JONGLIFE

www.igbc.ie/building-life-news/



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BUILDINGS ARE RESPONSIBLE FOR AROUND...

40% of energy consumption

36% of CO2 emissions.

50% of all extracted material

35% of the EU's total waste





Mission critical

To meet Europe's climate goals, both operational and embodied carbon ('whole life carbon') must be considered together and countries must adopt whole life carbon targets in the sector by 2030.

Few countries are currently on track.



Carbon currently under a pricing regime

acarbonpricingdashboard.worldbank.org/map_data C 990 998 002 03 005 006 007 008 600 010 011 012 013 2014 2015 2016 2018 2020 997 00 2019 **KEY STATISTICS FOR 2020 ON INITIATIVE(S)** Data last updated April, 01 2020 IMPLEMENTED OR SCHEDULED FOR STATUS Summary map of regional, national and subnational carbon pricing initiatives IMPLEMENTATION Implemented + Scheduled -6 Carbon pricing initiatives selected Under consideration TYPE OF INSTRUMENT Carbon tax National jurisdictions are covered by 46 the initiatives selected ETS Undecided Subnational jurisdictions are covered 32 TYPE OF JURISDICTION by the initiatives selected National Regional In 2020, these initiatives would cover Subnational 12 GtCO₂e, representing 22.3% of global GHG emissions ETS implemented or scheduled for implementation Carbon tax implemented or scheduled for implementation 2 ETS or carbon tax under consideration ETS and carbon tax implemented or scheduled SETS implemented or scheduled, ETS or carbon tax under con... Carbon tax implemented or scheduled, ETS under considera...

Note: Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources.

☆

Jurisdictions that only mention carbon pricing in their NDCs are not included as different interpretations of the NDC text are possible. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS does not only refer to cap-and-trade systems, but also baseline-and-credit systems such as in British Columbia and baseline-and-offset systems such as in Australia. Carbon pricing has evolved over the years and initiatives do not necessarily follow the two categories in a strict sense. Due to the dynamic approach to continuously improve data quality, changes to the map do not only reflect new developments, but also corrections following new information from official government sources.

Image reproduced from the World Bank website (https://carbonpricingdashboard.worldbank.org/map data), October 2020

Carbon currently under a pricing regime

← → C (a carbonpricingdashboard.worldbank.org/map_data



Data



Image reproduced from the World Bank website (https://carbonpricingdashboard.worldbank.org/map_data), October 2020



BuildingLife vision

By 2030, all new buildings, infrastructure and renovations will have at least 40% less embodied carbon with significant upfront carbon reduction, and all new buildings must be net zero operational carbon.

By 2050, new buildings, infrastructure and renovations will have net zero embodied carbon, and all buildings, including existing buildings, must be net zero operational carbon.



Currently the EU Energy Performance of Buildings Directive only considers the performance of buildings in Operation



....but a building has many stages in its lifecycle...





Model of a typical house





Carbon Emissions: New A2 rated home over 50 years - Upfront Embodied Carbon (A1 – A5) now constitutes 49% of lifetime emissions.





Sankey diagram, Global warming





The Carbon Burp







The Carbon Burp



Total CO2e

----Total CO2e



The problem

Currently building designers specify materials in great quantities but with very little access to data on the environmental impacts of the production processes involved.













WORLD GREEN BUILDING COUNCIL















Lightweight concrete block, with expanded clay aggregate, generic, 18 kg/block , 0.5x0.3x0.185 mm































Aluminium data taken from ICE database – assumes a 31% scrap input.















When do I decide?



Figure 7 Relationship between cost and opportunity of change through the project life cycle (Source

Kirkham, 2014)

Where do I find this information?



THE ENVIRONMENTAL PRODUCT DECLARATION PROGRAMME





www.igbc.ie/epd-home/ www.eco-platform.org/epd-data.html

www.circularecology.com/embodied-carbon-footprint-database.html



Growth in EPDs

Growth in numbers of Construction Product EPD to EN 15804

* EPD Programmes not previously surveyed so no data provided before 2019.



Source: Jane Anderson - constructionIca.co.uk



Simple carbon inventory

Inventory	X	Impacts	=	Total
Quantities of materials and processes in building		Estimate of carbon intensity		Carbon emissions
E.G				
100 kg steel	Х	0.43 kg CO ₂ e/kg	=	43 kg CO ₂ e
50 kg glass	Х	1.064 kg CO ₂ e/kg	=	53.2 kg CO ₂ e
1000kWh grid electricity	Х	0.23 kg CO ₂ e/kwh	=	230 kg CO ₂ e
TOTAL				326.2 kg CO ₂ e

Simple example of LCA calculation process adapted from Carbon leadership forum practice guide 2019 (p11)



Introducing Level(s)



- A first step towards a Sustainable Performance of Buildings directive in Europe
 Includes Life Cycle Assessment and Life Cycle Costing.
- Piloted across Europe over the past two years
 Intended for use in Green Public Procurement and regulations across Europe
- •IGBC supporting industry through Life for Level(s) with 8 other GBCs to mainstream the use of LCA and LCC over the next 3 years.

https://susproc.jrc.ec.europa.eu/productbureau//product-groups/412/documents

CLIFE Level(s)

Level(s) Macro-objectives





Green house gas emissions along a building's life cycle



Resource efficient + circular material lifecycles



Efficient use of water resources



Healthy + comfortable spaces





Optimised life cycle cost and value

Level(s) Key indicators



co2	1	Green house gas emissions along a building's life cycle	1.1 Use stage energy performance	kilowatt h square me year [kWf	ours per etre per n/m²/yr]	1.2 Life cycle Warming	e Global Potential	kgCO2 equ per square per year	ivalents e metre			' Le	vel(s)
	2	Resource efficient + circular material	2.1 Bill of quantities	Unit quantit mass + yea	ties rs	2 Construction + demolition waste + materials	kg of wa materia	iste + Is per m²	2.3 Design for adaptability use	Adaptability score	2.4 Desig decor reuse	In for Instruction, e + recycling	Deconstruction score
	3	Efficient use of water resources	3.1 Use stage water consumpti	m³/yr water p on occupa	per nt								
	4	Healthy + comfortable spaces	4.1 Indoor air quality	Parameters ventilation, + humidity	for Target TVOC, f CO ₂ CMR, V mold, b particu	list of pollutants: formaldehyde, /OC, LCI ratio, penzene, ulates, radon	4.2 Time of the comf	outside ermal ort range	% of the time out of range during the heating and cooling seasons	4.3 Lighting + visual comfort use	Level 1 check list	4.4 Acous + prote agains	stics ection t noise checklist
	5	Adaptation + Resilience	5.1 Protection c occupier he + thermal co	of Pi alth of omfort 21 [s	rojected % f range in t 030 and 20 ee also 4.2]	time out he years 50	5.2 Increa of extr weath	sed risk ⁻ eme er events	Level 1 checklist [under development]	5.3 Increased of flood ev	risk Level 1 ents checkl [under o	ist development]	
	6	Optimised life cycle cost and value	6.1 Life cycle	costs Euro metr	per square e [€/m²/yr]	e 6.2 Value + risk Indoc	e creation exposure or air quality	Level 1 checklis	st				

Level(s) Framework for reporting



Level 1 (qualitative): Conceptual design for the building project

Accessible entry point for the use of each indicator, assessments are qualitative Level 2 (quantitative): Detailed design and construction of the building

Quantifying the performance of building designs, common units of measurements with reference calculation methods are provided Level 3 (monitoring): As-built and in-use performance of the building after completion

Data collection on the real performance of the building project

Journey from initial concept design, construction and the reality of the completed building

Level(s) indicator 1.2 is based on the European Standard EN15978:2011

Sustainability of construction works. Assessment of environmental performance of buildings



<image><image><text><text><text><image>

RICS professional statement

https://shop.standards.ie/en-ie/standards/I-S-EN-15978-2011-875896_SAIG_NSAI_NSAI_2082014/ https://julkaisut.valtioneuvosto.fi/handle/10024/161796 https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf



The modules in the methodology are based on the full life cycle of a building



Raw Materials

A1- Raw materials extraction

Extraction

A2- Transport to factory









Use Stage

B4- Replacement

B5- Refurbishment

B6- Operational energy use

B7- Operational water use

Reuse

D - Reuse, Recovery, **Recycling potential**

EN15978 Reporting Modules

Reproduced from Potrc Obrecht, Tajda & Kunič, R & Jordan, Sabina & Legat, A. (2019). Roles of the reference service life (RSL) of buildings and the RSL of building components in the environmental impacts of buildings. IOP Conference Series: Earth and Environmental Science.

EN15978 Reporting Modules

= Embodied Carbon

= Operational Carbon **—** = Module D results are reported separately from the WLC

Reproduced from Potrc Obrecht, Tajda & Kunič, R & Jordan, Sabina & Legat, A. (2019). Roles of the reference service life (RSL) of buildings and the RSL of building components in the environmental impacts of buildings. IOP Conference Series: Earth and Environmental Science.

EN15978 Reporting

Project Name	IGBC Demo 2		Global Warming Potential GWP														
Location Dublin Use Type Office Example			Product stag	Constr process	uction s stage	Use stage			End (EoL	of Life) stage TOTAL*		TOTAL* normalised	Benefits and loads beyond the system boundary				
GIA (m²) or equivalent - please state	5,000.00		Biogenic carbon ¹ (negative value)		[A]					[B]				C]	[A] to [C] cradle to grave	cradle to grave	[D]*
Building el	ement category	L		[A1] [A2] [A3]	[A4]	[A5]	[B1]	[B2]*	[B3]*	[B4]* [B5]*	[B6]	[B7]	[C1] [C2] [C3] [C4]		(kaCOve/m ²	
Demo 0.1 cons 0.2 Toxic	olition prior to truction /Hazardous/Contami														0	0	
Facili 0.3 Temp 0.4 Adjao 0.5 Spec 0.6 Temp	itating works porary Support to cent Structures cialist Ground Works porary Diversion														0	0	
1 Subs	structure			150,000	7,500					15,000			8	,250	210,750	42	
2.1 Fram 2.2 Uppe 2.3 Roof 2.4 Stairs	erstructure le er Floors s and Ramps		0	300,000	15,000					30,000			1	3,500	361,500	72	
2.5 Exter 2.6 Wind	erstructure nal Walls lows and External			200,000	10,000	30,000				20,000			1	1,000	241,000	48	
2.7 Interr 2.8 Partit	erstructure nal Walls and tions			100,000	5,000					10,000			5	,500	120,500	24	
3 Finis	hes			0	0					0				0	0	0	
4 Fittin	gs, turnishings			0	0	0				0				0	0	0	building-related items building-related
5 Servi	ices (MEP)			300,000	15,000	12,000	0			600,000	2,014,87	5 (1	5,500	2,958,375	592	systems
	1000 (11121 /														0	0	non building-related systems
6 Prefa	abricated Buildings														0	0	
7 Work	k to Existing Building															0	
8 Exter	rnal works		0	1.050.000	53 500	42.000	0	0	0	675.000	2.014.075			750	0	0	
TOTAL normali	icod	- F	0	210	32,500	42,000	0	0	0	0/5,000	2,014,875		5	12	3,892,125	<u> </u>	0
TOTAL - IIUIIIIali	Seu	L	v	210		0	U	v	v	155	403	v		12	110		U U

The Standards for building LCA

Product level EPD

• **EN 15804** -Sustainability of construction works. Environmental Product Declarations. Core rules for the product category of construction products

Building level

• **EN 15978 -** Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method

Targets

Target: <650 kgCO₂e/m² Scope: A1 – C4

RIBA 2030 Climate Challenge target metrics for non-domestic buildings

RIBA Sustainable Outcome Metrics		Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy kWh/m²/y	*	225 kWh/m²/y DEC D rated (CIBSE TM46 benchmark)	< 170 kWh/m²/y DEC C rating	< 110 kWh/m²/y DEC B rating	< 0 tz 55 kWh/m²/y DEC A rating	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low- carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes (CCC)
Embodied Carbon kgCO ₂ e/m ²	+	1100 kgCO ₂ e/m² (M4i benchmark)	< 800 kgCO ₂ e/m²	< 650 kgCO ₂ e/m²	< 500 kgCO₂e/m²	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)
Potable Water Use Litres/person/day	١	>16 l/p/day (CIRA W11 benchmark)	< 16 l/p/day	<13 l/p/day	< 10 l/p/day	CIBSE Guide G

Table reproduced from the RIBA 2030 Climate Challenge. https://www.architecture.com/about/policy/climate-action/2030-climate-challenge

Current benchmarks

LETI (http://www.leti.london)

Target: <500 kgCO₂e/m²

Images reproduced from the LETI Embodied Carbon Primer https://www.leti.london/ecp

http://materialspalette.org/palette

Build better! The Material Pyramid is interactive

https://vandkunsten.com/en/news/material-pyramid

https://www.igbc.ie/events/wholelife-carbon-training/

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www.igbc.ie/building-life-news/

