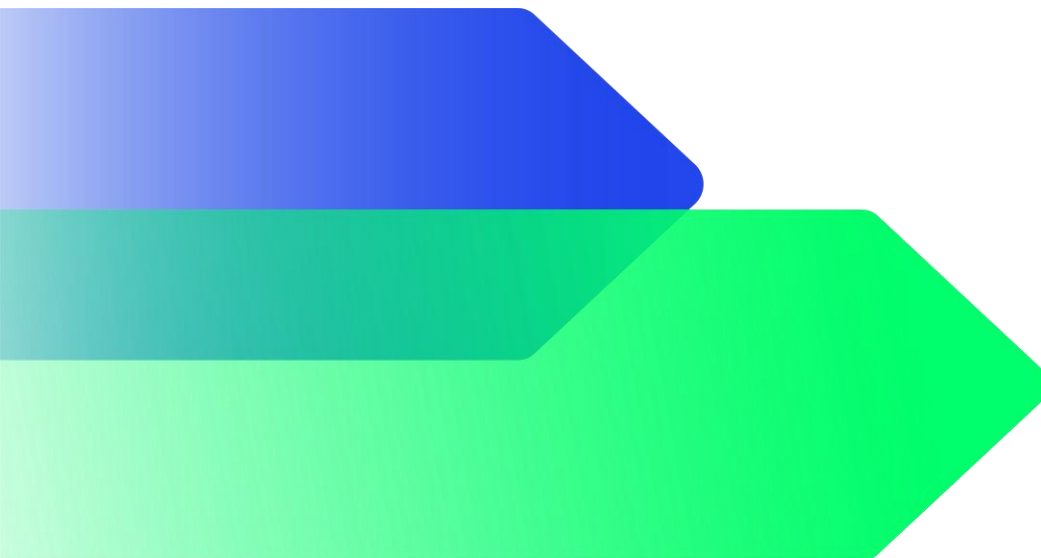# AIB Green Buildings Impact Assessment Methodology

For eligible Green Commercial and Residential Buildings projects.

September 2024

Contents

Abbreviations and glossary

AIB Impact tool	Developed by the Carbon Trust to calculate the impact and avoided emissions of the AIB green commercial and residential buildings included in the eligible asset pool for the green bond
Avoided carbon emissions	The avoided carbon emissions of the underlying properties when comparing them against a baseline of the average property (by sector and geography), on an annual basis. The avoided emissions are a result of these properties being more efficient and less carbon intensive than the average property (by sector and geography)
Baseline	The average energy and carbon intensity of properties by sector and geography, informed by the SEAI and EPC datasets
BER (Building Energy Rating)	An indication of the energy performance of residential or commercial premises (represented as $kWh/m^2/year$) in Ireland
Delivered Energy	The amount of energy that enters the building (and is used) without adjustment for any energy loss in the generation, transmission, and distribution of that energy
Eligible Green Project Portfolio	Eligible green bond use of proceeds as outlined in the Framework
EPC (Energy Performance Certificate)	Mandatory to issue for newly constructed, sold or rented commercial and residential properties in the UK. The certificates provide an indication of the energy performance of buildings
Framework	AIB's green bond framework outlines its green bond processes and procedures for (1) Use of Proceeds, (2) Process for Project Evaluation and Selection, (3) Management of Proceeds, and (4) Reporting
Green Commercial Loans	A category of the eligible the green bond portfolio as defined in the Framework
Primary Energy	The total amount of energy used, including the final energy used directly by the end-user, but also the energy inputs to transformation processes such as electricity generation and oil refining and other losses such as electricity transmission and distribution
SEAI BER Research tool	Developed by the SEAI and provides a database of BER certificates for all domestic properties in Ireland (that have been assessed)
SEAI non-domestic database	A database provided by SEAI containing the BER certificate data of non-domestic properties in Ireland (that have been assessed)

Introduction

Who We Are

Our mission is to accelerate the move to a decarbonised future. We have been climate pioneers for more than 20 years, partnering with leading businesses, governments and financial institutions globally. From strategic planning and target setting to activation and communication - we are your expert guide to turn your climate ambition into impact.

We are one global network of 400 experts with offices in the UK, the Netherlands, South Africa, China, Singapore and Mexico. To date, we have helped set 200+ science-based targets and guided 3,000+ organisations in 70 countries on their route to Net Zero.

AIB Overview

Aligned with its sustainability strategy, Allied Irish Banks ("**AIB**") intends to issue green bonds to finance and / or refinance loans that meet the requirements as described in the AIB Green Bond Framework ("**Framework**")[1]. The objective of the Framework, and subsequent green bonds issued from it, is to fund projects or assets that mitigate climate change by reducing emissions, protect ecosystems, or otherwise have a positive environmental impact. The Framework has been aligned with the ICMA Green Bond Principles and has received a Second Party Opinion from Sustainalytics.

The ICMA Green Bond Principles are a set of voluntary guidelines that recommend transparency and disclosure and promote integrity in the development of the green bond market by clarifying the approach to issuing a green bond. The Framework, therefore, has four key components:

1. Use of Proceeds
2. Process for Project Evaluation and Selection
3. Management of Proceeds
4. Reporting

For each green bond issued, AIB asserts that it will adopt (1) Use of Proceeds, (2) Process for Project Evaluation and Selection, (3) Management of Proceeds, and (4) Reporting, as set out in the Framework.

AIB, at its discretion but in accordance with the Green Bond Principles, will allocate the net proceeds of the Green Bonds to an eligible loan portfolio of new and existing green loans ("**Eligible Green Project Portfolio**"). The Eligible Green Project Portfolio is to be financed and/or refinanced in whole or in part by an allocation of the bond proceeds.

The Eligible Green Project Portfolio includes "Green Buildings", the criteria for which are set out below[1]:

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[1] AIB Green Bond Framework (2023)

Green Buildings

Loans to (re)finance the acquisition, ownership and construction of new or existing residential and commercial buildings that meet one or more of the following eligibility criteria:

Ireland

- Buildings built < 2021 that are within the top 15% low carbon buildings in Ireland [2]

- Buildings built ≥ 2021 with a primary energy demand at least 10% lower than the Nearly Zero-Energy Building (NZEB) standard [3]

UK

- Buildings with an Energy Performance Certificate ("EPC") A or B label or belonging to the top 15% low carbon buildings in the local context (i.e. England & Wales, Scotland and Northern Ireland)

EEA and the UK

- Commercial buildings holding at least one of the following certifications:

    - BREEAM 'Excellent' or higher

    - LEED 'Gold' or higher

    - DGNB 'Gold' or higher

EEA and the UK

- The building renovation leads to a reduction of primary energy demand (PED) of at least 30% [4], and

- The building renovation complies with the applicable requirements for major renovations [5]

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[2] For buildings built before 31 December 2020, to be aligned with the substantial contribution criteria of the EU Taxonomy Delegated Act, the building must be within the top 15% of the national or regional building stock expressed as operational Primary Energy Demand (PED) and demonstrated by adequate evidence, which at least compares the performance of the relevant asset to the performance of the national or regional stock built before 31 December 2020 and at least distinguishes between residential and non-residential buildings. As of Q4 2023, the top 15% of the national stock built

[3] In line with the EU EPBD directive, Ireland carries out a cost optimal analysis to define NZEB requirements. AIB will calculate the NZEB-10% threshold as per the official cost optimal analysis, as published by the Department of Housing, Local Government and Heritage. At the time of writing, the cost optimal analysis for residential and non-residential buildings can be found at https://www.gov.ie/en/publication/8b915-cost-optimal-residential-report- ireland-2018/ and https://www.gov.ie/en/publication/a81e9-report-on-the-development-of-cost-optimal-calculations-and-gap-analysis-for-buildings-in-ireland-under-directive-201031eu-on-the-energy- performance-of-buildings-recast-non-residential-buildings-2019/, respectively.

[4] The initial primary energy demand and the estimated improvement is based on a detailed building survey, an energy audit conducted by an accredited independent expert or any other transparent and proportionate method, and validated through an Energy Performance Certificate. The 30 % improvement results from an actual reduction in primary energy demand (where the reductions in net primary energy demand through renewable energy sources are not taken into account) and can be achieved through a succession of measures within a maximum of three years.

[5] As set in the applicable national and regional building regulations for 'major renovation' implementing Directive 2010/31/EU. The energy performance of the building or the renovated part that is upgraded meets cost-optimal minimum energy performance requirements in accordance with the respective directive

AIB would like to report on the avoided emissions impact of the Green Building loans financed and/or refinanced from the proceeds of the green bond(s) on an annual basis. Avoided emissions in this analysis are defined as the avoided carbon emissions of the underlying properties when comparing them against a baseline:

- of the average commercial property category (e.g., retail property) in Ireland, on an annual basis

- of the average commercial property category (e.g., student accommodation) in the UK, on an annual basis

- of the average domestic property (for housing real estate developments) in Ireland, on an annual basis.

At the time of methodology development, the eligible UK commercial properties included only student accommodation properties, while properties in Ireland were split between various types of commercial developments. The avoided emissions are a result of these properties being more efficient and less carbon intensive than the average respective property type in Ireland or the UK.

The Carbon Trust has therefore been commissioned to develop a methodology and tool to allow AIB to calculate the annual avoided emissions impact of the current Green Commercial and Residential Building asset pool within the Eligible Green Project Portfolio.

Methodology

Reporting Principles

Reporting of the environmental impacts of green bonds is evolving and is a relatively new concept. However, AIB is committed to reporting on the method used to calculate the avoided GHG emissions for its Green Bond Framework based on:

- *PCAF's The Global GHG Accounting and Reporting Standard Part A: Financed Emissions (2022)[6],*
- *IFI GHG Accounting for Grid Connected Renewable Energy Projects (April 2022)[7];*
- *Green Bond Principles, Voluntary Process Guidelines for Issuing Green Bonds (2021; June 2022 Appendix 1)[8];*
- *Climate Bonds Standard V3.0[9],*
- *Green Loan Principles (Feb 2021),*
- *ICMA Harmonised Framework for Impact Reporting (2023)[10], and,*
- *WBCSD Guidance on Avoided Emissions[11]*

AIB follows the key recommendations outlined in the Green Bond Principles, with external reviewers present across their reporting process. In addition, AIB is committed to reporting greenhouse gas emissions in accordance with the five principles contained within the Greenhouse Gas Protocol, namely relevance, completeness consistency, transparency, and accuracy.

In accordance with the principles of reporting described above, AIB commits to transparent disclosure of any assumptions and estimations used in the calculation of its reporting framework.

Scope of Calculations and Reporting

AIB intends to report the expected or actual quantitative environmental impact of green loan it finances. The reporting includes the estimated reduction or avoidance in greenhouse gases ("**GHGs**") estimated to have occurred from its loans. AIB also evaluates other indicators that are appropriate to report for environmental impact and performance, such as the signed amount and total export (MWh). At this stage, social and other economic indicators are not within the scope of the green bonds in question. Governance indicators are also not in scope.

The reporting includes both green indicators and resulting emissions reductions or avoidance, both of which require assumptions and calculations. The reporting is based on the net-benefit resulting from the

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[6] PCAF (2022). The Global GHG Accounting and Reporting Standard for the Financial Industry. second edition

[7] AHSA-001 - IFI Approach to GHG Accounting for Renewable Energy Projects

[8] ICMA (2021 (with June 2022 Appendix I)), Green Bond Principles, Voluntary Process Guidelines for Issuing Green Bonds

[9] Climate Bonds Standard V3.0 | Climate Bonds Initiative

[10] Handbook Harmonised framework for impact reporting (June 2023)

[11] WBCSD Guidance on Avoided Emissions (Mar 2023)

asset in a given period of operation, rather than the gross emissions change before or after the life of the asset or project.

Calculations include property-by-property impacts, as well as aggregated results across the portfolio of Green Mortgages. Environmental indicators are attributed to AIB on a property-by-property basis, based on the current percentage share financed (where applicable) and disbursed by the bank. The reporting is undertaken on an annual basis, covering the previous 12-month period and considers any dynamic changes in the assets financed or co-financed that occur from one reporting period to another.

Building Energy Ratings (BER)

BER certificates in Ireland provide an indication of the primary energy performance of residential and commercial premises (represented as $kWh/m^2/year$). The certificate rates each building on a scale of A-G with A being the most energy efficient and G the least energy efficient. Each building that is put forward for sale or lease requires a BER certificate.
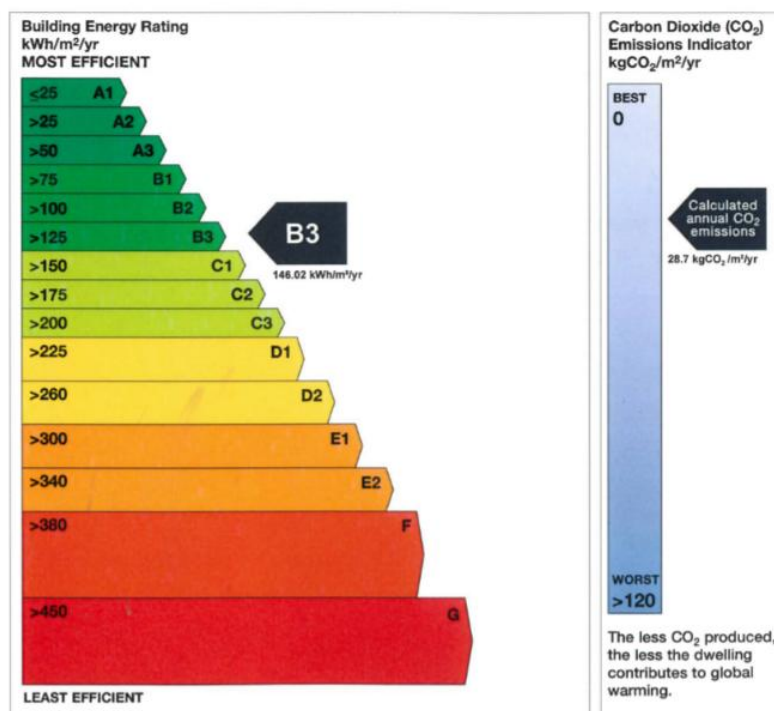

Figure 1 Illustration of a BER certificate indicating A-G scale and the building rating of B3 in this instance. The BER certificate also provides information on the $kWh/m^2/year$ and $kgCO_2/m^2/year$.[12]

A BER indicates the primary energy performance of a dwelling based on the energy use for space and hot water heating, ventilation and lighting. BER certificates also provide information on the total emissions of the property in kgCO2/m2/yr, which is determined by the source of energy supply such as electricity, natural gas etc. Actual performance will depend on how the occupants operate the dwelling and there is often a performance gap.

BER ratings and calculations are based on the major characteristics of a property including building orientation, insulation levels, type, efficiencies and operation of heating, cooling, DHW and lighting

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[12] BER used in figure 1 is for illustration purposes only.

systems. Occupancy patterns are also included in the calculation of a BER and these are modelled based on notional building use assumptions. However, the actual energy consumption of the property may vary significantly, depending on occupancy patterns, systems controls and operations and may differ significantly from assumptions made in a BER calculation. Despite the stated limitations, BER data is considered to be a good relative indicator of projected primary energy consumption and carbon emissions and is the best proxy to use given that AIB does not have access to the actual energy consumption and carbon emissions of their pool of Commercial or Residential Buildings.

Not all the BER certificate data is available in AIB's systems to be extracted. At present, only the BER category (A1, A2, etc.) is extractable, therefore the methodology is designed to cope with this limitation, but also utilise the building specific BER energy and carbon intensities when they become available.

SEAI data updates – energy factors and carbon emissions actors

It has been communicated from SEAI that new properties added to the BER database from 1 November 2019[13] will be assessed using updated carbon emission factors and energy factors. From analysis of the data, prior to this date, these had remained constant.

Energy factors are used to calculate the primary energy from the delivered energy figures. Delivered energy is the actual amount of energy consumed by the household, while primary energy includes an allowance for the energy "overhead" incurred in extracting, processing, and transporting fuel or other energy carrier to the building. The default data point modelled in a BER assessment is the delivered energy figure and primary energy figures are the obtained via a primary energy factor applied to the total delivered energy. Similarly, the CO2 figures are estimated using an emission conversion factor applied to the delivered energy value for the individual use case at the property.

The primary energy factor and CO_2 emission factors for electricity have been reduced from 2.7 to 2.08 and from 0.643 $kgCO_2$/kWh to 0.409 $kgCO_2$/kWh respectively. These reflect the decarbonisation of the broader energy system in Ireland.

SEAI do not retrospectively apply the new carbon emission factors and energy factors to the entire dataset, they get corrected over time when new BER certificates are issued for each property. Therefore, any new AIB properties added to the pool that have their BER certificates calculated in 2020, will be calculated using updated emission factors and energy intensities. The baseline therefore will be artificially higher than it should be.

In order to test the materiality of this, a bottom-up analysis was conducted by the Carbon Trust, applying the updated energy and carbon emission factors to the entire dataset using the detailed delivered energy data provided by SEAI. The impact of this on the final impact numbers was <-10%. Given that this analysis is not possible on the non-domestic dataset (as the delivered energy data isn't provided by SEAI), and the estimated impact on the figures is less than 10%, it is recommended that AIB do not adjust the baseline data but revisit this bottom-up analysis to keep abreast of its materially and disclose this in the impact report.

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[13] https://www.seai.ie/publications/Roadmap-for-DEAP-4.2.0.pdf

Energy Performance Certificates (EPC)

EPCs are mandatory to issue for newly constructed, sold or rented commercial and residential properties in England and Wales The certificates provide an indication of the energy performance of buildings (represented as $kWh/m^2/year$). The certificate rates each building on a scale of A-G with A being the most energy efficient and G the least energy efficient. Additionally, EPCs display the environmental impact of the property ($kgCO_2/m^2/year$) and suggested technological improvements to the building's energy efficiency.

EPC rating is a product of a software calculation based on the key characteristics of a property, such as building orientation, insulation levels, type, efficiencies and operation of heating, cooling, and lighting systems, which are appraised by a qualified assessor during an audit. Occupancy patterns are also considered in the calculation of an EPC and these are calculated on the basis of a notional family with a standard occupancy pattern. However, the actual energy consumption of the dwelling may vary significantly (the energy performance gap), depending on occupancy patterns, systems controls and operations and may differ significantly from the notional assumptions made during EPC calculations. Despite the stated limitations, EPC data is considered to be a good relative indicator of projected energy consumption and carbon emissions, and is the best proxy to use given that AIB does not have access to the actual energy consumption and carbon emissions of their pool of UK Green Commercial Building loans.
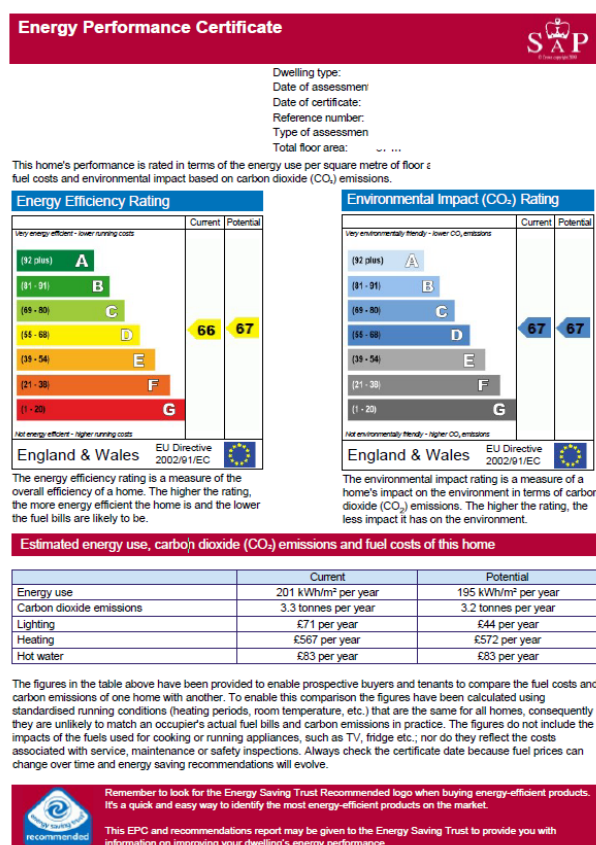

Figure 2: Illustration of an EPC certificate indicating A-G scale and the building rate of D in this instance. The EPC certificate also provides information on the $kWh/m^2/year$ and $kgCO_2/m^2/year$[14]

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[14] Anonymized example EPC from the public EPC register

UK University Accommodation Properties

The UK Ministry of Housing, Communities & Local Government (MHCLG) provides an open database of both commercial and domestic EPC certificates in England and Wales. There are currently no precise figures for database coverage of the total commercial building stock in England and Wales. However, it includes EPCs from all buildings constructed, sold or let since 2008, except if the property owners actively opted out of public information sharing. Therefore, the database is the most complete set of updated data on property energy and carbon performance available.

The published commercial data includes more than 800,000 EPCs, of which 3679 properties fall into 'Residential Institutions – Universities and Colleges' category, which includes halls of residences and other university facilities. This category corresponds to the type of assets currently present in AIB's UK portfolio, and was therefore used to determine the baseline figure for average CO2 emissions of that building category.

The original data set has been screened for erroneous values and filtered to include only unique values. Practically that involves removing duplicate values for EPCs issued during multiple property transactions overtime to keep the most recent emissions intensity figure per building. The bottom 1% (least efficient) carbon efficiency values have also been filtered out, because of extremes outliers present in the dataset (e.g., over 1000 $kgCO_2/m^2$/year for a number of properties). Subsequently, an average of BUILDING_EMISSIONS variable has been calculated, resulting in a figure of 66.4 $kgCO_2/m^2$/year.

The EPC database for universities does not contain energy performance figures, so this has not been calculated for this property type.

The EPC database is regularly updated by the UK Ministry of Housing, Communities & Local Government, and therefore the Carbon Trust suggests that AIB updates the baseline data on an annual basis.

For completeness, other baseline options were considered, such as using sector data from the, Chartered Institution of Building Services Engineers (CIBSE), who publish various energy and carbon intensity benchmark data for the UK via the CIBSE online benchmarking tool[15]. These benchmarks consider data from Display Energy Certificates, which analyse real energy use of premises, however, for university accommodation, the data was last updated in 2012 and therefore may not be representative of current performance. Following a review of other baseline options, it was concluded that EPC data represented the best source of data for calculating the baseline.

Data gaps

Where AIB only has the EPC category (e.g., A, F) on file for each UK commercial property, the England and Wales EPC register has been used to estimate the carbon intensity for those properties, the database does not include energy intensity figures. Where properties could be directly matched to their certificates using the postcode and address information, exact property-specific carbon emission values were extracted. The remaining buildings had readily available EPC bands, i.e. A-G labels without

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[15] https://www.cibse.org/knowledge/energy-benchmarking-tool-beta-version

specific energy consumption and carbon emission values. In such case category weighted averages from the general UK sample have been used as their carbon footprint proxies.

For university accommodation asset in Scotland, the Energy Savings Trust provides the Scottish Energy Register[16]. However, at present, it is possible only to extract individual EPCs based on property postcode, and no analysis on the full sample is possible. Therefore, UK baseline values are used when calculating emissions avoided for Scottish properties. Should the Scottish database be made available publicly in the future, it could be used to inform a separate baseline calculation for AIB commercial university properties in Scotland.

Scope of Green Buildings Impact Assessment

In order to calculate the impact of the pool of Green Commercial Buildings, it is necessary to understand the annual carbon footprint of each property and compare it against a baseline, to understand its incremental impact. The boundary of the carbon emissions assessment includes the carbon emissions associated with the electricity and fossil fuel (e.g., oil, natural gas) use in the property on an annual basis.

As AIB does not currently have access to the actual energy consumption and carbon emissions of each property this requires assumptions to be made. For Irish commercial and domestic properties, Building Energy Rating (BER) certificates have been identified as the most appropriate proxy for estimating these figures. For properties located in the UK, the Energy Performance Certificates (EPC) have been selected as a relevant proxy.

The identified baseline is the annual carbon emissions of the average commercial property, in the relevant geography and sector. This aligns with the approach used in the green bond market for assessing the impact of green bonds that are financing/ refinancing residential and commercial properties. The specific approaches for respective baseline calculations and proxy data are given below.

Commercial property developments in Ireland

For non-domestic (commercial) BER data, the SEAI does not have freely accessible data to download, so the Carbon Trust contacted the SEAI for a download of all non-domestic BER data records. This was provided to the Carbon Trust on 16/02/2022. This, however, did not include the floor area as in previous years so has made the calculation of energy intensity per m^2 impossible, and we have therefore not updated the baseline this year. The approach from last year is as below.

The data provided in the non-domestic BER database has been used to establish the baseline (country average) in primary energy use (kWh/m^2/year) and carbon emissions (kgCO$_2$/m^2/year) for each specific category/sector of commercial properties in Ireland.

SEAI states in the User Information Guide of the domestic BER tool that it manages a quality assurance system for the BER database, however, it takes no responsibility for undetected errors in the data set. It is assumed to be the same for the non-domestic dataset. Therefore, the Carbon Trust has performed a supplementary analysis of the BER database which has identified outliers in the dataset, which present

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[16] https://www.scottishepcregister.org.uk/

very high energy intensity figures. The top 1% has therefore been screened out of the analysis to ensure that the baseline figures are more realistic.

The raw SEAI dataset contains 46 different sector types. This presents a few key challenges. Firstly, the sample size to inform the baseline for certain sector types is very small, and therefore heavily skewed towards more efficient properties. Secondly, a few of the sector types are similar and overlapping in places. To correct this, we followed the approach used by the Central Statistics Office in Ireland[17], and categorised the sectors into 13 broader sector groups.

As with the domestic SEAI data set, the Carbon Trust assumes that there are no duplicates in the SEAI database, as has been verbally confirmed by representatives at SEAI. It is understood that if a property has been through multiple BER assessments, the latest (newest) BER certificate data is presented in the database. Therefore, all properties, excluding the outliers mentioned in the previous paragraph, have been considered in the analysis.

As with the domestic dataset, it is unclear as to when the BER database will be updated by SEAI and to what extent this will affect the BER benchmarks. The Carbon Trust suggests that AIB undertakes an annual review of the AIB impact tool and reaches out to SEAI to see if they have an updated database available.

Data gaps

Where the AIB only has the BER category (e.g., A1, A2) on file for each of the properties, the SEAI non-domestic database was used to estimate the carbon and energy intensity for those properties. Average carbon intensity values were calculated for each BER and building broad sector group and used as their carbon footprint proxies. If these values were not available, or unrealistic (i.e. negative values) the average for each BER category across the whole data set is used.

Where a building does not have a BER category assigned, the minimum required to comply with building standards in that year was applied.

Scope of Green Residential Buildings Impact Assessment

The Sustainable Energy Authority of Ireland ("**SEAI**") has developed the National BER Research Tool[18] which provides access to the BER certificate data for all domestic properties in Ireland (that have been through the BER assessment process). The database provides BER certificate data and information for approximately 1,038,133 domestic properties (as of November 2023, 828,747 from 1,021,278 properties in February 2022) in Ireland and consists of properties built between 1753 to 2023.[19] This database represents approximately 50% of all domestic properties when compared against the 2011 Census of Population.

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[17] Non-Domestic Building Energy Ratings (CSO)

[18] SEAI - National BER Research Tool

[19] The latest update of the SEAI database was used in the AIB impact tool dated 07/11/2023

The data provided in the BER Research Tool is used to establish the baseline (country average) in Primary energy use (kWh/m^2/year) and carbon emissions (kgCO$_2$/m^2/year) for domestic properties in Ireland.

SEAI states in the User Information Guide of the BER tool that it manages a quality assurance system for the BER database, however, it takes no responsibility for undetected errors in the data set. Therefore, the Carbon Trust has performed a supplementary analysis of the BER database. BERs that, to the best of our knowledge, are considered unrealistic have been excluded for inclusion in the BER analysis. Specifically, BER values of a) zero or less and b) 500kWh/m^2/year or more, have been excluded.

The Carbon Trust assumes that there are no duplicates in the SEAI database, as has been verbally confirmed by representatives at SEAI. It is understood that if a property has been through multiple BER assessments, the latest (newest) BER certificate data is presented in the database. Therefore, all properties, excluding the outliers mentioned in the previous paragraph, have been considered in the analysis.

The weighted average primary energy intensity of all domestic properties in Ireland, which have a BER certificate and are included in the latest available data in BER Research Tool (excluding the outliers mentioned above) is estimated to be 199.8 kWh/m2/year. The weighted average CO2 emissions intensity for the same properties is estimated at 45.6 kgCO2/m2/year. This data is correct as of November 2023.

As discussed in a previous report by AIB[20], (derived from a Central Statistics Office publication) the distribution of properties in the BER Research Tool is likely skewed slightly towards more efficient properties. This is expected given that BER ratings are only required for new, sold or rented properties, and the tool represents 50% of all properties. On discussion with AIB, we decided not to correct for this in the methodology when calculating the baseline as it would have required further assumptions to be made in the methodology. This is a conservative approach and in practice the average carbon intensity in Ireland is likely to be slightly higher than the baseline used in this analysis, however, it also considers the decision not to adjust the baseline with the updated emission and carbon factors.

It is unclear as to when the BER Research Tool will be updated by SEAI and to what extent this will affect the BER benchmarks. The Carbon Trust suggests that AIB undertakes a review of the AIB impact tool and updates the SEAI input on an annual basis.

AIB data gaps

Where the AIB only has the BER category (e.g., A1, A2) on file for each domestic property development, the SEAI National BER research tool has been used to estimate the carbon and energy intensity for those properties.

To do this, the weighted average intensities for the properties contained in the SEAI BER Research Tool have been calculated for each BER category. Where the intensities are missing for properties within the pool of Green Residential Buildings, the estimated intensities are matched to each property using the property's BER category.

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[20] Residential Buildings in Ireland (AIB)

Impact Calculation

Green Commercial and Residential Buildings Impact Calculation

Green Commercial and Residential Buildings Emissions Calculation

To account for data availability challenges when estimating the avoided emissions associated with a Commercial and Residential Property, three options have been made available, all of which provide a sufficient understanding of the emissions associated with the property to assess the impact. Option 1 is the recommended option, with the highest level of granularity and quality, and option 3 is the least granular but still suitable to sufficiently estimate the impact of the green building.

Option 1 – Actual Energy Consumption

1a – Actual energy consumption against supplier specific emissions factor and floor area

$$
\begin{aligned}
\textbf{\textit{Property Emissions Intensity}} &\ (\textbf{\textit{kgCO}}_2\textbf{\textit{e/m}}^2) \\
= \sum &(\textit{Actual Energy Intensity } (kWh/m^2/year) \\
&\times \textit{Supplier Specific Emissions Factor } (kgCO_2e/kWh)
\end{aligned}
$$

1b – Actual energy consumption against nationally specific emissions factor and floor area

$$
\begin{aligned}
\textbf{\textit{Property Emissions Intensity}} &\ (\textbf{\textit{kgCO}}_2\textbf{\textit{e/m}}^2) \\
= \sum &(\textit{Actual Energy Intensity } (kWh/m^2/year) \\
&\times \textit{Nationally Specific Emissions Factor } (kgCO_2e/kWh)
\end{aligned}
$$

Option 2 – Estimated Energy Consumption

2 – Estimated energy consumption per floor area based on BER rating and floor area

$$
\begin{aligned}
\textbf{\textit{Property Emissions Intensity}} &\ (\textbf{\textit{kgCO}}_2\textbf{\textit{e/m}}^2) \\
= \sum &(\textit{Estimated Energy Intensity } (kWh/m^2/year) \\
&\times \textit{Nationally Specific Emissions Factor } (kgCO_2e/kWh)
\end{aligned}
$$

Option 3 – Property Type Estimate

3 – Estimated energy consumption based on property type and location specific statistical data

$$
\begin{aligned}
\textbf{\textit{Property Emissions Intensity}} &\ (\textbf{\textit{kgCO}}_2\textbf{\textit{e/m}}^2) \\
= \sum &(\textit{Estimated Property Type Energy Consumption } (kWh/m^2/year) \\
&\times \textit{Nationally Specific Emissions Factor } (tCO_2e/kWh)
\end{aligned}
$$

Green Commercial and Residential Buildings Avoided Emissions Calculation

To calculate the impact of the pool of Green Commercial and Residential buildings, it is necessary to understand the annual carbon footprint of each property and then compare it against a suitable baseline, to understand its incremental impact. The identified baseline is the annual carbon emissions of the average commercial or domestic property, across the specific region. This aligns with the approach used in the green bond market for assessing the impact of green bonds that are financing/ refinancing residential and commercial properties.

Calculation of Baseline Carbon Intensity

$$\textit{Baseline Carbon Intensity } (\textit{\textbf{kgCO}}_2\textit{\textbf{e/m}}^2\textit{\textbf{/year}})$$
$$= (\sum \textit{Regional Average Residential or Commercial Properties Energy Consumption } (kWh)$$
$$\times \textit{Relevant Emissions Factor } (kgCO_2e/m^2))/ \textit{Portfolio Floor Area } (m^2)$$

Once the baseline has been determined, this is then subtracted against the emissions of the property to calculate the difference. This is applied for both energy consumption and carbon emissions.

Calculation of Avoided Emissions

$$\textit{Avoided Emissions } (\textit{\textbf{tCO}}_2\textit{\textbf{e/year}})$$
$$= (\textit{Carbon Intensity of Property } (kgCO_2e/m^2/year)$$
$$- \textit{Baseline Carbon Intensity } (kgCO_2e/m^2/year))$$
$$\times \sum \textit{Floor Area of Property } (m^2)$$

Attribution

As per the guidance of the Partnership for Carbon Accounting Financials (PCAF), and in line with the ICMA Reporting Metric and Databases Harmonised Framework, it is recommended that AIB *also* report their attribution.

The area of impact assessment related to green bonds and more widely the accounting of financed carbon emissions, is developing rapidly. Our aim is to represent current best practice and where possible move that forward. To this end we have considered current market practice, recognised impact reporting standards including ICMA's Harmonised Framework for Impact Reporting, and from the related area of emissions reporting, the PCAF methodologies, specifically around attribution.

$$\textit{Attribution Factor} = \frac{\textit{Outstanding Amount } (EUR)}{\textit{Property Value at Origination } (EUR)}$$

If neither the total project cost nor property value at origination is available, a 100% attribution should be applied.

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