

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

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Eurosistema



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1 Introduction

Climate change is a reality. Preventing and, ideally, reversing it is a pressing challenge. The Paris Agreement was a milestone in the fight against climate change, setting a series of specific goals for 2050.¹ Although it falls to governments to take the lead in the pursuit of these goals, the financial system has a pivotal role to play in transforming the economy in the direction of the Paris Agreement. Against this backdrop, recent years have seen the roll-out of numerous initiatives, both public and private, aimed at facilitating the mobilisation of the funds needed for the transition towards an economy low in greenhouse gas (GHG) emissions.

The Banco de España pays particular attention to the climate change-related aspects that cross over into the areas under its remit. One such area is the management of its own or investment portfolios; in other words, its non-monetary policy portfolios. Given that such portfolios account for a relatively small share of the total, the goal here is to set an example for those who manage portfolios that, owing to their size, are better placed to channel large capital flows towards sustainable investment projects.

Since 2019, sustainable and responsible investment (SRI) principles have been a cornerstone of the Banco de España's own portfolio investment policy.² This approach is in line with Recommendation no. 2 of the Network for Greening the Financial System (NGFS), which the Banco de España joined in April 2018, further testifying to its commitment in this area. Similarly, the application of these principles forms an integral part of the sustainability drive envisaged in the Banco de España's Strategic Plan 2024.³

In February 2021, the nineteen national central banks (NCBs) of the Eurosystem and the European Central Bank (ECB) defined a common stance for applying SRI principles in the management of their euro-denominated non-monetary policy portfolios.^{4,5} The Eurosystem also undertook to make annual climate disclosures for these portfolios, based on the

1 The Agreement, which counts Spain among its signatories, sets out a series of goals, namely: i) to hold the increase in the global temperature to below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C; ii) to increase the ability to adapt the economy to the adverse impacts of climate change and foster low greenhouse gas emissions development; and iii) to promote the financing of sustainable investment.

2 Banco de España (2020a).

3 Banco de España (2020b).

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

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

recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).^{6,7} The Banco de España has taken part in all of these developments and has fully embraced the decisions adopted. In addition to these recommendations, the ECB and the NCBs also follow the Guide on climate-related disclosure for central banks drawn up by the NGFS in 2021,⁸ and the Partnership for Carbon Accounting Financials (PCAF) Standard published in December 2022.⁹

In terms of communication, since 2019 the Banco de España has been reporting on compliance with SRI principles in its institutional reports, in public addresses by members of its management bodies and in press releases, as well as through the sustainability area of its website in the specific section “Monetary policy and investment portfolio”.¹⁰ The publication of this report, in coordination with the other Eurosystem central banks, represents a further step in this direction, with the release of the first document wholly and exclusively dedicated to the financial disclosure of the climate-related aspects of its euro-denominated investment portfolios.

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 As part of this commitment, the ECB published its first disclosure on 23 March (ECB (2023)), with other Eurosystem central banks following suit in the last week of March.

8 TCFD (2021) and NGFS (2021).

9 PCAF (2022).

10 <https://www.bde.es/bde/en/secciones/sobreelbanco/sostenibilidad-medioambiental/informacion-general/Politica-Monetaria-y-cartera-de-inversion/politica-monetaria-y-cartera-de-inversion.html>.

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 convertible 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.

With respect to the investment portfolios in general, and the euro-denominated portfolios in particular, 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

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/sobreelbanco/organizacion/Organos_rectores/La_Comision_Ejec/La_Comision_Ejecutiva.html.

is tasked with monitoring and managing the risks assumed, with the support of the Financial Risk Sub-Committee.

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.¹³ The application and monitoring of the 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.

¹³ See the Strategy section of this report.

3 Strategy

The Banco de España's Investment Policy¹⁴ 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 Eurosystem¹⁵ with respect to the application of SRI principles to euro-denominated 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 draws on 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).^{16, 17}

Moreover, as explained in greater detail in Section 5 of this report, 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.

¹⁴ Banco de España (2020a).

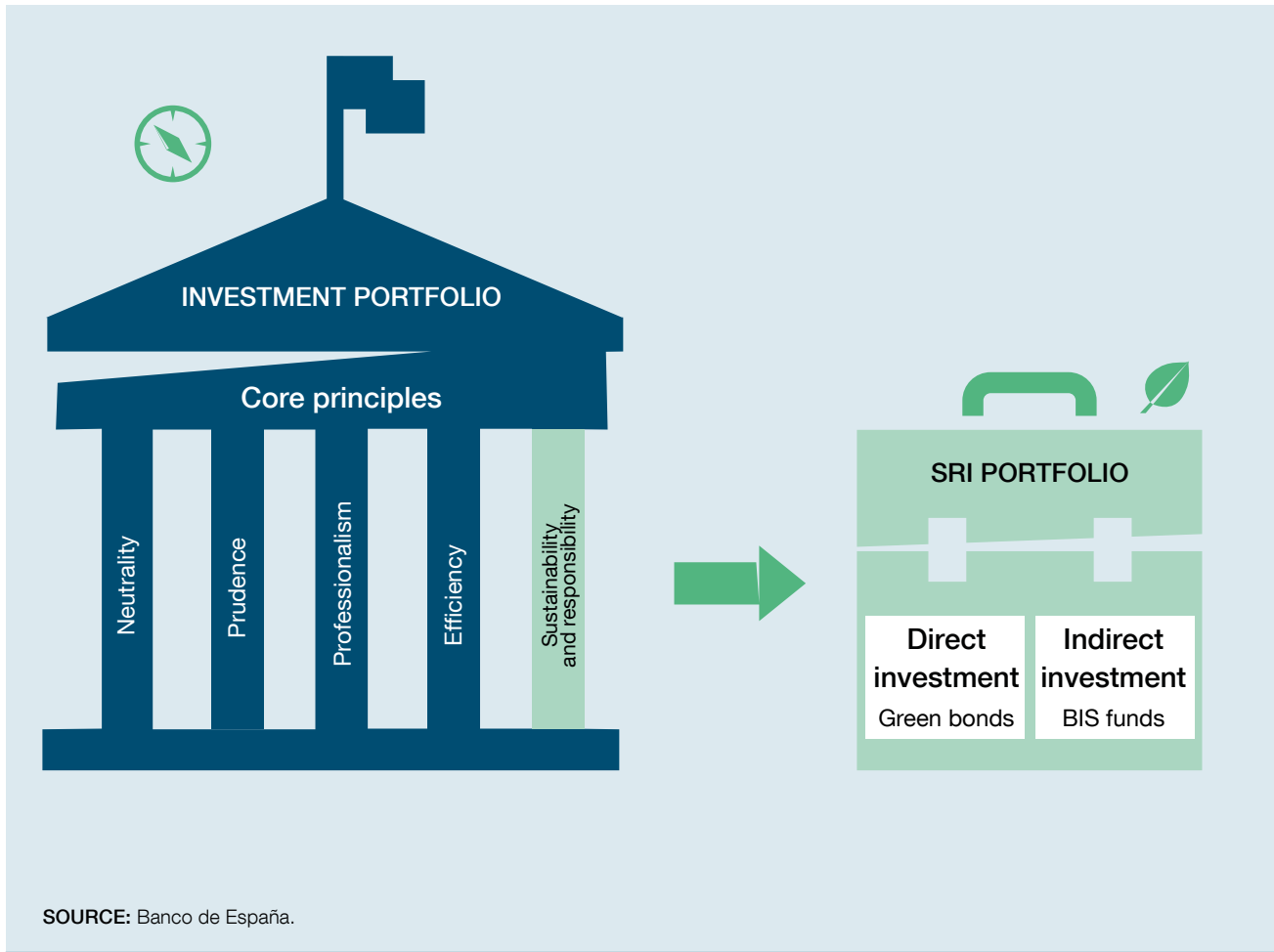
¹⁵ Press releases: "The Banco de España adopts the Eurosystem's common stance for sustainable investment" and "Eurosystem agrees on common stance for climate change-related sustainable investments in non-monetary policy portfolios", both of 4 February 2021.

¹⁶ The Banco de España is to participate in the green bond fund launched by the BIS, 26 September 2019; and The Banco de España is to participate in the second BIS green bond investment fund, 25 January 2021.

¹⁷ The dollar-denominated fund was launched in 2019 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. In January 2021, the BIS launched a euro-denominated green fund.

Figure 1

KEY ELEMENTS OF THE BANCO DE ESPAÑA'S SRI STRATEGY



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, meanwhile, refer to the probability and impact of extreme weather events (such as floods), and of progressive long-term climate changes (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 identification, assessment and management procedures, adopting an integrated approach.

When identifying potentially material climate risks, 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 impact 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 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).

In terms of assessing and monitoring climate change-related risks, the Banco de España is working in conjunction with the Eurosystem on the development and deployment of scenario analysis and stress testing tools. These tools also have other important applications in areas other than euro-denominated investment portfolio management, such as the Banco de España's in-house credit assessment system. Thus, climate risks have become a more relevant factor when determining the credit quality of non-financial corporations.

5 Metrics and targets

5.1 Metrics

The Banco de España's euro-denominated own portfolios include sovereign and sub-sovereign bonds (issued by regional governments), bonds issued by supranational entities and state agencies, and covered bonds. As Chart 1 shows, sovereign bonds make up the bulk of the own portfolios, amounting to 98% of the total at end-2022.

Considering the TCFD (2021), NGFS (2021) and PCAF (2022) recommendations, and in accordance with the decisions on harmonisation between the Eurosystem central banks adopted by the ECB's Governing Council, this report presents a set of metrics that enable classification of investments according to their implications for the fight against climate change and assessment of their exposure to transition risks. The main four metrics used are:¹⁸

- weighted average carbon intensity (WACI);
- total carbon 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 carbon 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 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.

Carbon footprint relates a portfolio's total GHG emissions to its volume and is expressed in tonnes of CO₂e per million euro. This enables comparisons to be made between portfolios of different sizes and at different points in time.

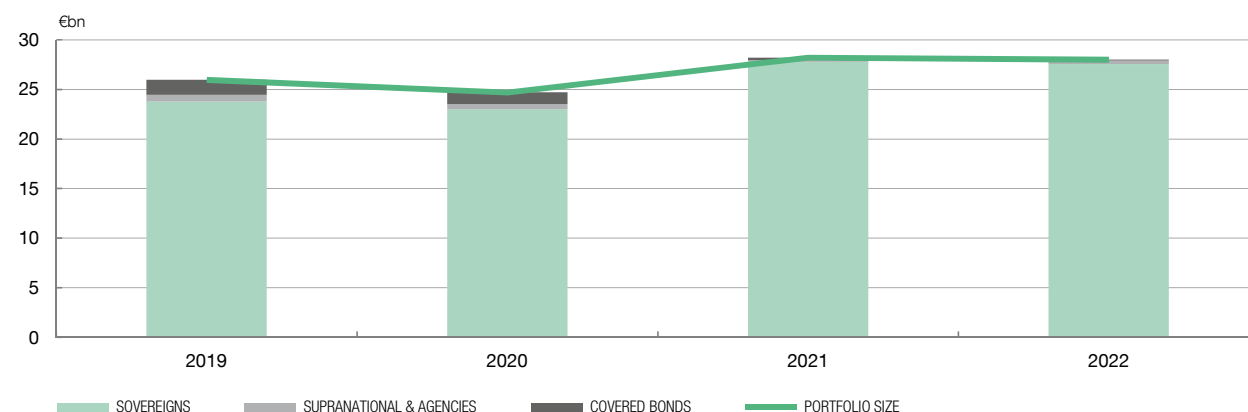
¹⁸ See Table A2.1 (Annex 2) for the formulae of the four metrics.

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

SOVEREIGN BONDS MAKE UP THE BULK OF THE OWN PORTFOLIOS

HOLDINGS IN EURO-DENOMINATED INVESTMENT PORTFOLIOS, 2019-2022



SOURCE: Banco de España.

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 (see Chart 1 for Spain). 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 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;
- 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.

Table 1

MAIN CLIMATE-RELATED METRICS OF EURO-DENOMINATED INVESTMENT PORTFOLIOS AT END-2022

Holdings in euro-denominated own portfolios, 2022	Sovereigns (a)			Non-sovereigns		
	Sovereign bonds (approaches)			Total	Supranational and agency bonds	Covered bonds
	Production	Government	Consumption			
Main metrics						
Portfolio size (€bn)		27.5		0.5	0.4	0.1
WACI (b)	176.7	91.1	7.5	2.2	2.2	2.2
<i>(tCO₂e/€m GDP (PPP), gov. expend., pop., €m revenues)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>65%</i>	<i>71%</i>	<i>40%</i>
Total absolute emissions	4,864,224	526,792	5,841,892	29	5	25
<i>(Scope 1 and 2 in tCO₂e)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>65%</i>	<i>71%</i>	<i>40%</i>
Carbon footprint	176.7	19.1	212.2	0.1	0.02	0.7
<i>(tCO₂e per €m invested)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>65%</i>	<i>71%</i>	<i>40%</i>
Additional metrics						
Carbon intensity	176.7	90.5	7.5	2.0	0.9	2.6
<i>(tCO₂e/€m GDP (PPP), revenues)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>65%</i>	<i>71%</i>	<i>40%</i>
Percentage of green bonds		3.6%		86%	100%	29%
<i>(%)</i>		<i>100%</i>		<i>100%</i>	<i>100%</i>	<i>100%</i>

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. Euro-denominated holdings in the BISIP fund are included under their respective asset class.

a This asset class includes sovereigns, sub-sovereigns and public entities.

b Weighted average carbon intensity.

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.

Figure A1.1 (Annex 1) sets out the main variables used by approach type and asset type. More details are provided in Annex 2. Meanwhile, the box in Annex 4 discusses the data sources for the variables used to calculate the indicators.

Table 1 presents the results of applying the metrics described to the Banco de España's euro-denominated investment portfolios at end-2022, the last full year available.

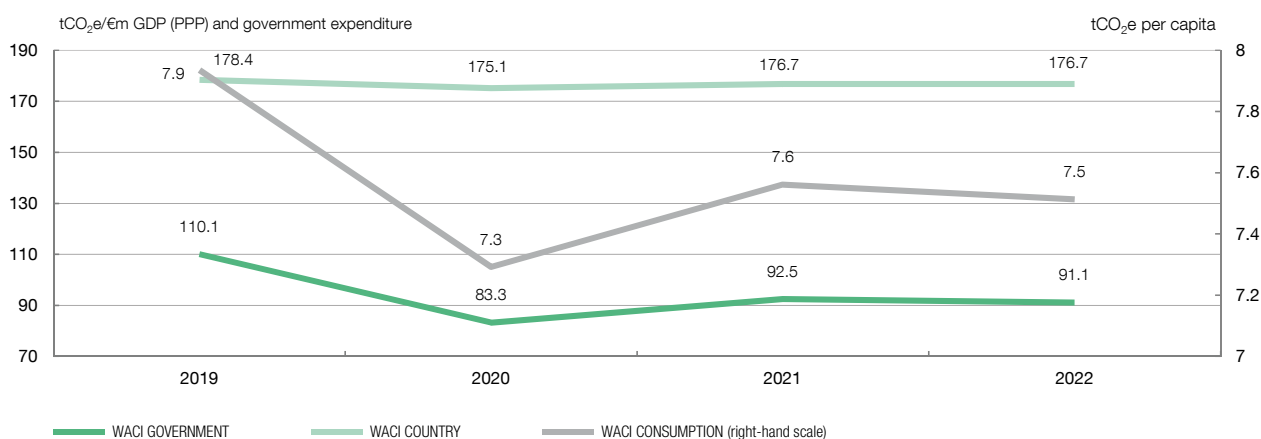
A dual perspective is advisable to interpret these values: a time perspective, to help assess how they evolve over time; and a spatial or geographical perspective, to enable comparison with the portfolios of other leading central banks.

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

Chart 2

PORTFOLIO QUALITY IMPROVING IN TERMS OF ITS CONTRIBUTION TO THE FIGHT AGAINST CLIMATE CHANGE

1 WEIGHTED AVERAGE CARBON INTENSITY (WACI) ACCORDING TO DIFFERENT APPROACHES: SOVEREIGN BONDS, 2019-2022



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

a 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. See [Climate-related data successfully procured](#).

mandates and/or a very different breakdown. 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, the relative emissions are significantly lower than might be expected of a portfolio of that size. This reflects the fact that most of the assets in these portfolios correspond to low carbon intensity issuers.

Turning to the time perspective, Table A3.1 (Annex 3) reproduces Table 1 for the years 2019-2021. Focusing on the most notable findings, Chart 2 shows how the WACI metric has evolved for sovereign bonds, which as indicated account for the bulk of the euro-denominated investment portfolios. As can be seen, leaving aside 2020, 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. Note that 2020 was the worst year of the COVID-19 pandemic, which had a singular and atypical impact both on economic indicators and GHG emissions.

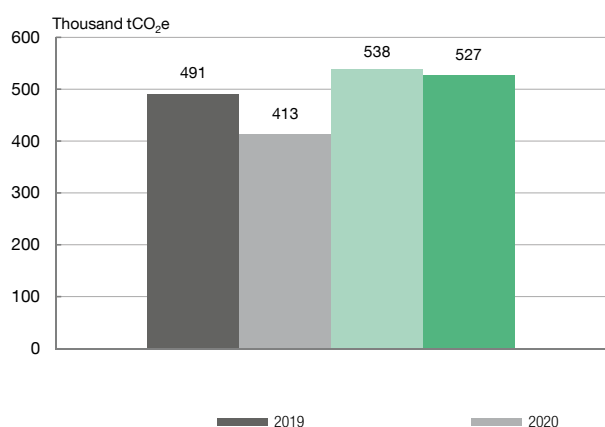
Chart 3 shows how absolute carbon emissions, the carbon footprint and carbon intensity have evolved, again for sovereign bonds. In this case, however, the chart only shows the findings corresponding to the government approach which, as indicated, avoids the problem of bias owing to double counting of GHG emissions of agents other than the sovereign issuer.

The trajectory of all GHG emissions essentially reflects the changes in portfolio size. As indicated above, this limits its usefulness for the purposes of analysis. The relative

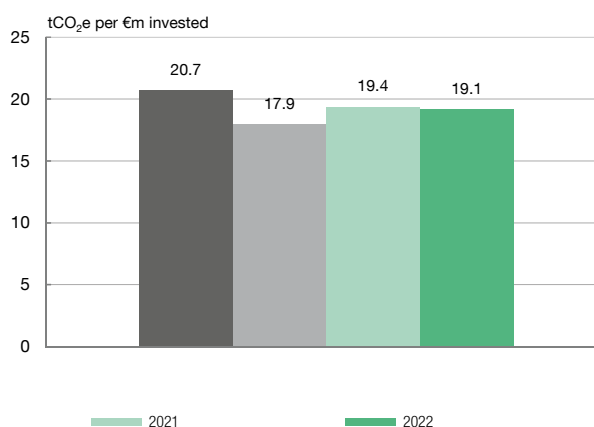
Chart 3

STEADY PROGRESS TOWARDS A PORTFOLIO MORE IN LINE WITH THE GOALS OF THE FIGHT AGAINST CLIMATE CHANGE

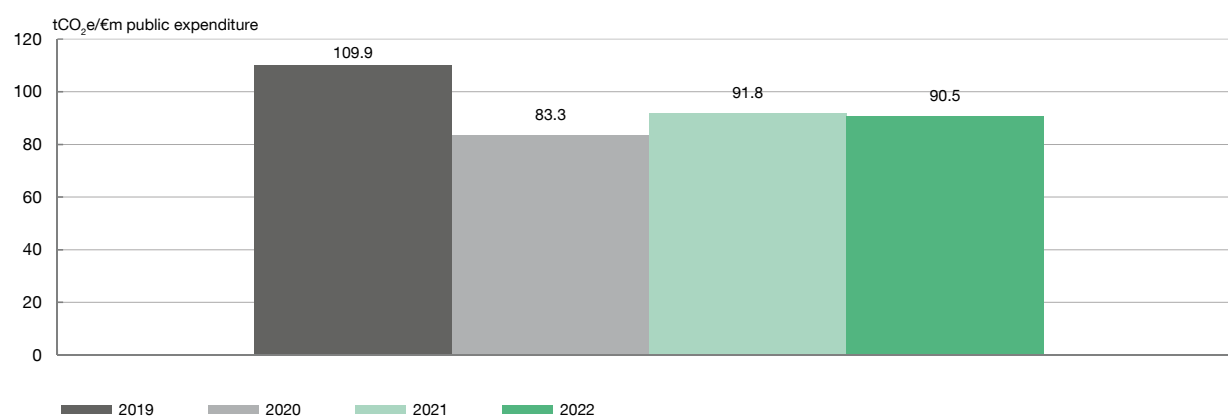
1 SOVEREIGN BONDS (GOVERNMENT APPROACH): ABSOLUTE EMISSIONS



2 SOVEREIGN BONDS (GOVERNMENT APPROACH): CARBON FOOTPRINT



3 SOVEREIGN BONDS (GOVERNMENT APPROACH): CARBON INTENSITY



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

a 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. See [Climate-related data successfully procured](#).

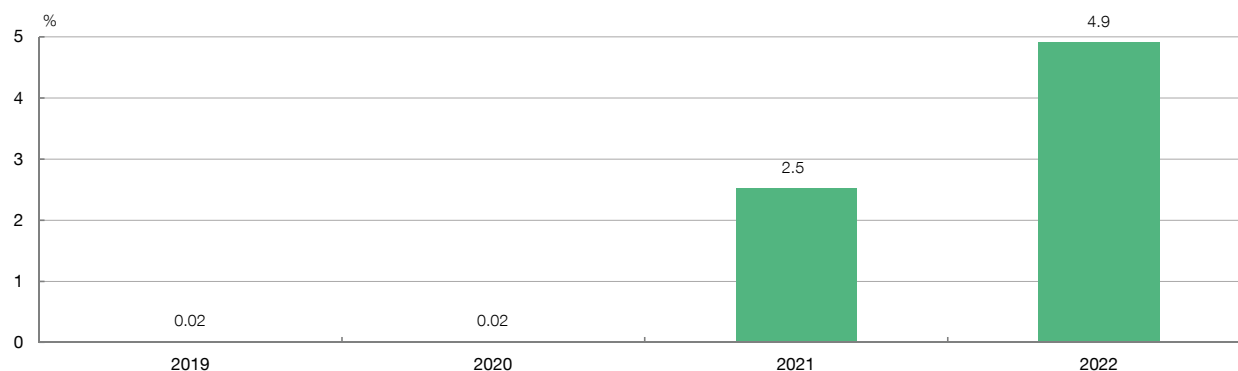
metrics – such as carbon footprint or carbon intensity – which correct this size effect show how the WACI metric declined in 2022 compared with the start of the period analysed. As in that case, both indicators fell continuously throughout the period analysed once 2020 is taken out of the equation. This echoes the conclusion drawn from Chart 2, showing steady progress towards a portfolio more in line with the goals of the fight against climate change.

Among the indicators corresponding to additional metrics, Table 1 includes the percentage of green bonds in the portfolio by asset class. As Chart 4 shows, the share of total investment in green bonds in the euro-denominated investment portfolios has risen significantly since 2019 as a result of the thematic investment

Chart 4

THE SHARE OF GREEN BONDS HAS INCREASED SIGNIFICANTLY AS A RESULT OF THE INVESTMENT STRATEGY

GREEN INVESTMENT AS A PERCENTAGE OF THE HOLDINGS IN EURO-DENOMINATED INVESTMENT PORTFOLIOS



SOURCE: Banco de España calculations.

strategy adopted. 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 calculating “avoided emissions”²⁰: 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.²⁰ The BIS calculates this indicator for its green investment funds.

As Table 2 shows, the estimated environmental impact attributable to the Banco de España’s holding in the euro-denominated BIS fund at end-September 2021 was 161,934 tonnes of CO₂e avoided annually. Renewable energy was the main contributor to this total, with 84,190 tonnes of CO₂e avoided annually, followed by clean transport projects (24% of the estimated avoided emissions), energy efficiency (20%) and waste management and green buildings (4% combined). The environmental impact of these estimated avoided emissions of CO₂e is equivalent to slightly more than 390,000 barrels of oil consumed or more than 35,000 cars driven in a year, or to charging more than 10,000 million smartphones or the electricity used by more than 16,000 households in a year.

This indicator rose substantially in 2022, also reflecting the increase in the holding in the fund. At end-September 2022, the estimated environmental impact attributable

²⁰ This does not include calculation of avoided emissions for direct investments in green bonds in the SRI portfolio owing to insufficient data coverage.

Table 2

ADDITIONAL METRICS RELATING TO HOLDINGS OF EURO-DENOMINATED GREEN BONDS

	2021	2022
Avoided emissions euro-denominated BISIP fund (a) (tCO ₂ e)	161,934 <i>95%</i>	484,580 <i>96%</i>

SOURCE: Banco de España calculations drawing on BIS data.

NOTE: The percentages in italics beneath the metrics denote the level of data availability.

a Estimated avoided emissions attributable to the Banco de España's investment in the BIS euro-denominated fund. Data as at 30/09/2021 and 30/09/2022.

to the Banco de España's investment in the euro-denominated BIS fund was 484,580 tonnes of CO₂e avoided annually. In relative terms, i.e. normalised by the size of the holding, the indicator would have risen by 50%.

5.2 Targets







The TCFD recommends that targets be set, as a fundamental pillar underpinning the strategy for the fight against climate change through climate-related financial disclosures.

The Banco de España has committed to a long-term goal to decarbonise its 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. The Law also aims to limit global warming to well below 2°C and to continue with the efforts to restrict global warming to 1.5°C, in accordance with the Paris Agreement.

As and when the headway made in this area allows, more short-term goals for specific indicators will be established to complement this long-term goal. In the meantime, as an intermediate and more short-term goal, the Banco de España intends to increase the share of its SRI portfolio, thus progressing in the thematic investment strategy discussed in Section 3 above.

Annex 1 Variables by approach and asset type

Figure A1.1

	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	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 Metrics and variables

A2.1 Description of main metrics

Table A2.1

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

A2.2 Carbon emissions by type of issuer

Table A2.2

Type of issuer	Sovereigns and sub-sovereigns	Supranational & agencies	Covered bonds
Factor	<ul style="list-style-type: none"> i) Country emissions, production approach ii) Government sector emissions iii) Country emissions, consumption approach 	Emissions scope 1 and 2	Emissions scope 1 and 2

A2.3 Normalisation factors by asset type

Table A2.3

Type of issuer	Sovereigns and sub-sovereigns	Supranational & agencies	Covered bonds
Factor	<ul style="list-style-type: none"> i) GDP ii) Central government final consumption expenditure iii) Population 	Revenue	Revenue

A2.4 Attribution factors by asset type

Table A2.4

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)

Annex 3 Main metrics of euro-denominated investment portfolios, 2019-2021

Table A3.1

Holdings in euro-denominated own portfolios, 2021	Sovereigns (a)			Non-sovereigns		
	Sovereign bonds (approaches)			Total	Supranational and agency bonds	Covered bonds
	Production	Government	Consumption			
Main metrics						
Portfolio size (€bn)		27.8		0.4	0.2	0.3
WACI (b)	176.7	92.5	7.6	1.2	0.9	1.6
<i>(tCO₂e/€m GDP (PPP), gov. expend., pop., €m revenue)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>37%</i>	<i>63%</i>	<i>22%</i>
Total absolute emissions	4,907,698	537,927	5,908,762	30	3	27
<i>(Scope 1 and 2 in tCO₂e)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>37%</i>	<i>63%</i>	<i>22%</i>
Carbon footprint	176.7	19.4	212.8	0.2	0.0	0.5
<i>(tCO₂e per €m invested)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>37%</i>	<i>63%</i>	<i>22%</i>
Additional metrics						
Carbon intensity	176.7	91.8	7.5	1.6	0.8	1.9
<i>(tCO₂e/€m GDP (PPP), revenues)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>37%</i>	<i>63%</i>	<i>22%</i>
Percentage of green bonds		2%		38%	100%	—
<i>(%)</i>		<i>100%</i>		<i>100%</i>	<i>100%</i>	<i>100%</i>
Holdings in euro-denominated own portfolios, 2020						
Main metrics						
Portfolio size (€bn)		23.0		1.7	0.5	1.2
WACI (b)	175.1	83.3	7.3	1.3	—	1.3
<i>(tCO₂e/€m GDP (PPP), gov. expend., pop., €m revenue)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>10%</i>	<i>0%</i>	<i>10%</i>
Total absolute emissions	4,027,255	412,714	4,884,951	39	—	39
<i>(Scope 1 and 2 in tCO₂e)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>10%</i>	<i>0%</i>	<i>10%</i>
Carbon footprint	175.1	17.9	212.4	0.3	—	0.3
<i>(tCO₂e per €m invested)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>10%</i>	<i>0%</i>	<i>10%</i>
Additional metrics						
Carbon intensity	175.1	83.3	7.3	1.4	—	1.4
<i>(tCO₂e/€m GDP (PPP), revenues)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>10%</i>	<i>0%</i>	<i>10%</i>
Percentage of green bonds		0.02%		—	—	—
<i>(%)</i>		<i>100%</i>		<i>100%</i>	<i>100%</i>	<i>100%</i>
Holdings in euro-denominated own portfolios, 2019						
Main metrics						
Portfolio size (€bn)		23.8		2.2	0.7	1.5
WACI (b)	178.4	110.1	7.9	5.0	—	5.0
<i>(tCO₂e/€m GDP (PPP), gov. expend., pop., €m revenue)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>11%</i>	<i>0%</i>	<i>11%</i>
Total absolute emissions	4,238,793	491,121	4,956,768	249	—	249
<i>(Scope 1 and 2 in tCO₂e)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>11%</i>	<i>0%</i>	<i>11%</i>
Carbon footprint	178.4	20.7	208.6	1.5	—	1.5
<i>(tCO₂e per €m invested)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>11%</i>	<i>0%</i>	<i>11%</i>
Additional metrics						
Carbon intensity	178.4	109.9	7.9	5.1	—	5.1
<i>(tCO₂e/€m GDP (PPP), revenues)</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>11%</i>	<i>0%</i>	<i>11%</i>
Percentage of green bonds		0.02%		—	—	—
<i>(%)</i>		<i>100%</i>		<i>100%</i>	<i>100%</i>	<i>100%</i>

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. Euro-denominated holdings in the BISIP fund are included under their respective asset class.

a This asset class includes sovereigns, sub-sovereigns and public entities.

b Weighted average carbon intensity.

Box

DATA SOURCES AND METHODOLOGY USED

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

Between 2021 and 2022 a joint Eurosystem procurement process for two climate-related data providers was undertaken by the ECB, led by the Bundesbank. The data providers selected, according to the criteria established, were Institutional Shareholder Services (ISS) and Carbon4 Finance (C4F).

Data from other sources, such as the World Bank and the European Environment Agency (EEA), have also been used.

There tends to be a lag in the release of GHG emission data, especially in the case of sovereigns. This explains why data from other sources have been combined with those from the data providers. In particular:

- a) For the GHG emission data, production (country) approach:
- the 2019-2020 data were obtained from ISS, with 2020 being the latest available data from this provider;
 - the 2021 data are the flash estimates provided by the countries and compiled by the EEA.

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

- the 2019-2020 data were obtained from ISS, with 2020 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 2019-2020 data were obtained from C4F, with 2020 being the latest available data from this provider;
- the 2021 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 2019-2021.

To calculate the metrics for 2022, the GHG emission data and macroeconomic variables for 2021 were used as that is the last year available.

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