

Methodology for estimating the impact of the Green Bond

The extent of the impact generated by CDP's Green Bond 2023 was analyzed and estimated from an environmental and socio-economic point of view, using well established assessment methodologies¹.

More specifically, two types of impact estimates were made:

- environmental, in terms of the reduction in CO2 equivalent and absolute physical indicators, specific to each eligible category;
- socio-economic, in terms of employment, production and value added, for the share of the portfolio allocated to Italy (over 96% of the total). With regard to the portion of investments allocated outside the Italian territory, the domestic return impacts were estimated in terms of production and value added.

Environmental impact assessment of projects

The environmental impact assessment of the initiatives included in the Green Bond portfolio was carried out starting from the Eligible Green Categories of the Framework; the disbursed resources were divided for all categories², and an analysis of the specific environmental impacts was carried out for each one, through the identification and valuation of the related indicators, in accordance with the ICMA guidelines³.

Bond	Eligible Green Categories	Disbursed (€/mln)
Green Bond 2025	Energy Efficiency	301
	Clean Transportation	103
	Renewable Energy	74
	Circular Economy	22
Portfolio Total		500

For all the projects financed by the Bond, the environmental impact was estimated, through calculations based on physical data produced by the beneficiaries, linked to the performance of production processes, infrastructures, energy efficiency measures and other types of financed projects, as provided for in the investment plans and corporate business plans.

In particular, the reduction of CO2e emissions was calculated as a result of the financed interventions in the Energy Efficiency, Clean Transportation and Renewable Energy categories. It was thus possible to quantify precisely the reduction in CO2e for operations corresponding to 478 million euro of loans, equal to 96% of the total value of the portfolio. For the "Circular Economy" category, it was not possible to estimate, through physical indicators, a reduction in emissions.

¹ The analyses and assessments were carried out internally within the CDP organization, in particular by the 'Monitoring and Impact Analysis' area.

² Information relating to the investment by category was found in the documents relating to loans and/or projects. As regards the investment plans that provide for actions to be implemented in several categories of the Framework, the total CAPEX was divided between the relevant categories, through the available data or, in the absence thereof, with estimates.

³ ICMA, "Harmonised-Framework-for-Impact-Reporting-Green-Bonds", June 2025

The methodology developed to quantify the GHG emissions avoided by the financed projects, estimated based on project parameters provided by the counterparties, is based on an adaptation of several international standards and references. The PCAF methodology represents the main reference standard for the identification and quantification of GHG emissions avoided associated with the projects and provides guidelines based on a Life Cycle Approach, where applicable.

In addition to the PCAF methodology, which defines the general framework for the methodological setting, other European standards were also considered as references for specific types of projects

- European Investment Bank (EIB), Version 11.3, January 2023, “Methodologies for the Assessment of Project GHG Emissions and Emission Variations”;
- International Financial Institutions Technical Working Group on Greenhouse Gas Accounting (IFI TWG), April 2022, Harmonized IFI Default Grid Factors 2021 v3.2;
- Department for Energy Security and Net Zero, 2025, Greenhouse gas reporting: conversion factors 2025⁴.

In line with the Global GHG Accounting and Reporting Standard for the Financial Industry, developed by the PCAF Global Core Team, avoided emissions are allocated on a pro rata basis, by assigning an environmental impact attribution factor to CDP’s Green Bond, taking into account: (i) the financing committed by CDP, (ii) the company’s investment plan, and (iii) the share of CDP financing disbursed

The reduction of greenhouse gas emissions is:

- reported in CO₂ equivalent (CO₂e), which is the unit of measurement used internationally to express, in a consistent manner, the impact on the climate of different greenhouse gases and hydrofluorocarbons with a 100-year global warming potential⁵, as identified in the IPCC Assessment Reports. The most important greenhouse gases, apart from carbon dioxide (CO₂), are methane (CH₄) and nitrous oxide (N₂O);
- assessed by category, in relation to the value invested in the portfolio for the specific category, obtaining an indicator of the intensity of greenhouse gas emissions reduction per million euro invested (tCO₂e/€ million); this was possible for the three categories for which avoided emissions were quantified, while the reduction intensity was not calculated for the total portfolio value, as the overall investment amount also refers to a category for which avoided emissions were not estimated;
- calculated using a counterfactual methodology, that is, by assessing the emissions reduction generated by the financed investment compared to what would have been emitted in the absence of the project or if the same investments had been carried out without the project specifications that achieve the green objectives and generate the related environmental impacts (baseline or counterfactual scenario).

A more detailed analysis of the environmental impact assessment methodologies is provided for each category of the Green Bond 2025.

Energy Efficiency

The measurement of CO₂e emissions reduction involves the application of different methodologies, depending on the specific features of the financed projects.

For the investment in battery energy storage systems, the annual energy savings expected from the efficiency-enhancing measures were measured and then converted into CO₂e through the emission

⁴ An external expert firm specialized in environmental impact assessment provided the value chain emission factors for certain financed interventions.

⁵ In other words, it is the amount of CO₂ that, over a given time horizon, would cause the same integrated radiative forcing (a measure of the strength of the drivers of climate change) as that generated by an emitted amount of another greenhouse gas or a mixture of greenhouse gases. In this regard, the PCAF recommends using 100-year global warming potentials.

factors for high-voltage plants and the related value chain emission factor for the national mix. In the case of financing for industrial energy savings, avoided emissions were instead calculated based on the increased production of finished products enabled by the financed plant, as provided by the counterparty.

For a specific operation in the field of Research and Development, a general economic equilibrium⁶ model was adopted in order to assess the impacts of structural changes over the medium to long term⁷. In this context, investments in R&D indirectly contribute to strengthening the national production structure, improving its efficiency in the use of energy and resources, as well as fostering the development of innovations supporting energy transition processes. The impact estimate is based on the assumption of an inverse relationship between R&D expenditure and the energy intensity associated with the use of gas and fossil fuels in production processes: through this transmission mechanism, the increase in R&D investments translates into a reduction in emissions

Clean Transportation

For the installation of electric vehicle charging points, given that this is a large-scale project involving the deployment of numerous charging stations, including abroad, a direct relationship was assumed between the energy delivered by the charging points and the number of kilometers that can be travelled by electric vehicles powered by them. The equivalent kilometers obtained were then associated with the emissions produced by a conventional vehicle, calculated based on average emission factors by fuel type, assuming that the charging infrastructure will be predominantly used for light-duty vehicles.

The calculation includes the emission factor for electricity consumption and its value chain for charging points installed in Italy, while for those installed abroad only the electricity consumption emission factor has been considered. It should be noted that the charging infrastructure represents part of a broader system and acts as an enabling factor, without directly determining emission reductions. For this reason, only a limited share of avoided emissions was considered, corresponding to 5%, as suggested by the literature⁸, in order to reflect the benefits of the infrastructure.

For the implementation of projects in the local public transport sector, reference was made to feasibility studies provided by the counterparties, which were subject to evaluation within the Second Party Opinion process.

Renewable Energy

The CO₂e emissions reduction was calculated taking into account: the expected annual energy production of each plant, as estimated by the counterparty and adjusted for technological degradation over the useful life of the plant; the national emission factor for intermittent electricity generation in Italy; and the national value chain emission factor for electricity consumption in Italy.

Circular Economy

For the valuation of impacts, a specific impact indicator was identified in relation to the financed investments, aimed at assessing the circularity objective pursued, in particular with reference to the production of steel from end-of-waste materials, based on data provided by the company.

⁶ Global Economic Model given by Oxford Economics.

⁷ 5 years period.

⁸ Lucas, Alexandre & Alexandra Silva, Carla & Costa Neto, Rui, 2012. "Life cycle analysis of energy supply infrastructure for conventional and electric vehicles," Energy Policy, Elsevier, vol. 41(C), pages 537-547.

Socio-economic impact assessment of the portfolio

The socio-economic impact assessment makes it possible to estimate the effects of the operations financed through the Bond on the following variables: i) production, ii) value added, and iii) employment. In particular, the **total impacts** generated by the Green Bond include:

- the *direct impacts*, relating solely to the sector affected by the issuance;
- the *indirect impacts*, relating to the processes activated in other sectors of economic activity (Leontief multiplier);
- the *induced impacts*, deriving from the increase in income stimulated by the financing of the interventions underlying the Bond issuance (Keynesian multiplier).

As input for the assessment, not all of the allocated €500 million were used; instead, a lower amount, equal to approximately €481.15 million of deployed resources, was considered. This is because activities that, despite having mobilized resources, do not have the characteristics required to generate a direct impact on national aggregate demand were excluded from the scope of the analysis. In particular, investments generating an impact abroad were excluded.

The vector of resources obtained at purchase prices was converted into basic prices, considering only the effects produced by the allocated committed resources, with no carryover effects on the economic system.

These resources, broken down by branches of economic activity, represent the input for the CDP-SAM macroeconomic model⁹. This is a model used to analyze the impact of investments on the Italian economic system. The model is based on the Social Accounting Matrix (SAM) for Italy (internally developed based on the Supply and Use Tables published by ISTAT), which provides a detailed representation of the economic and social transactions occurring within an economy over a given period of time, typically one year¹⁰. The key features of the SAM model are as follows:

- a highly detailed representation of the economic system, enabling an in-depth analysis of the economy. The matrix tracks the interactions among different sectors and economic agents, providing a comprehensive view of economic activities and their interrelationships;
- the representation of both economic flows (such as production, consumption and investment) and social flows (such as income distribution and transfers between different households or from the government);
- the model captures the interactions among different sectors and agents, allowing the assessment of how changes in one sector affect others, thereby facilitating an integrated analysis of the economy

This implies that it is possible to assess the impacts affecting the direct beneficiaries of the operations (direct effects), as well as those that are propagated to other economic sectors through intersectoral trade flows (indirect effects) and to increased consumption activated along the entire value chain (induced effects)

⁹ With regard to the model construction methodology, reference is made to Mandras, G., Conte, A., & Salotti, S. (2019). The RHOMOLO-IO modelling framework: a flexible Input-Output tool for policy analysis, European Commission Working Papers on Territorial Modelling and Analysis e Aray, H., Pedauga, L., & Velázquez, A. (2017). Financial Social Accounting Matrix: a useful tool for understanding the macro-financial linkages of an economy, Economic Systems Research.

¹⁰ The estimation methodology is based on a number of simplifying assumptions: i) the economic system is assumed to be initially in equilibrium, and any increase in demand is satisfied by a corresponding increase in production (rather than in inventories); ii) no economies of scale are considered, as primary production inputs (capital and labor) are assumed to be used in fixed proportions and substitution effects are absent; iii) hourly wages, hours worked, the relative intensity of domestic production and imports, and the intensity of employment and value added are held constant (exogenous); and iv) no technological progress is assumed. Impacts in terms of value added and employment are calculated by multiplying the level of production activated by CDP resources by the respective sectoral coefficients, which measure the relative intensity of capital and labor.

In summary, the SAM model provides a powerful tool for analyzing the complex economic and social interactions within a system and for assessing the effects generated by the investment programs implemented by CDP.

The ability of the model to accurately assess the effects of the investments financed through the Bond on the economic system and national employment clearly depends on the correct attribution of expenditure flows to the various product categories defined in the input-output classification and to the geographical areas in which the investments are realized.

With regard to employment impacts, jobs are measured in Full Time Equivalent (FTE) units: this represents the amount of work performed over a year by a full-time employee and constitutes the standard unit of measurement for the volume of labor employed in the production of goods and services included in Gross Domestic Product estimates, as used by ISTAT¹¹. It should be noted that employment impacts refer to jobs created and/or maintained, linked to the labor requirements of the production activated by the investments.

Finally, thanks to CDP's multi-country model, which takes into account global interlinkages among sectors and countries, it was possible to estimate these impact chains both within the domestic perimeter and across foreign economic systems, including the feedback effects on the Italian market of impacts generated by the portion of financing allocated abroad. Indeed, such impacts in foreign markets are relevant for the analysis as they generate a return effect in Italy through an increase in demand for Italian intermediate goods and services.

Financing allocated to projects abroad involved seven European countries (Austria, France, Germany, Greece, Portugal, Slovenia and Spain), for a total amount of approximately 18.85 million euro, contributing to generate positive effects on the national system through return impacts in terms of production and value added.

¹¹ Homogeneous unit of measurement for the volume of work carried out by employees. The unit of work represents the amount of work performed in the year by a full-time employee and provides the unit of measurement for the amount of work performed by part-time employees, by employees with reduced hours (for example, because they receive the earnings supplement fund or because they perform a double job), and by employees with a work duration of less than one year. Source: ISTAT Glossary.