



Ireland National Policy Brief

INDICAT

 **IGBC**
IRISH GREEN BUILDING COUNCIL

Authors

Stephen Barrett, Marion Jammet (IGBC)

Reviewers

Pat Barry (IGBC), Zsolt Toth (BPIE)

Laudes ———
— Foundation

Acknowledgement

IGBC gratefully acknowledges the Laudes Foundation for funding the INDICATE project.

In Ireland, INDICATE is a collaboration between Construct Innovate, SEAI, the Department of Housing, Local Government and Heritage, and the Irish Green Building Council to create a national database of projects all created to a single national methodology, using a fully transparent tool that allows full rigorous quality checking of completeness and data.

Graphic design

Luca Signorini (Distudio)

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About the Irish Green Building Council (IGBC): [The Irish Green Building Council \(IGBC\)](https://www.igbc.ie/) is a registered charity with over 400 members drawn from all parts of the value chain, from occupiers, design professionals, contractors, suppliers, academics, and public authorities. The IGBC provides leadership for a sustainable built environment and is affiliated with a global network of 70 national councils within the World Green Building Council. This allows us to create workable solutions and tools to deliver transformative change towards a sustainable built environment.

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About this policy brief

The objective of this policy brief is to provide useful information on the current status of whole-life carbon assessments in the context of the Irish built environment, to summarise the development of a method for carrying out assessments and the results it has produced to date, and to outline our recommendations and suggested next steps.

This paper should be read in conjunction with the [EU Policy Brief on Whole Life Carbon developed by BPIE](#).

1. Introduction

Climate change and the housing crisis are two of the most pressing issues facing Ireland. Both necessitate a re-evaluation of design requirements for building construction and operation. While ambitious policies have been implemented in recent years to address operational carbon emissions (OC) in the built environment in Ireland, embodied carbon (EC) remains unregulated to date.

Industrial policies such as the [Circular Economy Action Plan](#), the EU Emissions Trading System (ETS) and the [revised Construction Products Regulation \(CPR\)](#) are expected to gradually reduce the embodied impact of materials and construction products from the supply side. The updated Energy Performance of Buildings Directive (EPBD) will require lifecycle GHG emissions to be calculated and disclosed through the EPCs - called Building Energy Ratings (BERs) in Ireland, which will address the demand side. Both are required for meaningful decarbonisation but the EPBD will not be required for all buildings until 2030 – too late to meet our Ireland’s interim target of a 51% reduction by 2030. Policy development, an ambitious roadmap and tools are required now.

A 2022 report commissioned by the Irish Green Building Council (IGBC) from the Building in a Climate Emergency (BIACE) Research Group at the UCD School of Architecture shows that construction and the built environment are directly responsible for 37% of Ireland’s emissions, equivalent to those from agriculture. This is made up of about 23% operational emissions associated with the energy we use to heat, cool, and light our buildings, and a further 14% embodied carbon emissions from the production of construction materials, transport of materials, construction process, maintenance, repair and disposal of buildings and infrastructure. Most of this embodied carbon occurs in large-scale industrial production processes; in Ireland this is primarily cement for concrete and the emissions associated with producing and importing steel.

A forecast model was also developed to show the likely emissions associated with the built environment taking into account the effects of various government plans published to date, i.e., the National Retrofit Plan, the National Development Plan, the Housing for All Plan and the Climate Action Plan. It demonstrates that current plans are not aligned with the ambition to deliver a science-based cut of 51% in our GHG emissions by 2030. If left unchecked, emissions could increase as the operational carbon savings made when more renewables connect to the grid are replaced with embodied carbon due to manufacturing products for new buildings and infrastructure. See the Business as Usual graph below.

Business as Usual

If we don't address EC, it will double

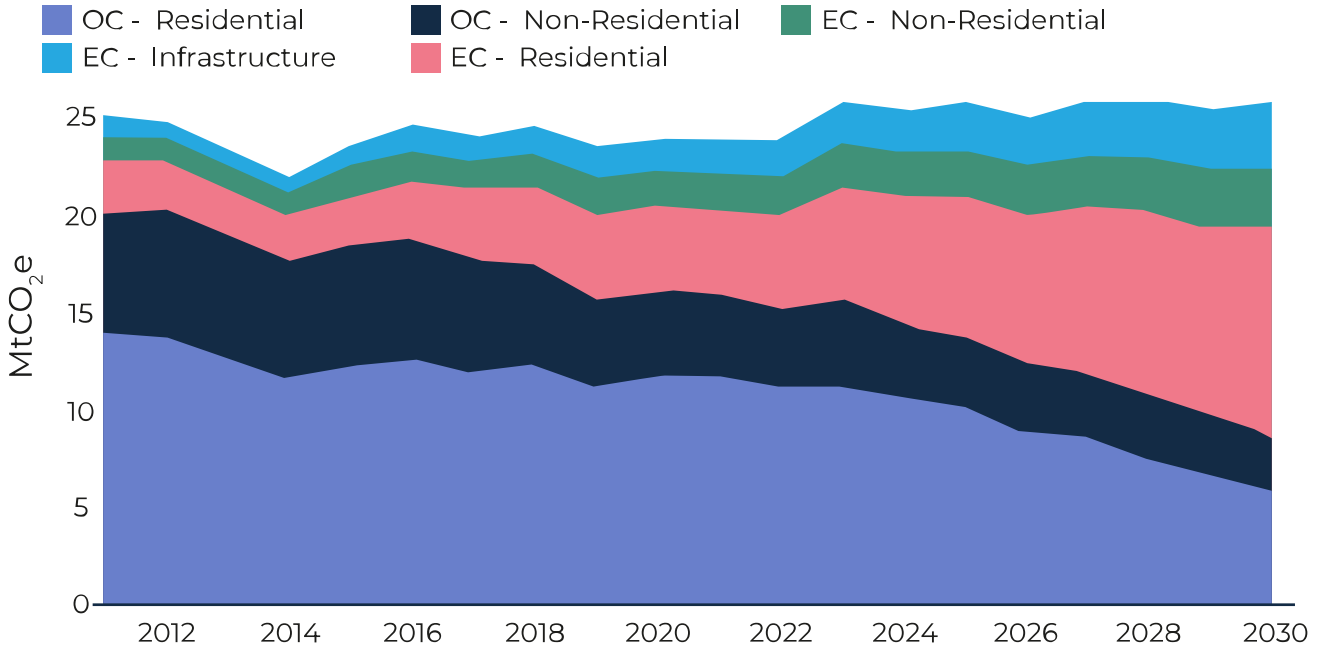


Chart: Irish Green Building Council. Source: BIACE UCD. Created with Datawrapper

Figure 1 - Forecast of national emissions operational and embodied carbon share to 2030 under an assumed 'Business as usual' scenario

Tackling embodied carbon emissions requires a re-consideration of both what and how we build. Firstly, we need to prioritise our requirements to ensure we fully utilise what we already have and avoid unnecessary construction – census data tells us there are over 150,000 vacant homes in Ireland today as well as a further 66,000 unoccupied holiday homes.¹ The CTCHC land use surveys also highlight that the ground floor commercial vacancy rate in towns in Ireland is 18- 31%, and that the upper floors in towns are at c. 80% - both these levels are unheard of in a European context.² We need to ensure our current building stock usage is optimised.

Secondly, as this paper will demonstrate, renovating existing buildings is usually the single most impactful measure we can take to avoid the need for more carbon-intensive concrete and steel structures. Local authorities maintain registers of derelict buildings although the actual number of potentially re-usable buildings is thought to be under-reported and need to be better monitored.

Thirdly, where newbuild is unavoidable, industry must be given the right conditions to allow new, leaner and innovative approaches to flourish. While scalable strategies for lower embodied carbon building already exist, their widespread implementation requires changes in our planning and regulatory systems.

Aligning these three strategies with our 1.5° aim also requires robust data on the baseline (our starting point) and best practice examples to support policymaking and target setting.

¹ <https://www.cso.ie/en/releasesandpublications/ep/p-cpp2/censusofpopulation2022profile2-housinginireland/vacantdwelling/>

² CTCHC Programme, June 2022.

“High-quality data on whole life carbon emissions associated with our built environment is critical to support policymaking and the decarbonisation of our building stock. SEAI recognises the importance of collecting standardised data through the development of a national methodology to assess these emissions and is pleased to support the INDICATE project.”

Joe Durkan, Head of Technical National Retrofit at the Sustainable Energy Authority of Ireland

“Addressing embodied carbon emissions is critical to halve our emissions by 2030 and reach carbon neutrality by 2050. The development of high-quality data and baseline data for buildings constructed in Ireland through pilot projects is a key step in supporting the regulation of these emissions in Ireland.”

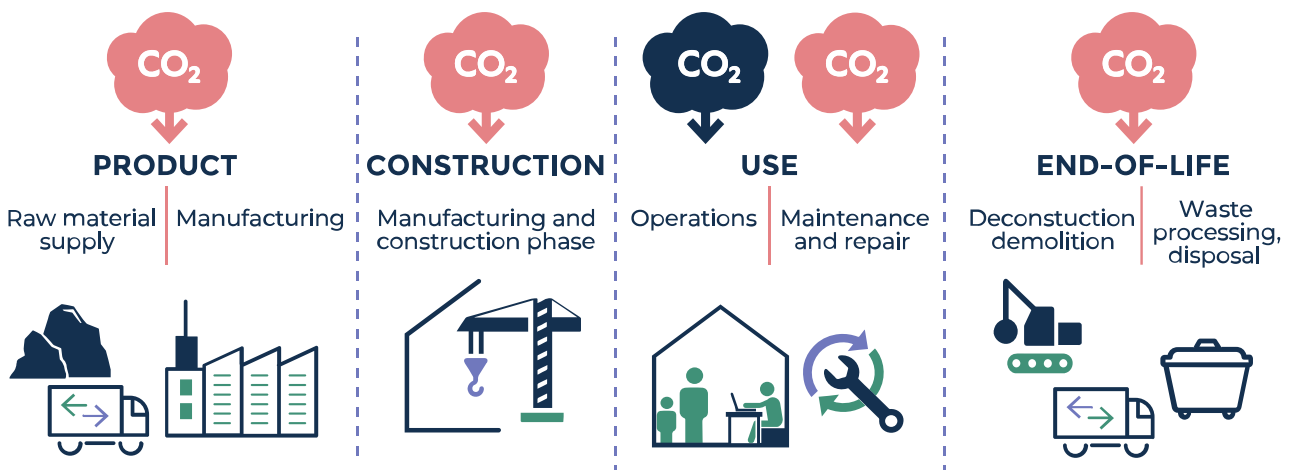
Francis Noel Duffy, TD (Member of the Irish Parliament)

About INDICATE

Against this background, the INDICATE initiative brings together government, industry, and academia to tackle one of the key barriers to decarbonising Ireland’s built environment: a lack of reliable and comprehensive emissions data for buildings. It seeks to accelerate policy developments by generating critical baseline data for buildings. This in turn will allow policymakers to set carbon limits that cover the full lifecycle impact of buildings, from manufacture and construction through to deconstruction and waste processing or recycling and create the right regulatory conditions for lower carbon material usage to reach these targets.

● Operational carbon

● Embodied carbon



INDICATE is an accelerator programme offering a project framework and co-funding to support efforts in generating essential building-level whole-life carbon data across Europe. This data must be generated now if industry and policy action on decarbonising buildings are to be brought in line with the 1.5° target set in the 2015 Paris COP21 agreement.

The accelerator is a collaboration between Smith Innovation as operator, BPIE, KU Leuven and the World Green Building Council delivering political and technical support, and Laudes Foundation as funding partner.

In Ireland, the initiative is being delivered through the national research centre for construction technology and innovation - Construct Innovate. This effort includes core personnel from the Irish Green Building Council, the University of Galway, and University College Dublin, with support from the Sustainable Energy Authority of Ireland (SEAI).

For further information on INDICATE, please visit <https://www.indicatedata.com/>.

2. Policy Background

EU context

The Energy Performance of Buildings Directive (EPBD) is the most important legislative driver to support the decarbonisation of the built environment in Europe. The recast EPBD - Directive (EU) [2024/1275](#) was published in the Official Journal of the EU on 8 May 2024. The recast includes the integration of lifecycle thinking by setting out a policy framework for measuring and reducing lifecycle global warming potential – Article 7.2 and Annex III.

Although the EPBD only requires measurement of the lifecycle GWP starting in 2028 – see timeline below - plans and supporting frameworks must be in place and published by 2027. Some countries such as Denmark, France, and the Netherlands, are moving faster and have already regulated embodied carbon emissions ahead of the EPBD update. In all these markets, the first crucial step was to develop a measurement methodology and use it to establish baselines that demonstrate the emissions associated with current building design. For consistency, the same methodology should be used to measure alternative proposals.

The INDICATE project has allowed us to develop a method of measurement for Ireland that is aligned with the finalised EPBD requirements as the method is based on the same indicator 1.2³ of the EU Level(s) framework as the EPBD requirements.³ Indicator 1.2, Lifecycle GWP forms the basis for developing any methodology for calculating lifecycle GHG emissions for buildings in Europe to meet the requirements of the EPBD when they come into force. Crucially, it also forms the technical screening criteria for new buildings in the EU Taxonomy for sustainable activities.

³ https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/2021-01/UM3_Indicator_1.2_v1.1_37pp.pdf

⁴ The EU Framework for Sustainable Buildings is known as Level(s) https://environment.ec.europa.eu/topics/circular-economy/levels_en

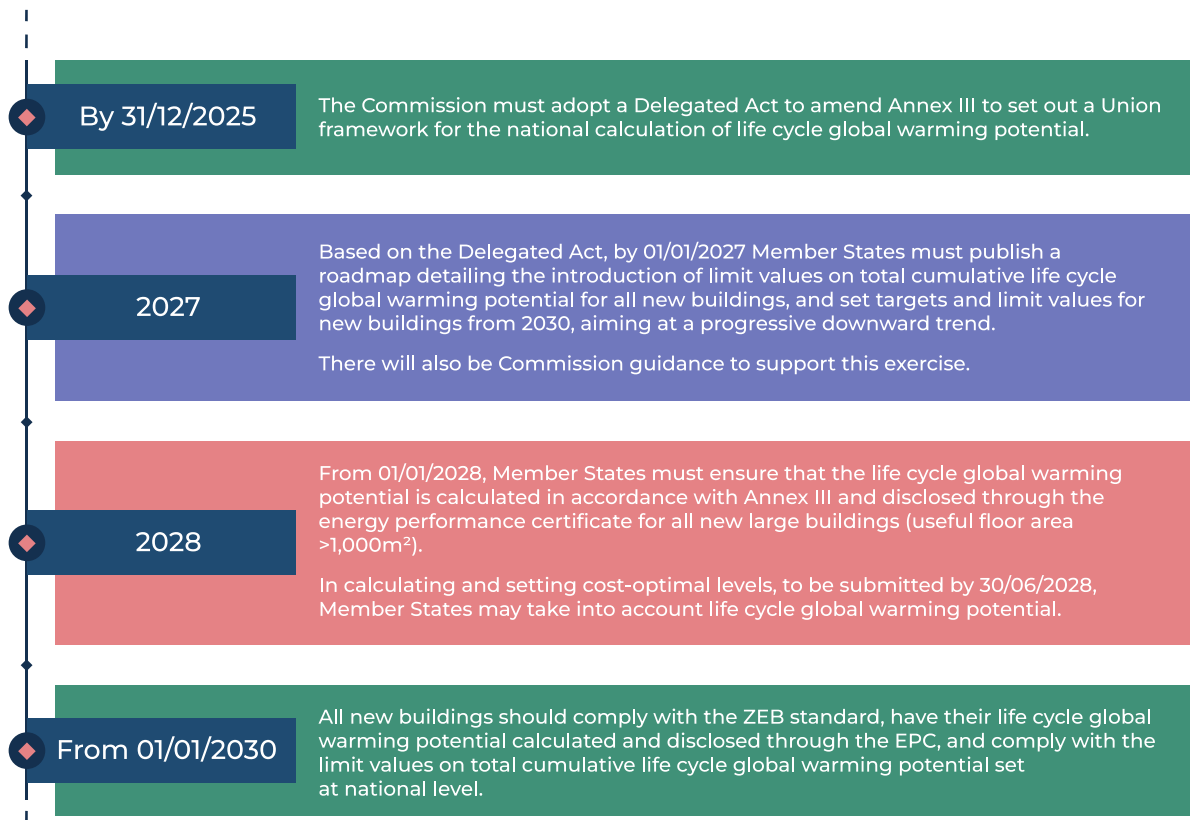


Figure 2 - EPBD timeline on implementation of life cycle global warming potential requirements -
Source: BPIE

The EPBD is the main directive aimed specifically at construction, but the more general reporting directives introduced under the EU Sustainable Finance Strategy are already having a major effect on construction investment decisions in Ireland; the Corporate Sustainability Reporting Directive (CSRD) and Sustainable Finance Disclosure Regulation (SFDR) (backed up by the Corporate Sustainability Due Diligence Directive (CSDDD)) are now linking all investment decisions to environmental reporting data, as indeed they were designed to do. Investors are demanding more data on the emissions related to all their investments, including buildings. We are seeing the connection between carbon data and finance solidifying; ultimately this means being ready with the data will allow Irish business to access funding under better terms.⁵ Indeed, not supplying the data may lead to penalties or even refusal of finance.

The EU Taxonomy and Level(s)

The data is being viewed through the lens of the [EU Taxonomy for sustainable activities](#). The Taxonomy outlines the key criteria to be met for an economic activity to be regarded as “green”, with a view to tackling greenwashing. In simple terms, the more environmentally friendly an activity can be demonstrated to be, the easier it should be to access funding at a lower interest rate. These criteria are known as Technical Screening Criteria (TSC).

⁵For example: Skanska's annual report is now their annual & sustainability report – an example of how the Taxonomy is beginning to combine with financial reporting: <https://group.skanska.com/493370/siteassets/investors/reports-publications/annual-reports/2023/annual-and-sustainability-report-2023.pdf>

For new buildings, the TSC is defined by the EU Framework for Sustainable Buildings called [Level\(s\), Indicator 1.2, Lifecycle GWP](#). This indicator forms the basis for developing any methodology for calculating lifecycle GHG emissions for buildings in Europe. It functions as both the Taxonomy TSC, and as the basis for the requirements of the EPBD when they come into force.

National Context

As of now, embodied carbon emissions remain unregulated in Ireland but the [Climate Action Plan](#) has tasked the SEAI with creating the necessary methodology and data infrastructure for assessments by Q3 2025.

Investors are already requiring this information and we at IGBC have received an unprecedented number of enquiries on reporting since the CSRD came into effect in January 2024. In its current state, assessment is inconsistent, varies in quality, is time-consuming, and expensive. There is a risk it could be perceived as additional red tape and cost. However, it is important to emphasise that early assessment, particularly when combined with life cycle costing, can lead to buildings that are more efficient in resource and energy use. This approach can reduce upfront capital costs, speed up delivery, and lower ongoing operational expenses. As assessment tools continue to develop and proliferate, the time and cost associated with assessment should decrease rapidly.

Chapter 13 of the Climate Action Plan 2024 deals with construction sector changes we need to see this decade, and it is worth recapping some of the key actions here:

13.3.2.2 - Reduction in Embodied Carbon in Construction Materials

13.3.2.3 - Reducing Concrete Use in Design and Construction

13.3.2.4 – Product Reformulation and Alternative Construction Materials

13.3.2.5 – Carbon Capture, Use, and Storage

To deliver on these actions – and those relating to embodied carbon in the EPBD, SEAI have set up an Embodied Carbon Programme with two key aims:

- A national database of materials and the official embodied carbon calculation methodology with associated software, and a resultant embodied carbon rating system for buildings.
- Decrease embodied carbon in materials produced and used in Ireland by 10% by 2025, and by at least 30% by 2030.

Embodied carbon emissions have also been extensively discussed in the Oireachtas (Irish Parliament). For instance, as part of the review of the Planning and Development Bill – See [debates of the 20th of February 2024](#). The [recently published report of the Housing Commission](#) also includes relevant recommendations; in particular, Recommendation #77: Meet emission reduction targets for the new residential construction sector.

Recommendation#77:

Meet emission reduction target for the new residential construction sector.

Actions

1. Plan and implement the IGBC Roadmap to achieve net zero whole-of-life carbon targets for all new housing by 2050.
2. Introduce whole-of-life carbon targets to the design of all new housing through the building regulations and planning processes.
3. Prioritise compact urban growth over new one-off houses.

Figure 3 - Extract from Housing Commission Report on Housing Needs published May 2024

The newly published “[Green Public Procurement Strategy and Action Plan – 2024-2027](#)” also includes actions to tackle whole life cycle emissions in buildings:

Actions

The Built Environment

A20 By the end of 2025, Capital Works Management Framework to include reference to available guidance, that is in accordance with the EPBD, using CPR data where available and EN 15978, as appropriate, for public bodies on inclusion of low carbon construction related components and sustainable building processes, and reference to GPP criteria related to construction, including National GPP Guidance and Criteria, where appropriate. Examine how implementation of GPP can be reported as part of other key reporting (e.g., project spend) at the project close stage (e.g., Stage 4 of the Capital Works Management Framework).

A21

In line with the Public Sector climate Action Mandate all public bodies shall specify low carbon construction methods and low carbon cement material as far as practicable for directly procured or supported construction projects from 2023.

Public bodies must include specifications for low carbon construction related components and sustainable building processes in accordance with EPBD, using CPR data where available and EN 15978, and reference to GPP criteria related to construction, including National GPP guidance, where appropriate in the Preliminary Project Brief.

In addition, whole life cycle analysis in accordance with EN 15978, where appropriate, shall be used to inform the design of building projects over 1,000 m² to ensure life cycle GWP is optimised at the building level and to facilitate declarations of embodied carbon for inclusion in the BER/EPC of buildings completed after 31 December 2027.

A22

Life Cycle Costing to be used by all public bodies for all works contracts as defined by the Capital Works Management Framework.

A23

For the procurement of low carbon cement material, public bodies and beneficiaries of grant (Exchequer) to implement construction related technical guidance, once established by the relevant body.

Figure 4 - Extract from the Green Public Procurement Strategy and Action Plan – 2024-2027

This new GPP strategy is supported by guidance on [“Reducing embodied carbon in cement and concrete through public procurement in Ireland”](#) published in May 2024 by the Department of Enterprise, Trade and Employment (DETE). The guidance document advocates for procuring low-carbon concrete and whole life carbon measurement.

It is also worth noting that the Irish Government is adopting the International Cost Management Standard (ICMS-3) to enable consistent reporting of capital and life-cycle costs and life-cycle analysis including embodied carbon across the National Development Plan (NDP). The first updated cost reporting templates incorporating ICMS were published in August 2023. They will be updated in 2025 to enable reporting on whole life carbon. It is expected that the EU Level(s) framework will also be updated to incorporate ICMS-3, making compliance more transparent.

Key Stakeholders

- The Department of the Taoiseach (Prime Minister) and the Department of Environment, Climate, and Communications (DECC) are jointly tracking progress against the Climate Action Plan and are responsible for its coordination.

- The Department of Housing, Local Government and Heritage (DHLGH) is responsible for planning and building regulations. They are responsible (in conjunction with DECC, DETE and SEAI) for the transposition of the EPBD into Irish law. They will be responsible for introducing the regulations on GWP disclosure once SEAI have completed their work in developing the methodology and database. DHLGH are also the notifying authority under the Construction Products Regulation (CPR) for Ireland, hence their strong focus on CPR-compliant data in any assessment method for GWP disclosure.
- The Housing Commission established to provide advice on measures to tackle the housing crisis published a [report](#) in May 2024 that includes the need to meet emission reduction targets for the new residential construction sector.
- The Land Development Agency (LDA) is tasked with delivering large-scale housing projects on government land and acquiring housing for affordable and social housing. Their latest [Sustainable Development Strategy](#) places tracking and reducing carbon across the lifecycle as their first strategic priority. They are now using [IGBC's Home Performance Index \(HPI\)](#) certification tool for their projects. The latest version of the HPI also requires mandatory WLC assessments.
- SEAI, as mentioned above, is tasked with the development of a national system comprising data on construction materials, an official embodied carbon calculation methodology with associated software, and a resultant embodied carbon rating system for buildings.
- Specific working groups have been established to support the decarbonisation of cement, and a greater use of timber in construction in Ireland:
 - The Department of Enterprise, Trade and Employment (DETE) lead the Cement and Construction Sector Decarbonisation Working Group, as one of the actions in the Climate Action Plan. They published a report in May 2024, Reducing Embodied Carbon in Cement and Concrete Through Public Procurement in Ireland – see previous section.
 - The Department of Agriculture, Food and the Marine (DAFM) is leading a cross-departmental working group on timber in construction. This is in line with their [forestry strategy](#) focus on adding value to timber products available from Ireland's maturing plantations and expanding forestry sector. The strategy advocates for using timber in construction and measuring embodied carbon to demonstrate its benefits.
- Additional taskforces and similar structures have been established to facilitate delivery of cross-departmental climate actions. These include:

Residential Built Environment	A Heat & Built Environment Taskforce has been established to accelerate and drive delivery in relation to retrofitting, renewable heat, district heating and decarbonisation of the building stock.
Industry	An Industrial Heat Decarbonisation Working Group (reporting to the Heat & Built Environment Taskforce) is focused on decarbonising industry and enterprise which is key to our future economic competitiveness.
Commercial Built Environment	A Commercial Built Environment Working Group (also reporting to the Heat & Built Environment Taskforce) focused on long-term decarbonisation of the commercial sector.

Current conditions

In the absence of regulation, lifecycle GWP assessment has been primarily driven by investors and green building certification in Ireland. A significant amount of work has also been done in the last three years by IGBC to increase awareness and build capacity and understanding within industry through [training](#) and [guidance resources](#). Over 500 industry professionals have undertaken our lifecycle GHG measurement courses since 2021.

The current position of LCA in Ireland

The CSRD, SFRD and the EU Taxonomy⁶ are already having a significant impact on how sustainability is assessed in parts of the market, with evidence that investors' requirements are driving demand for more lifecycle assessment to be included in tender submissions. Companies are increasingly using the Taxonomy to guide and showcase their taxonomy-aligned capital investments to meet the Green Deal targets. Since the CSRD came into effect this year, the IGBC has seen a significant increase in member enquiries about assessment methods as investors require more information.

Life-cycle assessment is a mandatory indicator under the latest version of the [Home Performance Index](#) – Ireland's national certification for new sustainable residential developments. Projects aiming for LEED or BREEAM certification also carry out assessments to gain the necessary credits. However, the assessment is often done late in the design process when little can be done to reduce embodied carbon emissions and there are no set targets or limits.

Early decisions on material palettes have the largest impact on a building's embodied carbon. The structural frame is usually the largest contributor to a building's embodied carbon, so visualising the difference a concrete, steel or timber approach can make at an early stage is a powerful tool in decision-making. To encourage good early decision-making, IGBC worked with the European software market leader One Click LCA to develop the [Carbon Designer for Ireland tool](#). The tool was developed with financial support from the LDA and the EPA and is free to use. It allows designers to quickly compare the approximate carbon impacts of differing materials approaches for a building, based on its size and type. It was launched in December 2021 and has served as an educational tool for both professionals and university students, with over 2,100 basic assessments carried out as of January 2024.

Materials Data

Building level assessments are reliant on data from the product level delivered in the form of an Environmental Product Declaration (EPD). With support from EPA Green Enterprise and University College Dublin, the IGBC developed the EPD Ireland Programme in 2018 to verify and [publish EPD](#) for Irish manufacturers. To date, it has published 100 EPDs for 250 products. EPDs from Irish manufacturers are also published with other programmes such as EPD International and EPD Hub.

Apart from cement production, Ireland does not have a heavy industry manufacturing sector. There are three cement manufacturers (Irish Cement, Breedon and Mannok) who are members of Cement Manufacturers Ireland, and one producer of GGBS cement (Ecocem Ireland). At the time of writing EPDs for Irish Cement, Breedon and Ecocem can be found at <https://www.igbc.ie/epd-search/>.

⁶ June 2024 update on Taxonomy aligned companies' performance at https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities/eu-taxonomys-uptake-ground_en

There is only one brick producer who has an EPD - Breedon. Munster Joinery publishes EPDs on their window products. Curtain walls are generally assembled from imported glass, aluminium, and timber. PIR/EPS insulation producers who use imported plastic beads and chemicals all have EPDs. All steel, aluminium, other metals, glass, plastic, and mineral wool insulation are imported with or without EPD data.

There is limited expertise in building material LCA in Ireland, with one LCA consultant having produced the vast majority of LCAs to develop the EPDs but this is starting to change.

Green Building Certification

IGBC's Home Performance Index (HPI) is the main tool used for large scale residential development - 21,000 homes are currently registered. WLC assessment is mandatory under HPI [version 3](#) but since this was only introduced in late 2022 no housing schemes have come through this version yet. The WLC assessment [guidance](#) is consistent with Level(s).

LEED is the main certification tool for non-residential property in Ireland, followed by BREEAM. This is mainly driven by US foreign direct investment. Some data on WLC is captured as part of LEED or BREEAM certification process though to date this is not a mandatory requirement in either scheme.

Building capacity in industry

As part of [Building Life II](#), the IGBC is supporting key stakeholders from all sectors in taking actions to support the decarbonisation of Ireland's built environment across its whole life cycle. See [Building a Zero Carbon Ireland Roadmap for specific recommendations for each sector](#).

Building databases and tools

As part of the [LIFE Level\(s\)](#) project IGBC developed generic data for a range of high impact products such as cement, steel, bricks, and aggregates. Generic data can be used in the absence of specific EPDs from manufacturers to give an estimate of a likely carbon impact.

This generic data has been used in the development of our most important tool development project – the UpfrontCO₂/INDICATE life-cycle GWP calculation methodology described in the next section.

3. WLC Assessment

Background of INDICATE

The project was initially funded by the SEAI to develop the calculation methodology that would fulfil the requirements of the Climate Action Plan (CAP) to create a lifecycle GWP rating system to go alongside the existing BER rating system. Further funding from the philanthropic organisation The Laudes Foundation has been used to apply the methodology to 50 test case studies of regular buildings being designed today. These case studies will provide the baseline measurement for the building industry in Ireland today. Future designs assessed using the same methodology will be comparable with this baseline.

Methodology used for LCA

The methodology developed and tested is based on the international standard for building level LCA (EN15978) and the Level(s) indicator 1.2.7 to be compliant with EU regulations and directives based on Level(s).

The table below shows the modular stages of a building's lifecycle that require measurement under the EN15978 standard, the assumptions that have been made and the source of any supporting data required. The assumptions were programmed into an excel calculation⁸ to allow end users to simply provide estimates of materials quantities, MEP quantities, and energy, water and refrigerant demand in order to produce a detailed forecast of the likely emissions of the building over its entire lifetime. Those marked 'Out of scope' are not considered to have a significant impact and/or are subject to individual circumstance, making them difficult to assess with any certainty while adding little insight to the overall result. Module D, which considers the re-use or recycling potential of materials is outside the scope of the assessment as its benefits are realised after the building's lifetime, usually some 50+ years from now.

Module	Name	Assumptions	Data Source
A1	Extraction of raw materials	Database of generic average carbon emissions for common materials was provided so all assessments use consistent assumptions on material provenance.	National Generic Dataset: igbc.ie/generic-data
A2	Transportation to plant		
A3	Manufacturing		
A4	Transportation to site	100km road journey for bulk materials and 200km for others. Imported materials also assumed 1,000km sea journey.	EPD Ireland
A4	Construction	Wastage rates on site	Level(s) manual
B1	In-use refrigerant leakage	Assumed annual leakage rate of 2%	CIBSE TM65
B2	Maintenance	Out of scope	n/a

⁷ This is a short synopsis. A detailed description can be read in the Benchmarking Embodied Carbon Baselines for Buildings in Ireland report submitted to the SEAI under the UpfrontCO₂ project.

⁸ The Excel spreadsheet can be downloaded [here](#)

Module	Name	Assumptions	Data Source
B3	Repair	Out of scope	n/a
B4	Replacement	Reference Service Life of elements	Level(s) manual
B2	Maintenance	Out of scope	n/a
B5	Refurbishment	Emissions factors of fuels and forecast of grid emissions factors	SEAI
B6	Operational Energy	Emissions factor for pumping water to and from buildings	Irish Water
B7	Operational Water	Per m ² estimate of demolition emissions	RICS
C1	Deconstruction	% of waste recycled, energy recovered or landfilled / distance to disposal facility	EPA / EPD Ireland
C3	Waste Processing	2022 Waste Disposal Carbon Factors (kgCO ₂ e/kg)	DEFRA
C4	Disposal	2022 Waste Disposal Carbon Factors (kgCO ₂ e/kg)	DEFRA
D	Re-use/recycle potential	Out of scope	n/a

Fundamentally, the methodology is quite simple: quantify the inventory and multiply each input in the inventory by an appropriate carbon factor, using credible sources to determine the carbon factors. The image below shows the relationships between the inventory, carbon factor sources and the modules in which each result is recorded. The authors used what we believe are the most credible assumption sources for each carbon factor. However they would advise scrutiny and consultation before launching any national requirement, particularly with regards to materials and MEP carbon factors.

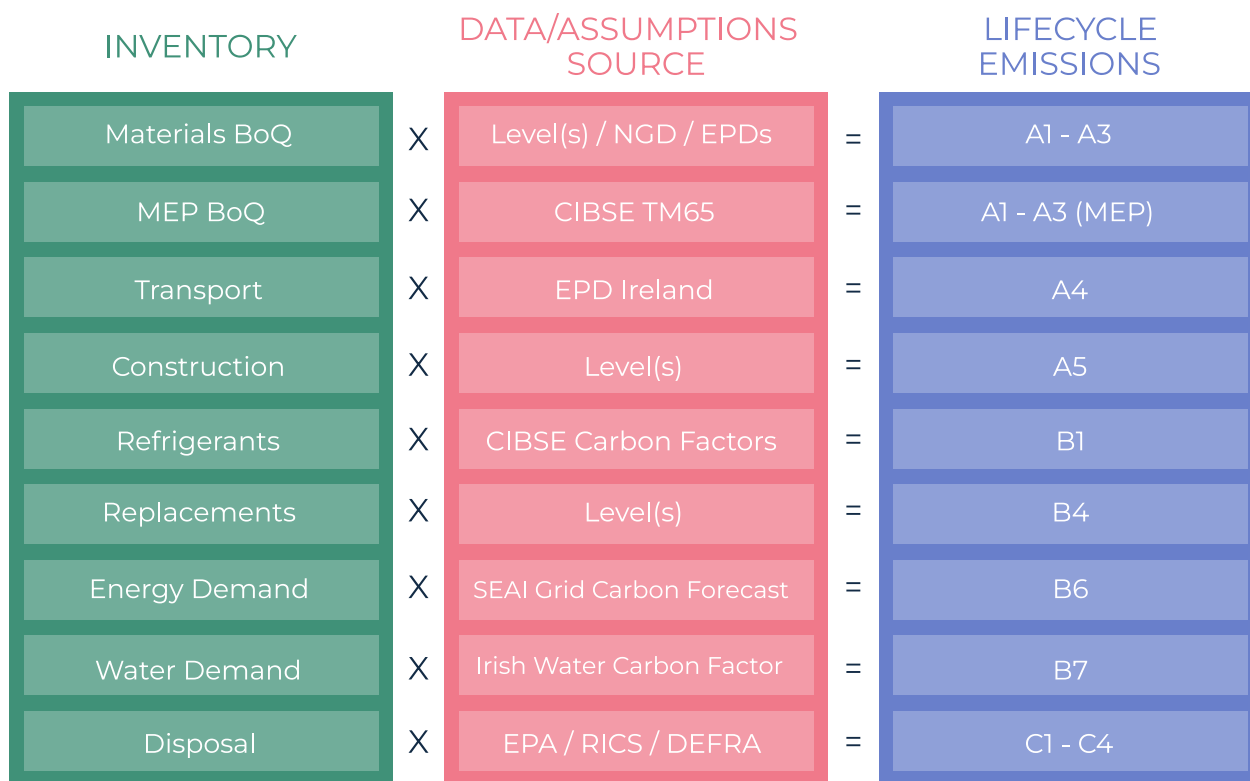


Figure 5 - Relationship between the inventory, background data sources and EN15978 modules used to record assessment results

Case studies and results

The below chart summarises the 51 case studies developed to date. It shows 46 new buildings of various typologies, four refurbishments (one apartment block, a school and two offices), and a mixed project involving both renovation and newbuild.

The results are presented in kgCO₂e/m² to demonstrate the variation depending on typology. The mean average for all newbuild shows a generic building has an embodied carbon footprint of 546kgCO₂e per m² up to practical completion (A1-A5), with an estimated further embodied carbon footprint of 279kgCO₂e/m² over its lifetime, this considers replacement of elements and deconstruction only. The four refurbishment assessments produced average results of 209kgCO₂e/m² up to completion, and an estimated further 189kgCO₂e/m² in the future. These are 62% and 32% lower respectively than the newbuild.

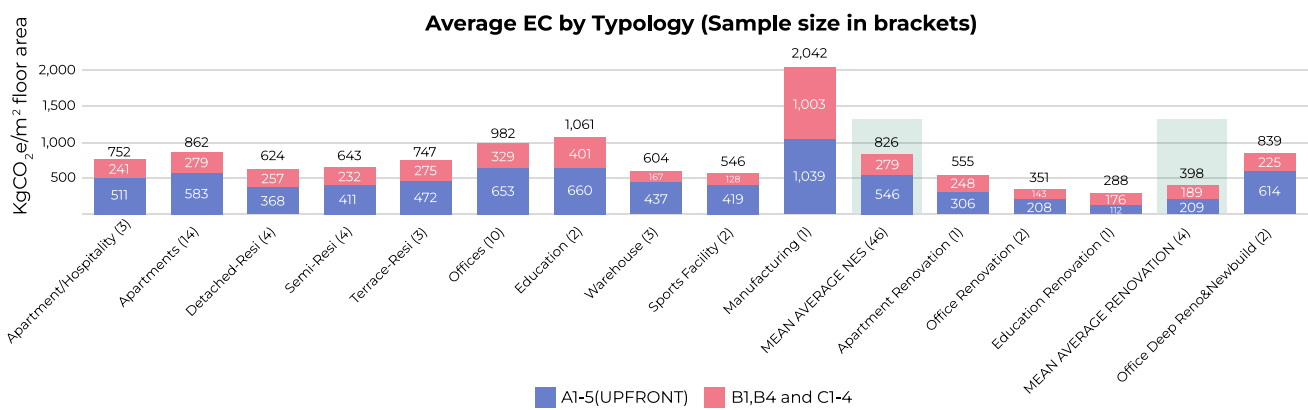


Figure 6 - Early indicative results of average WLC by typology (number of assessments sample size in brackets)

The reason the refurbishments are significantly lower than the newbuilds is because there was less need for new structural elements. The additional benefit of renovation, particularly in existing urban areas, requiring little or no new supporting road infrastructure was not quantified – See [Viable Homes report for information on embodied carbon impact of new infrastructure](#).

The following three charts show the average embodied carbon for elements of the average apartment block, average office and average renovation projects. It can be seen that the load bearing structure is the largest embodied carbon hotspot in newbuild, and removal of the need for this is the primary action that can be taken to reduce embodied carbon.

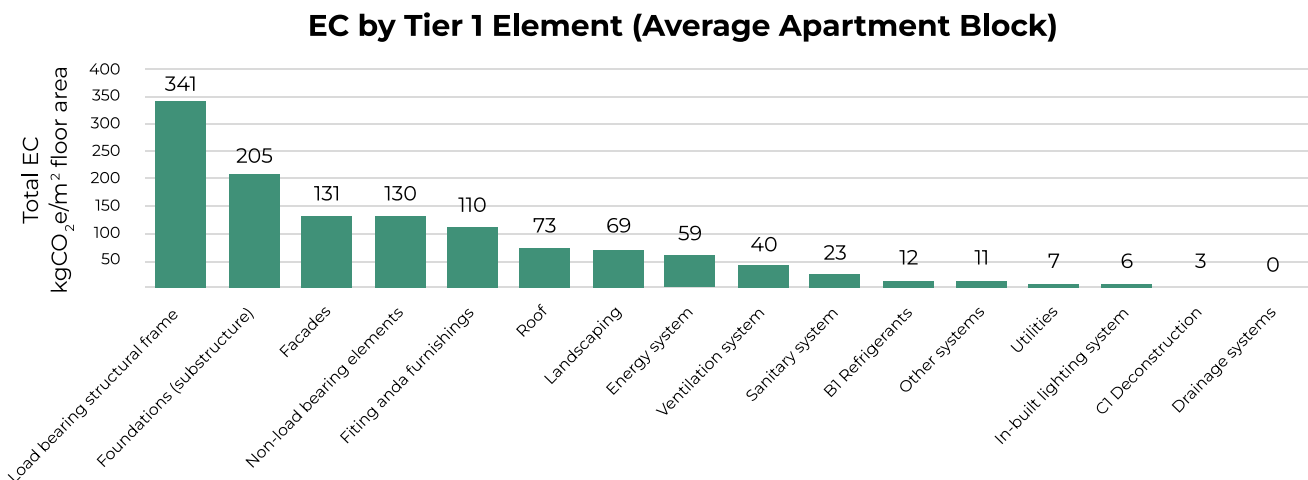


Figure 7 - INDICATE early indicative results – Average apartment block (sample size

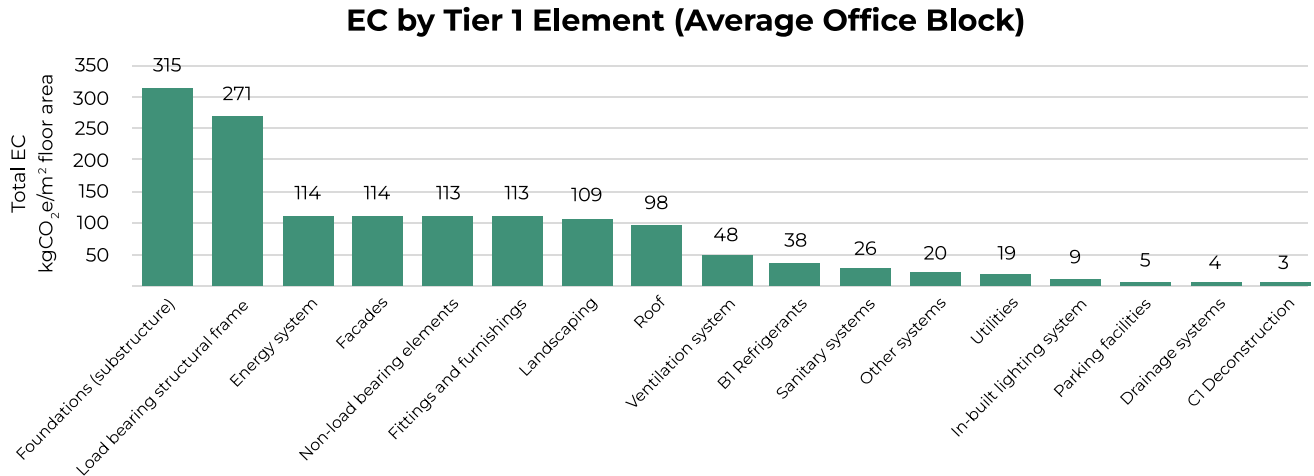


Figure 8 - INDICATE early indicative results – Average office block (sample size = 10)

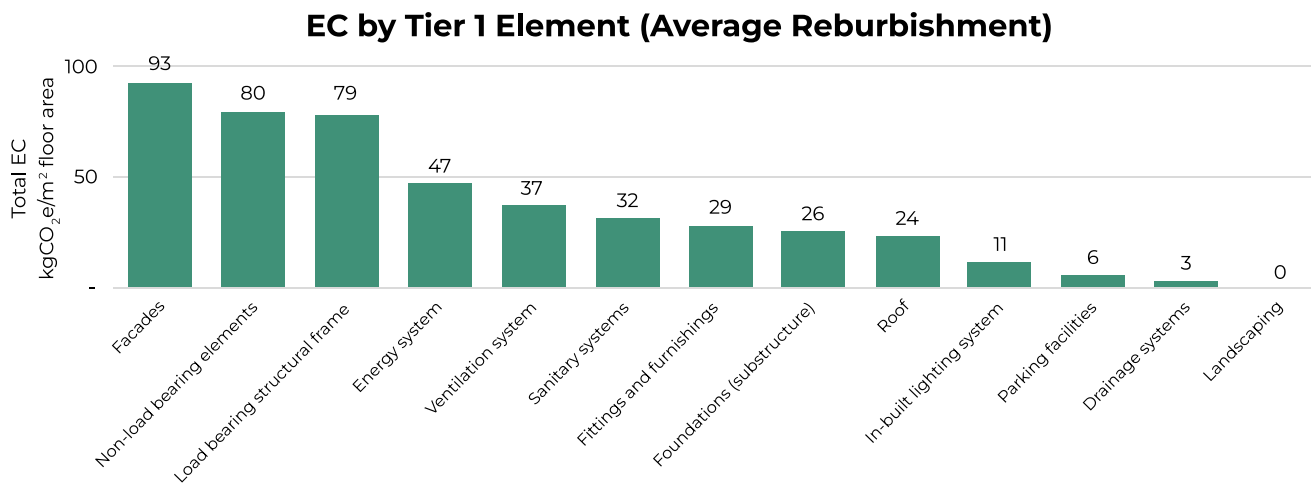
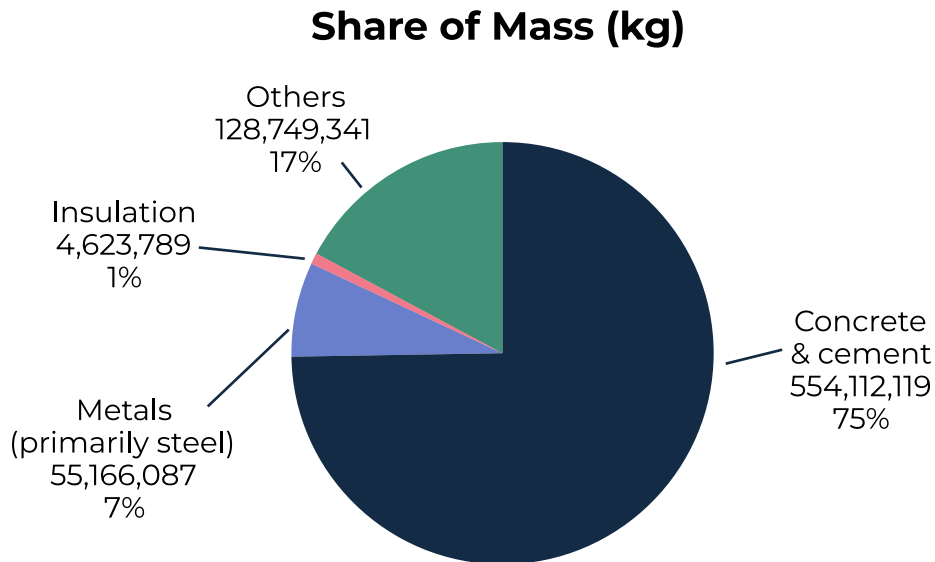


Figure 9 - INDICATE early indicative results – Average refurbishment (sample size = 4)

It is important to note these buildings have been assessed using the same background data and assumptions, so are comparable with one another. Individual LCAs often have the problem of not being comparable because of variations in carbon factors for materials, or replacement rates or deconstruction scenarios.

Sum of materials used

Over the 51 assessments, a total of 742,651 tonnes of specified materials was reported, with a total estimated carbon footprint of manufacture of 191,153 tonnes CO₂e. The two charts below show the breakdown of materials and their respective estimated carbon footprints.



Share of A 1-3 manufacturing emissions (kgCO₂e)

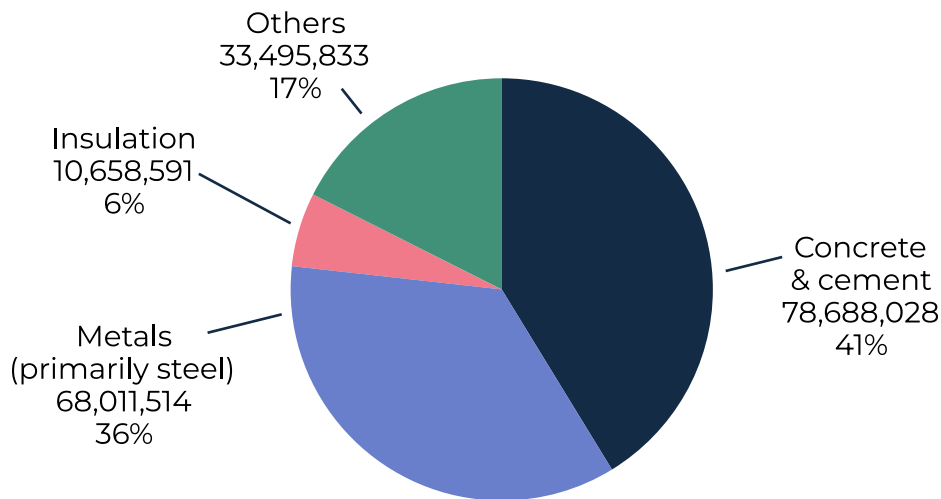


Figure 10 - Breakdown of the mass of all materials used across all assessments (kg) and their associated estimated manufacturing emissions (kgCO₂e)

It can be seen that the largest shares of both mass and emissions comes from concrete and cement used in the structural frames and basements. Steel, although smaller in mass, has a higher carbon footprint in manufacture, meaning its impact is comparable with concrete. Conventional insulations similarly have a disproportionately large impact on emissions.

Participants

These assessments were carried out with guidance from the IGBC, independently of one another with the co-operation and help of the companies and organisations listed here using the method described above:

BDP	Henry J Lyons Architects	PM Group
Arup	IGBC	Scott Tallon Walker Architects
Clúid Housing	Kosmos Building Consultants	University College Dublin
Coady Architects	Meehan Green Building Consultants	University of Galway
ECReduction Ltd	Michael McCarthy QS	Wain Morehead Architects
Helena McElmeel Architects	Mulcahy McDonagh and Partners QS	Walls Developers

4. Discussion

Challenges

Developing the methodology

Developing the methodology required knowledge of international standards, the key ones being EN15978 for LCA of buildings, and crucially, the background knowledge of ISO14040 and ISO14044, the two key standards for all LCA. These two ISO standards provide the systematic framework for LCA and should be understood by all practitioners and verifiers.

Establishing background data requires decisions on sources of information for generic materials carbon impact as well as likely replacement cycles and end-of-life scenarios. The Level(s) manuals provided some of this but other sources were chosen based on their reflecting the Irish context – the important aspect of developing scenarios for the future of a building is that it is plausible and that it is used consistently across assessments so they are representative and comparable.

Collecting data

To gather data, the IGBC engaged in extensive communication with its members, requesting data and incentivising them to take part in the pilot. Asking them to apply a separate methodology and spreadsheet to that required by rating tools such as BREEAM and LEED was challenging as it meant additional work for consultants and architects. There was also resistance to moving back to a spreadsheet approach for those accustomed to using One Click LCA, the market leader in LCA software in Europe. To overcome these challenges, some participants were paid a small fee to cover the time required, and a special [INDICATE Champion badge](#) was created for them to promote their participation in the project.

Analysing results

The results from all assessments were anonymised and averaged to produce ‘typical’ results. Since each assessment produced its own workbook of multi-faceted results relating to multiple elements of buildings of differing floor areas, producing the average for each element was challenging and required careful manipulation in Excel. Future experiments should consider the analysis stage in more detail at the outset to ensure data is collected in a format that will suit.

5. Recommendations

For policymakers

As major contributors to Ireland’s GHG emissions, the construction and operation of our built environment requires the development of quality climate impact data as a critical first step towards full decarbonisation. The data should be used to inform and enable viable carbon reduction strategies. We have to measure in order to manage. **Based on our initial findings, we would recommend policymakers focus on the larger contributors – the ‘hotspots’ – in order to bring about the greatest reductions with the fewest policy interventions. In the case of new buildings the hotspots are shown to be structural frames and basements and enclosures up to completion of a project, and as well as enclosures and energy system replacement cycles over the lifetime of the building.**

The Carbon Neutral Cities Alliance published an excellent [factsheet](#) covering a variety of approaches and ideas being introduced at the city or municipality level. It is important to emphasise that reducing emissions through increased use of recycled, renewable, and biobased materials can offer multiple co-benefits. These include providing sustainable jobs across the country. Ireland, with its large agricultural sector, has a strategic interest in identifying, encouraging, and developing local low-carbon solutions from agriculture and forestry, as well as promoting circular economy practices that reuse locally available resources. Communicating these co-benefits to the public is essential to counteract any concerns about increased red tape.

Climate Action Plan 2025 and transposition of the EPBD into Irish law

Acknowledgement of the impact of steel and concrete in their current production and use is essential; the next CAP should encourage a transition towards leaner design, lower carbon production proven through EPDs (and the upcoming changes to the CPR) and greater use of biobased materials where substitution is appropriate. To do this, targets should be set to encourage alternative approaches. This should be supported by Green Public Procurement (GPP) to stimulate the materials market to act, but also requires a review of Technical Guidance Documents (TGDs) B (fire safety) and D (on agréments and certification). Updates to the regulations in France mean publicly procured buildings must consist of 50% bio-based materials. In Italy, GPP rules mandate that 15% of a building’s mass is from recycled or recovered materials.

Its large agricultural sector and maturing forestry plantations means Ireland should have a strategic interest in identifying and developing low carbon, locally sourced, biobased solutions (including agricultural waste). By reviewing existing licensing requirements for industrial timber and hemp production and championing other measures that embrace biobased materials, policymakers could facilitate a lower carbon more cost-efficient model for industry, as well as support the creation of sustainable jobs.

Biobased materials such as timber joinery and breathable insulation solutions are appropriate in renovation of older buildings – our first priority - and new-build. They can contribute to the creation of healthier indoor environments, supporting occupants' health and wellbeing. In addition, healthier buildings typically command a premium in the rental sector (commercial and residential). Public education campaigns can raise awareness about these often overlooked co-benefits.

While the EPBD requires introducing lifecycle GHG measurements by January 2028, we would highlight that we cannot wait for the perfect data to address embodied carbon emissions. Investor ESG reporting requirements are already creating demand for this information. **It would make sense to focus first on carbon hotspots already identified, and to start creating limit values today.** Feedback from early assessments will then make it possible to update limit values with improved data in future. We have to begin to measure so we can begin to manage.

The EPBD requires a national roadmap to be developed by January 2027 including a timeline and progressive tightening of WLC limit and target values. We need to start collecting typical WLC benchmark data and developing building archetypes that provide full WLC data representative for the Irish building stock now in order to publish a roadmap by January 2027. One very clear example of what this may look like has grown out of research at Aarhus and Aalborg universities in Denmark; The Danish [Reduction Roadmap](#) details the pathway required by a country's construction industry to play its part in keeping within the Paris Agreement 1.5° carbon budget. We would recommend a similar document is developed for Ireland, including our current typical archetype emissions today, a timeline of progressively tightening targets and a method for measurement.

Our full recommendations for policymakers are available in the IGBC Decarbonisation Roadmap [here](#).

There are co-benefits - aligning life-cycle GHG measurement with life-cycle Costing could contribute to reducing capital and operational costs while tackling carbon emissions and waste by identifying and optimising activities, energy demand and materials at the earliest possible design stages.

With that regard, it's disappointing that the final version of the Planning & Development Bill (passed in October 2024) does not cover embodied carbon emissions.

IGBC recommended the following approach at planning stage:

1. Prioritise the re-use of existing buildings wherever possible.

Reason: The data shows that the largest embodied carbon hotspot when creating useful floorspace is the need for structural elements that are almost always concrete or steel. Re-using existing buildings also has the benefit of rejuvenating existing building stock and whole districts and reducing the need for new infrastructure and its significant associated embodied carbon emissions (new roads, communications, sewerage etc.)

2. Require WLC assessment based on generic GWP data of materials and energy performance at the planning stage. Challenge the project to produce figures lower than the generic averages this project is producing, measured using the same methodology.

Reason: Regardless of the result, undertaking the process of assessment changes the designer's approach. They will strive to reduce, re-use and recycle wherever possible to reduce the result of the assessment. It will also influence the design of the next project from the beginning when the most influential decisions are made. See the IGBC guidance for planners of [Viable Homes](#).

3. Specify structural materials at planning stage (primarily concrete strength, steel, timber). If using concrete, require optimised strength and quantity with maximum cement replacement.

Reason: Concrete is the largest contributor to embodied GHG emissions because of the cement present in the large volumes used. Minimising the volume of concrete required and the cement therein will have the greatest impact on the embodied carbon of a new building within the current building regulatory framework.⁸

4. Require an EPD for the structural materials to be provided at the planning stage so that the most impactful element of the building is covered by an accurate EPD.

Reason: By requiring an EPD for the largest mass single material component of the building a greater proportion of the mass of the building is evaluated using the accurate data of an EPD. This will encourage careful selection of materials and greater transparency in the structural materials market and create the right conditions for suppliers to develop or source innovative low carbon materials.

For educators and awareness raisers

Behaviour change and public acceptance will be critical to reaching our climate targets. While the benefits of energy efficiency are now largely understood and accepted, reducing whole life carbon emissions will be challenging as it requires re-evaluating expectations of constant growth in new construction and how we build. Besides extensive communication activities to raise awareness among the general public, the lack of skills at all levels of the supply chain also needs to be addressed. Tackling WLC challenges the industry to do much more with less, to value and re-use what we already have and to start on a decade of innovation and change. The media, our education system and construction bodies all have a role to play in supporting this transition.

Key recommendations:

1. Run large-scale awareness-raising campaigns to ensure all citizens understand the benefits and importance of tackling embodied carbon emissions and reusing buildings as per the proposed actions in the DAFM forestry strategy. The campaign should address the perceptions around reused materials and materials such as timber frame being of lower quality. To reach a wider audience, the campaign should be run in cooperation with banks, professional bodies, hardware stores and homeowner associations.
2. Run an awareness programme for local councillors on the WLC impact of buildings and the need to integrate it within development plans.
3. Ensure primary, secondary and third level curricula are infused with environmental education to increase carbon literacy and understanding of resource constraints. More specifically, WLC could be covered at secondary school level as part of STEM subjects, construction studies, geography, or home economics.
4. Third level institutions should engage with construction bodies to ensure key WLC skills are covered in their programmes.
5. Education and Training Boards should develop and run training courses covering key WLC skills identified and support upskilling of construction workers.

6. Focusing on high-impact decisions that make the most difference should be emphasised. It may be acceptable to create default data for elements which are not making a significant difference while efforts are focused on large emitters.

Our full recommendations for educators and awareness raisers are available in the IGBC Decarbonisation Roadmap [here](#).

For banks and financial institutions

As we transition to a low-carbon, circular economy, financial institutions are increasingly focused on financial risks associated with the decarbonisation of the built environment. Key drivers of this agenda include pressure from shareholders, increasing evidence of the financial materiality of climate risk, market demand for green buildings and opportunity in the real estate sector. Additionally, there is a push from policymakers, in particular the EU, to steer capital towards greener economic activities, and the increasing focus of financial regulators on climate-related financial risk.

Key recommendations:

1. Train staff to understand and evaluate key indicators of the built environment that affect carbon emissions, such as operational carbon, whole life carbon, transport emissions, and resource use, so that they can advise customers.
2. Financial institutions should commence measuring and disclosing the operational carbon emissions and embodied carbon of all properties (owned and financed) through annual reporting.
3. Introduce preferential incremental discounted green mortgages for new homes based on additional criteria such as WLC, transport accessibility and land use. These should be aligned with the EU taxonomy, and with higher discounts for net zero lifetime carbon.
4. Include net zero operational energy performance and embodied carbon targets in financing/project development criteria and verify them through agreed verification processes.
5. Our full recommendations for banks and financial institutions are available in the IGBC Decarbonisation Roadmap [here](#).

For property and construction industry

Multiple stakeholders are involved across the full lifecycle of the built environment from planning, design, construction, occupation/use, maintenance, repair, and ultimately demolition. Each group has a distinct role to play, but at a high level our recommendations are as follows:

- Upskill now on whole life carbon and circularity.
- Professional bodies and education providers to encourage more cross-disciplinary approaches.
- Adopt Building Information Modelling (BIM) to support greater efficiency and reduction in material usage and waste.

- Emphasise the co-benefits of reduction strategies:
 - Optimise operational energy (through Passivhaus principles for example) to reduce operational cost
 - Optimise material efficiency reducing capital cost and lifecycle cost of replacements
 - Emphasise biophilic benefits of organic building materials and health benefits of well designed, airtight Passivhaus standard buildings with controlled clean HVAC strategies.

Our full recommendations for industry are available in the IGBC Decarbonisation Roadmap [here](#).

For other countries developing WLC regulation

EN15978 and Level(s) indicator 1.2 is a good framework to work within. We are happy to share our approach.

- Create defaults for everything as current awareness of all the different sources of emissions is low – providing defaults allows assessment to begin and practitioners to start learning what is important and what is not so important.
- Carefully consider what elements of an assessment you will want to report on and ensure that these elements can be extracted from the resulting data of an assessment by carefully considering at the outset how the data should be presented in the assessment.
- Build cross-party political support but also build and nurture strong relationship with senior civil servants. Trust is critical.

We have taken data from energy, water and waste public bodies – involve them all to create cohesion.

6. Next Steps

We have already shared the assessment methodology in this paper with the SEAI along with a report on the assumptions and recommendations on rules around defaults. The SEAI will then need to review and adjust/clarify as necessary. We would recommend involvements from energy, water, and waste public bodies (we have used data from all of them) as one way of creating greater cohesion across stakeholders and ensuring consistent assumptions about building lifecycles from respected authorities.

We will review our 50 consistently assessed buildings and from there create generic average data points for every element at every module stage based on typology. Using these (with a conservative safety margin) should allow us to begin considering how we set targets.

The EPBD requires that each member state has in place a system to disclose the life cycle Global Warming Potential (GWP) of buildings by 2027 through their Energy Performance Certificate. We see the need to engage with international experts in front runner countries implementing building life cycle GWP disclosure regulations to develop a pathway for Ireland to introduce regulations. The development of the implementation pathway in Ireland will involve engagement with relevant authorities, bodies and industry stakeholders and will focus on key areas including the implementation methodology, embodied carbon data, digital infrastructure needs, and training and qualification requirements. The IGBC is hoping to organise a workshop on this topic in 2025.

Extensive engagement with the industry is needed both to make them aware of the new requirements but also in the design of the system to minimise the regulatory burden through digital efficiency. We need to review best international practice, lead extensive engagement with key stakeholders, support policy makers to ensure that the implementation of building life cycle GWP regulations is timely, smooth and effective and occurs ahead of the EU EPBD deadline as requested by the Joint Oireachtas committees, joining other peer frontrunner countries in Western and Northern Europe. To effectively achieve our goals, close collaboration will be required with relevant national authorities such as SEAI, NSAI, and the Department of Housing, as well as with construction industry bodies. Additionally, we must engage with the European community, including EU policymakers, Green Building Councils (GBCs), NGOs, and peer government officials from other implementing states.

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