Methodological guide to quantifying avoided greenhouse gas emissions

Green Buildings – Green Financing

V2

May 2023

Contents

1. Overview and objectives

In 2017, Icade issued its first Green Bond for €600 million to finance the low-carbon strategy of its Office Property Investment business. In November 2021, Icade updated its Green Financing Framework, to keep it in line with the industry's highest standards.

This included setting more ambitious eligibility criteria for Green Investments financed by green debt instruments, enhancing them with the criteria included in the EU Taxonomy at the time. The framework complies with the Green Bond Principles 2021 as published by the ICMA and the Green Loan Principles 2021, as published by the LMA.

In December 2021, Icade extended its use of green finance by reclassifying the €600 million bond issued in January 2021 as a green bond.

The proceeds are used for the financing and/or refinancing of existing and/or future Eligible Green Investments (together the "Eligible Green Portfolio"), exclusively located in France, that would fall under the following definition: Eligible Green Portfolio refers to (i) Buildings owned by Icade's Office Property Investment Division, exclusively located in France, including , including office assets, business parks and other assets (mainly hotels and retail); (ii) Capital Expenditures.

Green Buildings shall meet all of the following criteria:

1. Distance to public transport not exceeding 400 metres (bus, train, tram, metro, river shuttle, private shuttle bus);
2. Green Lease Committees organized[1] by Icade with tenants to share best practices and draft action plans to reduce energy and water consumption and improve waste management (for occupied assets subject to green lease clauses[2], namely commercial spaces over 2,000 sq.m), subject to tenant approval;
3. At least one of the following Technical Criteria is met:

<table>
<tr><td>Acquisition or Ownership</td><td rowspan="3">Certification:
• HQE™, BREEAM® or LEED®
• New Build, Refurbishment or In Use
• "Excellent" or better / "Platinum" (LEED®)</td><td>Built before 12.31.2020
Energy Performance Certificate = A or better OR in the top 15% of energy efficient buildings[3]</td><td rowspan="2">Built after 12.31.2020
Primary Energy Demand (PED) lower by at least 10% than Thermal Regulation (RT) threshold[3]</td></tr>
<tr><td>Under Construction</td><td></td></tr>
<tr><td>Under Refurbishment</td><td>Achieve an energy (PED) reduction of at least 30% or complies with the Energy Performance of Buildings Directive[3]</td><td></td></tr>
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1- Existing or planned at the reporting date.
2- Law No. 2010-788 of July 12, 2010 on the national commitment to the environment.
3- European Taxonomy criteria7

1. Overview and objectives

Capital expenditures involve investments in the energy transition of existing properties falling under one of the following categories:

- **Energy efficiency**: Investments in individual energy performance improvement measures aiming at improving energy efficiency. These may include, but are not limited to: insulation; windows and doors; light sources; heating, ventilation and air-conditioning systems; water heating systems; district heating and heat pumps; thermostats and sensing equipment; building automation and energy management systems; smart meters;
- **Renewable energy**: Investments in installation, and operation (including maintenance and repair) of new or existing renewable energy production facilities, such as: solar photovoltaic and solar thermal energy systems; wind turbines; geothermal energy solutions with life cycle GHG emissions from the generation of electricity lower than 100g CO_2e/kWh; purchase of renewable energy for electricity consumption under medium- and long-term power purchase agreements (maturity greater than 5 years);
- **Clean transportation**: Investments related to installation and operation (including maintenance and repair) of new or existing low-carbon transport infrastructure promoting the use of low-carbon transport solutions in urban areas (electric vehicles charging stations, bicycle parking, bicycle storage and bicycle lanes).

Icade is committed to both quantifying and reporting avoided emissions as a result of the buildings and projects financed under the Green Financing Framework and publishing this methodological guide.

The purpose of this document is to describe both the methodology and assumptions used to calculate the greenhouse gas emissions avoided, as of 2022.

Nota bene: the previous methodology, covering reports from 2017 to 2021, is available on demand.

2. Methodological concepts

This methodology has been developed based on key concepts related to carbon accounting including the following reporting guidelines in particular :

- "***GHG Protocol***", developed by the World Resources Institute and the World Business Council for Sustainable Development; and
- "***Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting***", published in October 2017.

2.1. Baseline scenario

In order to calculate the emissions avoided, a baseline scenario must be defined for comparison.

The baseline scenario provides the reference for comparing a project scenario. This baseline may have more than one source:

- Applicable regulatory requirements;
- Common practice (average benchmark);
- Amount recorded before the project.

2.2. Project scenario

This refers to the project under consideration (example: Building A or Capital Expenditure B). Avoided emissions are presented as the difference between project emissions and baseline emissions.

2.3. Additionality

This principle states that emissions may be deemed "avoided" only if the scenario under consideration goes beyond common practice and current regulatory requirements.

2.4. Conservative approach

This approach consists in taking into account the least favourable scenario and reporting conservative results in terms of carbon footprint. This ensures that reductions in greenhouse gas emissions are not overestimated.

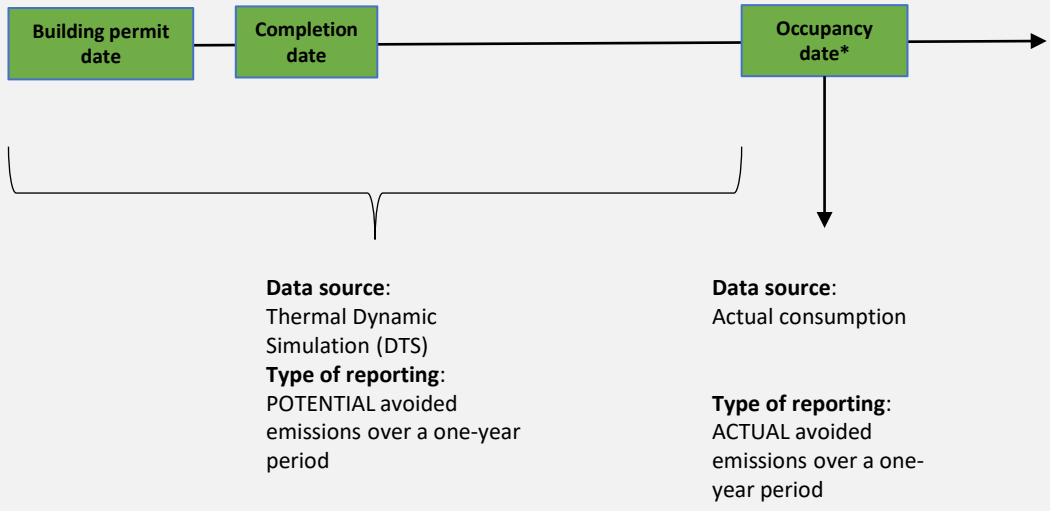
2. Methodological concepts

2.5. Types of avoided emissions

In order to calculate avoided emissions under Icade's Green Financing, emissions are grouped into two categories:

- **ACTUAL avoided emissions :** are expressed over a one-year period and calculated further to the building's actual occupancy (i.e. above a threshold of at least a 20% occupancy rate) using actual consumption data;
- **POTENTIAL avoided emissions :** are expressed over a one-year period and calculated using data resulting from theoretic calculations of energy consumption for green buildings and capital expenditures

The diagram below shows the different types of avoided emissions for green buildings:



* ***Occupancy date**: date at which more than 20% of the asset's floor area has been occupied for at least one year.*

Avoided emissions are calculated using data from January 1st to December 31st, of the reporting year.

3. Data sources

Energy consumption data for the portfolio of green buildings under the Green Financing is obtained from 2 possible sources:

(1) Dynamic Thermal Simulation (DTS);

(2) Actual energy consumption (bills);

DTS calculations are carried out by engineering consultancies during the assets' design phase.

Note: the methodology for energy consumption and carbon emissions data for Capital Expenditures is currently under review. Publication planned for June 2024.

3.1. Dynamic Thermal Simulation (all end uses) - Buildings

The Dynamic Thermal Simulation uses 3D modelling of the building's thermal behaviour hour by hour throughout the year. It estimates the projected consumption of the building encompassing all the energy uses of a still unoccupied asset.

3.3. Actual consumption (all uses) - Buildings

Energy bills allow the actual energy consumption (all end uses) of the buildings in the portfolio to be measured once they have had an occupancy rate of at least 20% for at least one year (below this percentage, DTS data is used).

Since 2017, Icade has partnered with DEEPKI, an energy management solution, which has automated the collection of energy bills directly from suppliers for both the common areas (whose energy supply is managed by Icade) and private areas (energy contracts managed directly and independently by each tenant). All billing data is made available in an online dedicated customer platform, allowing Icade to access the total actual consumption of each building and to identify areas that could be improved.

4. Calculation method
4.1 Green buildings

General methodology:

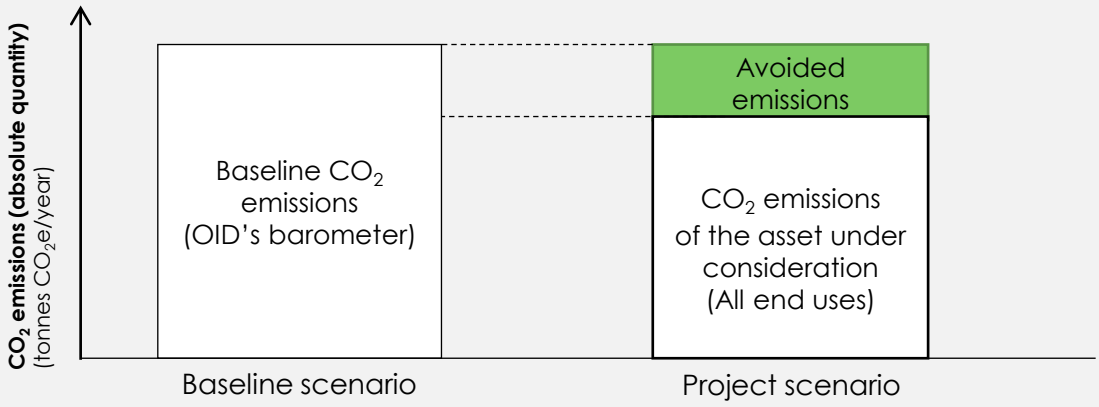
The data used for the building may have two sources:

- Dynamic Thermal Simulation (DTS), where a building has yet to be occupied;
- Actual data (bills, etc.), where a building has had a 20% occupancy rate for at least one year.

Avoided emissions are presented as the difference between the absolute levels of CO_2 emissions under the baseline and project scenarios. They are calculated as follows:

(baseline carbon intensity – building carbon intensity) x floor area of the building under consideration.

The baseline scenario is the carbon intensity (kg CO_2e/sq.m/yr) indicator for "all offices", published in the OID's* yearly Barometer of Energy Performance in Buildings. This barometer stems from the most recent benchmark of energy consumption for all end uses and average carbon emissions from commercial real estate in France.



** Observatoire de l'Immobilier Durable : French Green Building Observatory*

4. Calculation method
4.1 Green buildings

Detailed methodology:

Initial data:

The following initial data is required:

Variables	Unit
Completion date	*DD/MM/YYYY*
Date of actual occupancy	*DD/MM/YYYY*
→ *Data used to determine if the avoided emissions are actual or potential*	
Floor space	*NLA* sq.m*
→ *Data used to determine intensity*	
Electric energy consumption (final energy)	*kWh_{fe}/year*
Natural gas consumption (final energy)	*kWh_{fe}/year*
Fuel oil consumption (final energy)	*kWh_{fe}/year*
District heating energy consumption (final energy)	*kWh_{fe}/year*
District cooling energy consumption (final energy)	*kWh_{fe}/year*

**Net leasable area (NLA): refers to a building's habitable areas. It excludes any vertical and horizontal circulation areas, stair landings and areas occupied by built structures (walls, posts, etc.).*

Calculating energy consumption:

The five types of energy consumption are added together to obtain the total final energy consumption (EC) of the building under consideration:

$$EC_{f,\,building\ n,\,total} = EC_{f,\,building\ n,\,elec} + EC_{f,\,building\ n,\,gas} + EC_{f,\,building\ n,\,fuel\ oil} + EC_{f,\,building\ n,\,heat} + EC_{f,\,building\ n,\,cold}$$

Where:

- $EC_{f,\,building\ n,\,total}$ = *total annual final energy consumption of building$_n$ (kWh_{fe}/year).*
- $EC_{f,\,building\ n,\,elec}$ = *final electric energy consumption of building$_n$ (kWh_{fe}/year).*

  elec = electricity

  gas = natural gas

  fuel oil = domestic fuel oil

  heat = heating (from a district network)

  cold = cooling (from a district network)

4. Calculation method
4.1 Green buildings

Calculating energy intensity:

The energy intensity (EI) of each building is defined as the ratio between the sum of each type of the building's energy consumption and its floor area:

$$EI_{building_n} = \frac{\sum EC_{building_n}}{floor\ area_{building_n}}$$

Where:

- $EI_{building_n}$ = annual energy intensity of building$_n$ (kWh_{fe}/NLA sq.m/year).
- $EC_{building_n}$ = annual final energy consumption of building$_n$ (kWh_{fe}/year).
- Floor area $_{building_n}$ = building's floor area (NLA sq.m).

Calculating energy savings:

For energy savings (in MWh), the calculation is as follows:

$$ES_{building_n} = \frac{[EI_{base} - EI_{building_n}] \times floor\ area_{building_n}}{1000}$$

Where:

- $ES_{building_n}$ = energy savings of building$_n$ compared to the baseline(kWh_{fe}/sq.m/year).
- EI_{base} = baseline energy intensity (kWh_{fe}/NLA sq.m/year)*
- $EI_{building_n}$ = annual energy intensity of building$_n$ (kWh_{fe}/NLA sq.m/year).
- floor area $_{building_n}$ = building's floor area (NLA sq.m).

* The OID publishes a yearly Barometer of Energy Performance in Buildings (across France), with average intensities in energy by type (offices, residential, retail, etc.) and by construction period.

3 baseline scenarios for offices are selected to compare Green Buildings against, according to construction period: 2000-2004 / 2005-2011 / 2012.

4. Calculation method
4.1 Green buildings

Calculating carbon intensity:

The calculation of a building's carbon intensity (CI) is based on final energy consumption:

$$\mathrm{CI}_{building\ n} = \frac{[EC_{f,\ building_n,\ elec} \times EF_{\ elec}] + [EC_{f,\ building_n,\ gas} \times EF_{\ gas}] + [EC_{f,\ building_n,\ fuel\ oil} \times EF_{\ fuel\ oil}] + [EC_{f,\ building_n,\ heat} \times EF_{\ heat}] + [EC_{f,\ building_n,\ cold} \times EF_{\ cold}]}{floor\ area}$$

Where:

- $CI_{building\ n}$ = *building's carbon intensity (kg CO_2e/NLA sq.m/year).*
- $EC_{f,\ building\ n}$ = *annual final energy consumption of building$_n$ (kWh$_{fe}$/year).*
- *EF = emission factor (kg CO_2e/kWh)*

  elec = electricity

  heat = heating (from a district network)

  cold = cooling (from a district network)

  fuel oil = domestic fuel oil

  gas = natural gas
- *Floor area = building's floor area (NLA sq.m)*

Calculating avoided emissions:

The building's annual avoided emissions are calculated based on the same principle whether they are POTENTIAL or ACTUAL. As stated above, the difference between these two types of avoided emissions is related to the source of the data (respectively DTS if the building is not occupied and actual data if the building has an occupancy rate of at least 20%.)

These emissions are calculated as follows:

$$AE_{\ building\ n} = \frac{[CI_{\ base} - CI_{\ building\ n}] \times floor\ area}{1000}$$

Where:

- $AE_{building\ n}$ = *annual avoided emissions (t CO_2e/year).*
- CI_{base} = *baseline carbon intensity → "All Offices" carbon intensity indicator from the yearly barometer published by OID (kg CO_2e/NLA sq.m/year).*
- $CI_{building\ n}$ = *building's carbon intensity (kg CO_2e/NLA sq.m/year).*
- *Floor area = building's floor area (NLA sq.m).*

4. Calculation method
4.2 Capital expenditures

The calculation methodology for avoided emissions from Capital Expenditures is currently under review following the revision of the Green Financing Framework.

It will be published in June 2024.

5. Emission factors

Emission factors are taken from the most up to date regulatory Orders. Updates for emission factors are checked yearly, both for the Green Financing Report and the Universal Registration Document.

Emission factor – energy type	Amount updated	Unit	Latest update
Average electricity mix in France	0.0569	kg CO_2e/kWh_{fe}	2021
Natural gas	0.2047	kg CO_2e/kWh_{fe}	2018
Domestic fuel oil	0.3247	kg CO_2e/kWh_{fe}	2017
Renewable electricity used in buildings	0	kg CO_2e/kWh_{fe}	-

Emission factor – district networks	Amount updated	Unit	Latest update
Paris heating networks, Paris and bordering municipalities, Paris	0.154	kg CO_2e/kWh_{fe}	2023
Hauts-de-Seine heating networks, La Défense-Enertherm network, Courbevoie	0.028	kg CO_2e/kWh_{fe}	2023
Paris heating network, Climespace, Paris	0.211	kg CO_2e/kWh_{fe}	2023
Thassalia heating network, Marseille	0.049	kg CO_2e/kWh_{fe}	2023
Paris cooling network, Climespace, Paris	0.008	kg CO_2e/kWh_{fe}	2023
Suc Urban Cooling network, Courebvoie	0.011	kg CO_2e/kWh_{fe}	2023
Hauts-de-Seine cooling network, Courbevoie, La Défense-Enertherm network	0.012	kg CO_2e/kWh_{fe}	2023
Thassalia cooling network, Marseille	0.011	kg CO_2e/kWh_{fe}	2023

The list above illustrates some of the most common district heating and cooling networks in the green portfolio. The complete list is in the avoided emissions spreadsheet.

6. Data sources and references

Green Buildings

Energy and carbon intensities under the baseline scenarios for buildings have been taken from the following:

All End Uses:

Type of baseline	Amount	Unit	Source
Energy intensity – final energy, offices, 2000	163	kWh_{fe}/NLA sq.m/year	2022 OID Barometer
Energy intensity – final energy, offices, 2005	162	kWh_{fe}/NLA sq.m/year	2022 OID Barometer
Energy intensity – final energy, offices, 2012	133	kWh_{fe}/NLA sq.m/year	2022 OID Barometer
Carbon intensity – all offices	12	kg CO_2/NLA sq.m/year	2022 OID Barometer
Energy intensity – Top 15% - primary energy, all offices	169	kWh_{pe}/NLA sq.m/year	2022 OID Barometer

The conversion factors to convert final energy into primary energy (used for comparison to the Top 15% most energy-efficient buildings of the national building stock) are as follows:

Type of data	Qty	Unit	Source
Electricity conversion factor	2.3		Order dated August 4, 2021, relating to energy performance assessments (DPE)
Gas conversion factor	1		Order dated February 8, 2012 relating to energy performance assessments (DPE)
Fuel oil conversion factor	1		Order dated February 8, 2012 relating to energy performance assessments (DPE)
Conversion factor for district heating	1		Order dated February 8, 2012 relating to energy performance assessments (DPE)
Conversion factor for district cooling	1		Order dated February 8, 2012 relating to energy performance assessments (DPE)

6. Data sources and references

Capital Expenditures

The data sources and references for avoided emissions from Capital Expenditures is currently under review following the revision of the Green Financing Framework.

They will be published in June 2024.

[3] Choice of the most recent data to date