METHODOLOGY FOR THE CALCULATION OF AVOIDED EMISSIONS OF GREEN BUILDINGS

BANCA POPOLARE DI SONDRIO

POSITIVE CARBON IMPACT

Bologna, 12/07/2023

Copying prohibited.

Contents

Copying prohibited.

1. EMISSIONS METHODOLOGY

This section provides an overview of CRIF's methodology to estimate avoided CO_2 emissions of Banca Popolare di Sondrio's green buildings portfolio (following 'Portfolio').

The assessment relies on four pillars:

- Calculation of buildings' related greenhouse gas emissions;
- Identification of a national benchmark;
- Calculation of portfolio positive impact;
- Reporting measures.

1.1. Calculation of buildings' greenhouse gas emissions

The calculation of GHG emissions of Banca Popolare di Sondrio's Green Buildings consists of three approaches:

1. The CO_2 emissions are available through a valid Energy Performance Certificate (following 'EPC'). In Italy, EPCs provide this information in a standard format. Estimated CO_2 emissions result from an automatic computation by professional software in line with existing national legislation on energy efficiency and the characteristics of the assets as provided by the real estate valuer.

   This approach is implemented for the larger share of the Portfolio.

2. The estimation of CO_2 emissions is the result of a data management process through an automatic algorithm implementing the Primary Energy Demand.

   This approach is executed for a small portion of the Portfolio for which the EPC label and Primary Energy Demand are available but not CO_2 emissions due to lack of data provided by regional energy cadastres.

3. The CO_2 emissions are estimated by assigning a benchmark value based on the national distribution specific to the energy class of the property, geolocation, age of construction and its physical characteristics.

Copying prohibited.

1.2. Identification of a National benchmark

To address the problems related to the lack of building energy efficiency data through regional energy cadasters, the Ministerial Decree on 26/06/2015 introduced a new national database, SIAPE, managed by ENEA. The SIAPE database represents the most important available data pool on the energy efficiency of Italian real estate stock, and CRIF has identified it as the data source for national benchmarks.

The reference value for emissions of residential properties in Italy is 39,1 kg CO_2 per square meter per year. However, as shown in the left graph in figure 1, it varies according to the climatic zone.

The reference value for the primary energy demand for residential properties at national level is 195,1 kWh per square meter per year. This parameter is strongly related on the climatic zone, higher for the "F" and lower to the "A" and "B".

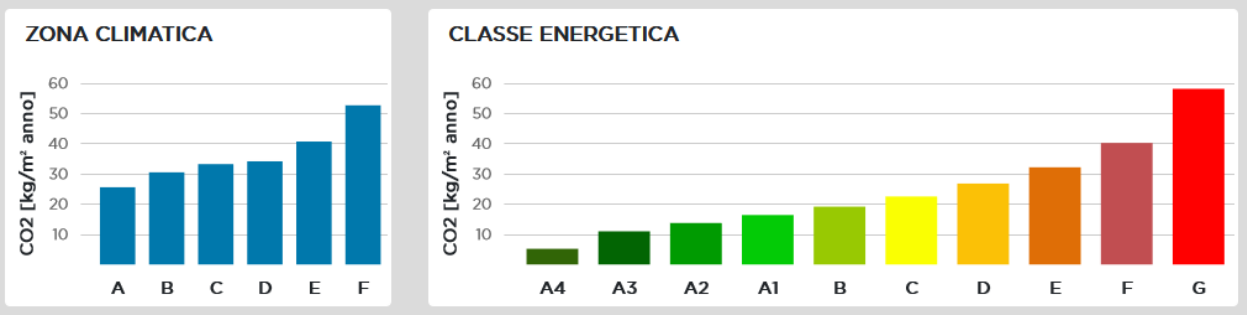

Figure 1 – Residential Buildings - Average of emissions for climate zone (zona climatica) and EPC label (classe energetica) from SIAPE portal

The reference values for emissions and primary energy demand for non-residential properties in Italy are, respectively, 64,3 kg CO2 per square meter per year and 305,6 kWh per square meter per year.

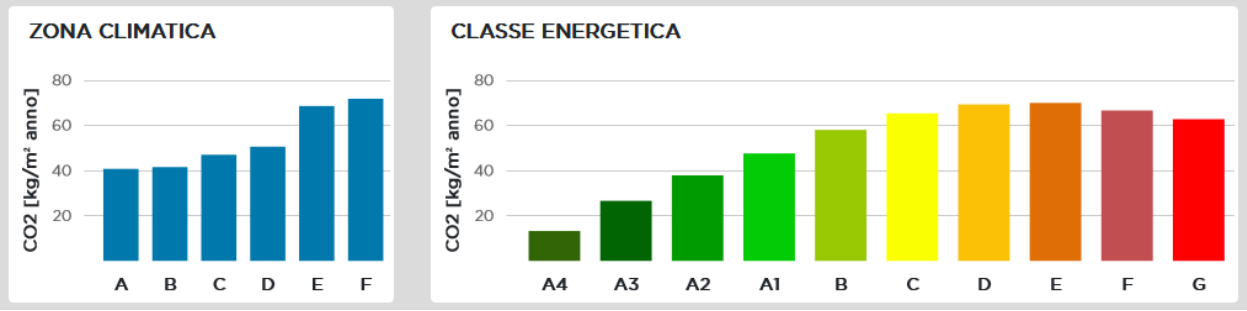

Figure 2 – Commercial Buildings - Average of emissions for climate zone (zona climatica) and EPC label (classe energetica) from SIAPE portal

Copying prohibited.

1.3. Financed emissions

Intending to measure Banca Popolare di Sondrio's financed emissions for both mortgages for residential properties and commercial real estate, CRIF's methodology is in line with PCAF[1] standard. Accordingly, the following steps are followed:

1.3.1. Attribution of emissions

The first step consists of the identification of a proper attribution factor: Loan-to-value (LTV)
Thus, the attribution is equal to the ratio of the outstanding amount at the time of GHG accounting (t) to the property value at loan origination[2] (t_0):

$$Attribution\ factor_t = \frac{Outstanding\ amount_t}{Property\ Value_{t_0}}$$

The attribution factor is constantly updated by changing the numerator following the mortgage repayment plan. The denominator remains constant over time, and it represents the whole value of properties (e.g. the sum of dwelling and garage values). A cap of 1 is applied to the attribution factor.[3]

1.3.2. Financed emissions

The emissions of buildings are calculated as the product of a building's energy consumption and computed attribution factor as in the previous section:

$$Financed\ emissions = \sum_i^t Attribution\ factor_{i,t} \times Estimated\ emissions_{\ i,t}$$

Where, i = property in Banca Popolare di Sondrio's portfolio at time t.

[1] Available at: https://carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf, pag. 77-88.

[2] When the property value at origination is not feasible to obtain, financial institutions shall use the latest property value available and fix this value for the following years of GHG accounting (i.e., the denominator remains constant). The scope of this methodology is on-balance mortgages; off-balance are not included.

[3] The bank emission saving cannot be greater than the real one.

Copying prohibited.

Estimated emissions' calculation relies on **Section 1.1**. In the applied methodology, no distinction is made between private or corporate mortgages. Concerning energy and emissions data, higher limits have been applied to limit errors in data. The limits for emissions are 80 kg per square meter per year, which is the average emissions of buildings in the worst energy class. Instead, the upper limit for energy consumption is 300 kWh, the average of buildings with poor efficiency.

1.3.3. Positive carbon impact

Starting from SIAPE's data, the portfolio's positive impact in terms of emission is calculated.

$$Positive\ Carbon\ Impact = [\ (\sum_{i}^{t} Attribution\ factor_{i,t} \times Benchmark\ emissions_{\ i,t}\ ) - Financed\ emission\ ] \times Building\ surface$$

The formula expresses the total amount of savings in kg of CO^2 for the guarantees under investigation, considering the attribution factor and a market benchmark. A cap of 2,000 and a floor of 20 square meters is applied to the building surface. In case of missing data, the surface has been estimated from the cadastral category, using the statistics provided by *Agenzia della Entrate.*

Copying prohibited.

1.4. Reporting measures

Once the emissions of every building are known or estimated (section 1.1), an analysis of all the mortgage guarantees shows portfolio performance, and the difference with the national benchmark is executed (section 1.2). Finally, the financial impact of each contract is calculated (see section 1.3), and the following impact indicators show the portfolio features in terms of energy efficiency:

- **Positive carbon impact:** It measures the positive impact of lower carbon emissions by considering the attribution factor and a benchmark. It is expressed in tons per year.
- **Positive carbon impact per million euros invested:** It measures the positive impact per million euros invested in tons per year.
- **Energy-saving:** Portfolio energy savings are calculated starting from the EPC and the national benchmark information. The measure is obtained from the difference between actual data and benchmark and multiplying the result for the surface.

Allocation (mln €)	Positive carbon impact (tons)	Positive carbon impact (tons per 1 mln €)	Square metres	Energy saving (MWh)
1,000 €	20,000	20.0	1,200,000	100,000

Table 1 – Example of portfolio impact

Copying prohibited.

CRIF is a global company specializing in credit bureau and business information, outsourcing and processing services, and credit solutions. Established in 1988 in Bologna (Italy), CRIF has an international presence, operating over four continents (Europe, America, Africa and Asia).

Via M. Fantin, 1-3 | 40131 Bologna, Italy

Tel. +39 051 4176111

Fax +39 051 4176010

Email info@crif.com

www.crif.com

Copying prohibited.