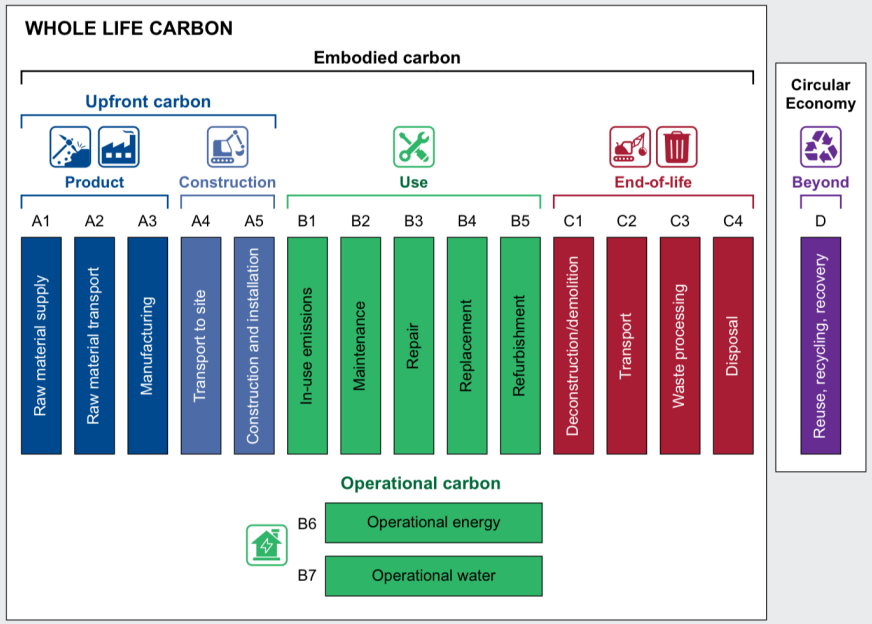
International Survey of Mandatory Whole Life/Embodied Carbon Requirements in Building Codes and Regulations

June 2025



BECWG Webinar:
Mandatory Embodied Carbon Policies

Mandatory Whole Life/Embodied Carbon Requirements in Building Regulations

Adam Hinge
Sustainable Energy Partnerships
Tarrytown, New York USA

19 June 2025

International Survey of Mandatory Whole Life/Embodied Carbon Requirements in Building Codes and Regulations

- Commissioned by the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW) as an Australian input to the Building Energy Codes Working Group (BECWG), a Working Group of the International Energy Agency's Energy in Buildings & Communities Technical Collaboration Program

- Project direction and oversight by Stanford Harrison and Mitch Tobin, Australian DCCEEW Commercial Buildings Policy Section

Why Consider & Regulate Embodied Carbon?

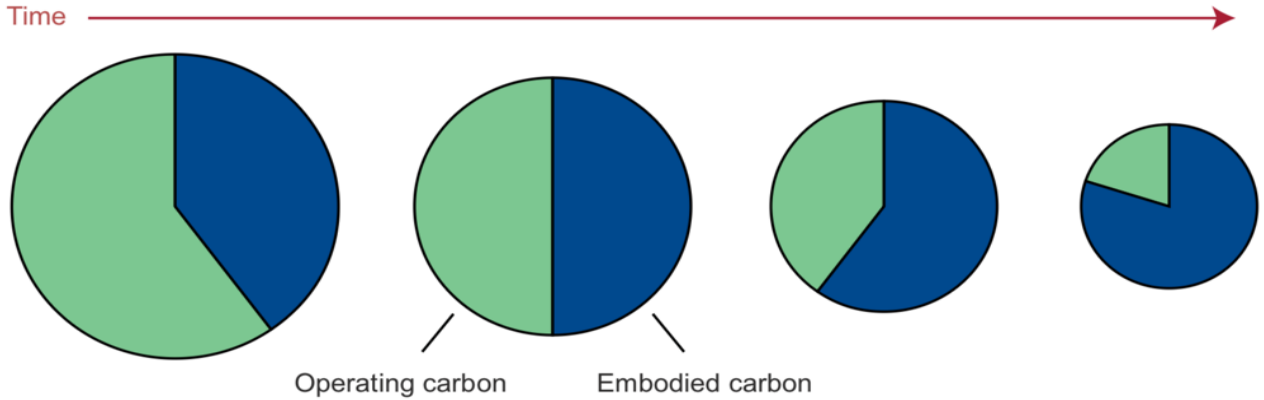


Figure 1. Embodied emissions make up a larger portion of total emissions as building operating carbon goes down. (Source: NZ MBIE 2020)

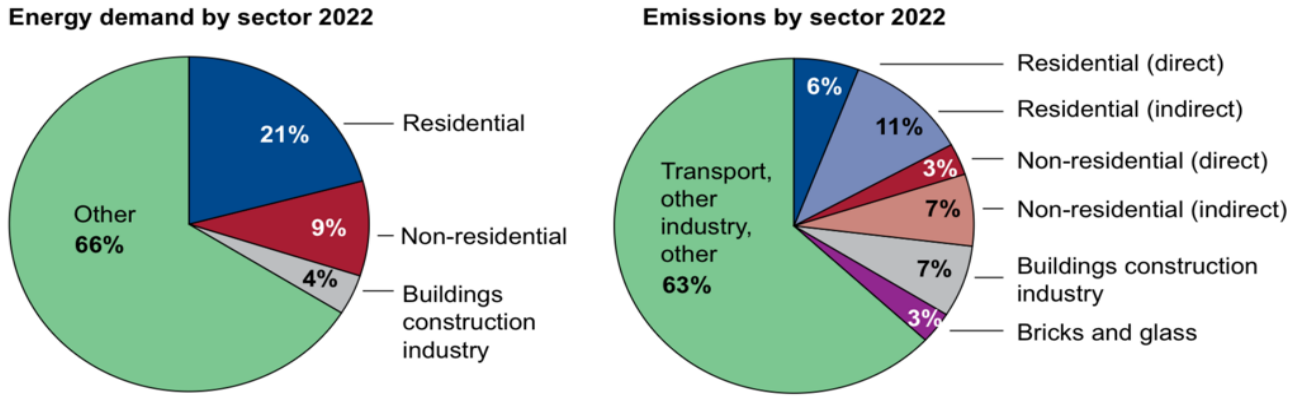


Figure 2. Share of buildings in total final energy consumption and share of buildings in global energy and process emissions. (Adapted from UNEP 2024).

Building Life Cycle Stages and Modules

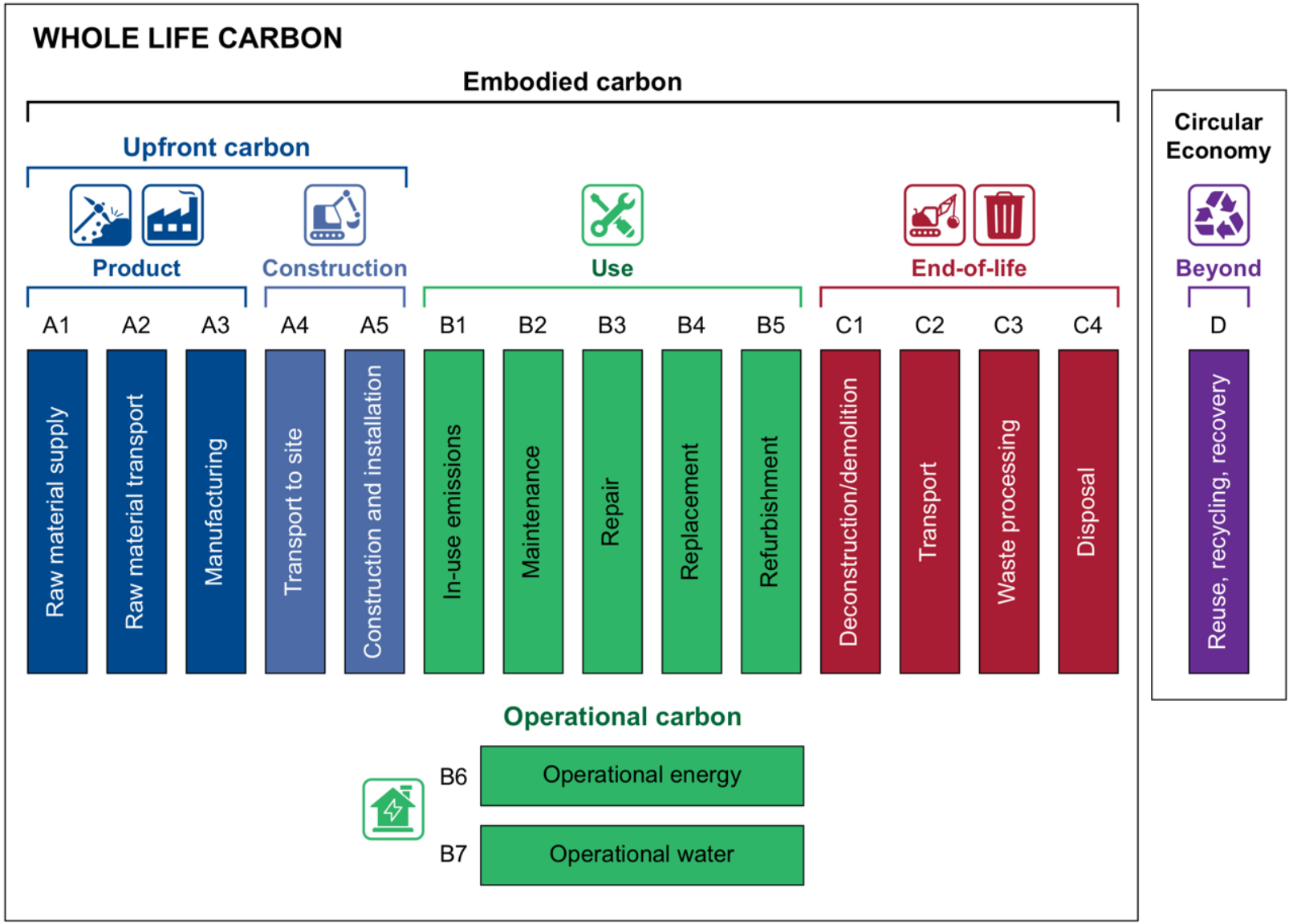


Figure 3. Life cycle stages and modules that subcategorize the full life cycle of a building. (Adapted from Carbon Leadership Forum 2024)

Life Cycle Emissions Vary by Building Type
(Danish case study sample data)

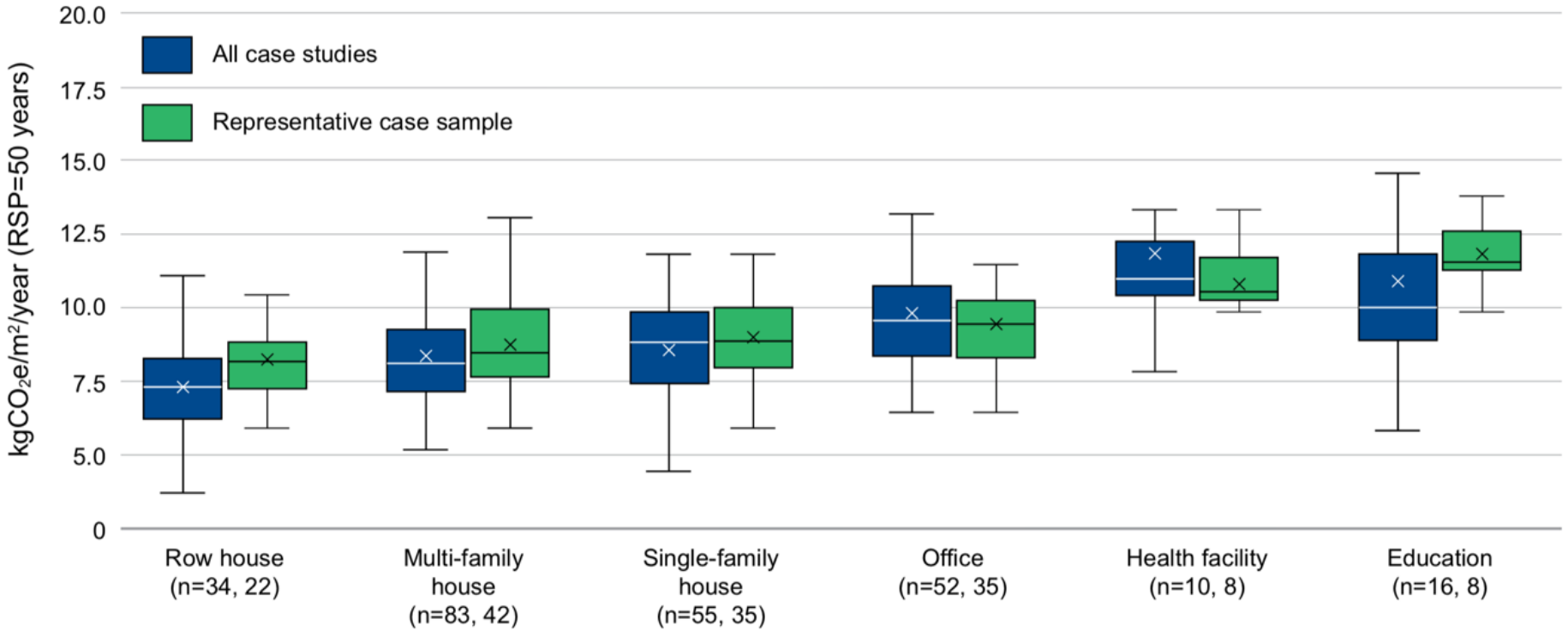


Figure 4. Comparing the life cycle GHGe by building type of Danish case studies and the representative sample of the case studies (Adapted from Tozan, Hoxha et.al. 2024)

Policies Reviewed in Nine Leading Jurisdictions

Mandatory Carbon Limits:

- Netherlands
- France
- Denmark
- Sweden
- Finland
- European Union

Other Mandatory Carbon Requirements:

- London
- Vancouver
- California

Each Policy Review addresses:

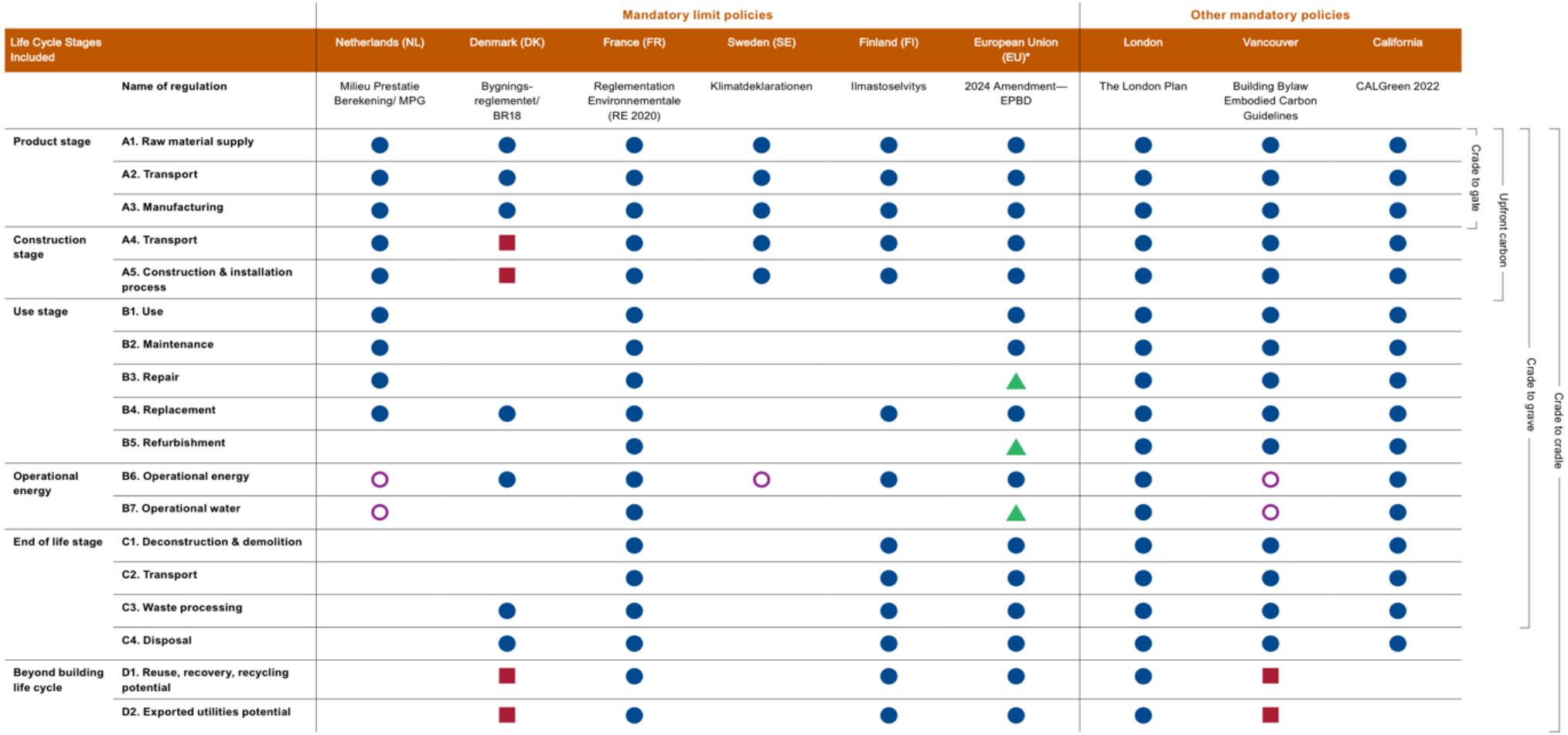
- *Summary of Coverage*
- *Specific Scope Requirements*
- *Supporting Policies*
- *Sources and Additional Information*

Overview of Policies

Mandatory limit policies

	Netherlands (NL)	Denmark (DK)	France (FR)	Sweden (SE)	Finland (FI)	European Union (EU)
Name of regulation	Milieu Prestatie Berekening/ MPG	Bygnings-reglementet/ BR18	Reglementation Environnementale (RE 2020)	Klimatdekla-rationen	Ilmastoselvitys	2024 Amendment—EPBD
Year initially adopted	2013	2020	2021	2022	2023	2024
Initial date for reporting/ declaration	2018	2023	2022	2022	2025	2028
Initial date for limit values	2018	2023	2022	2025	2026	2030
Building types covered	Residential and office	All	Residential, office and educational	All (some exceptions[a])	Nearly all	All
Initial building size threshold (m^2)	100	1,000	none	100	none[b]	1,000
Floor area definition[c]	GFA	GFA/HFA	LA/UA	GFA	NHA	UFA
Design-level (at permit application) or as-built?	Permit	As-built	Permit + as-built	As-built	Permit + as-built	TBD
Reference study period (years)	50/75[d]	50	50	50	50	50

Life Cycle Modules Included by Jurisdiction



		Mandatory limit policies						Other mandatory policies		
Life Cycle Stages Included		**Netherlands (NL)**	**Denmark (DK)**	**France (FR)**	**Sweden (SE)**	**Finland (FI)**	**European Union (EU)***	**London**	**Vancouver**	**California**
	Name of regulation	Milieu Prestatie Berekening/ MPG	Bygnings-reglementet/ BR18	Reglementation Environnementale (RE 2020)	Klimatdeklarationen	Ilmastoselvitys	2024 Amendment—EPBD	The London Plan	Building Bylaw Embodied Carbon Guidelines	CALGreen 2022
Product stage	**A1. Raw material supply**	●	●	●	●	●	●	●	●	●
	A2. Transport	●	●	●	●	●	●	●	●	●
	A3. Manufacturing	●	●	●	●	●	●	●	●	●
Construction stage	**A4. Transport**	●	■	●	●	●	●	●	●	●
	A5. Construction & installation process	●	■	●	●	●	●	●	●	●
Use stage	**B1. Use**	●		●			●	●	●	●
	B2. Maintenance	●		●			●	●	●	●
	B3. Repair	●		●			▲	●	●	●
	B4. Replacement	●	●	●		●	●	●	●	●
	B5. Refurbishment			●			▲	●	●	●
Operational energy	**B6. Operational energy**	○	●	●	○	●	●	●	○	●
	B7. Operational water	○		●			▲	●	○	●
End of life stage	**C1. Deconstruction & demolition**			●		●	●	●	●	●
	C2. Transport			●		●	●	●	●	●
	C3. Waste processing		●	●		●	●	●	●	●
	C4. Disposal		●	●		●	●	●	●	●
Beyond building life cycle	**D1. Reuse, recovery, recycling potential**		■	●		●	●	●	■	
	D2. Exported utilities potential		■	●		●	●	●	■	

Crade to gate
Upfront carbon
Crade to grave
Crade to cradle

* EU: Modules shown based on current EN15978; there are proposed amendments to be resolved

● Required by Legislation/Regulation
○ Regulated in other policy measure
■ Reported as separate value
▲ Optional

Building Elements Covered by Different Policies

Mandatory limit policies

	Netherlands (NL)	Denmark (DK)	France (FR)	Sweden (SE)	Finland (FI)	European Union (EU)*
Name of regulation	Milieu Prestatie Berekening/ MPG	Bygnings-reglementet/ BR18	Reglementation Environnementale (RE 2020)	Klimatdekla-rationen	Ilmastoselvitys	2024 Amendment—EPBD
Substructure	●	●	●	●	●	●
Superstructure	●	●	●	●		
Enclosure	●	●	●	●		
Interiors	●	●	●	●		
Services (MEP)	●	■	●	⊖		
Equipment and Furnishings	⊖	■	●	⊖		
Sitework (including landscape)	⊖	⊖	●	●		

Other mandatory policies

	London	Vancouver	California
Name of regulation	London Plan Policy SI 2 (Minimizing GHG emissions)	Building Bylaw Embodied Carbon Guidelines	CALGreen 2022
Substructure	●	●	●
Superstructure	●	●	●
Enclosure	●	●	●
Interiors	●	⊖	▲
Services (MEP)	●	⊖	▲
Equipment and Furnishings	●	⊖	▲
Sitework (including landscape)	●	⊖	▲

* All EU elements as currently proposed but subject to change

● Required

■ Required via proxy values

▲ Optional

⊖ Not required

International Standards Growing & Evolving

Standard		What it Governs	Other Information
International Organization for Standardization (ISO)	**ISO 14040, 14044**	Life-cycle assessment (LCA) principles, methodologies, and requirements	
	ISO 14025	Type III environmental product declaration (EPD) development and presentation	Aligns with ISO 14040/44
	ISO 14027	Product category rule (PCR) development (not construction specific)	Aligns with ISO 14040/44/25
	ISO 21930	EPD development for construction-related products and services	Mirrors EN 15804+A1; Not fully compatible with 15804+A2
European Committee for Standardization (CEN)	**EN 15978**	Building-level LCA; Building life-cycle stages A–D	Aligns with ISO 14040/44. Currently in revision with new version expected later in 2025
	EN 15804+A1	Product category rules (PCRs) for construction-related EPDs	Includes seven environmental impact categories. Aligns with ISO 14040/44/25 and 21930.
	EN 15804+A2	2019 amendment to EN 15804 that supersedes A1 in the European Union	Compared with the A1 version, the more recent standard. No longer fully compatible with ISO 21930, changes include: Triple the number of impact categories; New approach to biogenic carbon emissions and storage; Expanded scope that includes a product's end-of-use impacts

Key Embodied Carbon Policy Design Features

1 Scope: Building type and size

- What building types?
- Initially cover >1,000m2? 100m2?

2 Reference study period

- Usually 50 years
- NL 75 years for residential buildings

3 WLC metric

- Often total life cycle GHG emissions (generally either $kgCO_2e/m^2$ for the full reference study period, or $kgCO_2e/m^2/yr$)

4 Building elements

- Include substructure?
- What other elements?

5 Life cycle modules

- Just A1-A3?
- Include A4–A5, B1–B7, C1–C4?

6 Reporting templates

- Specify reporting template?
- Part of construction permitting process?

7 Scenario assumptions: grid decarbonization, biogenic carbon, exported energy

- Planned decarbonization of electric grid?
- Static vs dynamic (include LULUC impacts & carbon storage benefits)?

8 Calculation tools

- What tools allowed/required?

9 Data sources and default values

Figure 8. Key design features that need to be decided as part of any whole life carbon policy (Adapted from BPIE 2024)

Key Steps in Developing & Implementing Policies

1 Build up competence

- Learning resources adapted to national contexts
- Certification schemes to foster competition
- **Stakeholders: Academia, Industry**

2 Secure stakeholder involvement

- Balance current readiness with future requirements
- Monitoring and revisiting regulation
- **Stakeholders: Authorities, Policymakers, Industry**

3 Ensure access to generic data and standard values

- Phasing out of the conservativity factor in generic data
- Use of standard component values for as-built reporting
- **Stakeholders: Authorities, Academia, Industry**

4 Improve availability and digitalization of EPDs

- Alignment of structure and content of databases
- Subsidies or automated tools designed to generate EPDs
- **Stakeholders: Authorities, EPD Operators**

5 Create a case basis and structure for the limit values

- Real cases sample for feasible limit values (archetypes for potentials)
- Need for differentiation of limit values
- **Stakeholders: Academia, Authorities**

6 Determine the initial scope and method

- Start with a limited scope (size and type, modules, building model)
- Need to highlight upfront carbon reduction (several options)
- **Stakeholders: Policymakers, Authorities, Academia**

7 Establish a suggested limit value pathway

- Incremental implementation of methods and limit value levels (long-term roadmap)
- Impact assessments to support gradual expansion (scope/ projects)
- **Stakeholders: Authorities, Policymakers, Industry**

8 Expand the regulation to renovations

- Avoid creating burdens for renovations with environ. benefits
- Develop a harmonised approach (start with deep renovations)
- **Stakeholders: Authorities, Academia, Industry**

Figure 10. Key Steps to consider in developing and implementing whole life carbon limits (Source: Nordic Sustainable Construction 2024)

Report Conclusions

- Relatively early days with embodied carbon policy development and implementation; not yet much actual experience with implementation issues and success of policies
- Leading jurisdictions are reporting better data collection and consistency in reporting, though not yet any drastic changes to construction practices
- Big picture takeaways:
  - Lots of variation in current policy approaches
  - Need to improve data availability, calculation methodologies, and the ability to directly compare results
  - More international coordination and collaboration is needed

Report Conclusions (continued)

Best Practices include:

- Building capacity of regulators and the construction industry before implementing mandatory requirements
- Early engagement with building owners, designers and other key stakeholders
- Starting small to gain experience: smaller scope and number of buildings to start, and reasonably achievable limit values

Full Report at:

https://www.eec.org.au/uploads/Documents/Mandatory WholeLife-EmbodiedCarbonReport-accessible%206.16.2025.pdf

Questions:

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Delivering on the European Green Deal and Fit for 55

Energy Performance of Buildings Directive (EPBD)

Life-cycle Global Warming Potential

Bunthan IEA, Ph.D., Policy Officer
European Commission – DG ENERGY
Unit B3 - Buildings and Products

EU legislation on energy and buildings*

1970s — Oil crisis

2002 — EPBD 2002-91-EC

Minimum performance requirements (2004)

2009 — RES Directive 2009/28/EC

2010 — EPBD 2010/31/EU – recast

2012 — EE Directive 2012/27/EU

2018 — **EPBD (EU) 2018/844 – amending**

RES Directive – amending + EE Directive – amending

Nearly Zero Energy Buildings (2020)

2021 — EU Green Taxonomy

2023 — RES Directive – amending + EE Directive – recast

2024 — EPBD recast

Zero Emission Buildings (2030) + life-cycle Global Warming Potential

Also at product level:

- Ecodesign
- Ecodesign for Sustainable Product Regulation (ESPR)
- Energy labelling

Life-cycle GWP

Recitals

(7) Buildings are responsible for **greenhouse gas emissions before, during and after their operational lifetime**. The 2050 vision for a decarbonised building stock goes beyond the current focus on operational greenhouse gas emissions. The **whole-life-cycle emissions of buildings should therefore progressively be taken into account, starting with new buildings.** Buildings are a significant material bank, being repositories for resources over many decades, and the **design options and choices of materials largely influence the whole-life-cycle emissions** both for new buildings and renovations. The whole-life-cycle performance of buildings should be taken into account not only in new construction, but also in renovations through the inclusion of policies for the reduction of whole-life-cycle greenhouse gas emissions in Member States' national building renovation plans.

Summarise of the provisions on Global Warming Potential

- Article 7(2) : Calculation of LC Global Warming Potential (GWP) from 1-01-2028 for large new buildings & from 01-01-2030 for all new buildings
  - ➢ Article 7(3) Calculation in accordance with the main principles of Annex III, pending the adoption of a DA to set out a Union framework for the national calculation of GWP by 31 December 2025
- Article 7(5) : By 01-01-2027, publication & notification of national roadmaps detailing introduction of limit values and set targets

Timeline of the provisions for Life-cycle GWP

May 2024

Publication of the EPBD in the OJ & entry into force
Directive - EU - 2024/1275 - EN - EUR-Lex (europa.eu)

31 December 2025

The Commission shall adopt a delegated act setting out a Union framework for the national calculation of life-cycle GWP.

Article 7(3)

January 2027

Member States shall publish and notify to the Commission a roadmap on the introduction of limit values & targets

Article 7(5)

January 2028

> New buildings over 1000m2 useful floor area

Member States shall ensure that life-cycle GWP is calculated in accordance with Annex III and disclosed in the energy performance certificate.

Article 7(2)

January 2030

> All new buildings

Member States shall ensure that life-cycle GWP is calculated in accordance with Annex III (and DA) and disclosed in the energy performance certificate

+ **limit values** for all new buildings from national roadmaps

Article 7(2) + Article 7(5)

Process

What has been done so far

- October 2024 : 1st Stakeholder meeting
- December 2024 : EPB meeting with MS
- February 2025 : EPB Discussion with MS
- February 2025 : 2nd stakeholder meeting
- **Adjustments and further discussion with MS**

Delegated act

- ~June 2025 : Launch “Have your say”
- Opinion of the MS expert group & Finetuning
- Validation & Translation
- Adoption : **before December 2025**

Guidance

- Validation
- Adoption of the package of the guidance : **~ Mid 2025**

Delivering on the European Green Deal and Fit for 55

Energy Performance of Buildings Directive (EPBD)

Draft of the delegated act setting out a Union framework for the national calculation of life-cycle GWP

Bunthan IEA, Ph.D., Policy Officer
European Commission – DG ENERGY
Unit B3 - Buildings and Products

Summarise of the provisions on Global Warming Potential

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Provisions of the recast EPBD for Life-cycle GWP

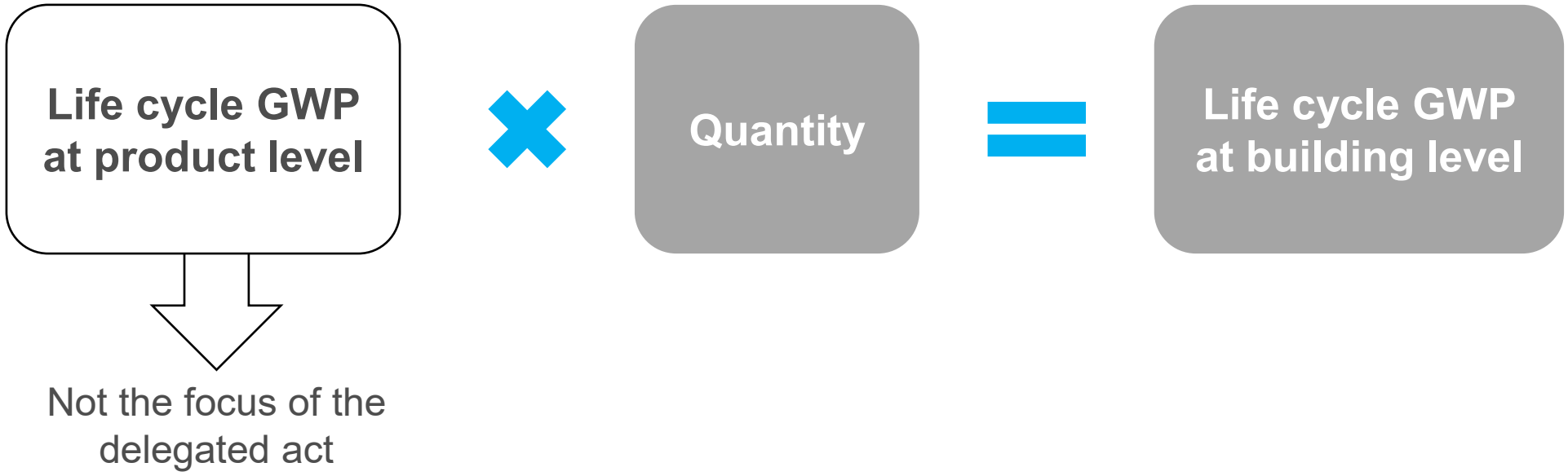
Annex III

For the calculation of the life-cycle GWP of new buildings pursuant to Article 7(2), the **total life-cycle GWP** is communicated as a numeric indicator **for each life-cycle stage** expressed as **kgCO2eq/(m2)** (of useful floor area) calculated over a reference **study period of 50 years**. The data selection, scenario definition and calculations shall be carried out in accordance with EN 15978 (EN 15978:2011 Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method) and taking into account any subsequent standard relating to the sustainability of construction works and the calculation method for the assessment of environmental performance of buildings. The **scope of building elements and technical equipment** is as defined in the **Level(s) common EU framework for indicator 1.2**. Where a national calculation tool or method exists, or is required for making disclosures or for obtaining building permits, that tool or method may be used to provide the required disclosure. Other calculation tools or methods may be used if they fulfil the minimum criteria established by the Level(s) common EU framework. **Data regarding specific construction products** calculated in accordance with Regulation (EU) No 305/2011 of the European Parliament and of the Council (1) shall be used when available.

Consideration for the delegated Act

1. General consideration for the Union framework
2. Scope of Life Cycle Modules
3. Scope of building components
4. Reference Study period
5. Life-cycle GWP calculation
6. Data regarding construction products
7. Useful floor area
8. Reporting format

Life cycle GWP calculation



Production stage (A1-A3)	Construction process (A4-A5)	Use (B1)	Maintenance (B2)	…	End of life (C)	Benefits and loads beyond the system boundary (D)
-492 kgCO2eq.	91 kgCO2eq.	0	0	…	737 kgCO2eq.	-221 kgCO2eq.

Example of 1 m3 of wood (source INIES)

Delivering on the European Green Deal and Fit for 55

Energy Performance of Buildings Directive (EPBD)

Guidance on the life-cycle Global Warming Potential of new buildings (Article 7(2), (5) of the recast Energy Performance of Buildings Directive)

Bunthan IEA, Ph.D., Policy Officer
European Commission – DG ENERGY
Unit B3 - Buildings and Products

Summarise of the provisions on Global Warming Potential

- Article 7(2) : Calculation of LC Global Warming Potential (GWP) from 1-01-2028 for large new buildings & from 01-01-2030 for all new buildings
  - ➢ Article 7(3) Calculation in accordance with the main principles of Annex III, pending the adoption of a DA to set out a Union framework for the national calculation of GWP by 31 December 2025
- Article 7(5) : By 01-01-2027, publication & notification of national roadmaps detailing introduction of limit values and set targets

Provisions of Article 7(5)

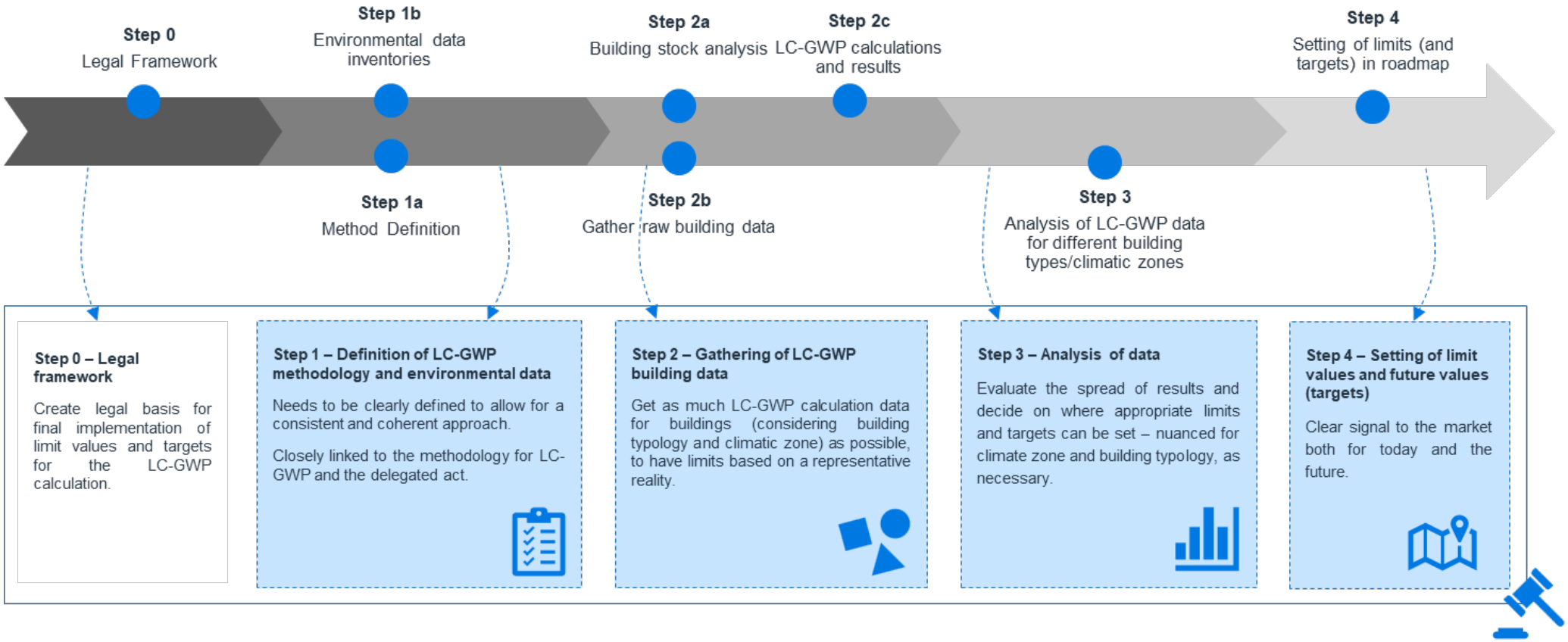
Article 7(5)

By 1 January 2027, Member States shall publish and notify to the Commission a roadmap detailing the introduction of limit values on the total cumulative life-cycle GWP of all new buildings and set targets for new buildings from 2030, considering a progressive downward trend, as well as maximum limit values, detailed for different climatic zones and building typologies.

Those maximum limit values shall be in line with the Union's objective of achieving climate neutrality.

The Commission shall issue guidance, share evidence on existing national policies and offer technical support to Member States, at their request.

RECOMMENDED PROCESS



Step 0 : General considerations on legal framework during the whole process

NB : Proposed fast-track and example in the draft

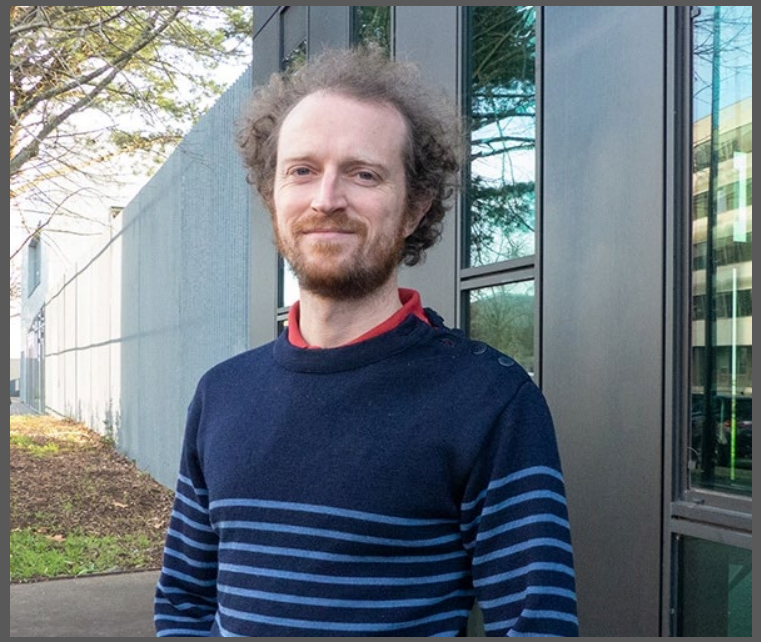
Thank you!

EBC

Energy in Buildings and Communities Programme

International Review Mandatory Embodied Carbon/Whole Life Requirements

19 June 2025



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Cerema, France

EBC

Energy in Buildings and Communities Programme

International Review Mandatory Embodied Carbon/Whole Life Requirements

19 June 2025

RE 2020: A look back at 3 years of carbon regulation in France

BOURRU Louis
Cerema, France

RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

6 Key Performance Indicators

Applies from 2022 to new residential, school and office buildings

ENERGY	**Bbio** [points]	Intrinsic building envelope efficiency **Bioclimatic needs**	Assessment of **heating and cooling needs** (air-conditioned building or not) and **lighting**.	Evolution
ENERGY	**Cep** [kWhep/(m².year)]	**Total energy consumption** (in primary energy)	Assessment of energy consumption for the **5 RT2012 uses** (heating, cooling, domestic hot water, lighting, ventilation and auxiliaries) + - parking lighting / ventilation - collective circulation lighting - elevators / escalators electric consumption	Evolution
ENERGY	**Cep, nr** [kWhep/(m².year)]	**Non renewable energy** consumption		New
CARBON	**Ic énergie** [kg eq. CO2/m²]	**Carbon impact** relative to energy consumptions	Assessment of **greenhouse gas emissions** from the **energy consumed** during the operation of the building, *ie* **50 years**. Based on an LCA.	New
CARBON	**Ic construction** [kg eq. CO2/m²]	**Carbon impact** relative to "equipments and materials & products of construction" and "construction site"	Assessment of **greenhouse gas emissions** from **construction products and materials over their life cycle** (50 years) **and implementation**	New
SUMMER COMFORT	**DH** [°C.h]	**Degrees of summer discomfort** : Number of hours of discomfort perceived by occupants during the summer season	Evaluation of the **differences between the building temperature and the comfort temperature** (adapted according to the previous days, it varies between 26 and 28 ° C).	New

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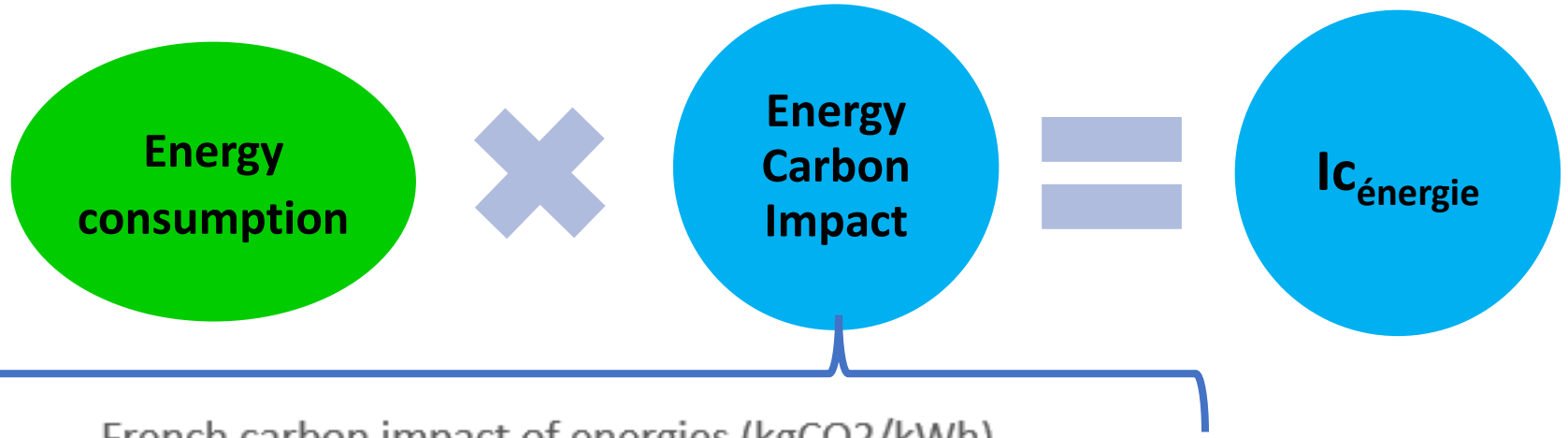
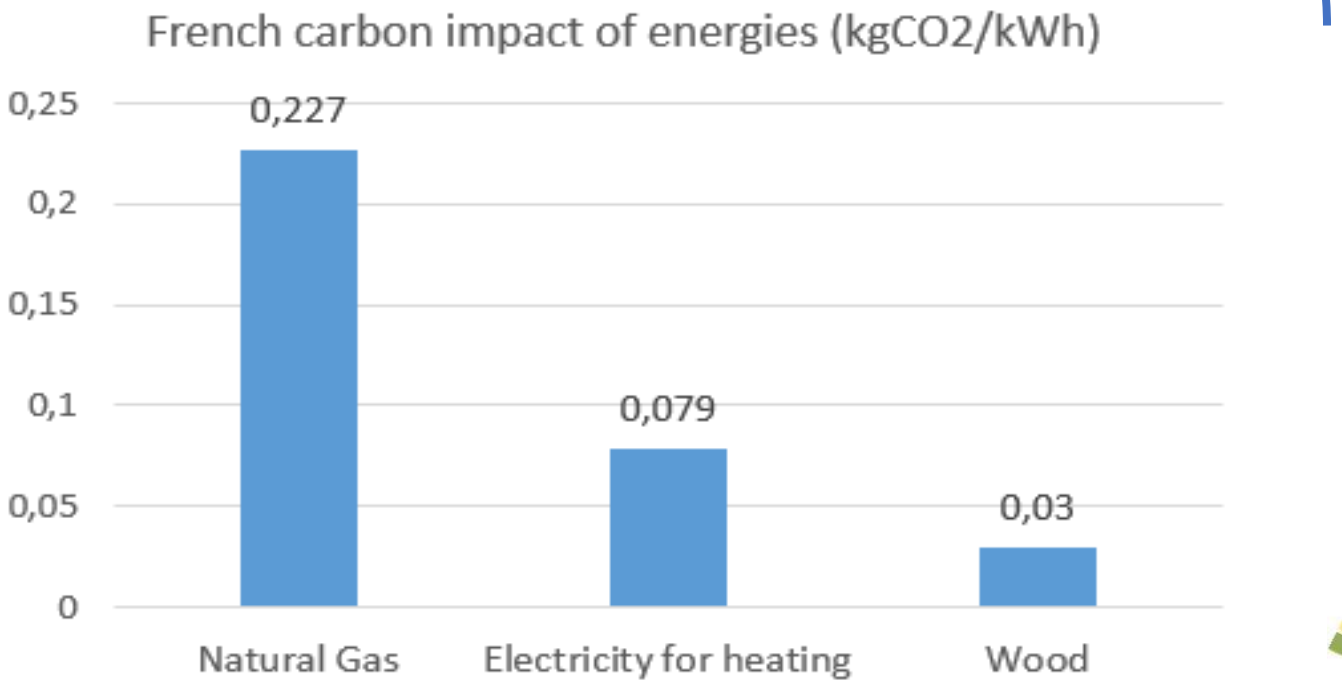
RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

Ic energie: Carbon impact relative to energy consumption (during 50 years)





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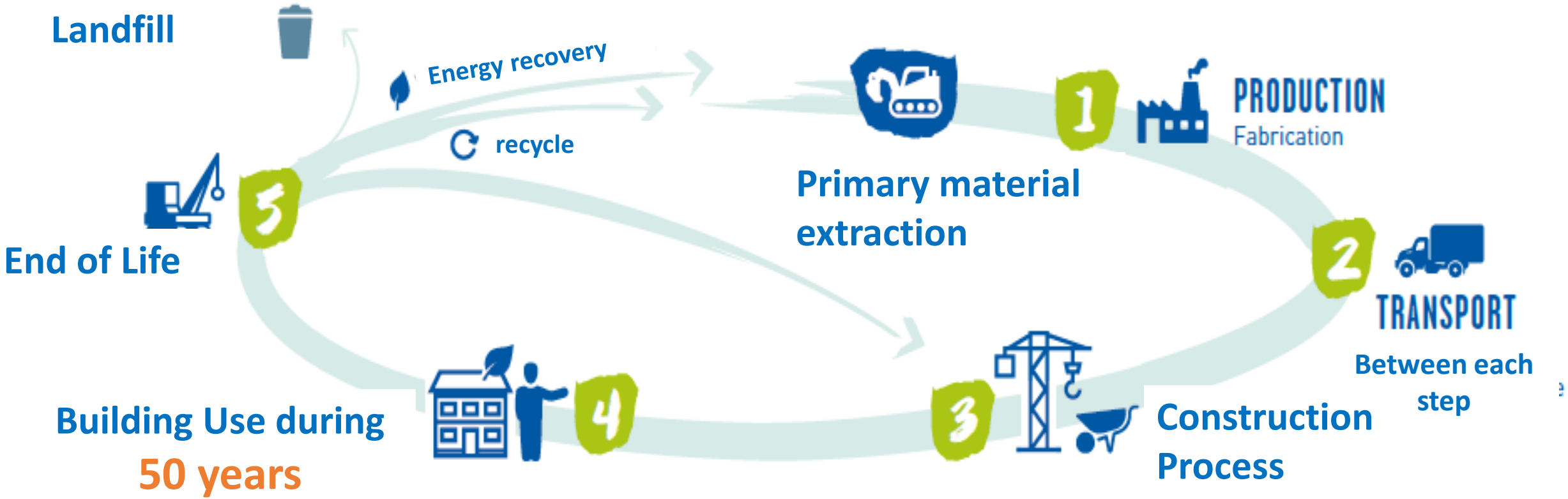
RÉGLEMENTATION ENVIRONNEMENTALE

Ic construction: carbon impact of equipments, construction products



Modules included: A1-5, B1-7, C1-4, D

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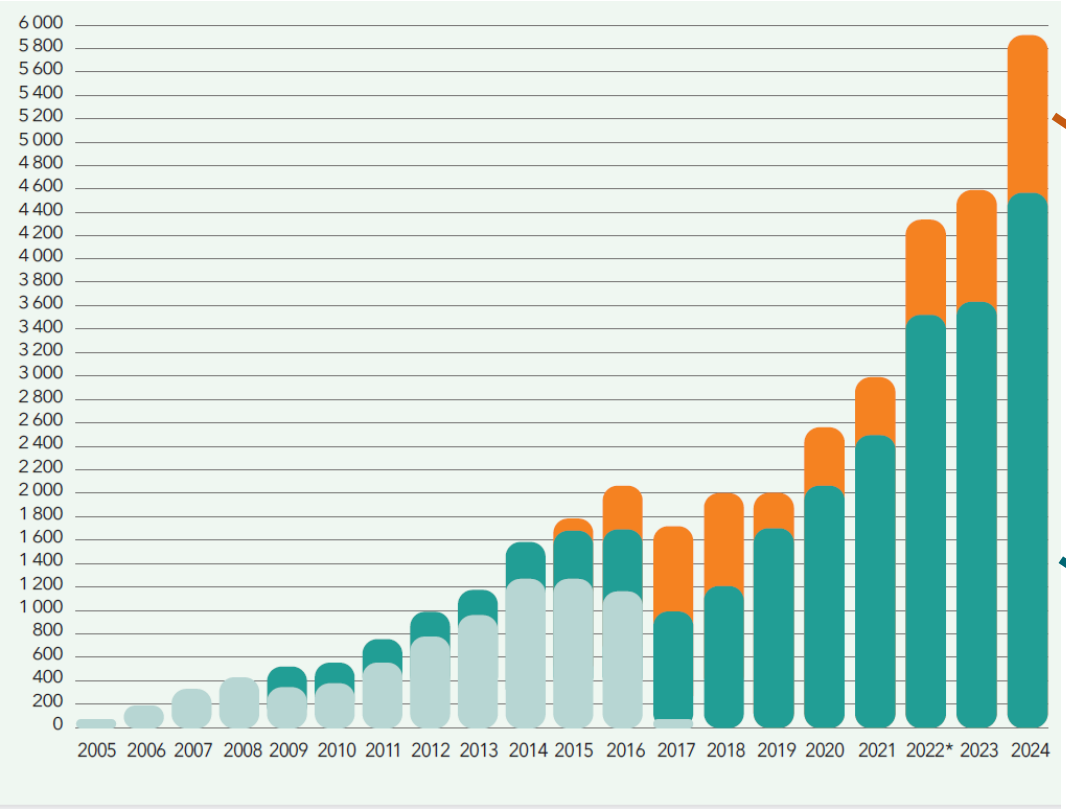
RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

www.inies.fr: French database of building product environmental declarations

Declarations evolution over the past 20 years



- INIES Database : Free access
- Lifecycle data from manufacturers + governmental default data (DED)
- This database contains more than 4,500 data entries for construction products (FDES) representing 267,059 sales references.
- And 1 518 for building equipment: from luminaries to chillers and solar panels (PEP)
- All declarations are verified

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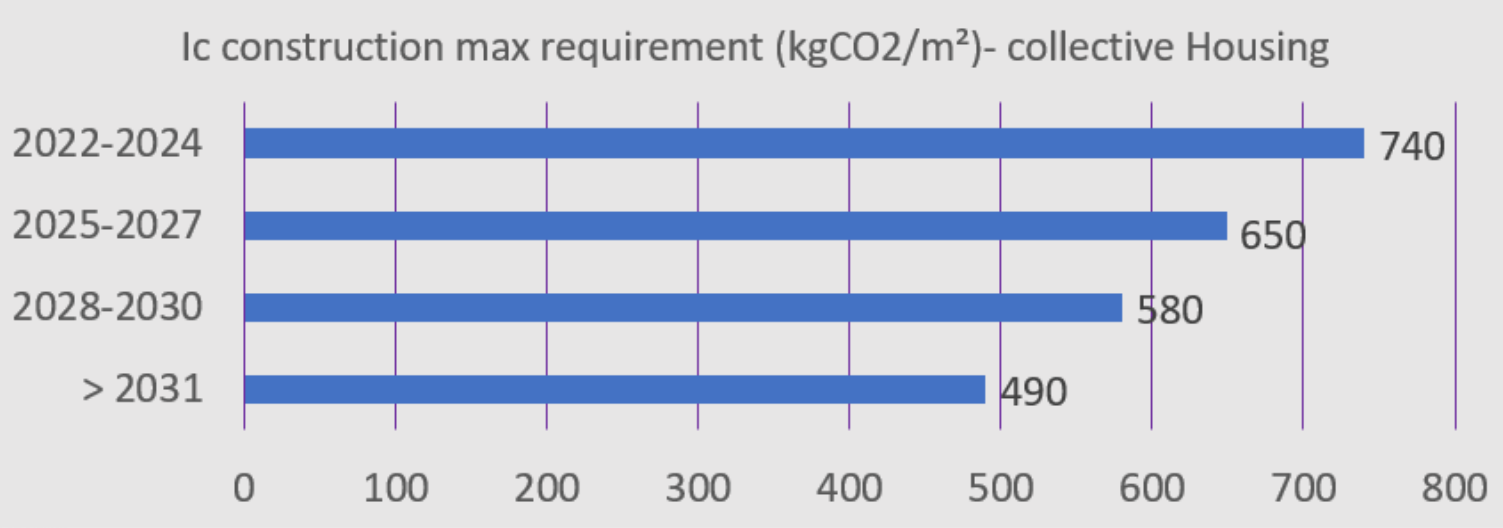
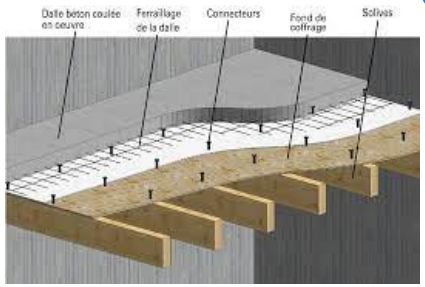
RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

Carbon impact of building: increasing requirements over time



New French LCA rule: Carbon emitted today carries more weight than carbon emitted later in time **("partially dynamic LCA").**

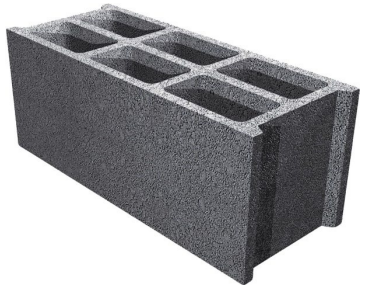
"Encouraged"



Bio-sourced materials such as wood by virtue **of their carbon-storing function**.

mixed or low-carbon materials

"Discouraged"



Materials emitting the most carbon during production

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RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

Extended scope of application

From January 1, 2026, these requirements will apply to the construction of the following buildings :

- Libraries,
- University teaching and research buildings,
- Hotels,
- Childcare facilities, nurseries
- Restaurants,
- Shops,
- Healthcare and senior care facilities,
- Air terminals
- Industrial and craft buildings
- Sports facilities and locker rooms.

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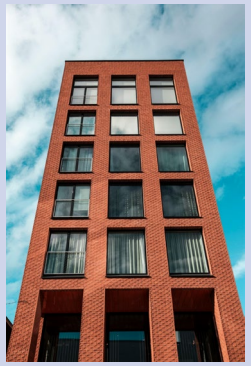
RE 2020
RÉGLEMENTATION ENVIRONNEMENTALE

A 3-years database of RE 2020 projects

	homes	apartment blocks	offices	schools	Colleges and high schools
Number of projects registered					
At permit application: 426 383	353 310	49 005	20 844	2 097	1 127
As-Built: 80 575	78 366	1 131	957	75	46

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https://re-batiment2020.cstb.fr/opee/statistiques

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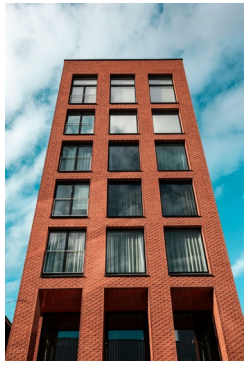
Some lessons from the first 3 years


- In 3 years, life-cycle assessment has been mastered by design offices
- Environmental product declarations refined, with less impact (process optimization) than in 2022

Ways to build with less carbon:

- Optimize facade designs, floor plans and compactness
- Reduce quantities of materials
- Increase exchanges between architects, engineers, builders, etc.
- Avoid underground parkings, reduce the number of elevators
- Generalize re-used and bio-sourced products
- Target low-carbon products with optimized environmental declarations

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EBC

Energy in Buildings and Communities Programme

Thank you!

Cerema
CLIMAT & TERRITOIRES DE DEMAIN

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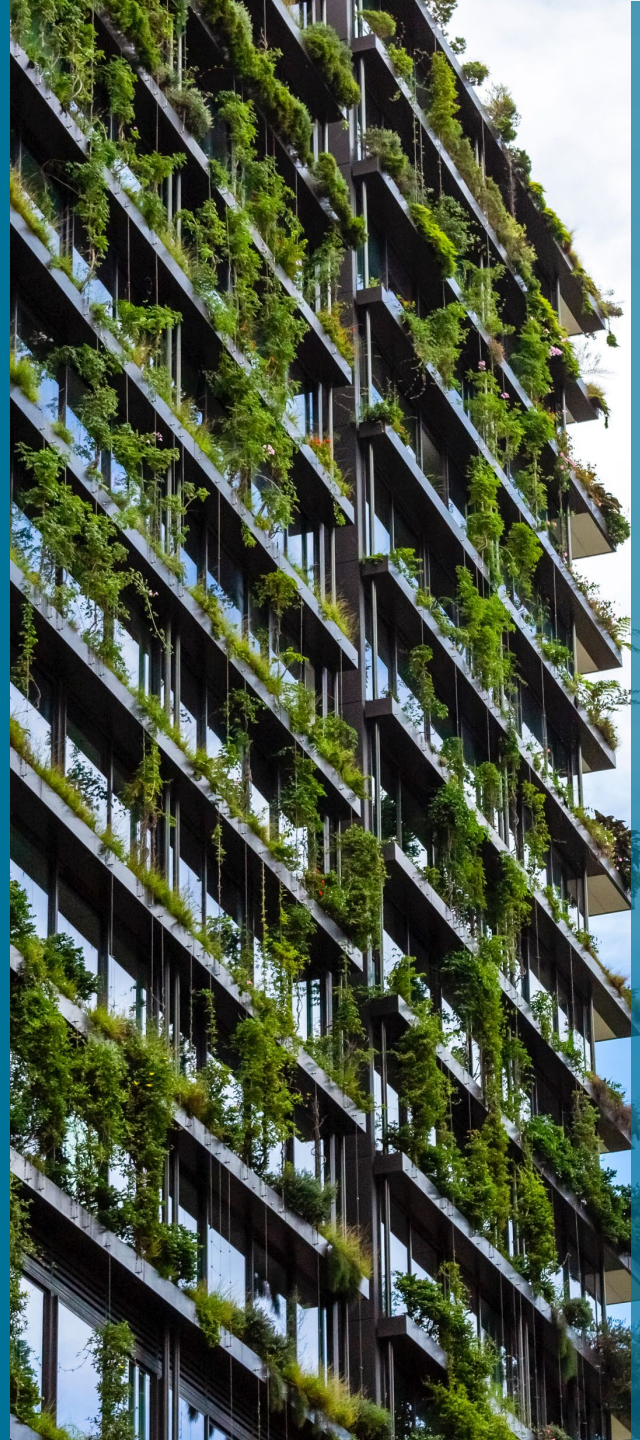
Nantes, France

NABERS Embodied Carbon

June 2025



NABERS

We measure performance

1 STAR
Making a start

2 STARS
Opportunities for upgrades

3 STARS
Market standard

4 STARS
High Performance

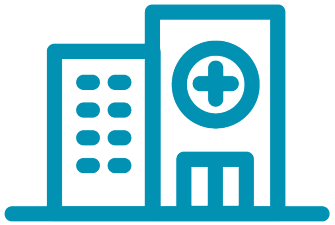
5 STARS
Superior Performance

6 STARS
Market leading

Fair comparison

Area

+



Building type

+

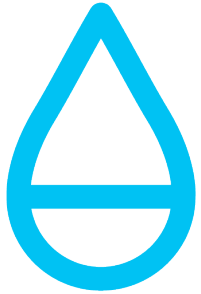
Height

+

Parking area

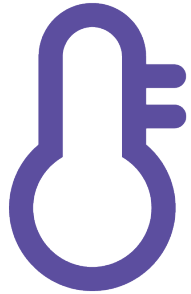
We certify buildings on

Energy



Water

Waste

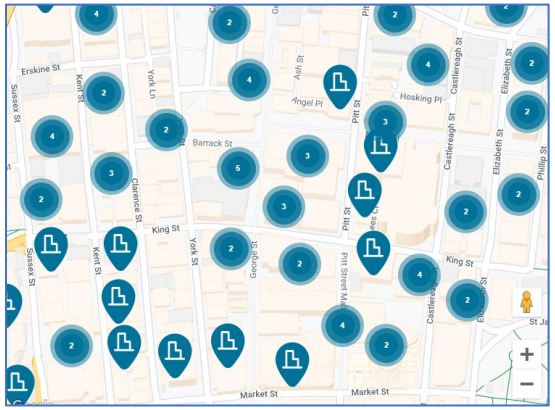


Indoor environment

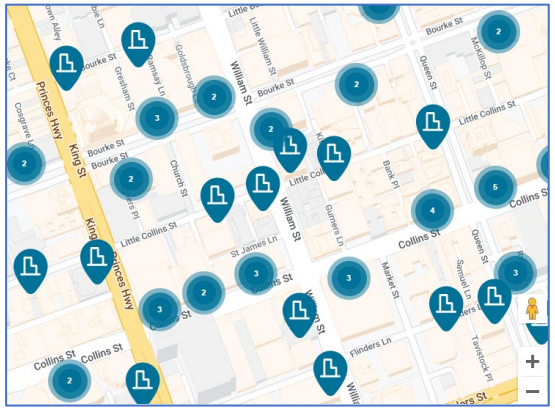
Embodied carbon

Spaces we rate

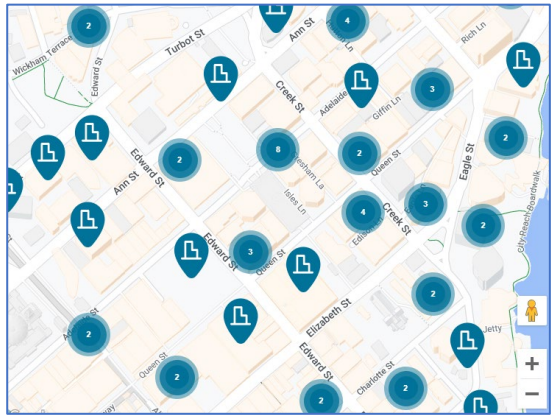
Sydney



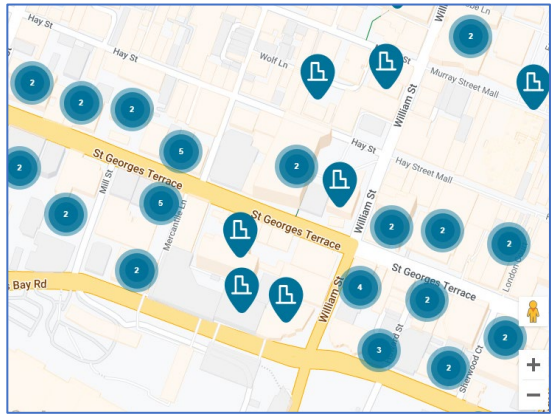
Melbourne



Brisbane

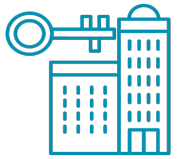


Perth



Tool development started in 2021

200+
organisations

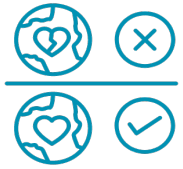


Decision makers

Developers, owners, tenants

Project teams

Architects, engineers, quantity surveyors, construction, LCA experts



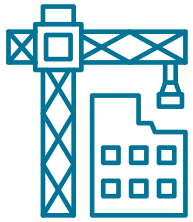
Influencers

Policy makers, investors, industry peaks, standards bodies, academics

Supply side

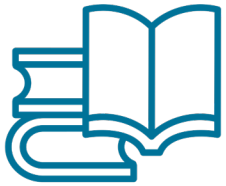
Product manufacturers

The embodied carbon tool is:



Rules
Standardise scope and documentation requirements

Emissions
National database of default emission factors

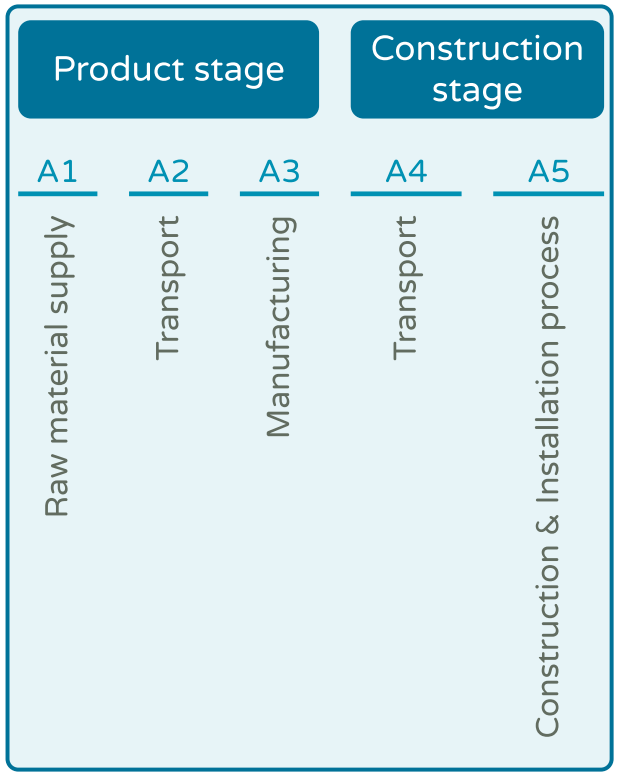


Training
Ensure all Assessors follow the rules consistently

Certification
As-built verification of the emissions of a building

Benchmark
To set targets and compare buildings against others

Upfront embodied carbon



Upfront embodied carbon

We are focusing on upfront carbon because:

- Urgent action is needed
- It's the biggest part of the picture. Around 65 to 75% of all embodied carbon (ASBEC 2025).
- For whole-of-life carbon (WoL), we need to make assumptions about the future, which are likely to be incorrect.
- Make decisions today that are informed by whole of life considerations. But avoid trading off higher emissions now, for things that may not happen in the future.

Measuring upfront carbon

Quantity of each material

x emissions of material

+ transport
+ construction energy
+ emissions from construction waste

Scope: materials

- Substructure
- Superstructure
- Envelope
- Internal items such as stairs, floors, ceilings and internal walls
- Building services and vertical transport

Not included: fixtures, fittings, fit out materials, other things that make a smaller impact and would be difficult to measure.

Material	Office, residential	Hospital	Public building, residential aged care and retirement living	Retail	Industrial
Aggregate, fill, asphalt, concrete kerb	✓	✓	✓	✓	✓
Concrete/masonry	✓	✓	✓	✓	✓
Reinforcement	✓	✓	✓	✓	✓
Structural framing	✓	✓	✓	✓	✓
Windows/curtain wall	✓	✓	✓	✓	✓
External doors	✓	✓	✓	✓	✓
Internal walls (framing and lining, including glazed partitions)	✓	✓	✓	×	×

Materials: evidence required

- Evidence of which specific products were used in the building, and what quantity.
- **As-built** evidence: delivery dockets, returnable schedules, receipts, etc.

Emission factors: scope of measurement

Different LCA methodologies for measuring product emissions:

- **Process-based:** can be used to differentiate between product variants. International standards define the scope of measurement.
- **Input-output:** top-down approach that uses economic data to estimate emissions per economic sector. Cannot distinguish between products from the same sector.
- **Hybrid:** combines the two methods above, seeking to achieve the best of both worlds. No international standard for the exact scope of what hybrid LCA should cover, so comparison is difficult.

We heard a strong preference from industry for the **process-based method**.

- **EPDs**
- **Product carbon footprints** compliant with ISO 14067 or PAS 2050 and equivalent in system boundary to EN 15804 or ISO 21930

Emission factors database

NABERS developed default emission factors because:

- not all products have a measured product-specific emission factor.
- there was no other source of up-to-date product specific emission factors for the Australian market.

					Upfront carbon emissions							
					Quantity basis ($kgCO_2e$/declared unit)				Mass basis ($kgCO_2e$/kg)			
Emission Factor material type	Emission Factor material category	Declared unit	Data qualitative Rating	Uncertainty adjustment (%)	Default (uncertainty adjusted)	Max in category EF	Min in category EF	Average EF	Default (uncertainty adjusted)	Max in category EF	Min in category EF	Average EF
Concrete in-situ	≤10 MPa	m³	Tier 3	110%	**273**	248	142	181	**0.114**	0.103	0.0590	0.0755
Concrete in-situ	>10 MPa to ≤20 MPa	m³	Tier 1	102%	**371**	364	136	198	**0.155**	0.152	0.0567	0.0827
Concrete in-situ	>20 MPa to ≤25 MPa	m³	Tier 1	102%	**396**	388	149	220	**0.165**	0.162	0.0621	0.0916
Concrete in-situ	>25 MPa to ≤32 MPa	m³	Tier 1	102%	**468**	459	167	249	**0.195**	0.191	0.0696	0.104
Concrete in-situ	>32 MPa to ≤40 MPa	m³	Tier 1	102%	**556**	545	185	300	**0.232**	0.227	0.0771	0.125
Concrete in-situ	>40 MPa to ≤50 MPa	m³	Tier 1	102%	**621**	609	101	357	**0.259**	0.254	0.0421	0.149
Concrete in-situ	>50 MPa to ≤65 MPa	m³	Tier 2	105%	**640**	609	274	382	**0.267**	0.254	0.114	0.159
Concrete in-situ	>65 MPa to ≤80 MPa	m³	Tier 3	110%	**670**	609	301	426	**0.279**	0.254	0.125	0.177
Concrete in-situ	>80 MPa +	m³	Tier 4	120%	**731**	609	444	444	**0.305**	0.254	0.185	0.185

Emission factors

The emission factors database, and the rating calculator, will be updated each year.

Using products that have measured emissions (e.g. EPD or carbon footprint) will improve your rating.

Make sure you collect the evidence required to use product-specific emissions data.

National agreement

- Developed in partnership with the GBCA and industry
- Aligned with international standards for measuring embodied carbon in buildings
- Joined up approach with Infrastructure NSW, Transport for NSW, Infrastructure Australia
- Already in policy: NSW Sustainable Buildings SEPP, Environmentally Sustainable Procurement Policy, voluntary pathway in next update to National Construction Code

Downloads

- Emission factors database
- Embodied carbon rating **rules**

- Embodied carbon rating **calculator**