

CLIMATE-RELATED ASPECTS
OF THE BANCO DE ESPAÑA'S
NON-MONETARY POLICY PORTFOLIOS

2024

June

BANCO DE **ESPAÑA**
Eurosistema



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1 Introduction

In 2023 the Banco de España published its first annual report wholly and exclusively dedicated to the financial disclosure of the climate-related aspects of its non-monetary policy portfolios.¹ This publication is part of the annual disclosure commitment announced by the Eurosystem national central banks (NCBs) and the European Central Bank (ECB) in February 2021,^{2, 3} as part of the common stance for applying sustainable and responsible investment (SRI) principles in such portfolios. The 20 Eurosystem NCBs and the ECB⁴ published this information for the first time in March 2023.⁵

This second report, again published in a coordinated approach and pursuant to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD),⁶ furthers efforts to enhance transparency in this area. This edition updates the information disclosed last year on euro-denominated own or investment portfolios (i.e. non-monetary policy portfolios). In addition, for the first time, it now includes climate-related disclosures on non-euro-denominated portfolios.

Although it falls to governments to lead the fight against climate change, central banks also have a role to play in the economic transition needed to achieve the goals set out in the Paris Agreement, contributing to this transition to the extent that their mandates allow. Examples of that contribution include disclosure exercises such as this report or managing investment portfolios in line with SRI principles. Since 2019, SRI principles have been a cornerstone of the Banco de España's own portfolio investment policy.⁷ This approach is in line with Recommendation no. 2 of the Network for Greening the Financial System (NGFS),⁸ which the Banco de España joined in April 2018, along with the ten recommendations published by the NGFS in 2024 to further the integration of SRI practices.⁹

At the same time, the application of these principles forms an integral part of the sustainability drive envisaged in the Banco de España's Strategic Plan 2024.¹⁰ Thus, the Banco de España focuses in particular on the climate change-related aspects that cross over into the areas under

1 Banco de España (2023a).

2 Press release "Eurosystem agrees on common stance for climate change-related sustainable investments in non-monetary policy portfolios", 4 February 2021.

3 Press release "The Banco de España adopts the Eurosystem's common stance for sustainable investment", 4 February 2021.

4 ECB (2023).

5 All of the reports are available at <https://www.ecb.europa.eu/ecb/climate/climate-related-financial-disclosures/html/index.en.html>

6 TCFD (2017). The Task Force on Climate-related Financial Disclosure (TCFD) was set up in late 2015 by the Financial Stability Board (FSB), at the request of the G20, and is made up of representatives from the private sector. It was charged with drawing up a set of voluntary recommendations for the consistent, comparable, accurate and clear disclosure of information on climate change-related financial risks and opportunities.

7 Banco de España (2020a and 2023b).

8 NGFS (2019).

9 NGFS (2024).

10 Banco de España (2020b).

its remit. One such area is the management of its own or investment portfolios; in other words, its non-monetary policy portfolios.

The analysis presented in this report confirms the gradual improvement over recent years in the quality of both the euro and non-euro denominated investment portfolios, in terms of their contribution to combating climate change. Furthermore, the proportion of these portfolios invested in green bonds has progressively increased in recent years, standing in 2023 at 7.1% for euro-denominated portfolios and at 3% for non-euro portfolios. These investments support projects that have a positive environmental impact.

The Banco de España is committed to decarbonising its investment portfolios. Accordingly, it will continue to monitor the climate-related aspects of those portfolios with the ultimate aim of aligning them with the Paris Agreement goals and with the carbon neutral goals defined in the European Climate Law.

2 Governance

As is the case at all of the other Eurosystem central banks, the Banco de España's balance sheet includes various financial asset portfolios that are key to the discharge of its statutory functions.¹¹ These investments, comprising gold and financial assets denominated in euro and foreign currencies, can be grouped into three main categories:

- Monetary policy portfolios resulting from the monetary policy decisions adopted by the Governing Council of the ECB.
- Third-party portfolios managed by the Banco de España on behalf of their third-party owners.
- Investment portfolios created in response to other needs relating to the Banco de España's functions and which are controlled exclusively by its management bodies. These portfolios are denominated both in euro and in foreign currencies.

With respect to the investment portfolios, the Banco de España takes an integrated approach to managing the risks and opportunities offered by the different assets. Thus, the climate change-related aspects are addressed by the governing bodies together with the other key factors.

More specifically, the Banco de España's Executive Commission¹² is responsible for approving the Financial Investment Policy, which has a medium-term outlook and sets out the core principles that govern investment decisions and the procedures on decision-making and reporting to the decision-making bodies. To complement the Financial Investment Policy, every year the Executive Commission approves the Financial Investment Guidelines, which guide investment portfolio management over the short term (the year following their approval).

Responsibility for the integral management of the investment portfolios lies with the Directorate General Operations, Markets and Payment Systems, whose Director is tasked with submitting the relevant proposals to the Executive Commission for its approval, as well as with reporting on their implementation. The Operations Department, supported by the Investments Sub-Committee, is responsible for the day-to-day management of financial operations, while the Financial Risks Department is tasked with monitoring and managing the risks assumed, with the support of the Financial Risk Sub-Committee.

11 Law 13/1994 of 1 June 1994 of Autonomy of the Banco de España. Treaty on the Functioning of the European Union (Official Journal of the European Union of 7 June 2016) and the Statute of the European System of Central Banks and of the European Central Bank (Official Journal of the European Union of 7 June 2016).

12 The Executive Commission comprises the Governor, the Deputy Governor and two elected members appointed by the Governing Council of the Banco de España. Its meetings are attended, in a non-voting capacity, by the General Secretary and the Directors General. See https://www.bde.es/bde/en/secciones/sobreeelbanco/organizacion/Organos_rectores/El_Consejo_de_Go/El_Consejo_de_Gobierno.html

The SRI strategy is presented to the Executive Commission at least once a year, as part of the process for approving the financial investment guidelines. The application and monitoring of this strategy form an integral part of the responsibilities described above.

Beyond matters of a purely financial investment-related nature and to give fresh impetus to the Banco de España's sustainability initiatives, a High-Level Steering Group was set up in 2021, bringing together representatives from the different Directorates General. The aim of this group is to develop a general strategy for combating climate change and to facilitate the coordination of the various areas involved. Although it has not been assigned specific tasks directly related to financial investments, this group promotes analyses of climate change-related risks and opportunities and methodological improvements to enhance decision-making on the Banco de España's sustainable finance investments.

3 Strategy

The Banco de España's investment policy for own portfolios,¹³ both denominated in euro and in other currencies, is governed by the principles of market neutrality, prudence, professionalism, efficiency and SRI (see Figure 1). The Banco de España also subscribes to the common stance adopted by the Eurosystem¹⁴ with respect to the application of SRI principles to non-monetary policy portfolios. In both cases, the ultimate aim is to contribute to the global response needed to meet the Paris Agreement goals in terms of managing financial risks and mobilising capital for green and low-carbon investments, leading by example.

More specifically, the Banco de España has adopted, first of all, a thematic strategy in the form of a specific SRI portfolio. The aim here is to give priority to investments in assets directly related to projects that have a positive environmental impact, thereby incorporating an additional climate change dimension into the standard risk and profitability considerations.

This SRI portfolio comprises direct investment in green bonds denominated in different currencies and holdings in green investment funds (denominated in US dollars and in euro) managed by the Bank for International Settlements (BIS).

The Banco de España began participating in the BIS dollar-denominated investment fund in 2019 (see Figure 2), the year in which it was launched to promote sustainable finance through investments in renewable energy and energy efficiency projects, inter alia, and to support the adoption of best practices to deepen the green bond market.¹⁵ In January 2021 the Banco de España began participating in the BIS' second green bond investment fund, this time comprising euro-denominated bonds.¹⁶

Moreover, the Banco de España monitors the climate-related aspects of all of its euro-denominated investment portfolios, in coordination with the other Eurosystem central banks, as explained in greater detail in Section 5 of this report.

13 Banco de España (2020a).

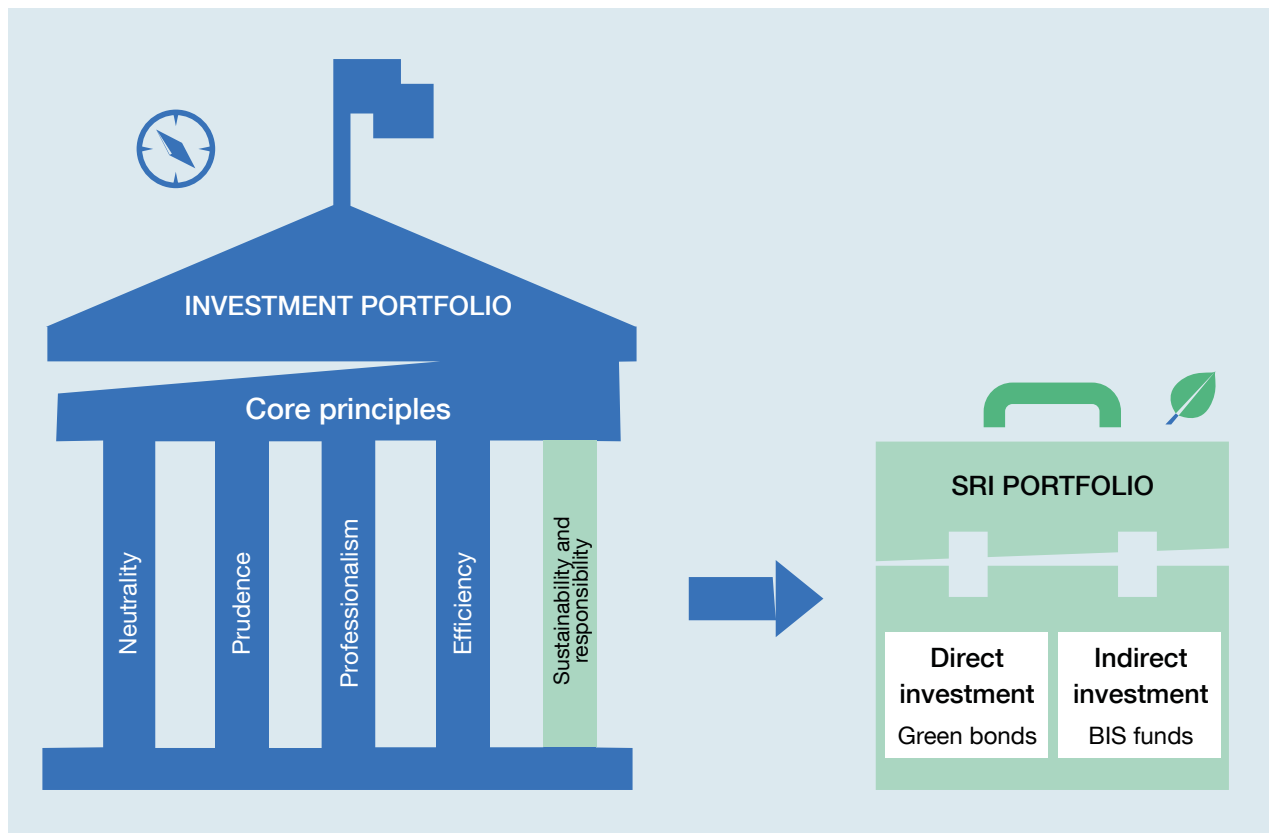
14 Press releases "[The Banco de España adopts the Eurosystem's common stance for sustainable investment](#)" and "[Eurosystem agrees on common stance for climate change-related sustainable investments in non-monetary policy portfolios](#)", both of 4 February 2021.

15 Press release "[The Banco de España is to participate in the green bond fund launched by the BIS](#)", 26 September 2019.

16 Press release "[The Banco de España is to participate in the green bond fund launched by the BIS](#)", 25 January 2021.

Figure 1

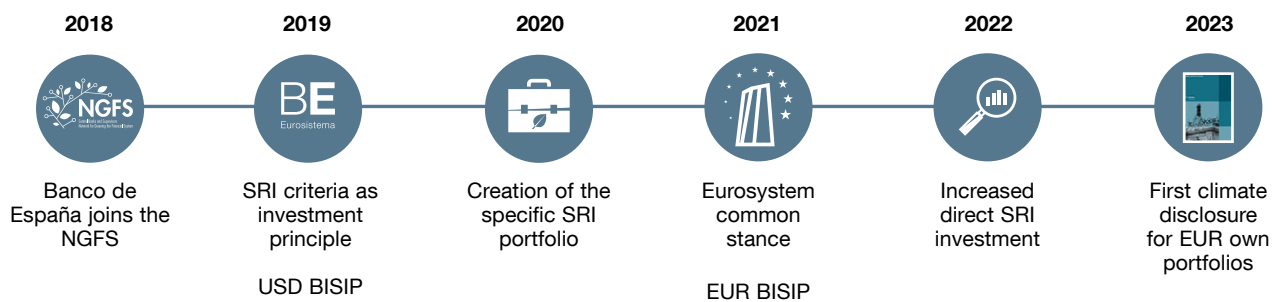
Key elements of the Banco de España's SRI strategy



SOURCE: Banco de España.

Figure 2

Key milestones in the Banco de España's SRI strategy



SOURCE: Banco de España.

4 Risk management

Central banks' investment portfolios are exposed to climate-related financial risks ("climate risks") that could have adverse consequences. The Banco de España has adopted the recommendations and terminology proposed by the TCFD, and distinguishes between transition and physical risks. Transition risks refer to the probability and impact of the economic consequences deriving from adaptation to a carbon-neutral economy. The physical risks refer to the probability and impact of extreme weather events (such as floods), and of progressive or long-term climate change phenomena (such as changes in precipitation patterns).

Although climate risks have their own characteristics, their impact is felt in the form of the traditional financial risks: credit risk, market risk, liquidity risk and operational risk. They are therefore included within the standard risk management procedures, adopting an integrated approach as detailed below.

At the identification and analysis stage, the Banco de España employs, first, traditional risk management tools, which capture climate risks to the extent that they are reflected in the prices, volatility and credit assessments of the investment portfolio assets. Second, the Banco de España is working in conjunction with the Eurosystem to identify the relevant climate-related metrics and on the development and deployment of new scenario analysis and stress-testing tools. The Banco de España is also supporting the Eurosystem in efforts to improve the availability and quality of climate data, along with transparency in terms of how external credit assessment institutions incorporate material climate risks in their credit ratings.

According to the Banco de España's risk strategies and policies, the investment portfolio objectives must be achieved with the least possible risk. SRI principles are incorporated in its investment framework for managing non-monetary policy portfolios. This framework takes into consideration the materiality of the climate risks for the portfolios and defines the priorities for establishing risk management measures. The Banco de España applies a "double materiality" perspective. First, material climate risks have a significant impact due to their ability to generate economic losses or adversely affect capital. Second, it is necessary to identify the positive or negative contribution made by the balance sheet to long-term climate risks in the form, essentially, of the greenhouse gas (GHG) emissions of the agents whose securities comprise the portfolio, or the volume of GHG emissions saved thanks to investment in green bonds (as opposed to conventional bonds). Sovereign debt is the predominant asset class in the Banco de España's investment portfolios. Accordingly, the climate risks depend largely on the transition policies implemented by governments.

The Banco de España mitigates climate risk both through general measures, such as a system of limits, and through climate risk-specific measures, such as setting up the SRI portfolio, as detailed in Section 3.

As the coverage and the quality of the required data improves, so too does the monitoring and reporting of the climate risk exposures in investment portfolios.

In 2023 the Banco de España published its first report wholly and exclusively dedicated to the financial disclosure of the climate-related aspects of its euro-denominated investment portfolios. As noted in the introduction, the scope of this year's report is considerably broader and includes investment portfolios denominated in other currencies.

5 Metrics and targets

5.1 Metrics

This section details the results for the most important climate metrics of euro-denominated portfolios, updating the information published in the 2023 report (see Section 5.1.1), and broadens the scope of the report to include non-euro-denominated portfolios (see Section 5.1.2). The published information thus covers almost 70% of total reserves at end-2023 (see Chart 1). Gold holdings, special drawing rights (SDRs)¹⁷ and cash and cash equivalents (e.g. deposits) are excluded from the climate report because there is no clear and agreed methodology to rate these assets from a climate standpoint.

The metrics used to characterise and assess investments from a climate standpoint are the same in both portfolios, and follow the same methodological approach as in the first report published in 2023, based on the recommendations set out in Task Force on Climate-related Financial Disclosures (2021), Network for Greening the Financial System (2021) and Partnership for Carbon Accounting Financials (2022). At the same time, they are in line with the decisions on the Eurosystem central banks' common disclosure framework adopted by the ECB's Governing Council.¹⁸ In particular, the four metrics used are the following:

- weighted average carbon intensity (WACI),
- total absolute GHG emissions,
- carbon footprint,
- carbon intensity.

Weighted average carbon intensity (WACI) measures a portfolio's exposure to more carbon-intensive agents and is expressed in tonnes of CO₂ equivalent (CO₂e)¹⁹ per million euro. The carbon intensity of each issuer is calculated by normalising its GHG emissions using a measure of its economic activity. A portfolio's WACI is calculated by weighting the carbon intensity score for each securities issuer by the proportion of the investments in those securities.

Total absolute GHG emissions quantify the emissions associated with each portfolio in tonnes of CO₂e. As this is an absolute measure that does not correct for the investment volume, it is of limited use for making comparisons between portfolios and over time, as it is overdependent

¹⁷ Special drawing rights (SDRs) are included under the heading claims on the International Monetary Fund (IMF). They are an international reserve asset created by the IMF to complement its members' official reserve assets. The SDR is defined in terms of a basket of currencies. Its value is determined as the weighted sum of the exchange rates of five major currencies: the US dollar, the euro, the Japanese yen, the pound sterling and the Chinese renminbi.

¹⁸ See Table A2.1 (Annex 2) for the formulae of the four metrics.

¹⁹ Carbon dioxide equivalent (CO₂e) is a measure used to compare different GHG emissions. It converts other GHG emissions into the CO₂ equivalent (i.e. with the same global warming potential). For more information, see [Eurostat](#).

Chart 1

Reserves of the Banco de España, 2023 (a)



SOURCE: Banco de España (2024).

a Assets that fall within the scope of this climate report are shown in green and assets excluded owing to a lack of a standardised methodology are shown in grey. The size of the rectangles is proportional to the asset amounts, based on the accounting valuation used in Banco de España (2024).

on portfolio size. To correct this constraint and offer a clearer picture, this metric must be accompanied by others that correct for the different size of investments.

The carbon footprint is the ratio of a portfolio's total GHG emissions to its volume and is expressed in tonnes of CO₂e per equivalent million euro invested. This makes it possible to compare portfolios of different sizes at different points in time.

Carbon intensity measures the volume of GHG emissions normalised using a measure of economic activity and is expressed in tonnes of CO₂e per million euro. This metric quantifies a portfolio's carbon emission efficiency by normalising the size of each issuer in respect of their revenues.

Importantly, these metrics were recommended by the TCFD, with a view to classifying investments in assets issued by financial and, especially, non-financial firms in terms of their climate change impact. Yet in central banks' portfolios other types of assets generally tend to predominate. This is true of the Banco de España, as detailed in the following sections. For this reason, the metrics have had to be adapted somewhat, to apply them to assets such as sovereign bonds.

More specifically, in the case of sovereign bonds three approaches were considered to calculate the metrics described above:

- country (or production) approach, under which all GHG emissions produced in a country, including those linked to domestic consumption and exports, are assigned to the sovereign issuer;
- government approach, which considers the central government's GHG emissions;

- c) consumption approach, which includes the GHG emissions produced in the country, correcting for trade effects; emissions assigned to imports are included while those assigned to exports are excluded.

It should be noted that the country and consumption approaches both give rise to a double counting problem that results in an upward bias in the indicators of any portfolio that includes securities other than sovereign bonds. This is because the GHG emissions of the non-sovereign agents will also be included in the total emissions produced in the country.

In the case of the country approach, the information published in 2023 for euro-denominated portfolios did not consider emissions related to land use, land use change and forestry (LULUCF) (see Box 1 for more details about these emissions). This year's report includes the same information as in 2023, but also details the results including these LULUCF emissions, as can be seen in the corresponding tables.

5.1.1 Euro-denominated portfolios

The Banco de España's euro-denominated own portfolios include euro-denominated fixed-income securities issued by euro area residents and non-residents that are not held for monetary policy purposes. This portfolio includes sovereign bonds, sub-sovereign bonds (issued by regional governments), bonds issued by supranational entities and state agencies, and covered bonds. Sovereign bonds make up the bulk of the own portfolios, accounting for 95% of the total at end-2023 (see Chart 2).

Table 1 presents the results of applying the metrics described to the Banco de España's euro-denominated investment portfolios at end-2023, the last full year available.²⁰ This table also shows the share of investment in green bonds by asset type for 2023 (see Annex 3 for previous years). More details are provided in Section 5.1.3 with additional metrics.

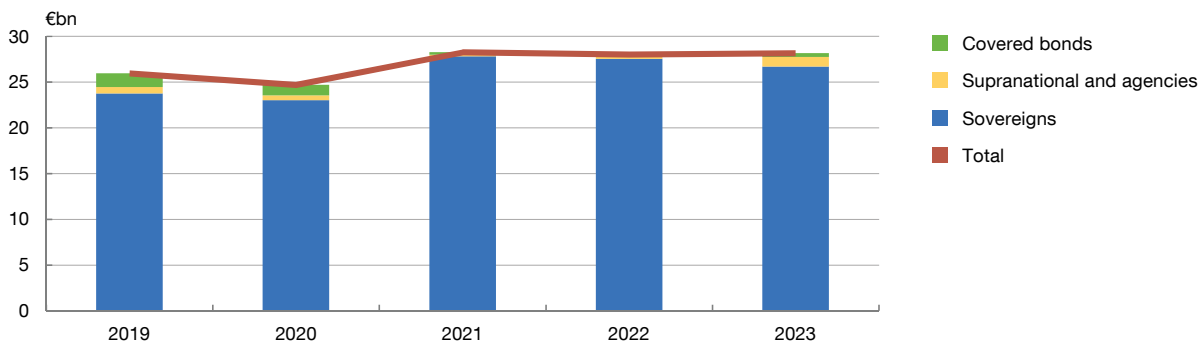
A dual perspective is advisable to interpret these values: a time perspective, to help assess how they evolve over time; and a spatial or geographical perspective, to enable comparison with the portfolios of other leading central banks.

As regards the spatial or geographical perspective, the work performed by the Eurosystem has resulted in the creation of a common disclosure framework which will clearly be helpful, albeit bearing in mind that these portfolios may have different mandates and/or a very different breakdown. Based on the information published by the NCBs in 2023, the Banco de España's portfolio is one of the largest, resulting in a high total emissions indicator. However, once this size effect is corrected, its relative emissions are significantly below the median of the group.

²⁰ Figure A1.1 (Annex 1) sets out the main variables used by type of approach and asset. More details are provided in Annex 2. Meanwhile, Box 2 discusses the data sources for the variables used to calculate the indicators.

Chart 2

Holdings in euro-denominated investment portfolios, 2019-2023 (a)



SOURCE: Banco de España.

a Nominal amounts. The holdings reported are the position at year-end.



Table 1

Main climate-related metrics for euro-denominated investment portfolios at end-2023

Holdings in euro-denominated own portfolios, 2023	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn)		26.7			1.5	1.1	0.4
WACI	140.1	120.9	74.7	7.6	1.8	2.1	0.6
(tCO ₂ e/€m GDP (PPP), gov. exp., population, €m revenues)	100%	100%	100%	100%	85%	89%	76%
Total absolute emissions	3,734,441	3,222,160	400,257	4,486,693	447	405	42
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	85%	89%	76%
Carbon footprint	140.1	120.9	15.0	168.3	0.4	0.4	0.1
(tCO ₂ e per €m invested)	100%	100%	100%	100%	85%	89%	76%
Additional metrics							
Carbon intensity	140.1	120.9	74.5	7.6	4.9	15.7	0.6
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	85%	89%	76%
Percentage of green bonds		4.5%			54%	64%	25%
(%)		100%			100%	100%	100%

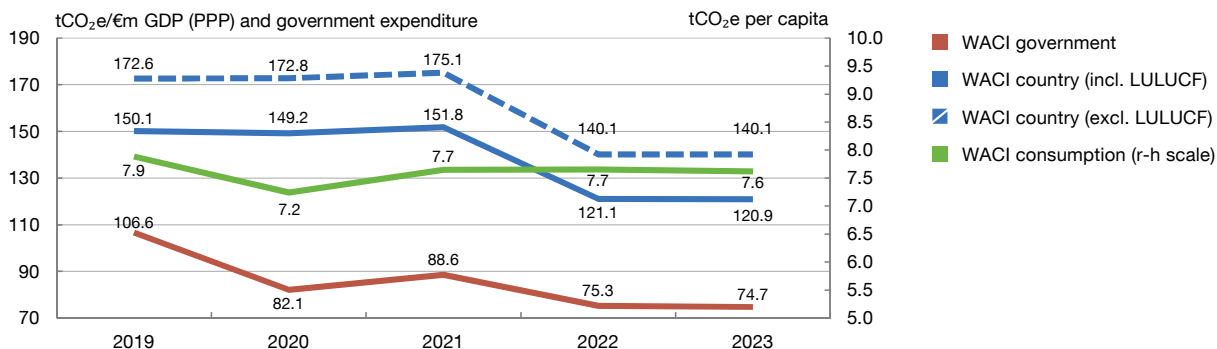
SOURCE: Banco de España calculations drawing on ISS, C4F, World Bank, EEA and BIS data.

NOTE: The percentages in italics beneath the metrics denote the level of data availability. The metrics are calculated using nominal values. The holdings refer to the position at year-end. Holdings in the euro-denominated BISIP fund are included under their respective asset class. Information taken from the data providers ISS and C4F which were selected in the joint Eurosystem procurement process, led by the Bundesbank, in 2021-2022.

a This asset class includes sovereign and sub-sovereign bonds and bonds issued by public sector entities.

Chart 3

WACI according to different approaches: sovereign bonds in euro-denominated portfolios, 2019-2023 (a)



SOURCE: Banco de España calculations, drawing on ISS, C4F, World Bank and EEA data.

a Previous years' figures have been updated per the data revisions and the latest information available (see Box 2).



This reflects the fact that most of the assets in the Banco de España's portfolios correspond to low carbon intensity issuers. At the date of publication of this report, there is not yet sufficient information to make an up-to-date comparison.

Turning to the time perspective, Table A3.1 (Annex 3) reproduces Table 1 for the years 2019-2022. Focusing on the most notable findings, Chart 3 shows WACI metric developments to 2023 for sovereign bonds, which, as indicated above, account for the bulk of the euro-denominated investment portfolios. As can be seen, leaving aside 2020,²¹ under all three approaches this indicator declined continuously throughout the period analysed, reflecting a gradual improvement in portfolio quality in terms of its contribution to fighting climate change. It is important to note that the data for 2023 are incomplete, as they combine the portfolios for that year with emissions information for the previous year (see Box 2). Thus, any changes between those two years is determined entirely by changes in the portfolio size and composition.

Charts 4.a, 4.b and 4.c show the changes in total absolute carbon emissions, the carbon footprint and carbon intensity, respectively, for sovereign bonds. However, this chart only shows the results based on the government approach which, as mentioned above, avoids the problem of bias owing to double counting of GHG emissions of agents other than the sovereign issuer.

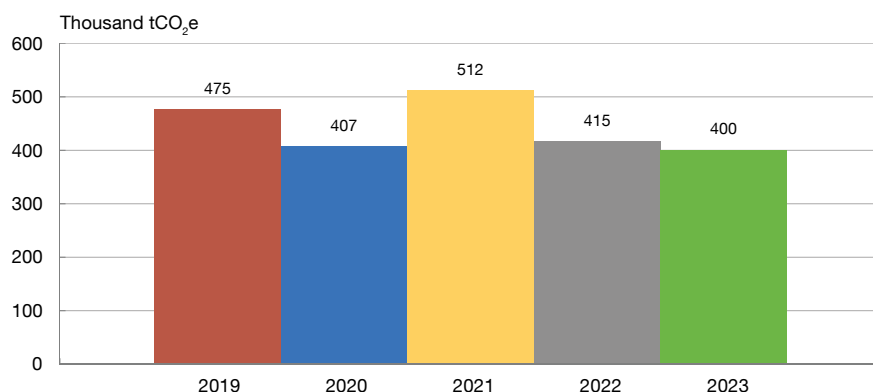
The trajectory of total absolute GHG emissions essentially reflects the changes in portfolio size. As indicated above, this limits its usefulness for the purposes of analysis. Like the WACI metric, the relative metrics (such as the carbon footprint or carbon intensity), which correct this size

²¹ 2020 was the worst year of the COVID-19 pandemic, which had a singular and atypical impact on both the economic indicators and GHG emissions.

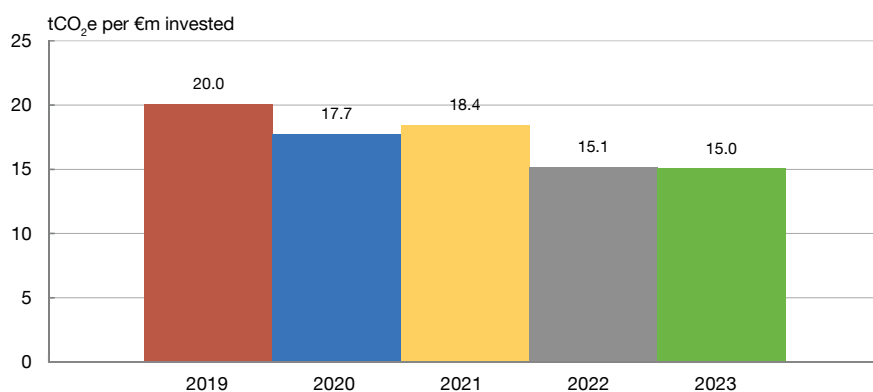
Chart 4

Metrics for sovereign bonds in euro-denominated portfolios, 2019-2023: government approach (a)

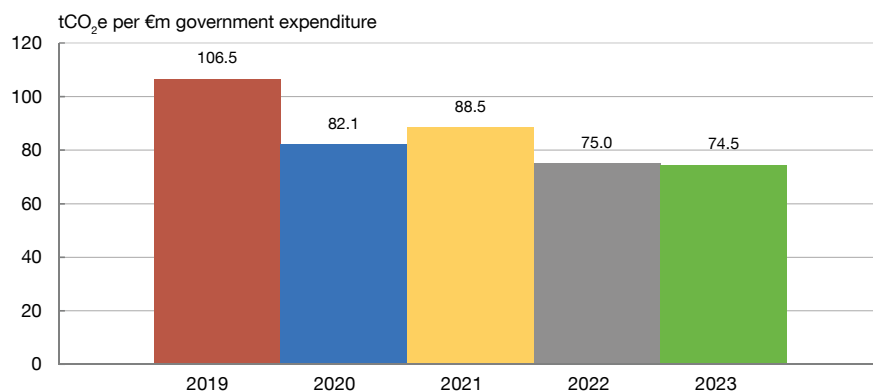
4.a Absolute emissions



4.b Carbon footprint



4.c Carbon intensity



SOURCE: Banco de España calculations, drawing on ISS, C4F, World Bank and EEA data.

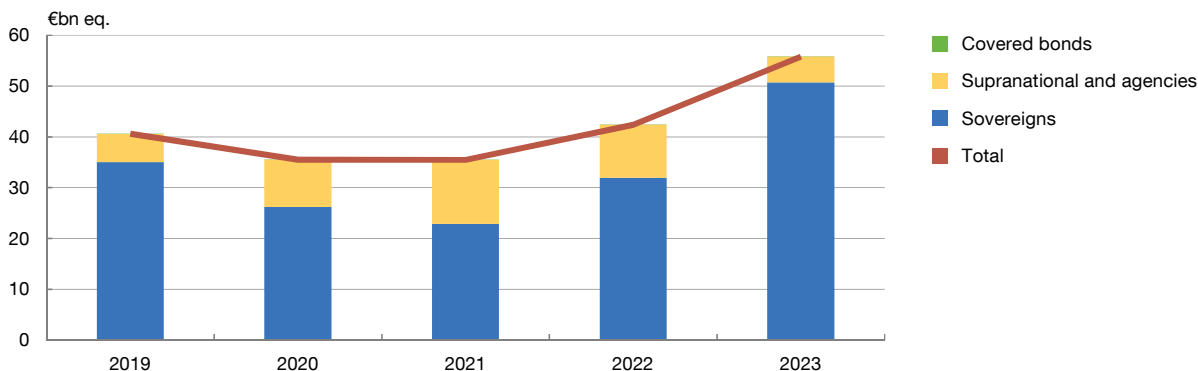
a Previous years' figures have been updated in line with revised data and new information published (see Box 2).



effect, improved compared with the start of the period analysed. As in the case of the WACI metric, both indicators fell continuously throughout the period analysed once 2020 is taken out of the equation. This echoes the conclusion drawn from Chart 3, showing steady progress towards a portfolio more in line with the climate goals.

Chart 5

Holdings in non-euro-denominated investment portfolios, 2019-2023 (a)



SOURCE: Banco de España.

a Nominal amounts. The holdings reported are the position at year-end.



5.1.2 Non-euro-denominated portfolios

The Banco de España independently manages foreign reserves that have not been transferred to the ECB. These reserves consist of debt securities issued by euro area and non-euro area residents denominated in US dollars, Canadian dollars, pound sterling, yen²² and Chinese renminbi.²³ These portfolios include current accounts, deposits, sovereign bonds, sub-sovereign bonds (issued by regional governments), bonds issued by supranational entities and state agencies, and covered bonds, as well as other foreign currency assets.

The calculation of climate metrics takes into account positions in sovereign and sub-sovereign bonds, bonds issued by supranational entities and agencies, and covered bonds. However, it excludes cash and equivalents and derivatives, since, as mentioned above, there is no standardised methodology for measuring the emissions associated with these products. As a result, the totals shown in this report (see Chart 5) differ from the actual size of the portfolios. In terms of composition, 91% of the reported assets at end-2023 included in the chart are sovereign bonds, compared with 75% in 2022.

Table 2 presents the results of applying the metrics described to the assets reported for the Banco de España's non-euro-denominated investment portfolios at end-2023, the last full year available.²⁴ This table shows the share of investment in green bonds by asset type for 2023 (see Annex 4 for previous years). More details are provided in Section 5.1.3 with additional metrics.

Annex 4 presents Table 2 for each year in the period 2019-2022, showing how the indicators have changed over time. Focusing on the most notable findings, Chart 6 shows how the WACI

²² The exchange rate risk on yen-denominated investments is hedged by swap transactions (mainly against the US dollar).

²³ Banco de España (2024).

²⁴ Figure A1.1 (Annex 1) sets out the main variables used by type of approach and asset. More details are provided in Annex 2. Meanwhile, Box 2 discusses the data sources for the variables used to calculate the indicators.

Table 2

Main climate-related metrics for non-euro-denominated investment portfolios at end-2023

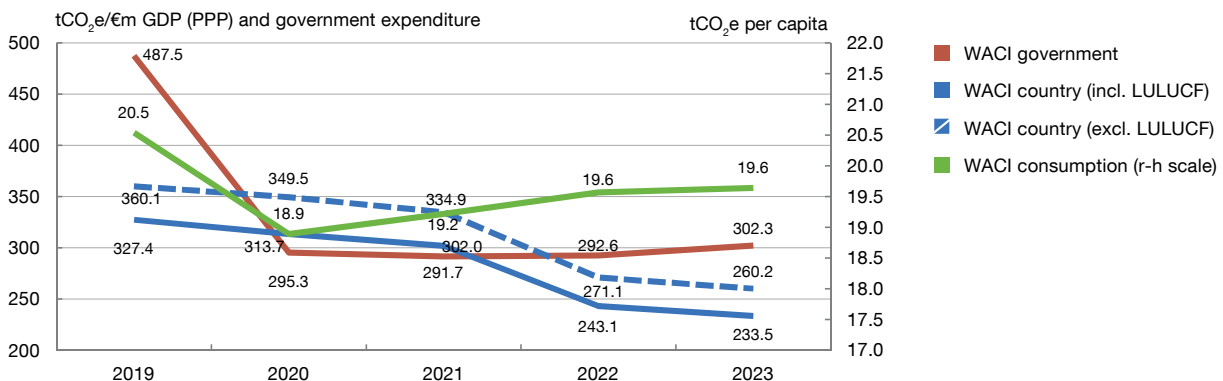
Holdings in non-euro-denominated own portfolios, 2023	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn eq.)		50.7			5.1	5.1	0.001
WACI	260.2	233.5	302.3	19.6	1.1	1.1	0.6
(tCO ₂ e/€m GDP (PPP), gov. exp., population, €m revenues)	100%	100%	100%	100%	89%	89%	100%
Total absolute emissions	13,181,557	11,831,517	1,910,500	14,464,320	108	108	0.1
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	89%	89%	100%
Carbon footprint	260.2	233.5	37.7	285.5	0.03	0.03	0.1
(tCO ₂ e per €m eq. invested)	100%	100%	100%	100%	89%	89%	100%
Additional metrics							
Carbon intensity	260.2	233.5	282.3	19.0	1.1	1.1	0.6
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	89%	89%	100%
Percentage of green bonds		0.6%			27%	27%	100%
(%)		100%			100%	100%	100%

SOURCE: Banco de España calculations drawing on ISS, C4F, World Bank and BIS data.

NOTE: The percentages in italics beneath the metrics denote the level of data availability. The metrics are calculated using nominal values. The holdings refer to the position at year-end. Holdings in the US dollar-denominated BISIP fund are included under their respective asset class. Information taken from the data providers ISS and C4F which were selected in the joint Eurosystem procurement process, led by the Bundesbank, in 2021-2022.

a This asset class includes sovereign and sub-sovereign bonds and bonds issued by public sector entities.

Chart 6

WACI according to different approaches: sovereign bonds in non-euro-denominated portfolios, 2019-2023


SOURCE: Banco de España drawing on ISS, C4F and World Bank data.

metric has evolved for sovereign bonds, which, as indicated above, account for the bulk of the non-euro-denominated investment portfolios. As can be seen, leaving aside 2000, the worst year of the COVID-19 pandemic, under all three approaches this indicator declined in the period analysed (from 2019 onwards), reflecting a gradual improvement in portfolio quality in terms of its contribution to fighting climate change.

Charts 7.a, 7.b and 7.c show the changes in total absolute carbon emissions, the carbon footprint and carbon intensity, respectively, for sovereign bonds. This chart only shows the results based on the government approach which, as mentioned above, avoids the problem of bias owing to double counting of GHG emissions of agents other than the sovereign issuer.

The trajectory of total absolute GHG emissions essentially reflects the changes in the volume of reported assets. As indicated above, this limits its usefulness for the purposes of analysis. The changes in this metric are determined by the effect of the portfolio size mentioned at the start of this section. This can be seen more clearly in Chart 8. Like the WACI metric, the relative metrics (such as the carbon footprint or carbon intensity), which correct this size effect, improved compared with the start of the period under analysis. As in the case of the WACI metric, both indicators declined in the period analysed (from 2019 onwards). This echoes the conclusion drawn from Chart 6, showing steady progress towards a portfolio more in line with the climate goals.

5.1.3 Investment in green bonds

Sections 5.1.1 and 5.1.2 include information on the proportion of both euro and non-euro-denominated portfolios invested in green bonds in 2023 (see Tables 1 and 2, respectively). Further details on these assets, using specific metrics, can be found below.

Charts 9 and 10 show how the relative weight of green bond investments in the Banco de España's euro and non-euro-denominated own portfolios has continued to grow significantly since 2019 as a result of the thematic investment strategy adopted (see Section 3). Once again, analysis of this indicator suggests that the portfolio is increasingly aligned with the aims pursued.

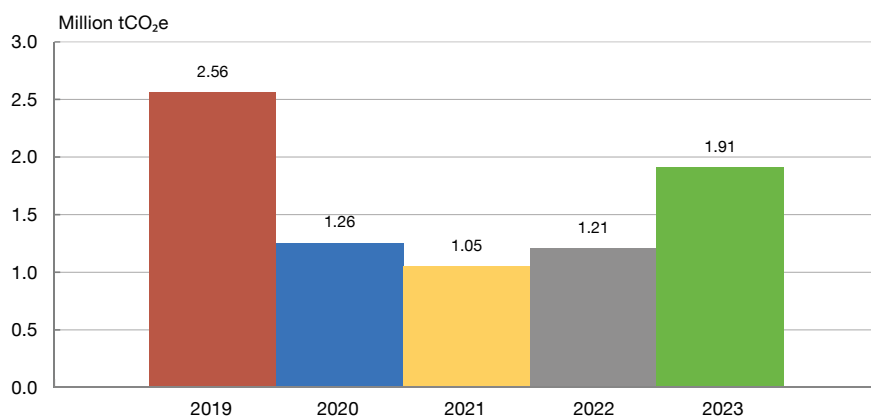
Another relatively common way to measure the environmental impact of investment in green bonds is by estimating "avoided emissions": investment in green bonds translates into funding for renewable energy and energy efficiency projects, among others, which can be seen as one way of reducing GHG emissions, measured in tonnes of CO₂e avoided.²⁵ The BIS compiles this indicator for its green investment funds as an estimation of the annual impact expected of the projects financed using the funds raised by the green bonds once at their expected operating capacity in normal conditions, based on the data provided by the issuers of the green bonds in the investment fund portfolio.

²⁵ This does not include calculation of avoided emissions for direct investments in green bonds in the SRI portfolio owing to insufficient data coverage.

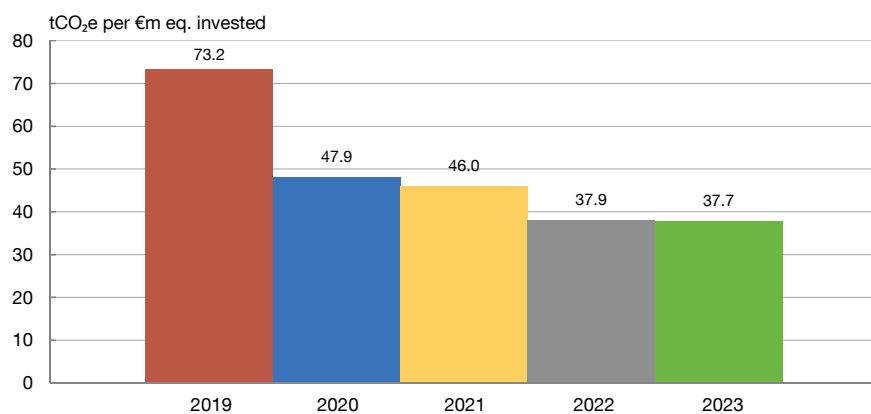
Chart 7

Metrics for sovereign bonds in non-euro-denominated portfolios, 2019-2023: government approach

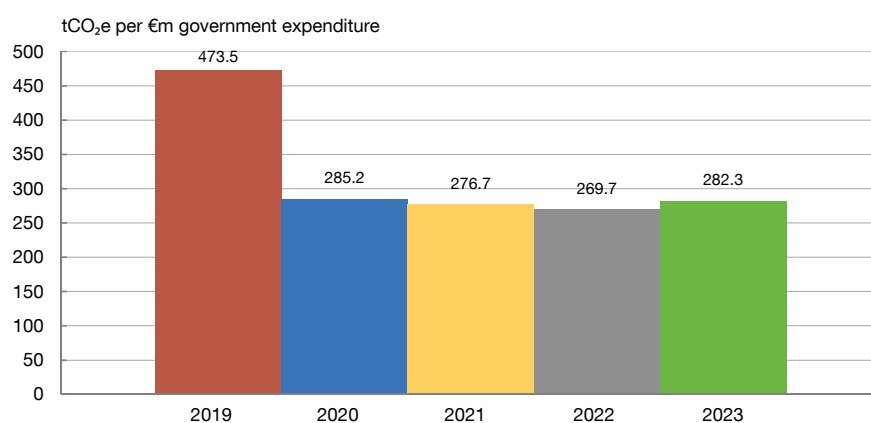
7.a Absolute emissions



7.b Carbon footprint



7.c Carbon intensity

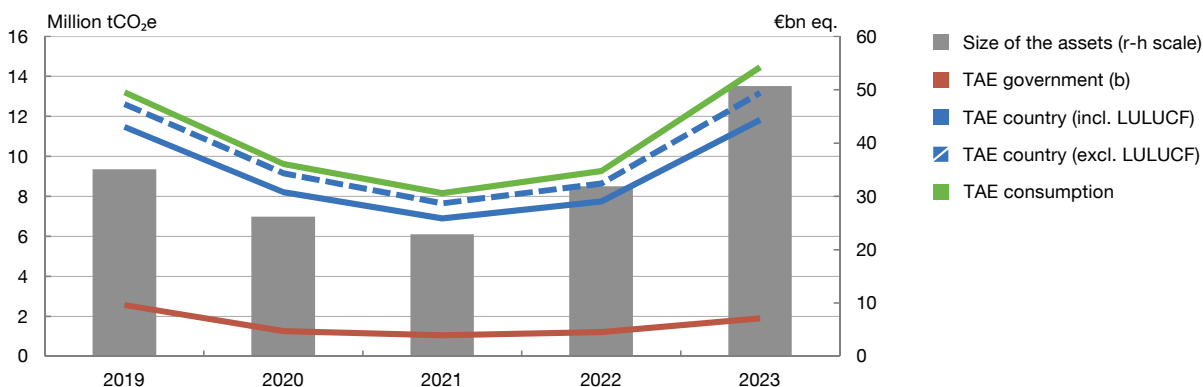


SOURCE: Banco de España calculations drawing on ISS, C4F and World Bank data.



Chart 8

Absolute emissions and size of sovereign assets in non-euro-denominated portfolios (a)



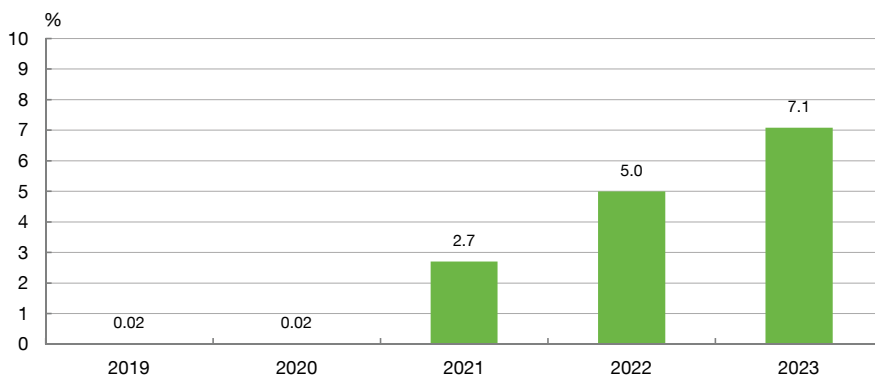
SOURCE: Banco de España calculations drawing on ISS, C4F and World Bank data.

- a Nominal values for sovereign assets. Holdings refer to the position at year-end.
b TAE: total absolute emissions.



Chart 9

Green investment as a percentage of the holdings in euro-denominated investment portfolios



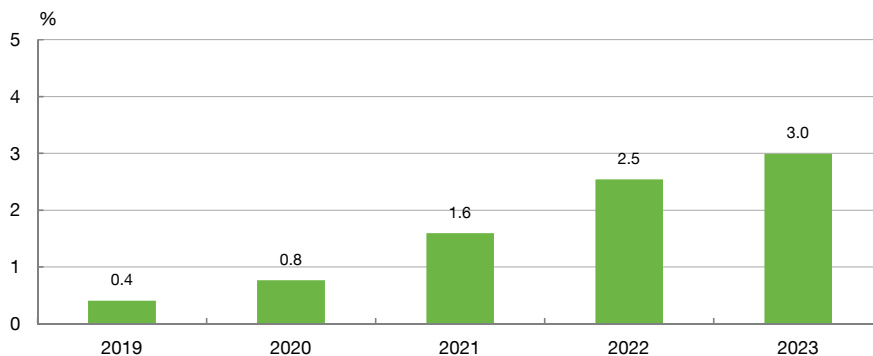
SOURCE: Banco de España calculations.



As Table 3 shows, the estimated environmental impact attributable to the Banco de España's holding in the euro-denominated BIS fund at end-September 2023 was 299,670 tonnes of CO₂e avoided annually. Renewable energy was the main contributor to this total, with an estimated 154,768 tonnes of CO₂e avoided annually, followed by energy efficiency projects (31% of the estimated avoided emissions), clean transport (12%) and biodiversity, sustainable land use, green buildings and waste management (5% combined) (see Chart 11). The environmental impact of these estimated avoided emissions of CO₂e is equivalent to consuming slightly more than 688,000 barrels of oil annually, driving more than 66,000 cars for a year, charging more than 50 billion smartphones or to the electricity used by more than 80,000 households in a year.

Chart 10

Green investment as a percentage of the holdings in non-euro-denominated investment portfolios



SOURCE: Banco de España calculations.



Table 3

Additional metrics relating to indirect holdings of US dollar and euro-denominated green bonds

		2021	2022	2023
Avoided emissions euro-denominated BISIP fund (a)		151,437	393,594	299,670
(tCO ₂ e)		95%	96%	84%
	2020	2021	2022	2023
Avoided emissions US dollar-denominated BISIP fund (a)	69,856	65,175	43,286	44,681
(tCO ₂ e)	100%	94%	95%	83%

SOURCE: Banco de España calculations drawing on the aggregated data provided by the BIS.

NOTE: The percentages in italics beneath the metrics denote the level of data availability. Previous years' figures have been updated per the data revisions.

a Annual avoided emissions estimated for each fund, attributed based on the holding therein. Data as at end-September each year.

As Table 3 shows, the estimated environmental impact attributable to the Banco de España's holding in the US dollar-denominated BIS fund at end-September 2023 was 44,681 tonnes of CO₂e avoided annually. Renewable energy was the main contributor to this total, with an estimated 29,562 tonnes of CO₂e avoided annually, followed by clean transport (11% of the estimated avoided emissions), energy efficiency (10%), biodiversity (7%) and sustainable land use, green buildings and waste management (5% combined) (see Chart 12). The environmental impact of these estimated avoided annual emissions of CO₂e is equivalent to consuming slightly more than 100,000 barrels of oil annually, driving just short of 10,000 cars for a year, charging more than 5 billion smartphones or to the electricity used by more than 8,000 households in a year.

The annual avoided emissions attributable to the Banco de España's investment in these funds varies over time depending on changes in two components: the emissions avoided per fund

Chart 11

Environmental impact of the estimated avoided GHG emissions by type of project, as a percentage. Euro-denominated BISIP (2023) (a)



SOURCES: Banco de España calculations drawing on the aggregated data provided by the BIS.

a Annual avoided emissions estimated for each fund, attributed based on the holding therein. Data as at end-September 2023.



Chart 12

Environmental impact of the estimated avoided GHG emissions by type of project, as a percentage. US dollar-denominated BISIP (2023) (a)



SOURCE: Banco de España calculations drawing on the aggregated data provided by the BIS.

a Annual avoided emissions estimated for each fund, attributed based on the holding therein. Data as at end-September 2023.



participation unit and the Banco de España's overall holdings in the fund. The second factor remained unchanged over 2023, and the changes in emissions avoided are therefore entirely down to the first factor (which, in any event, accounts for most of the changes to this indicator over the entire period considered).

5.2 Targets

The Banco de España has committed to a long-term goal to decarbonise its euro and non-euro-denominated investment portfolios, to make them carbon neutral by 2050. This is in line

with the Paris Agreement goals and with the carbon neutral goals defined in the European Climate Law, which aims for the Union to reach climate neutrality by 2050.

Given the composition of the Banco de España's portfolios (in which sovereign bonds account for a sizeable share), this will also depend on how the decarbonisation process develops in the relevant countries.

As a better understanding is gained of indicators that enable long-term goals to be set, shorter-term interim goals will be designed based on specific indicators, such as an increase in the relative weight of the thematic SRI portfolios, in line with the investment strategy described in Section 3.

Annex 1. Variables by approach and asset type

Figure A1.1

Variables by approach and asset type

	Sovereign and sub-sovereign bonds			Supranational entities and state agencies	Covered bonds
	Approach				
	Country 	Government 	Consumption 		
GHG emissions allocation (scope 1 and 2) 	Emissions produced within a country's physical borders, including domestic consumption and exports Excluding and including LULUCF GHG emissions	Central government's direct and indirect emissions	Domestic demand emissions, taking into account trade effects (including imports and excluding exports)	GHG emissions	
Normalisation 	GDP (PPP)	Central government final consumption expenditure	Population	Revenues	
Attribution 	GDP (PPP)			EVIC	

SOURCE: Banco de España.

Annex 2. Breakdown of metrics and variables

Table A2.1

Description of main metrics

Metric	Formula
Weighted average carbon intensity (in tCO ₂ e/€m revenues, GDP (PPP), Gov. Expenditure or per capita)	$WACI = \sum_i \left(\frac{\text{investment value}_i}{\text{current portfolio value}} \times \frac{\text{GHG emissions}_i}{\text{Revenues}_i, \text{GDP (PPP)}_i, \text{Gov. Expend.}_i \text{ or Population}_i} \right)$
Total absolute emissions (scope 1 and 2 in tCO ₂ e)	$\text{Total absolute emissions} = \sum_i \left(\frac{\text{investment value}_i}{\text{GDP PPA}_i \text{ or EVIC}_i} \times \text{GHG emissions}_i \right)$
Carbon footprint (tCO ₂ e per €m eq. invested)	$\text{Carbon footprint} = \frac{\sum_i \left(\frac{\text{investment value}_i}{\text{GDP PPA}_i \text{ or EVIC}_i} \times \text{GHG emissions}_i \right)}{\text{current portfolio value}}$
Carbon intensity (in tCO ₂ e/€m revenues, GDP (PPP), Gov. Expenditure or per capita)	$\text{Carbon intensity} = \frac{\sum_i \left(\frac{\text{investment value}_i}{\text{GDP PPA}_i \text{ or EVIC}_i} \times \text{GHG emissions}_i \right)}{\sum_i \left(\frac{\text{investment value}_i}{\text{GDP PPA}_i \text{ or EVIC}_i} \times \text{Revenues}_i, \text{GDP (PPP)}_i, \text{Gov. Expend.}_i \text{ or Population}_i \right)}$

SOURCE: Banco de España.

Table A2.2

Carbon emissions by type of issuer

Type of issuer	Sovereigns and sub-sovereigns	Supranational & agencies	Covered bonds
Factor	i) Country emissions, production approach (excluding and including LULUCF) ii) Government sector emissions iii) Country emissions, consumption approach	Emissions scope 1 and 2	Emissions scope 1 and 2

SOURCE: Banco de España.

Table A2.3

Normalisation factors by asset type

Type of issuer	Sovereigns and sub-sovereigns	Supranational & agencies	Covered bonds
Factor	i) GDP (PPP adjusted) ii) Central government final consumption expenditure iii) Population	Revenue	Revenue

SOURCE: Banco de España.

Table A2.4

Attribution factors by asset type

Type of issuer	Sovereigns and sub-sovereigns	Supranational & agencies	Covered bonds
Factor	GDP (PPP adjusted)	Enterprise value including cash (EVIC)	Enterprise value including cash (EVIC)

SOURCE: Banco de España.

Annex 3. Main metrics of euro-denominated investment portfolios, 2019-2022

Chart A3.1

Main metrics of euro-denominated investment portfolios, 2019-2022

Holdings in euro-denominated own portfolios, 2022	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn)		27.5			0.5	0.4	0.1
WACI (b)	140.1	121.1	75.3	7.7	2.4	2.6	1.1
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100 %	100%	70%	77%	41%
Total absolute emissions	3,855,401	3,332,373	415,440	4,640,872	231	220	10
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	70%	77%	41%
Carbon footprint	140.1	121.1	15.1	168.7	0.7	0.7	0.3
(tCO ₂ e per €m invested)	100%	100%	100%	100%	70%	77%	41%
Additional metrics							
Carbon intensity	140.1	121.1	75.0	7.6	12.5	23.1	1.2
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	70%	77%	41%
Percentage of green bonds		3.6%			87%	100%	30%
(%)		100%			100%	100%	100%

Holdings in euro-denominated own portfolios, 2021	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn)		27.8			0.5	0.2	0.3
WACI (b)	175.1	151.8	88.6	7.7	1.5	1.5	1.6
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	44%	74%	22%
Total absolute emissions	4,863,989	4,216,634	511,599	5,868,044	32	5	27
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	44%	69%	22%
Carbon footprint	175.1	151.8	18.4	211.3	0.2	0.04	0.5
(tCO ₂ e per €m invested)	100%	100%	100%	100%	44%	69%	22%
Additional metrics							
Carbon intensity	175.1	151.8	88.5	7.6	1.7	1.1	1.9
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	44%	69%	22%
Percentage of green bonds		2.0%			43%	100%	—
(%)		100%			100%	100%	100%

SOURCE: Banco de España calculations, drawing on ISS, C4F, World Bank, EEA and BIS data. Previous years' figures have been updated per the data revisions and the latest information available (see Box 5.2).

NOTE: The percentages in italics beneath the metrics denote the level of data availability. The metrics are calculated using nominal values. The holdings refer to the position at each year-end. Holdings in the euro-denominated BISIP fund are included under their respective asset class.

a This asset class includes sovereign and sub-sovereign bonds and bonds issued by public sector entities.

b Weighted average carbon intensity.

Table A3.1

Main metrics of euro-denominated investment portfolios, 2019-2022 (cont'd.)

Holdings in euro-denominated own portfolios, 2020	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn)		23.0			1.7	0.5	1.2
WACI (b)	172.8	149.2	82.1	7.2	1.3	—	1.3
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	7%	—	10%
Total absolute emissions	3.973.183	3.430.744	407.223	4.782.031	39	—	39
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	7%	—	10%
Carbon footprint	172.8	149.2	17.7	208.0	0.3	—	0.3
(tCO ₂ e per €m invested)	100%	100%	100%	100%	7%	—	10%
Additional metrics							
Carbon intensity	172.8	149.2	82.1	7.2	1.4	—	1.4
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	7%	—	10%
Percentage of green bonds		0.02%			—	—	—
(%)		100%			100%	100%	100%

Holdings in euro-denominated own portfolios, 2019	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn)		23.8			2.2	0.7	1.5
WACI (b)	172.6	150.1	106.6	7.9	5.0	—	5.0
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	7%	—	11%
Total absolute emissions	4.101.976	3.566.259	475.360	4.766.327	249	—	249
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	7%	—	11%
Carbon footprint	172.6	150.1	20.0	200.6	1.5	—	1.5
(tCO ₂ e per €m invested)	100%	100%	100%	100%	7%	—	11%
Additional metrics							
Carbon intensity	172.6	150.1	106.5	7.9	5.1	—	5.1
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	7%	—	11%
Percentage of green bonds		0.02%			—	—	—
(%)		100%			100%	100%	100%

SOURCE: Banco de España calculations, drawing on ISS, C4F, World Bank, EEA and BIS data. Previous years' figures have been updated per the data revisions and the latest information available (see Box 5.2).

Note: The percentages in italics beneath the metrics denote the level of data availability. The metrics are calculated using nominal values. The holdings refer to the position at each year-end. Holdings in the euro-denominated BISIP fund are included under their respective asset class.

a This asset class includes sovereign and sub-sovereign bonds and bonds issued by public sector entities.

b Weighted average carbon intensity.

Annex 4. Main metrics of non-euro-denominated investment portfolios, 2019-2022

Table A4.1

Main metrics of non-euro-denominated investment portfolios, 2019-2022

Holdings in non-euro-denominated own portfolios, 2022	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn eq)		31.9			10.5	10.5	0.001
WACI (b)	271.1	243.1	292.6	19.6	0.4	0.4	0.6
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	93%	93%	100%
Total absolute emissions	8,647,075	7,752,594	1,208,327	9,265,163	94	94	0.1
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100 %	93%	93%	100%
Carbon footprint	271.1	243.1	37.9	290.5	0.01	0.01	0.1
(tCO ₂ e per €m eq. invested)	100%	100%	100%	100%	93%	93%	100%
Additional metrics							
Carbon intensity	271.1	243.1	269.7	18.9	0.9	0.9	0.6
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	93%	93%	100%
Percentage of green bonds		0.7 %			8%	8%	100%
(%)		100%			100%	100%	100%

Holdings in non-euro-denominated own portfolios, 2021	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn eq)		22.9			12.6	12.6	0.003
WACI (b)	334.9	302.0	291.7	19.2	3.0	3.0	0.6
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	50%	50%	100%
Total absolute emissions	7,652,167	6,899,566	1,050,618	8,163,612	681	680	0.2
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	49 %	49%	100%
Carbon footprint	334.9	302.0	46.0	357.3	0.1	0.1	0.1
(tCO2e per €m eq. invested)	100%	100%	100%	100%	49%	49%	100%
Additional metrics							
Carbon intensity	334.9	302.0	276.7	18.3	4.1	4.1	0.6
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	49%	49%	100%
Percentage of green bonds		0.6%			3.5%	3.5%	100%
(%)		100%			100%	100%	100%

SOURCE: Banco de España calculations, drawing on ISS, C4F, World Bank and BIS data.

NOTE: The percentages in italics beneath the metrics denote the level of data availability. The metrics are calculated using nominal values. The holdings refer to the position at each year-end. Holdings in the US dollar-denominated BISIP fund are included under their respective asset class.

a This asset class includes sovereign and sub-sovereign bonds and bonds issued by public sector entities.

b Weighted average carbon intensity.

Table A4.1

Main metrics of non-euro-denominated investment portfolios, 2019-2022 (cont'd)

Holdings in non-euro-denominated own portfolios, 2020	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn eq)		26.2			9.3	9.3	0.01
WACI (b)	349.5	313.7	295.3	18.9	2.4	2.4	0.6
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	47%	47%	100%
Total absolute emissions	9,155,680	8,216,294	1,255,945	9,617,757	330	330	0.4
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	47%	47%	100%
Carbon footprint	349.5	313.7	47.9	367.2	0.1	0.1	0.1
(tCO ₂ e per €m eq. invested)	100%	100%	100%	100%	47%	47%	100%
Additional metrics							
Carbon intensity	349.5	313.7	285.2	18.3	2.1	2.1	0.6
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	47%	47%	100%
Percentage of green bonds		0.2%			2.3%	2.3%	100%
(%)		100%			100%	100%	100%

Holdings in non-euro-denominated own portfolios, 2019	Sovereigns (a)				Non-sovereigns		
	Approaches				Total	Supranational and agency bonds	Covered bonds
	Country excl. LULUCF	Country incl. LULUCF	Government	Consumption			
Main metrics							
Portfolio size (€bn eq)		35.0			5.6	5.5	0.01
WACI (b)	360.1	327.4	487.5	20.5	1.7	1.7	0.7
(tCO ₂ e/€m GDP (PPP), gov. expend., pop., €m revenue)	100%	100%	100%	100%	78%	78%	100%
Total absolute emissions	12,615,200	11,469,111	2,564,231	13,209,064	355	354	1
(Scope 1 and 2 in tCO ₂ e)	100%	100%	100%	100%	78%	78%	100%
Carbon footprint	360.1	327.4	73.2	377.0	0.1	0.1	0.1
(tCO ₂ e per €m eq. invested)	100%	100%	100%	100%	78%	78%	100%
Additional metrics							
Carbon intensity	360.1	327.4	473.5	19.9	1.2	1.2	0.7
(tCO ₂ e/€m GDP (PPP), revenues)	100%	100%	100%	100%	78%	78%	100%
Percentage of green bonds		0.1%			2.4%	2.3%	100%
(%)		100%			100%	100%	100%

SOURCE: Banco de España calculations, drawing on ISS, C4F, World Bank and BIS data.

Note: The percentages in italics beneath the metrics denote the level of data availability. The metrics are calculated using nominal values. The holdings refer to the position at each year-end. Holdings in the US dollar-denominated BISIP fund are included under their respective asset class

a This asset class includes sovereign and sub-sovereign bonds and bonds issued by public sector entities.

b Weighted average carbon intensity.

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Box 1

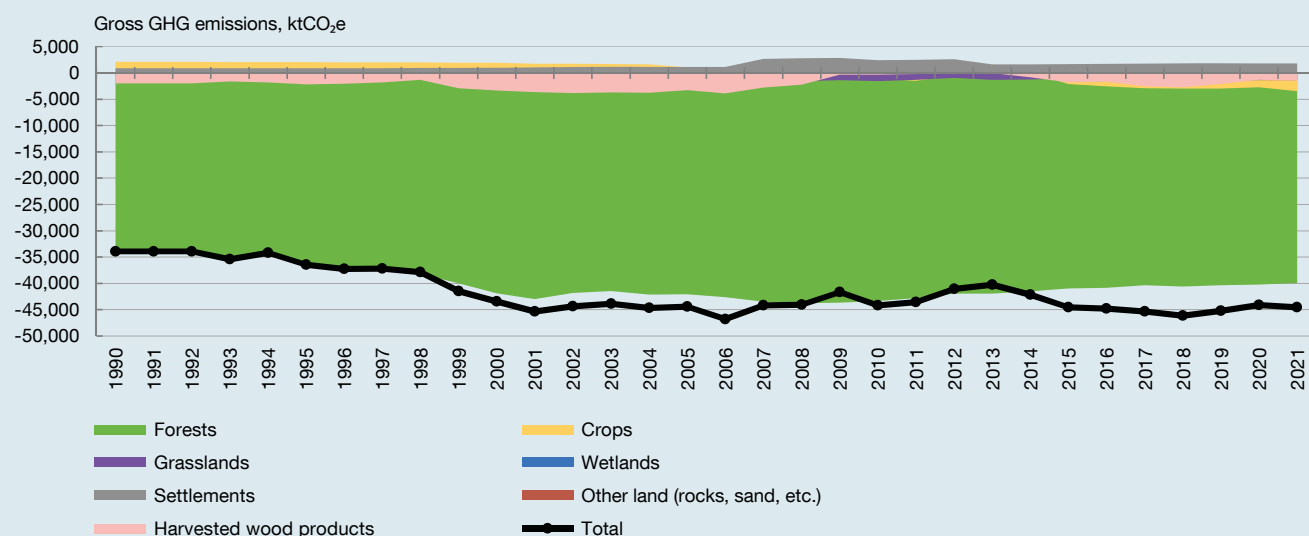
LAND USE, LAND-USE CHANGE, AND FORESTRY (LULUCF)

LULUCF refers to land use, land-use change and forestry. These activities have to do with climate change, since the ecosystem's carbon reserves and the relations between ecosystems and the atmosphere in the carbon cycle are affected by human activity. Mitigating carbon-capture initiatives are needed if the net zero emissions goal is to be met. Different mitigation actions can be carried out through these initiatives to help eliminate GHG emissions from the atmosphere via ecosystems (forests, wetlands,

agricultural land, etc.). In the case of Spain,¹ LULUCF activities have a sink effect. In other words, they lower the country's total GHG emissions due to this capture effect, the largest contribution coming from the forestry sector, as can be seen in the following chart. However, such activities may have the opposite effect in other regions, since they may be associated with adverse side effects on ecosystems, due to a greater use of land and water (forest fires or the destruction of ecosystems such as wetlands).

Chart 1

LULUCF GHG emissions in Spain, by sector. 1990-2021



SOURCES: Ministerio para la Transición Ecológica y el Reto Demográfico and Observatorio Climático (SEO BirdLife).

¹ For further details see [Ministerio para la Transición Ecológica y el Reto Demográfico](#).

Box 2

DATA SOURCES AND METHODOLOGY USED

The data sources used to calculate the metrics include both private data providers and public institutions.

The data providers used to calculate the metrics are *Institutional Shareholder Services group of companies* (ISS) and *Carbon4 Finance* (C4F), which were selected in the joint procurement process staged by the Eurosystem. Data from other sources, such as the World Bank and the European Environment Agency (EEA), have also been used.

The data on GHG emissions, as well as the financial/macro-economic data used, coincide with the reference year of the holdings, except for the most recent years due to a lag in the release of GHG data. In the case of non-sovereign issuers, the latest available GHG emissions and financial figures are for 2022, and have been used for the 2022 and 2023 calculations.

Moreover, in the case of sovereigns, there is an additional one-year lag in the availability of GHG emissions data. This explains why data from other sources have been combined with those from other data providers. In particular:

- a) For the GHG emission data, production (country) approach, excluding and including LULUCF:
 - the 2019-2021 data were obtained from ISS, with 2021 being the latest available data from this provider.
 - the 2022 data are the flash estimates provided by the countries and compiled by the EEA.

- b) For the GHG emission data, production (government) approach:

- the 2019-2021 data were obtained from ISS, with 2021 being the latest available data from this provider.
- the 2021 data were estimated according to ISS methodology.

- c) For the GHG emission data, consumption approach:

- the 2019-2021 data were obtained from C4F, with 2021 being the latest available data from this provider.
- the 2022 data were estimated applying the growth path of the flash estimates for GHG emission data (production approach) provided by the countries and compiled by the EEA.

The macroeconomic data on countries' GDP (PPP) and population were obtained from the World Bank for each year of the period 2019-2022.

In view of the standard backward-looking revision of the historical series of financial/macro-economic data and the publication of the latest GHG emissions data, the Banco de España has updated the results obtained in previous years. This same approach will be taken in future reports as and when such revisions are conducted.

The Banco de España publishes various types of documents providing information on its activity (economic reports, statistics, research papers, etc.), which can be consulted in the Institutional Repository at <https://repositorio.bde.es/>.

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