural elements for offices areas (CLT beam/columns or frame, CLT flooring, wooden frame facades, bio-based outdoor flooring etc.). It reflects a strong commitment to incorporating bio-based materials as a key low-carbon strategy for whole building design, and values the significant storage provided by those projects.

4. LCBI whole-life carbon rating

Once the project has been assessed against the three criteria of the LCBI methodology (Embodied, Operational, and Biogenic Carbon storage) and has demonstrated compliance with the different Targets (1 or 2), then the LCBI whole-life carbon rating can be delivered. This rating system is comprised on three levels of increasing exemplarity, based on its overall performance: Standard, Performance, Excellence. This system has been designed so that T1 defines an entry level of minimum performance for low-carbon buildings, while T2 captures exemplarity projects—based on current data and knowledge.

In order to grant the certification, the proposed method cautiously avoids mixing the very different flows of carbon emissions (Embodied, Operational, and Biogenic) into a single indicator. It instead defines its performance levels based on three criteria, with the following weighting:

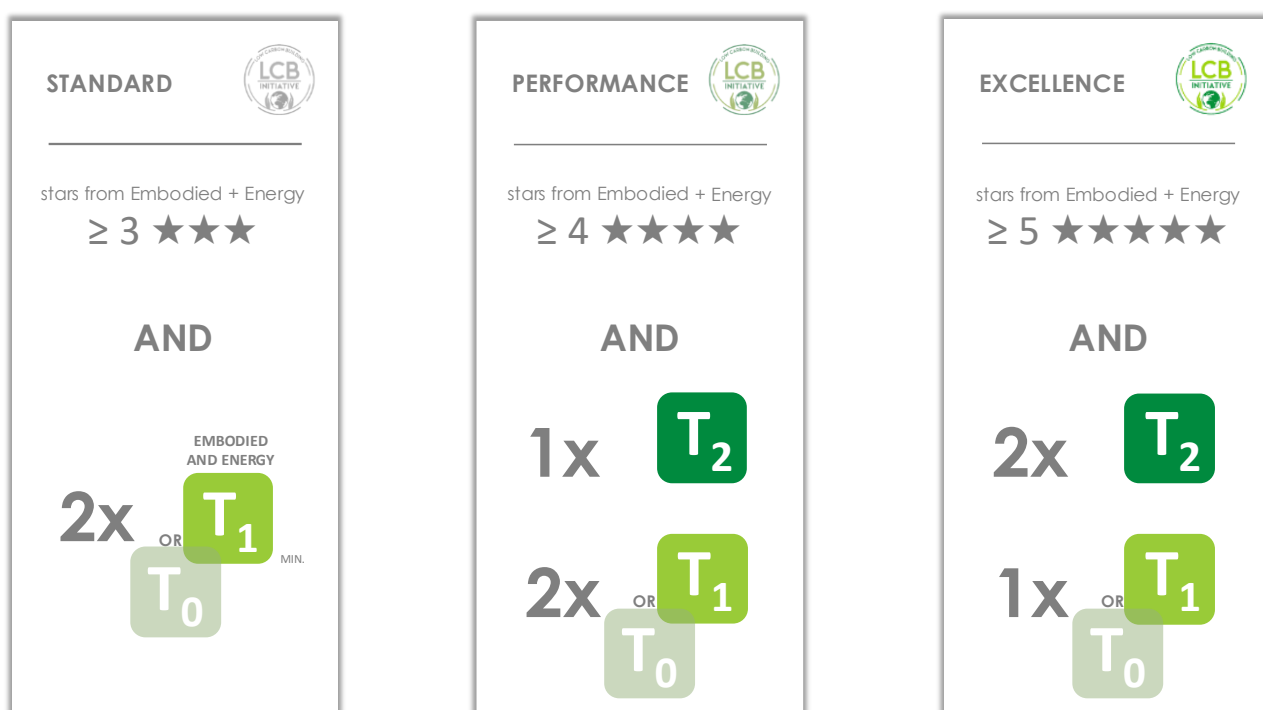


Figure 13: LCBI rating system

- **STANDARD: First steps towards low-carbon buildings**
 - ✓ Satisfactory assessment completeness on components + Energy indicators (at least 3★) with a minimum performance (Target 1) on Embodied and Operational Carbon,
 - ✓ Embodied Carbon does not exceed **600** (or 675 kgCO_{2e}/m² for cold & frozen assets),
 - ✓ The carbon performance of the building is within the **Top 50% of benchmarked projects** carrying out a **detailed LCA**, with an energy performance aligned with **CRREM 2035** trajectories,
 - ✓ While LCBI Standard certification is accessible for most specifications, incorporating recycled content in key materials and utilizing lightweight structures must be part of the design. Therefore, the **LCBI Standard certification sets a high bar for low-carbon buildings, aiming to challenge conventional practices and to exclude a “business-as-usual” approach.**
- **PERFORMANCE: Low-carbon briefs to challenge design**
 - ✓ Market best practice in terms of assessment completeness: **a wider scope is required** (at least 4★),
 - ✓ Projects need at least one exemplary result within their strategy: **one Target 2 achieved (T2)**,
 - ✓ Efficient and sufficient projects can highlight their efforts to reduce material use while aiming for exemplarity design with T2,

- ✓ Projects shall question and mitigate the impact of their site and external components while maximizing the potential for on-site energy production,
 - ✓ Balance between operational and embodied emissions must be studied carefully, including MEP design, to find optimal trade-offs.
- **EXCELLENCE:** *Groundbreaking projects with exemplary reporting*
- ✓ Projects require a complete scope of assessment (at least 5★) and two Target 2 results for the three criteria to align with the highest standards of low-carbon buildings,
 - ✓ All the carbon impacts of the building are fully assessed,
 - ✓ This level challenges traditional building design and **incentivizes a deep practice shift to decarbonize each building part,**
 - ✓ From efficient volumes to bio-based structural materials, from energy production systems to fossil-free heating, from alternative choices and careful sourcing materials and equipment to a proper understanding of MEPs,
 - ✓ **The carbon performance** of the building is within the **Top 25%** of projects with consistent emission reporting, **achieving a carbon emissions reduction of more than 33% over the entire life cycle compared to business-as-usual.**

This grading system guarantees that exemplary low-carbon claims rely on sufficiently complete assessments (whilst acknowledging current limitations in LCA practice), transparency (a carbon result in kgCO₂e/m² can no longer be disclosed without an associated number of stars), and performance (with T1 and T2 representing state-of-the-art absolute carbon emissions thresholds).

Lower Embodied Carbon results achieved through the use of bio-based materials (as substitutes for carbon intensive materials) are implicitly expected. However, setting separate targets for embodied and biogenic indicators prevents projects from compensating for poor overall design with extensive amounts of bio-based materials.

These three LCBI certification levels are developed in a flexible and resilient way so that final targets and/or star rating calibrations can be tightened (or loosened) in the future. Targets may evolve in future versions to become country-based and better adapted to the three building types.

Finally, independent of the LCBI certification process, the proposed universal 2D rating framework of (*Carbon performance*) x (*Completeness*) which separately addresses embodied life-cycle emissions, operational (yearly emissions) and biogenic (temporary storage) carbon, is expected to become a valuable reporting tool at a multi-asset portfolio level. It can be used as a monitoring tool to understand, track, and plan improvements in the carbon performance of building stock.

4.APPENDIX

1. Environmental data

1.1. EPD standard

In accordance with the EN 15978, the Low Carbon Building Initiative (LCBI) method is based on Environmental Product Data sheets (EPDs) defined by the EN 15804+A2 standard. **Although EPDs must comply with the +A2 amendment since July 2022**, many EPD databases still contain +A1 EPDs and the transition is not complete at date. As this transition may still take some time, LCBI will accept the use of +A1 EPDs **until 2027** to ensure enough environmental data is available to LCA practitioners. **However, priority should be given to EN15804+A2.**

Although full reporting on all life-cycle stages was not mandatory within the EN 15804+A1 EPD format (e.g. A4-A5 or C-D stages), LCBI requires whole life-cycle data for each construction product, which may request LCA practitioners to fill the gaps of missing stages in incomplete EPDs. Market available tools with built-in features are available to ensure this is achievable during the +A2 deployment in EPD databases.

1.2.Environmental databases

Various databases and programs in Europe provide EN 15804 compliant data for construction materials and equipment. All these databases can be used by the practitioner (a non-exhaustive list is available¹⁵). However, practitioners should ensure they use local data, as detailed in the next section.

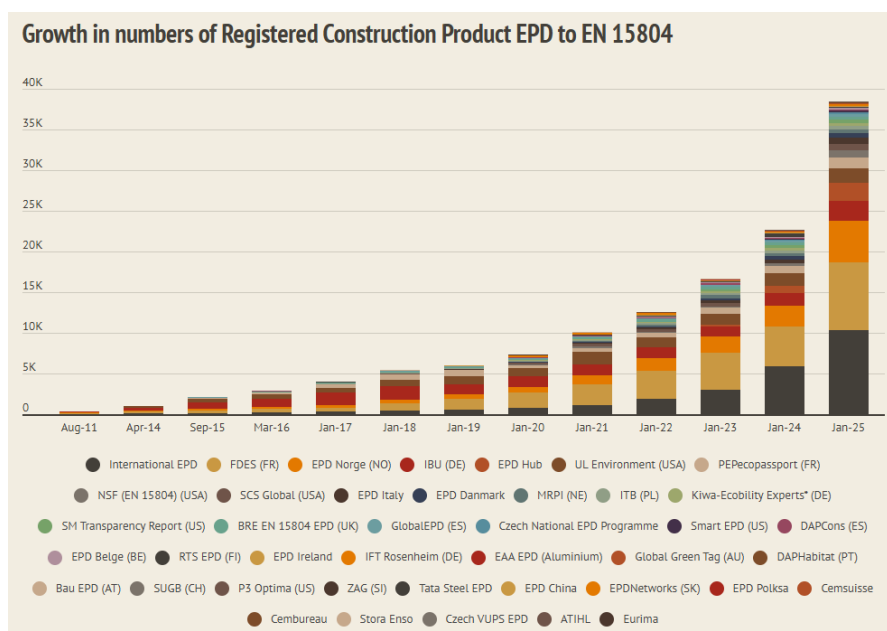


Figure 14: Database list and number of EPDs available, source [ConstructionLCA](https://infogram.com/constructionlca-2025-guide-to-epd-1hnp27ev311rn4g), 2025

¹⁵ <https://infogram.com/constructionlca-2025-guide-to-epd-1hnp27ev311rn4g>

1.3. Prioritization of the EPD usage

Choosing the correct EPD to describe the environmental data of an element is critical for the Embodied carbon performance of a building, as it defines the manufacturing process, the functional units, the transport and assembly assumptions, the reference service life, and other factors that affect obtaining accurate LCA results. However, most European countries still lack sufficient data for LCA. While many manufacturers have not yet published EPDs for their products, this remains a key hindrance to the widespread adoption of LCA practices.

Therefore, LCBI does not restrict the use of local EPDs but allows the use of foreign or equivalent EPDs to describe a specific product if no local or generic data is available.

The following table outlines the **priority hierarchy for selecting environmental data based on product specificity and geographic relevance**:

Priority of use	Type of data	Definition and case of use
1	Product specific EPD	Product specific EPD. The product can be manufactured at different factories but comes from a single supplier. Use is authorized if the commercial reference of the implemented product is explicitly covered by the specific EPD.
2	Average EPD	Represents the average of multiple products from one or more companies, typically provided by industrial associations that cover the product. Use is authorized if the commercial reference of the implemented product is covered by the list of commercial references of the average EPD.
3	Generic dataset	Environmental data in accordance with EN 15804 calculated as an average of all manufacturers of a given product and representative of a country or region. This type of product data, if available, can always be used. However, to improve assessment accuracy, it is recommended to use a specific or average EPD when available.
4	Equivalent product EPD	This is a product specific EPD or an average EPD for an equivalent product, with the same technical characteristics and the appropriate geographical scope, but it does not cover the exact product (e.g. a different brand).
5	Product specific EPD or Average EPD (other country)	A specific company product or an average EPD for a group of products from one or more companies, based on data from foreign industrial associations. Meaning the application's geographical scope of this EPD does not cover the country or region of the project. These types of data sourced from foreign databases can be used if there is a lack of available data for the local database. This data will be localized by adjusting the hypothesis to the project's host country, including production, transport, and end-of-life scenarios.
6	Generic dataset (other country)	Environmental data in accordance with EN 15804 calculated as an average of all manufacturers of this product, based on the average of all manufacturers of this product, from another country or region that is transferred to the project's country.

Table 4 : Prioritization of the EPD usage

Because product environmental data may not reflect its region of use, inaccuracies can occur in the LCA. Therefore, in cases 5 and 6 of the table above, the product's Embodied carbon for production and transport should be adjusted to the average market of the project's country. Market available tools offer built-in features to facilitate this adjustment.

EPDs are usually valid for five years; all EPDs used for the calculation at the end of the design phase must therefore be valid at that time. If any of these EPDs are updated, deleted, or expired, they remain usable for the final LCBI calculation at the end of construction.

1.4. Non-accounting of biogenic carbon

The Embodied carbon performance indicator measures the global warming impact of fossil and LULUC greenhouse gas emissions. For an EPD that follows the EN 15804+A2 standard, the LCA practitioners will add these two impact indicators:

- Climate change – fossil,
- Climate change – land use and land change (LULUC).

The impact indicator “Climate change – biogenic” is **excluded** from this specific indicator.

However, for EPDs developed according to the EN 15804+A1 standard, fossil and Biogenic carbon emissions are not distinguished. In the case of an EPD +A1, therefore, LCA practitioners must ensure that the Biogenic carbon content is neither deducted in stage A, nor released in stage C. To do this (either through automated features in their LCA software or manually), LCA practitioners must add Biogenic carbon storage of the product to the climate change impact of phases A1-A3, and subtract the corresponding end-of-life biomass biogenic carbon release for phases C1-C4. This carbon release is calculated on a case-by-case basis based on the end-of-life scenario described in the EPD. Consequently, no lifecycle stage shall display a negative emission value.

1.5. Scenarios for completing cradle-to-gate EPDs

For EPDs in the EN 15804+A1 format, only modules A1, A2 and A3 are mandatory. These EPDs are referred to as “cradle-to-gate”. However, LCBI assesses performance over the entire life cycle of the building: from A1 to C4. These missing data points must therefore be completed by the LCA practitioner in accordance with the scenarios for each stage of the life cycle described in Article 8 of EN 15978.

However, since this standard leaves a great deal of freedom in the description of the end-of-life scenarios — which can heavily influence results—the recommended solution proposed at this stage is to rely on the combination of the LCA practitioner’s experience, state-of-the-art LCA tools, and increased collaboration between designers and manufacturers to allow for custom definition of end-of-life scenarios, rather than strictly sticking to the detailed (or missing) scenario in the available EPD. The LCA assessor should propose a realistic end-of-life scenario for the material under consideration. The end-of-life scenario chosen should be clearly explained, together with the information sources. In particular, it may be based on the end-of-life scenario assumptions described in paragraph 5.6.1 of the RICS “Whole life carbon assessment for the built environment”, 2nd edition, September 2023. Module D is systematically set to 0.

Regarding any missing data for B stages, the LCA practitioner can supplement the data using one of the following methods:

- Using a similar, comprehensive EPD and applying a proportional weighting based on the impacts of stages A1–A3.
- Applying an average percentage of $B1-B5_{GWP} / A1-A3_{GWP}$ derived from the LCA category/macro-lot and multiplying the latter by $A1-A3_{GWP}$ of the material to be completed.

1.6. Refrigerants

When an LCA encompasses the Technical & Services scope, some equipment containing refrigerants can be modelled (e.g. heat pumps or chillers). Usually, the environmental data (EPD) contains direct refrigerant emissions (generally in B1) and the impacts of refrigerant production equivalent to leaks in B2. These impacts should be included in the Operational Carbon indicator as building operating impacts. To avoid double counting, the LCA practitioner must therefore ensure that these B1 and B2 modules are removed from the Embodied carbon.

1.7.Default service lives

Most EPDs provide a service life for the covered product. However, when EPDs do not give the product service life the following default data can be used:

		Default service lives ¹⁶ (years)	
FRAME & SHELL ★★★★	1.1 Frame	Slabs	≥ 50
		Beams	
		Columns	
	1.2 Facade	Walls	30
		Stairs, ramps and safety guarding	
		Rain screens, timber panels	
		Brick, stone, block and precast concrete panels	≥ 50
SITE & EXTERNAL ★★★★	2.1 Sub-structure	Glazing systems	35
		Shading devices	30
		Structural elements	≥ 50
	2.2 External work	Roof coverings	30
		Foundations and piling	≥ 50
		Basement slabs	
		Retaining walls and structural frame	
PARTITIONS & FINISHES ★★★★	3.1 Internal fittings	Asphalt	35
		Concrete and stone paving	≥ 50
		Timber decking	15
		Fencing, railings and walls	20
		Drainage systems	30
		Studwork internal walls	30
		Blockwork internal walls	≥ 50
		Interior acoustic and thermal insulation	30
		Internal doors	30
	3.2 Finishes	Raised access floor RAF pedestal	50
		Raised access floor tile	30
		Suspended ceilings	25
		Sanitary fittings	20
		Carpet / Vinyl floor finishes	7
		Floor coatings	10
		Stone tiles floor finishes	25
		Cupboards, wardrobes and worktops	10
		Sockets and switches	30
TECHNICAL & SERVICES ★★★★	4.1 Heating and hot water	Skirting and trimming	30
		Wall render finishes	30
		Wall paint finishes	10
		Ceiling paint finishes	10
	4.2 Cooling	Heat source (boilers, calorifiers...)	20
		Heat pumps	15
		Heating and hot water distribution network	25
	4.3 Ventilation system	Heating emitters	20
		Cooling generation equipment	15
		Cooling distribution network	15
	4.4 Sanitary systems	Cooling emitters	15
		Air movement (fan coil systems...)	15
		Air terminals	20
	4.5 Electrical installations	Ductwork galvanised	40
		Ductwork plastic or flexible	15
		Cold water systems	25
	4.6 Other systems	Sanitaryware	20
		Drainage and rainwater	25
		Lighting systems and light fittings	15
		Onsite electricity generation	15
		Electricity distribution	30

Table 5 : Default service lives

¹⁶Sources: Level(s) indicator 1.2: Life cycle Global Warming Potential (GWP), Table 4. Default service lives for the minimum scope of building parts and elements. Whole life carbon assessment (WLCA) for the built environment, RICS, 2023. Table 20: Indicative component lifespans.

1.8. District heating

For a building that fails to meet Operational carbon targets due to its connection to a carbon-intensive heating network supplying more than 50% of its heating needs (heating + DHW), the applicant can request an adjustment from the audit. The auditor will then refer the matter to the LCBI Technical Commission to verify that the building meets the minimum thermal performance requirements and has an energy supply strategy aligned with the certification's original intent.

This request must be supported by a technical file comprising the following documents:

- A written narrative justifying the choice to connect to the selected district heating network and discarded alternative options, and demonstrating that this specific choice causes the threshold to be exceeded,
- An assessment of the project's energy consumption and its positioning in relation to CRREM energy pathways,
- Documentation sourced from the district heating utility provider specifying the carbon content of the energy delivered, and its 2030 decarbonization roadmap,
- An explanatory diagram of the energy supply systems installed on the project, including a description of their installed capacity and estimated coverage rates per end-use for the various energy sources.

On the basis of this complete file and a consistency check by the auditor, the technical commission may issue a validation notice regarding an adapted value of T1, and make recommendations on the associated reporting requirements.

1.9. Target setting methodology for operational carbon

Carbon performance thresholds have been established to assess the level of climate ambition achieved by logistics facilities based on their operational greenhouse gas emissions (associated with energy consumption). The methodology combines empirical market data, benchmarking against comparable assets, and alignment with **the Carbon Risk Real Estate Monitor (CRREM)**. This approach ensures that the resulting thresholds are both technically achievable and consistent with long-term climate objectives for the real estate sector.

Reference Dataset Development

The first step involved collecting and analysing carbon performance data from a portfolio of pilot logistics facilities across multiple European countries. To reflect the diversity of operational features within the logistics sector, assets were categorised into three functional groups : **unconditioned; heated and cold/frozen warehouses**. Projects were also grouped by country to account for discrepancies in **national electricity grids**. This distinction is essential, as buildings with similar energy performance may report significantly different operational carbon figures depending on the carbon intensity of the energy supplied within their respective locations.

Preliminary Threshold Calibration

These preliminary thresholds were established based on the performance levels observed in pilot projects and aim to strike a balance between market realities and environmental ambition. The objective is not to reflect current market practices, but rather to define performance levels that facilitate the transition to low-carbon logistics facilities, while remaining achievable through proven design and operational strategies.

Alignment with CRREM Decarbonization Pathways

To ensure consistency with internationally recognised climate targets, the calibrated thresholds were compared against the decarbonization pathways developed by the Carbon Risk Real Estate Monitor (CRREM¹⁷).

Within this framework :

- The Target 1 (T1) threshold was calibrated to reflect a level of performance broadly equivalent to the carbon intensity expected under CRREM pathways around 2030, preventing newly constructed assets from being delivered with performance levels that would already render them "misaligned assets" under upcoming carbon regulations;
- The Target 2 (T2) threshold was calibrated to align with a more ambitious level of performance comparable to CRREM expectations around 2035.

The objective is not to replicate CRREM thresholds directly, but rather to ensure that the framework remains aligned with the direction and level of ambition implied by recognised decarbonisation trajectories.

Final Adjustments

The proposed thresholds were reviewed against the technical features of the assessed projects to ensure alignment with recognised low-carbon design and operational principles. This qualitative assessment was undertaken to verify that the threshold framework rewards projects that achieve carbon reductions through robust and replicable decarbonisation strategies, rather than through favourable external conditions alone.

Particular consideration was given to measures that contribute to a sustained reduction in operational energy demand and greenhouse gas emissions, including :

- High-performance building envelopes and thermal efficiency measures;
- Passive design strategies that reduce heating and cooling loads;
- Effective management of solar gains and internal heat loads;
- The deployment of high-efficiency building systems and equipment;
- The use of low-carbon heating, cooling and energy supply solutions;
- On-site renewable energy generation, particularly photovoltaic installations;
- Heat recovery and energy reuse strategies;
- The selection of refrigerants with low Global Warming Potential (GWP);
- Advanced energy monitoring, control and optimization systems.

Conversely, projects relying on inherently carbon-intensive solutions or demonstrating limited efforts to reduce operational emissions were considered not aligned with minimum T1 operational threshold. Such characteristics may include:

- Extensive reliance on fossil-fuel-based heating systems;
- Inadequate thermal performance of the building envelope;
- Building designs resulting in avoidable heating or cooling demand;
- Limited integration of renewable energy solutions where technically feasible;
- Refrigeration systems utilizing high-GWP refrigerants;
- Insufficient energy management, monitoring or operational optimization practices.

The purpose of this qualitative review is not to replace the quantitative assessment of carbon emissions, but to ensure that the resulting thresholds appropriately recognise projects that have embedded meaningful and durable decarbonization measures within their design and operation.

This approach helps ensure that high-performing assets are identified not only on the basis of measured emissions, but also through the quality, resilience and long-term credibility of the implemented decarbonization strategies.

¹⁷ CRREM pathways provide a widely accepted framework for assessing whether real estate assets are aligned with the goals of the Paris Agreement and a net-zero transition trajectory.

2. LCA tools

LCBI requires detailed LCA reporting to ensure comparability and transparent verifiability, as well as consistency in data formatting and completeness. To ensure accurate calculations, the **LCA tools** must meet the following procedural requirements:

- Filling gaps in EPDs to cover missing life-cycle stages of cradle-to-gate EPDs
- Reporting LCA results in a format that allows them to be independently read:
 - Global warming potential for stages A1 to C4
 - Global warming potential for the D stages
 - Biogenic carbon storage

The global warming potential for the A1 to C4 stages should thus not include Biogenic carbon.

3. Reporting spreadsheet

Projects applying for the certification must complete the **official LCBI Excel Reporting Sheet**. It summarizes all the input data needed to calculate the three indicators (Embodied carbon, Operational carbon, and Biogenic carbon storage), as well as the results of the life-cycle assessment. Its purpose is to standardize LCBI studies and facilitate their audit. The Excel Reporting Sheet is available on LCBI official website ¹⁸.

In addition to this reporting sheet, the applicant must provide the following information:

- General information about the project,
- Embodied carbon and Biogenic carbon storage: a detailed LCA component by component (quantities of materials, the name of the EPD and the database, carbon impact phase by phase, etc.),
- Operational carbon: a detailed report of regulatory energy consumptions or thermal simulation results, together with documentation of the associated modelling assumptions, as appropriate to the building's thermal conditioning features. and documentation on their associated assumptions.

The certifying body will provide a detailed list of the mandatory documents required when the certification process is initiated.

¹⁸ lowcarbonbuilding.com

