



EUROPEAN CENTRAL BANK

EUROSYSTEM

Climate-related financial disclosures of Eurosystem assets held for monetary policy purposes and of the ECB's foreign reserves

June 2024



Contents

Foreword	2
1 Introduction	4
2 Governance	7
2.1 General governance aspects related to the APP and PEPP	7
2.2 Governance aspects related to the ECB's foreign reserves	8
3 Strategy	9
3.1 General strategy aspects related to the APP and PEPP	9
3.2 Strategy aspects related to corporate holdings	10
3.3 Strategy aspects related to the ECB's foreign reserves	12
4 Risk management	14
4.1 General risk management aspects	14
4.2 Risk management aspects related to the APP and PEPP	17
4.3 Risk management aspects related to the ECB's foreign reserves	19
5 Metrics and targets	20
5.1 APP and PEPP holdings	21
5.2 The ECB's foreign reserves	38
Annexes	44
Annex 1	44
Annex 2	45
Annex 3	46
Annex 4	48
Annex 5	49
Annex 6	51

Foreword



As the climate crisis unfolds, climate-related disasters are becoming more frequent and more severe. The latest evidence from the Intergovernmental Panel on Climate Change shows that we are on a path towards global heating of 3°C. Combating climate change requires ever more determination in these uncertain times. Mitigating the risks but also preparing for the inevitable effects are key for the future resilience of our continent. While elected governments are primarily responsible for implementing appropriate policies to address climate change, we all have a role to play.

At the ECB, this means acting within our mandate. To fulfil our primary objective of price stability, we need to understand the impacts of climate change and the green transition as well as manage the related risks. In addition, and without prejudice to our primary mandate, we must continue to support the European Union's objectives.

One of the actions we have taken is to be more transparent about the climate-related risks and the carbon footprint of our financial portfolios. By increasing the availability of climate-related information on central banking activities, we also support wider efforts by regulators and other stakeholders to close the climate data and reporting gap, a task that is vital for tackling this global challenge.

This is our second report on the carbon footprint of the corporate sector assets we hold for monetary policy purposes. It allows us to track the emission reduction process and confirms that our corporate sector portfolios reduced emissions more quickly in 2022 compared with the previous year, with greater issuer carbon efficiency being the strongest driver. The data on Eurosystem holdings for 2023 points towards continued progress. Overall, the tilting framework applied to corporate sector portfolios accounted for around one-fifth of our total emission reduction in 2022 and 2023. The effectiveness of this tilting approach was confirmed in our formal review in October 2023, which concluded that the tilting framework remained adequate and was delivering the intended results.

Beyond tracking the progress made on reducing the carbon footprint of our corporate portfolios, this report also delivers on our commitment to enhance transparency. In this report, we publish for the first time the carbon footprints of the Eurosystem's public sector and covered bond portfolios held for monetary policy purposes. By expanding the scope of disclosures from corporate sector assets to encompass these portfolios, we now disclose climate-related information for over 99% of the Eurosystem's assets held for monetary policy purposes under the asset purchase programme and the pandemic emergency purchase programme. In addition, the report now contains a section on the ECB's foreign reserves. The available data also point towards a gradual reduction in emissions for these investment classes.

The Eurosystem remains committed to improving the quality of our disclosures in line with improvements in climate-related data and regulation. Within our mandate, we will also continue to reduce the carbon footprint of our corporate portfolios on a path that supports the goals of the Paris Agreement. However, we cannot effect change alone.

To reduce the carbon footprint of our portfolio, in particular for public sector assets, we depend on issuers delivering on commitments to lower their associated emissions. Ultimately, action needs to be taken at issuer level for the economy to decarbonise. This is what matters most to put the world on track towards net zero carbon emissions.

Frankfurt am Main, June 2024
Christine Lagarde
President

1 Introduction

This report presents the climate-related financial disclosures for the Eurosystem's assets held for monetary policy purposes and for the ECB's foreign reserves.

The primary objective of the ECB is to maintain price stability in the euro area, targeting an inflation rate of 2% over the medium term. Macroeconomic and financial market disruption linked to climate change and transition policies can affect the outlook for price stability owing to their impact on our economy. A host of macroeconomic indicators can be affected, such as inflation, output, employment, interest rates, investment, productivity, financial stability and the transmission of monetary policy. Moreover, climate change and transition policies affect the value and the risk profile of the assets held on the Eurosystem's balance sheet, potentially leading to an undesirable accumulation of climate-related financial risks.

In addition, and without prejudice to the primary objective of price stability, the ECB must support the general economic policies in the European Union with the aim of contributing to the achievement of the Union's objectives as laid down in Article 3 of the Treaty on European Union.

The ECB's climate work focuses on three main objectives: managing climate-related risks; supporting the green transition using measures within its mandate; and sharing our experiences to foster wider action.¹ By publishing climate-related financial disclosures, the Eurosystem enhances transparency on its portfolios' exposure to climate risks and their carbon footprint.

In March 2023 the Eurosystem published the first annual [climate-related financial disclosures for its corporate sector holdings](#) held for monetary policy purposes, covering a total of €395 billion in financial assets.² The initial report focused exclusively on corporate bonds. This second report expands the scope of the disclosures to the Eurosystem's holdings of public sector and covered bonds under the asset purchase programme (APP) and the pandemic emergency purchase programme (PEPP). It also covers the ECB's foreign reserves (Figure 1).³ As such, the report now covers a total nominal value of €4,486 billion in financial assets, or 99.7% of the total assets held for monetary policy purposes under the APP and PEPP, and marks an important step towards increased transparency.

In addition to the expanded scope, the metrics have also evolved. For the first time, this report covers the scope 3 emissions of non-sovereign issuers (see Annexes 4 and

¹ See "[Climate change and the ECB](#)" on the ECB's website.

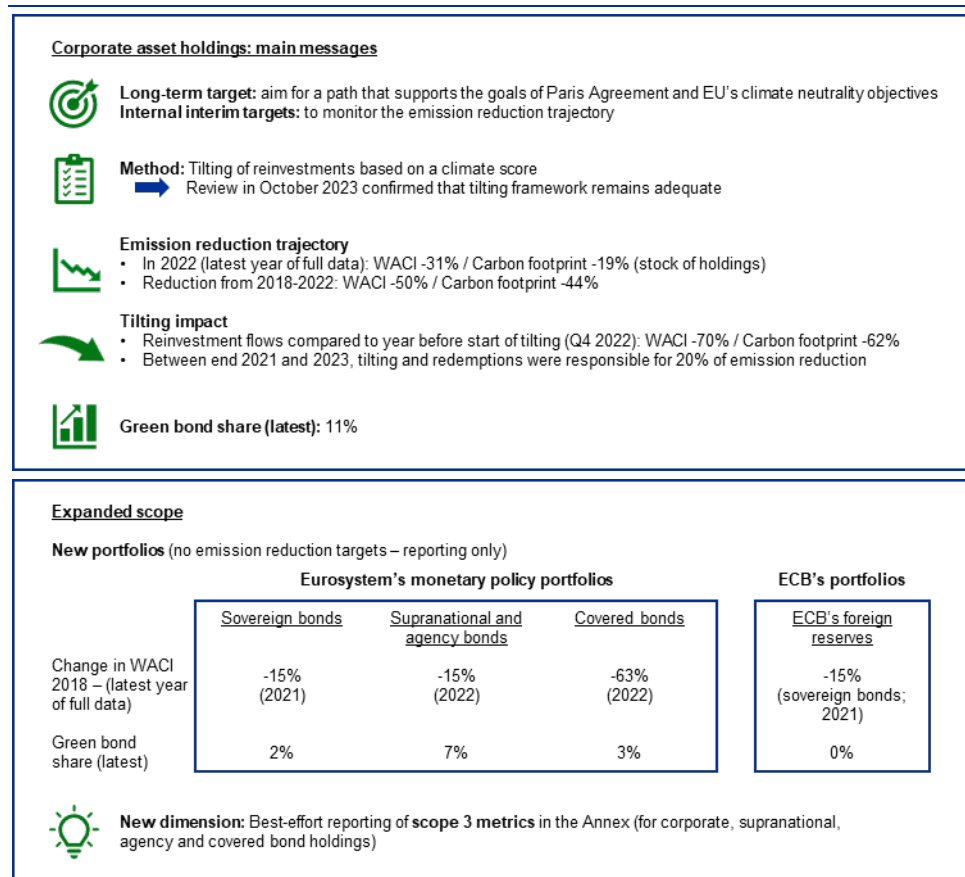
² The ECB and the Eurosystem national central banks have also published annual climate-related financial disclosures for their euro-denominated non-monetary policy portfolios in dedicated reports.

³ The following are excluded from the scope of this report owing to insufficient climate data availability and a lack of methodological guidance: i) holdings of asset-backed securities under the asset-backed securities purchase programme (ABSPP); and ii) holdings of physical gold, special drawing rights, and cash and cash equivalents under the ECB's foreign reserves. The total market value of the ECB's foreign reserves at the end of 2023 amounted to €87.7 billion.

6). For sovereign issuers, production emissions are reported both excluding and including the effects of land use, land-use change and forestry (LULUCF).

The reporting on the APP and PEPP shows that euro area sovereign bond holdings are gradually reducing their emissions following efforts by euro area governments to decarbonise their economies in pursuit of the goals of the Paris Agreement and the EU's climate neutrality objectives. Between the end of 2021 and the end of 2022 euro area corporate sector holdings lowered their emissions at an accelerated pace thanks to efforts at issuer level and the Eurosystem's tilting of reinvestments towards issuers with a better climate performance. The reporting on the ECB's foreign reserves, which covers a nominal value of €39 billion equivalent in financial assets invested in the United States dollar (USD), Japanese yen (JPY) and Chinese yuan renminbi (CNY), shows that these sovereign bond holdings are also on a decarbonisation path.

Figure 1
Summary of key developments and the expanded scope of the Eurosystem's climate-related financial reporting



Source: ECB.

The disclosures follow the recommendations and the supplemental guidance for asset owners of the Task Force on Climate-related Financial Disclosures (TCFD) of the Financial Stability Board. The recommendations are divided into four categories: "Governance", "Strategy", "Risk management" and "Metrics and targets". Additionally, the Eurosystem considers the recommendations of both the Partnership for Carbon

Accounting Financials (PCAF) and the Network of central banks and supervisors for Greening the Financial System (NGFS).⁴ Finally, disclosures in the “Metrics and targets” category adhere to the Eurosystem’s in-house common minimum disclosure framework, which was originally developed for non-monetary policy portfolios.

The report is structured as follows. Section 2 summarises the governance and decision-making responsibilities for the APP, the PEPP and the ECB’s foreign reserves. Section 3 outlines the Eurosystem’s strategy for integrating climate change considerations into the portfolios. Section 4 explains how climate considerations are integrated in managing the risks related to the portfolios. Section 5 presents the climate-related metrics and targets.

⁴ See TCFD, [Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures](#), October 2021 and NGFS, [“Guide on climate-related disclosure for banks”](#), December 2021.

2 Governance

This section summarises governance aspects related to climate change considerations in the Eurosystem's assets held for monetary policy purposes and for the ECB's foreign reserves. It outlines general aspects that apply across the APP and the PEPP before shedding light on the relevant governance aspects related to the ECB's foreign reserves.

2.1 General governance aspects related to the APP and PEPP

The ECB's Governing Council is responsible for setting the monetary policy for the euro area. It consists of the six members of the ECB's Executive Board and 20 national central bank (NCB) governors, one from each euro area country.

Monetary policy is implemented through various instruments, including the outright purchases of financial assets. The assets bought under the APP and PEPP are part of the Eurosystem's monetary policy portfolios. Following the ECB's monetary policy strategy review of 2020-21, the Governing Council adopted an [action plan](#) to incorporate climate change considerations into the Eurosystem's monetary policy framework.

The ECB continues to address climate-related risks and opportunities within its existing governance structures.⁵ The ECB's Executive Board is exclusively competent for preparing the meetings of the Governing Council. This also includes preparations for discussing the oversight of climate-related risks for monetary policy-related holdings and the ECB's foreign reserves and related decisions (Figure 2). The Executive Board's proposals are based on the preparatory work conducted by the Eurosystem's Market Operations Committee and Risk Management Committee, in consultation with the Monetary Policy Committee and the Legal Committee. In addition, the ECB's climate change centre steers the ECB's climate strategy and promotes collaboration on climate issues across the different parts of the organisation. The ECB's [Annual Report](#) provides an overview of the ECB's climate strategy and its implementation.

When developing policy proposals to put forward to the Governing Council, ECB and NCB staff responsible for portfolio and risk management convene in dedicated working groups and taskforces focused on integrating climate considerations into the Eurosystem's asset purchases, along with staff and/or committees responsible for monetary policy and legal assessments as appropriate. Additionally, ECB and NCB staff collaborate with external stakeholders such as standard-setting bodies, international organisations and academic institutions to exchange knowledge, share

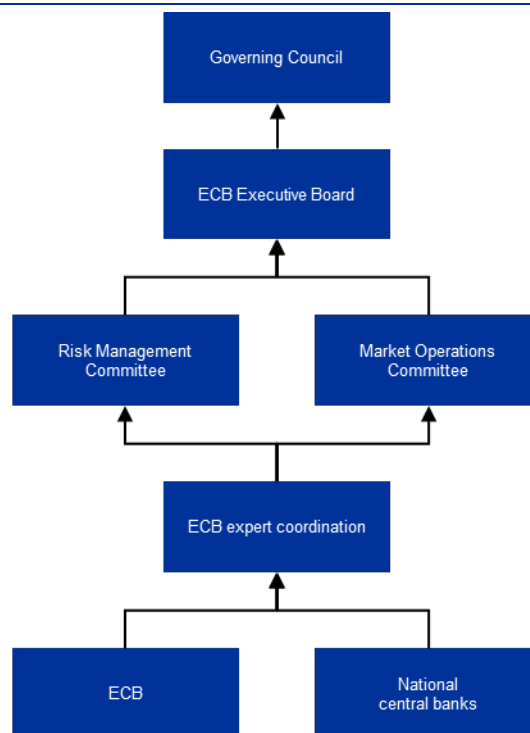
⁵ See the governance section in the [report on Climate-related financial disclosures of the Eurosystem's corporate sector holdings for monetary policy purposes](#), March 2023.

best practices and develop common frameworks for assessing and disclosing climate-related impacts on the portfolios and for addressing climate risks.

Within the ECB, collaboration across business areas enriches the analyses used in the policy recommendations put forward by the Eurosystem committees to the Executive Board. The climate-related work at these various levels contributes to shaping views and building consensus within the Eurosystem.

Figure 2

The Eurosystem’s governance on the inclusion of climate change considerations in its monetary policy holdings and the ECB’s foreign reserves



Source: ECB.

2.2 Governance aspects related to the ECB’s foreign reserves

The climate risk management of the ECB’s foreign reserves (which are managed in a decentralised manner within the Eurosystem) is integrated in the existing governance structures for the APP and PEPP.

The ECB’s Executive Board, together with the Eurosystem’s Market Operations Committee and Risk Management Committee, supports the Governing Council in the oversight of climate-related risks and opportunities for the ECB’s foreign reserves.

When developing policy proposals that deal with integrating climate-related considerations into the management of the ECB’s foreign reserves to put forward to the Governing Council, ECB and NCB staff responsible for portfolio and risk management convene in dedicated working groups and taskforces.

3 Strategy

This section gives an overview of the purpose of the Eurosystem's monetary policy portfolios and the ECB's foreign reserves and summarises strategy aspects related to climate change considerations. It first outlines general policy aspects that apply across the APP and PEPP, before focusing on corporate bond holdings, and finally sheds light on strategy aspects related to the ECB's foreign reserves.

3.1 General strategy aspects related to the APP and PEPP

The APP was among the measures initiated in mid-2014 to support the monetary policy transmission mechanism and provide the amount of policy accommodation needed to ensure price stability. The APP, combined with other monetary policy tools, helped the ECB meet its price stability objective at a time when room for further interest rate cuts had become limited.⁶ The APP comprises the public sector purchase programme (PSPP), the corporate sector purchase programme (CSPP), the third covered bond purchase programme (CBPP3) and the asset-backed securities purchase programme (ABSPP)⁷. The Governing Council decided to discontinue reinvestments under the APP as of July 2023. This means that the stock of APP holdings is gradually declining at the rate of principal redemptions from maturing debt instruments.

The PEPP was initiated in March 2020 to counter the serious risks to the monetary policy transmission mechanism and the outlook for the euro area posed by the coronavirus (COVID-19) outbreak. It includes all asset classes that are eligible under the APP. The Governing Council decided to discontinue net asset purchases under the PEPP as of the end of March 2022. Maturing principal payments from securities purchased under the PEPP will be reinvested in full until the end of June 2024. The ECB intends to reduce the PEPP portfolio by €7.5 billion per month on average over the second half of the year and to discontinue reinvestments at the end of 2024.

Climate change and the transition to a low-carbon economy can affect price stability, which is the primary objective of the ECB's monetary policy. In addition, and without prejudice to the primary objective of price stability, the ECB shall support the general economic policies in the European Union with the aim of contributing to the achievement of the Union's objectives as laid down in Article 3 of the Treaty on European Union. These include working for the sustainable development of Europe and a high level of protection and improvement of the quality of the environment.




The ECB's climate work focuses on three main objectives: managing and mitigating the financial risks associated with climate change and assessing its economic impact; supporting an orderly transition to a low-carbon economy with measures that are

⁶ See ["Taking stock of the Eurosystem's asset purchase programme after the end of net asset purchases"](#) on the ECB's website.

⁷ Asset-backed securities are excluded from the scope of this report owing to insufficient data availability.

within its mandate; and sharing expertise to foster wider changes in behaviour (Figure 3).

Figure 3
The ECB's strategic objectives on climate change

Managing climate-related risks 	Supporting the green transition 	Fostering wider action 
<p>We work to better understand, monitor and manage climate-related risks in monetary policy and investment operations, and in the financial system. We also assess the economic impact of climate-related policies and explore the relationship between climate, nature and the economy.</p>	<p>We support an orderly transition to a carbon-neutral economy using measures within our mandate. This includes promoting the development of sustainable finance and creating incentives for a greener financial system.</p>	<p>We help improve general understanding of climate and nature-related risks and work closely with European and international partners on climate and sustainable finance topics. We also work to improve the transparency of our activities and reduce our own environmental impact.</p>

Source: ECB.

The Eurosystem's holdings under the APP and PEPP and the ECB's foreign reserve holdings are exposed to climate risks.⁸ The Eurosystem therefore needs to manage as effectively as possible the climate-related financial risks to which it is exposed when implementing monetary policy in pursuit of its primary objective of maintaining price stability.⁹

The composition of APP and PEPP holdings is driven by monetary policy considerations and takes due account of legal requirements and risk management considerations.

Regarding public sector assets, as the stock of PSPP holdings gradually declines, following the end of APP reinvestments in July 2023, developments in holdings by jurisdiction and asset class are mostly driven by the timing of redemptions.¹⁰ The reduction of emissions related to sovereign bonds mostly depends on governments delivering on their decarbonisation pledges under the Paris Agreement. The ECB calls upon governments to deliver on these pledges. The reduction of emissions related to supranational, agency and covered bonds depends on issuers delivering on their individual decarbonisation plans.

3.2 Strategy aspects related to corporate holdings

This section outlines how the strategic aspects of the tilting framework for corporate holdings evolved in 2023. This includes the results of the first review of the climate

⁸ See "Climate change and monetary policy in the euro area", *Occasional Paper Series*, No 271, ECB, September 2021.

⁹ The adoption by the Eurosystem of measures designed to circumscribe the risk of financial losses, including climate-related financial losses, forms part of the definition and implementation of monetary policy, as also reflected in the Statute of the European System of Central Banks and of the European Central Bank (hereinafter the "Statute of the ESCB").





¹⁰ Ongoing public sector reinvestments under the PEPP, at least in part, until the end of 2024.

score methodology in the second half of 2023 and the changes in the implementation modalities of the tilting framework when the reinvestment of the APP holdings decreased from full to partial reinvestment in March 2023 and then to full run-off as of July 2023.

To mitigate climate-related risks on its balance sheet, in July 2022 the Governing Council decided to gradually decarbonise its corporate bond holdings on a path that supports the goals of the Paris Agreement and the EU's climate neutrality objectives¹¹ by tilting the reinvestment of redemptions towards issuers with a better climate performance. This measure also aims to provide incentives for issuers to be more transparent and reduce their greenhouse gas emissions.¹²

The Eurosystem's tilting framework for corporate purchases relies on a climate score to assess eligible corporate sector issuers' climate performance based on issuers' past emissions, the level of ambition in issuers' reduction targets and the quality of their climate-related disclosures.¹³ In addition, the tilting framework contains maturity limits for issuers assessed as having a high level of climate risk (and thus a low climate score), preferential treatment for green bonds that fulfil stringent criteria and a higher Eurosystem bid in the primary issuance of bonds from issuers with better climate performance¹⁴ (Figure 4).

Figure 4
Overview of the Eurosystem's framework for incorporating climate considerations into the corporate sector portfolios

 Objective	Aligning the implementation of corporate sector portfolios with the ECB's climate-related objectives
 Approach	<ol style="list-style-type: none"> 1. Combination of best-in-class and best-in-universe approaches for assessing carbon intensity <ul style="list-style-type: none"> • Reported scope 1 & 2 greenhouse gas emissions data • Sectoral average scope 3 greenhouse gas emissions data 2. Validation by a third party of the ambitiousness of the greenhouse gas emissions target 3. Quality of disclosures: for example completeness and third-party verification of emissions
 Tools	<p>Based on issuers' climate scores:</p> <ul style="list-style-type: none"> • Purchases guided by tilted benchmark towards issuers with higher climate scores • Maturity limits set for lower scoring issuers • Primary market bid that favours issuers with higher climate scores • Primary market bid that favours eligible issuers' green bonds that fulfil stringent criteria
 Targets	Decarbonisation of the portfolio on a path that supports the goals of the Paris Agreement and the EU's climate neutrality objectives.

Source: ECB.

The construction of the tilting framework allows for the strength of the tilt to be adjusted to retain the desired climate-related effects through changes in the monetary policy stance.¹⁵ Following the decision to reduce APP reinvestments in March 2023, the

¹¹ See "ECB takes further steps to incorporate climate change into its monetary policy operations", *press release*, ECB, 4 July 2022.

¹² Subsequently, greenhouse gases are referred to as "emissions" and denote the greenhouse gases defined in the *Kyoto Protocol*.

¹³ See the strategy section in the report on *Climate-related financial disclosures of the Eurosystem's corporate sector holdings for monetary policy purposes*, March 2023.

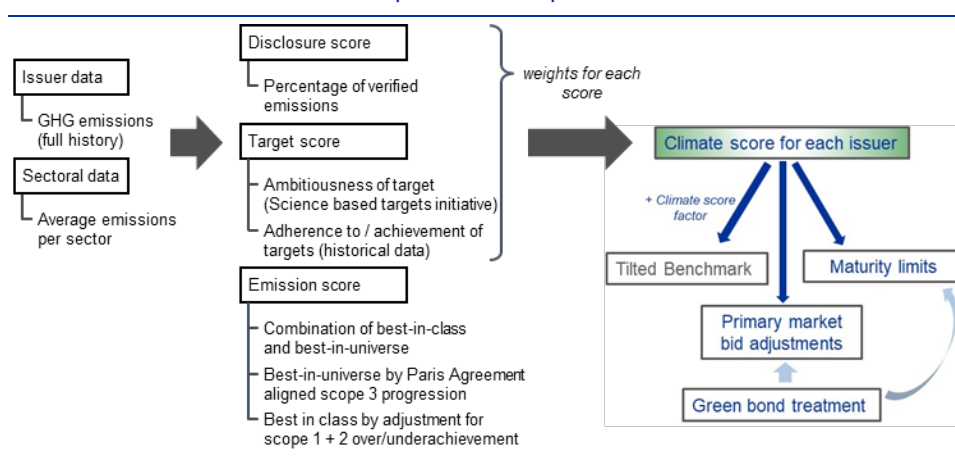
¹⁴ See the "FAQ on the integration of climate-related considerations into the CSPP" on the ECB's website.

¹⁵ See, for instance, the changes to the tilting parameter outlined in "ECB decides on detailed modalities for reducing asset purchase programme holdings", *press release*, ECB, 2 February 2023.

tilting parameters were increased accordingly. Without prejudice to the ECB's price stability objective, the increased tilting continued to support the gradual decarbonisation of the Eurosystem's corporate bond holdings on a path aligned with the goals of the Paris Agreement. Thereafter, in July 2023 the Governing Council decided to cease APP reinvestments in full. PEPP reinvestments, albeit modest, continued to be implemented using this framework and a higher tilting factor.

In October 2023 the Governing Council took note of the annual review of the tilting framework for the corporate bond portfolios. The CSPP climate score and tilting framework was found to be broadly successful in achieving its aims in its first annual review. Furthermore, increasing data availability allowed for some improvements to the otherwise stable methodological building blocks (Figure 5). Sufficient data became available to be able to assess (i) the rate of decarbonisation, and (ii) whether the Paris Agreement targets, expressed in terms of decarbonisation, were being adhered to by an issuer. The first point has been integrated into the backward-looking emissions score providing a view of the extent to which issuers are decarbonising. This measure therefore supports the goals of the Paris Agreement and the EU's climate neutrality objectives. The second point allows some measure of accountability for emission reduction targets met to be implemented within the target sub-score. Going forward, the measures will continue to be regularly reviewed to ensure they remain fit for purpose and on a path that supports the goals of the Paris Agreement and the EU's climate neutrality objectives.

Figure 5
Overview of the revised elements of the Eurosystem's framework for incorporating climate considerations into the corporate sector portfolios



Source: ECB.

3.3 Strategy aspects related to the ECB's foreign reserves

The ECB's foreign reserves have been in place since the introduction of the euro at the end of 1998.¹⁶ As part of the basic tasks to be carried out by the ECB in

¹⁶ For more information on the ECB's foreign reserves, see the article entitled "Trends in central banks' foreign currency reserves and the case of the ECB", *Economic Bulletin*, Issue 7, ECB, 2019.

accordance with Article 127(2) of the Treaty on the Functioning of the European Union, the main purpose of the ECB's foreign reserves is to ensure that the Eurosystem has sufficient and liquid resources for foreign exchange operations whenever needed. The euro's external value is not a policy target for the ECB.

The ECB's foreign reserves are composed of gold, special drawing rights (SDR) and highly liquid and creditworthy assets in US dollars (USD), Japanese yen (JPY) and Chinese renminbi (CNY). The currency composition of the ECB's reserves reflects policy considerations focused on the ability to conduct and fund effective interventions in euro against other major currencies. From this point of view, the US dollar and Japanese yen are the two most relevant intervention currencies. The Chinese renminbi was added in 2017 following its inclusion in the SDR basket in 2016 and given its increasing international role and the importance of China as one of the euro area's largest trading partners.

The objectives and the current composition of the foreign reserves' portfolio leave limited leeway for a specific climate strategy. Climate risks are integrated in the general risk management framework for the portfolio (Section 4.3).

4 Risk management

This section summarises climate-related risk management aspects for the Eurosystem's asset holdings held for monetary policy purposes and for the ECB's foreign reserves. It first outlines general aspects that apply across portfolios and goes on to focus on the APP and PEPP, as well as the ECB's foreign reserves.

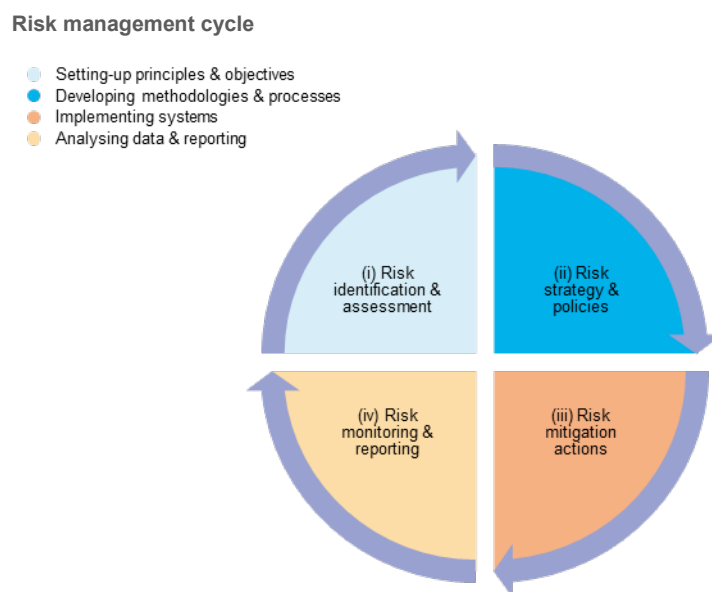
4.1 General risk management aspects

Assets held under the APP, PEPP and the ECB's foreign reserves are exposed to transition risks and physical risks. Transition risks refer to risks related to the transition to a low-carbon economy. Physical risks relate to the physical impacts of climate change. The Eurosystem takes a bottom-up approach to assessing climate risks and treats them as amplifiers of financial risks. Climate risks are integrated in the Eurosystem's financial risk management framework on an ongoing basis.

4.1.1 Integration of climate risks in the risk management cycle

This section outlines how climate risks are integrated in the four stages of the Eurosystem's risk management cycle, which comprises (i) risk identification and assessment, (ii) risk strategies and policies, (iii) risk mitigation, and (iv) monitoring and reporting.

Figure 6
Overview of the Eurosystem’s risk management cycle



Source: ECB.

Climate risks are considered in the risk identification and assessment stage. Regular analytical risk tools capture climate risks to the extent that they are already reflected in asset prices, asset price volatilities and credit risk indicators, such as ratings by external credit rating agencies. The risk identification and assessment process also uses qualitative and scenario analyses that allow climate risks beyond those priced in by market indicators to be incorporated. Climate stress tests are used for this purpose. Additionally, the Eurosystem works towards improving the availability and quality of climate data to better identify and manage climate-related risks and opportunities. In this context, indicators reflecting different dimensions of climate risk are considered: backward-looking metrics (based on historical emissions) and forward-looking metrics (i.e. scenario projections), as well as inward risks and outward risks.¹⁷

Risk strategies and policies are defined by the ECB’s decision-making bodies. The Eurosystem’s financial risk management frameworks aim to achieve the respective objectives of the monetary policy and foreign reserves portfolios with the lowest possible risk. The risk strategies and policies of the Eurosystem consider the materiality of climate risks on its financial portfolios and define priorities for implementing the appropriate risk management measures.

The Eurosystem carries out risk mitigation of its portfolios by applying eligibility criteria, credit risk assessment and purchase limits, as well as through price checks. Depending on the portfolio, applying benchmarks, issuer (group) limits, counterparty

¹⁷ As defined in the [NGFS guide on climate-related disclosures for central banks](#), inward risks are climate-related risks to central banks’ balance sheets and internal operations, while outward risks arise because central banks indirectly finance greenhouse gas emissions when lending to, or investing in, countries or companies responsible for those emissions.

limits and/or due diligence contributes to mitigating the risk. Such measures intrinsically afford protection against climate risk. For instance, benchmarking and limits prevent too large an exposure to geographically concentrated issuers, mitigating the impact of acute, localised physical risks; diversifying the portfolio mitigates the transition risk that can affect certain sectors. Additional portfolio and climate risk-specific measures include the integration of climate risk considerations in the Eurosystem's credit assessments and the CSPP tilting.

The monitoring and reporting of portfolios' exposure to climate risks is gradually being enhanced and expanded as the coverage and quality of data improve. In 2023 the Eurosystem published its first climate-related financial disclosures for the Eurosystem's corporate sector holdings held for monetary policy purposes under the CSPP and PEPP.¹⁸

4.1.2 Climate stress testing

The Eurosystem has developed a climate stress testing framework which aims to assess the impact of climate risks on the financial risk profile of the Eurosystem's balance sheet. Using this framework, the Eurosystem conducted a climate stress test in 2022.¹⁹ The climate stress test covered collateralised credit operations and holdings of corporate securities, covered bonds and asset-backed securities in the Eurosystem's monetary policy portfolios. The climate stress test explored three long-term scenarios, assuming various timings for climate policy implementation and the resulting implications for climate change and its impact on the global economy. It also assessed two short-term scenarios, one reflecting the impact of a severe physical hazard and the other a sharp and sudden increase in the carbon price.

The corporate sector holdings are major drivers of the aggregate results of this exercise: in all scenarios they make a larger contribution to the total increase in risk than the other assets in scope.

By contrast, covered bonds held by the Eurosystem represent a small share of the total risk increase in the two long-term scenarios, although the increase in risk is still material. This share is more significant in the short-term flood risk scenario, as assets in this asset class are more sensitive than others to changes in real estate prices (mostly owing to the characteristics of the underlying cover pools).

Climate risk stress tests of the Eurosystem balance sheet will continue to be carried out, with the next exercise scheduled for 2024. The Eurosystem regards climate scenario analysis as a key tool in assessing the implications of climate change for financial risks.

¹⁸ See [Climate-related financial disclosures of the Eurosystem's corporate sector holdings for monetary policy purposes](#), March 2023.

¹⁹ See "[Results of the 2022 climate risk stress test of the Eurosystem balance sheet](#)", *Economic Bulletin*, Issue 2, ECB, 2023 and Section 4.3 of [this report](#).

4.1.3 Integrating climate considerations in the Eurosystem credit assessment framework

The Eurosystem seeks to ensure that climate considerations are integrated in the rating systems which underpin the credit risk assessment for assets. The Eurosystem credit assessment framework mitigates the credit risk of collateral used in monetary policy operations and establishes appropriate valuation and risk control measures. To assess the credit quality of eligible assets, the Eurosystem takes into account information from credit assessment systems belonging to one of three sources: external credit assessment institutions (ECAIs), i.e. credit rating agencies; national central banks' in-house credit assessment systems (ICASs); and internal rating-based approaches (IRBs).

ECAIs are largely used to assess the creditworthiness of marketable assets for collateral and play an important role in the risk control framework for outright purchase programmes. The ECB investigated whether ECAIs are disclosing the necessary information about the integration of climate change risk in their credit ratings. Staff analysis and recommendations on this topic were included in an ECB Occasional Paper in September 2022.²⁰ The ECB continues its close dialogue with ECAIs and regularly monitors developments in disclosure by ECAIs.

The Eurosystem also sets standards for incorporating climate change risks into the rating process of ICASs.²¹ Moreover, IRBs are included in the scope of initiatives undertaken by ECB Banking Supervision to assess the level of preparedness for managing climate risks of supervised institutions.²²

The review and evaluation of climate change-related risks in credit ratings and the implementation of minimum standards for ICASs will continue in 2024 and beyond as part of the ECB's climate and nature plan.

4.2 Risk management aspects related to the APP and PEPP

The risk management framework of the Eurosystem's monetary policy operations aims to achieve policy objectives with the lowest possible risk to the Eurosystem and the ECB, i.e. risk-efficiency.²³ The options for effectively managing and mitigating climate risks in the Eurosystem and ECB portfolios differ across asset classes.

Euro area sovereign bonds held under the PSPP and PEPP account for a major part of those portfolios' exposure to climate risks. Transition risks are linked, in particular, to the level and trend of carbon emissions, which are related to countries' economic

²⁰ See "[Disclosure of climate change risk in credit ratings](#)", *Occasional Paper Series*, No 303, ECB, September 2022.

²¹ The respective set of common minimum standards will be implemented by the end of 2024 (see the box entitled "[Common minimum standards for incorporating climate change risks into in-house credit assessment systems in the Eurosystem](#)", *Economic Bulletin*, Issue 6, ECB, 2022).

²² In July 2022 ECB Banking Supervision conducted a [climate risk stress test](#) and in November 2022 assessed the banking sector's implementation of its [Good practices for climate related and environmental risk management](#). For more details, see Section 1.8 of the [ECB guide to internal models](#).

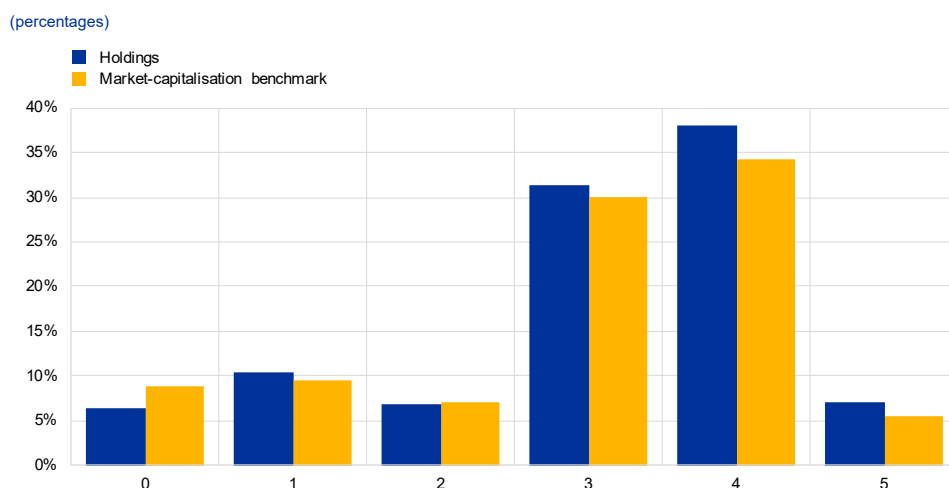
²³ See ECB, [The financial risk management of the Eurosystem's monetary policy operations](#), July 2015.

models. For instance, physical risks depend on a country’s geography and its capacity for risk adaptation, which refers to the process of adjusting to the current and future effects of climate change.

Supranational and agency bonds account for the remainder of public sector securities held under the PSPP and PEPP. Their exposure to transition risks depends on issuers’ carbon emissions (that also account for their financing activities). Their exposure to physical risks depends on the geographic location of their offices as well as the location and diversification of their financing activities.

The Eurosystem’s climate agenda defines corporate sector assets held under the CSPP and PEPP as a priority for the management and reporting of climate risks. So far, climate considerations have been incorporated into the due diligence procedure, the application of maturity limits and the tilting framework guiding the allocation of corporate sector purchases. Chart 1 shows the distribution of climate scores for assets held under the CSPP and the corporate part of the PEPP. The change in the climate risk profile of the Eurosystem’s corporate sector portfolio illustrates the effects of tilting, whereby the tilting effect on the distribution of climate scores of issuers results from tilted purchases since October 2022 that include primary market participation only in securities of issuers with a better climate performance and green bonds that comply with a stringent identification process. A significant shift towards improved climate performance has been observed since the initiation of the tilting programme.

Chart 1
Distribution of climate scores for holdings under the CSPP and PEPP



Source: ECB calculations.
Note: Higher climate scores indicate that the issuer has a better overall climate performance.

Covered bonds are characterised by a double-recourse structure. This structure includes the bond issuer and the cover pool, which serves as additional security layer in case the issuer defaults on its bond payments. The exposure of covered bonds to climate risks can therefore be analysed and managed from these two different angles. However, since available data for cover pools remains fragmented, the current evaluation of the exposure to climate risks of covered bonds held under the CBPP3 and PEPP is based only on issuer-specific carbon emissions data. The Eurosystem is

working with regulators and data providers to improve the availability of emissions data at cover pool level.²⁴

4.3 Risk management aspects related to the ECB's foreign reserves

The primary purpose of the ECB's foreign reserves holdings is to enable foreign exchange interventions, whenever needed. The management of the foreign reserves is therefore aimed at meeting three main requirements: liquidity, security and return, in that order. The ECB manages the investment of its foreign currency holdings by designing benchmark portfolios, approved by the ECB's decision-making bodies. The permitted deviation from these benchmarks in terms of risk is controlled by the ECB, making the benchmarks an important driver of the risk profile of the ECB's foreign reserves. The fixed-income assets of the foreign reserves portfolio consist mainly of sovereign bonds of the United States, Japan and China.

Transition risks depend on the carbon emissions and the decarbonisation path of these jurisdictions, as well as the transition policies that are, or will be, implemented by the respective governments and other national authorities. Physical risks can affect the market value of bonds in the short run and can also be a driver of volatility.

The objectives of the foreign reserves portfolio leave limited leeway for specific climate risk management measures. Nevertheless, the financial risk framework for this portfolio, focused on ensuring liquidity, security and returns, caters for an efficient management of various risk factors, including climate.

²⁴ In the [call for advice](#) to the European Banking Authority (EBA) on the performance and review of the EU covered bonds framework, the Commission has invited the EBA to assess the relevance of introducing disclosure requirements for the ESG risks of the cover pools for covered bonds, taking into account interlinkages with the Pillar 3 disclosures on ESG risks and the March 2023 ESA/ECB joint statement on disclosures.

5 Metrics and targets

This section provides transparency on the exposure to climate risks of the Eurosystem's monetary policy portfolios and the ECB's foreign reserves. Four key metrics form the foundation of the Eurosystem's climate disclosures. These metrics are the weighted average carbon intensity (WACI), carbon intensity, total carbon emissions and the carbon footprint. Annex 1 sets out how each metric is calculated and outlines the main elements of the common Eurosystem framework developed to align the reporting methodology. Annex 2 provides further information on the applied emissions allocation methods, normalisation and attribution factors.

High levels of data availability and quality are essential for calculating reliable and relevant climate metrics. The independent climate data providers Institutional Shareholder Services (ISS) and Carbon4 Finance supply the Eurosystem with climate data. The Eurosystem promotes transparent disclosures aimed at providing the most relevant and accurate information available. To this end, the Eurosystem regularly discusses improvements in data availability and quality with policymakers and its climate data providers.

Sovereign bond metrics are calculated based on three methods for emissions allocation: (i) the emissions within a country's physical borders (production emissions), (ii) the emissions related to domestic consumption (consumption emissions), and (iii) the emissions related to government institutions and government expenditure (government emissions). Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). Production emissions are self-reported by sovereigns, while all other emissions are modelled by the abovementioned data providers. The three emissions allocation methods are reported to provide a maximum degree of transparency. They are complementary, as each of them provides a different angle on the emissions associated with sovereign issuers.

Metrics for supranational, agency and corporate issuers are based on issuers' scope 1 and scope 2 emissions. For the first time, metrics based on scope 3 emissions are reported for these issuers in the Annexes but are not analysed in the main text. Scope 1, 2 and 3 emissions are partly self-reported by issuers and partly modelled by the data providers, with self-reported emissions preferred whenever available. The reason for separate reporting in the Annexes is that scope 3 emissions data remain subject to data quality issues that limit their reliability, including i) considerable estimation uncertainty, ii) diverging estimates across different data providers, and iii) methodological changes over time. Despite these data shortcomings, the Eurosystem decided to start reporting scope 3 emissions to incentivise issuers and data providers to enhance scope 3 emissions reporting.

Emissions and financial data that match the reference year of the holdings are used whenever possible for calculating the metrics. However, reference years do not match for the most recent reporting periods, owing to the natural delay with which emissions data become available. This data limitation is most notable where identical emissions

data have been applied to non-sovereign holdings for 2022 and 2023 and to sovereign holdings for 2021 to 2023. This works to artificially stabilise the metrics used in this report for these years across the portfolios.

In future reports, as the data become available, the ECB will retrospectively update the metrics that were based on data with different reference years than those of the portfolio holdings. Following this logic, this report presents updated metrics for corporate sector assets for the years 2021 and 2022 compared to the metrics presented for these years in the previous report.

5.1 APP and PEPP holdings

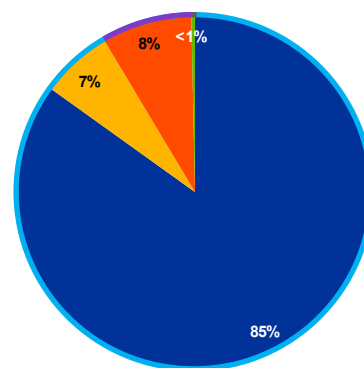
As at the end of 2023, Eurosystem holdings of assets under its APP and PEPP amount to €4,447 billion in nominal value. Chart 2 shows a breakdown of the holdings by asset class. Compared with the previous report, which only covered corporate sector assets, this report also includes the Eurosystem’s holdings of public sector assets (sovereign, sub-sovereign, agency and supranational bonds) and covered bonds. In terms of scope, these three asset classes together account for 99.7% of the total assets held for monetary policy purposes under the APP and PEPP. Each asset class is discussed separately in the following sections. Asset-backed securities remain out of the reporting scope owing to a lack of reliable climate data.

Chart 2

Eurosystem APP and PEPP holdings by asset class

(percentages)

- Public sector bonds
- Covered bonds
- Corporate bonds
- Asset-backed securities
- Portfolios additionally in scope of this report
- Portfolios in scope of the previous report
- Portfolios out of scope of this report



Source: ECB calculations.

Note: The chart shows the allocation of Eurosystem holdings held for monetary policy purposes under the APP and PEPP across asset classes.

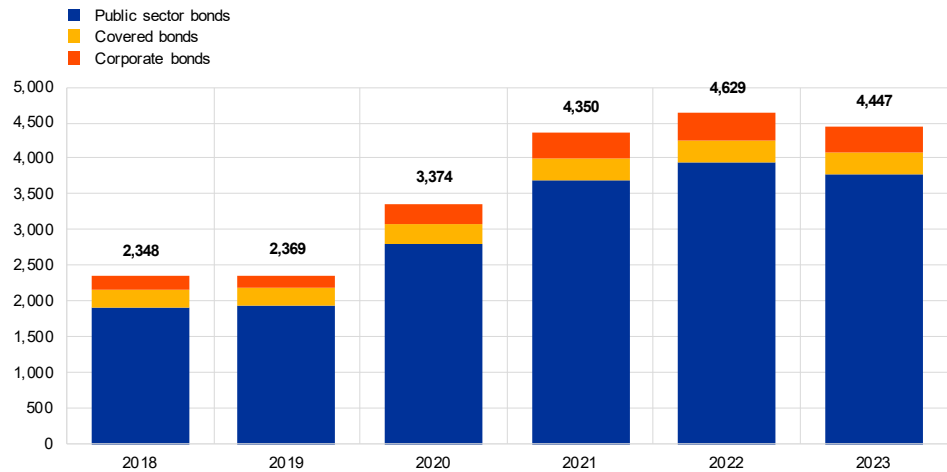
Chart 3 shows the total value of APP and PEPP holdings covered in this report over time. Holdings increased over the reporting period from 2018 to 2023. The large increases in 2020 to 2022 relate to the increase in the pace of APP purchases and the introduction of the PEPP in response to the serious risks to the monetary policy transmission mechanism and the outlook for the euro area posed by the pandemic. Following the Governing Council’s decision to reduce the pace of APP reinvestments

as of 1 March and to cease these reinvestments as of 1 July 2023, holdings started to gradually decline from 2023.

Chart 3

Historical developments in the Eurosystem’s APP and PEPP holdings by asset class

(€ billions)



Source: ECB calculations.

Note: The chart shows the allocation of Eurosystem holdings held for monetary policy purposes under the APP and PEPP across the asset classes covered in this report, expressed at nominal value.

Table 1 shows the key metrics for the Eurosystem’s assets held for monetary policy purposes under the APP and PEPP as at the end of 2023 based on scope 1 + 2 emissions, which form the basis of the report. Annex 3 contains a comprehensive overview of historic key metrics based on scope 1 and scope 2 emissions. Annex 4 shows metrics based on scope 3 emissions.

Table 1

Financial and climate-related metrics for the Eurosystem's APP and PEPP holdings as at the end of 2023

	Sovereign and sub-sovereign bonds			
	Production		Consumption	Government
	excl. LULUCF	incl. LULUCF		
Portfolio value (EUR billion nominal value)	3,260			
WACI	140	133	10	64
Total carbon emissions	455,163,384	432,390,453	588,175,323	44,331,173
Carbon footprint	140	133	180	14
Carbon intensity	140	133	10	64

Other issuers

	Total	Agency bonds	Supranational bonds	Covered bonds	Corporate bonds
Portfolio value (EUR billion nominal value)	1,187	298	231	291	367
WACI	55	3.8	0.2	1.4	172
Total carbon emissions	47,091,767	258,948	98	94,410	46,738,311
Carbon footprint	48	0.9	0.0	0.3	132
Carbon intensity	72	17	0.0	1.6	187

Sources: ISS, Carbon4 Finance, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: The table shows key metrics for the Eurosystem's assets held for monetary policy purposes by asset class. For sovereign bonds, metrics are provided separately for production, consumption and government emissions. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). For other issuers, metrics are provided on asset class and aggregate level ("Total"), based on issuers' scope 1 + 2 emissions. Portfolio value is expressed in € billions in nominal value. The WACI and carbon intensity are expressed as tCO₂e per € million revenue (corporate issuers), PPP-adjusted GDP (sovereign issuers and production emissions), per capita (sovereign issuers and consumption emissions), or final consumption expenditure (sovereign issuers and government emissions). Total carbon emissions are expressed as tCO₂e. Carbon footprint is expressed as tCO₂e per € million invested. Metrics are calculated using bonds' nominal values. Underlying holdings refer to year-end values.

5.1.1 Public sector bond metrics

Public sector bonds account for 85% of total APP and PEPP holdings as at the end of 2023. Emission methodologies underlying the calculation of metrics for sovereign bonds (i.e. production, consumption and government) and non-sovereign bonds (i.e. scope 1 and scope 2 emissions) are not comparable. Therefore, sovereign bond metrics should be interpreted separately from non-sovereign metrics.

When interpreting the results, it is necessary to bear in mind that the metrics and trends for public sector bonds are subject to uncertainty as well as methodological and data-related limitations. These limitations include (i) the typical two-year delay with which sovereign emissions data become available, (ii) the embedded downward bias in metrics over time as a result of inflation, and (iii) the effects of temporary shocks to sovereign emissions and economic activity, for example the shock from the pandemic. Given these limitations, specific metric values and trends should be understood as indicative and produced on a best-effort basis. Work is ongoing to address these limitations and improve climate-related disclosure frameworks for sovereign bond investments at investor, data provider and standard-setter level.

Sovereign and sub-sovereign bonds

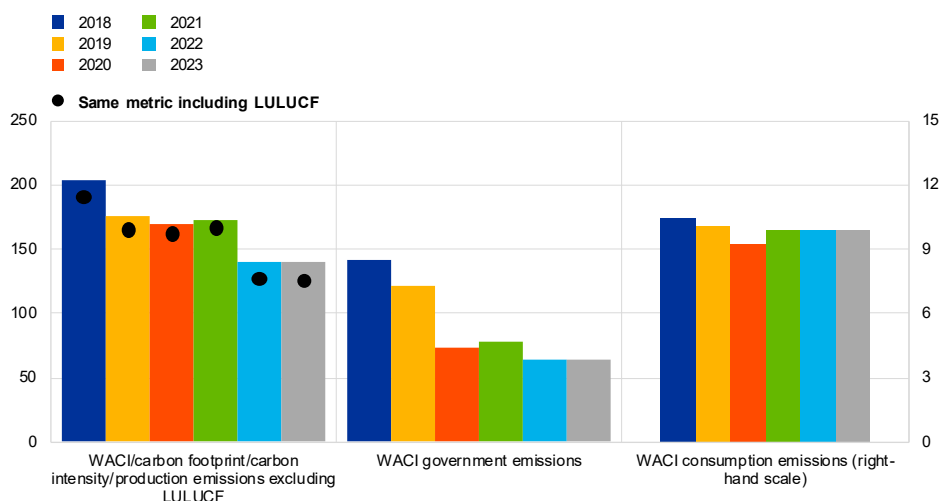
Sovereign (and sub-sovereign) bonds account for 86% of the Eurosystem's public sector bond holdings.²⁵

Sovereign bond holdings decarbonised in recent years, as shown by the decline in the WACI (Chart 4). Looking at the longer-term trend, between 2018 and 2023 the WACI for government emissions showed the most notable decline, dropping by 55%, while the WACI of for production emissions (equal to the carbon footprint and the carbon intensity metrics) fell by 31% (including and excluding LULUCF) and that for consumption emissions declined by 6%. Between 2019 and 2020, there was a 40% reduction in the WACI for government emissions owing to the pandemic, which reduced central government direct and indirect emissions.

Chart 4

Evolution of the WACI for sovereign bond holdings in the PSPP and PEPP

(left-hand scale: tCO₂e per € million; right-hand scale: tCO₂e per capita)



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: The WACI is shown for production, consumption and government emissions. Production and government emissions are based on data provided by ISS; consumption emissions are based on data provided by Carbon4 Finance. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). The WACI is denominated in tCO₂e per € million GDP (production emissions), tCO₂e per € million government consumption (government emissions) and tCO₂e per capita (consumption emissions). Metrics are calculated using bonds in nominal value. Underlying holdings refer to year-end values.

Several factors contributed to the reduction in emissions in public sector holdings that has been trending since 2018. As signatories of the Paris Agreement, all euro area sovereigns represented in the ECB's public sector portfolios have committed to decarbonising their economies over time. Euro area sovereigns are also subject to the European Climate Law, which requires EU states to achieve net zero emissions by 2050 and to reduce them by 55% by 2030. On a macro level, the pandemic lockdowns led to a widespread reduction in global economic activity, which resulted in a widespread decline in global sovereign emissions. It is likely that the reduction in emissions visible in the data from 2021 to 2023 is overstated, as it is driven by recent macro data that reflect increased economic activity in the euro area following the

²⁵ For the purposes of this report, bonds issued by the EU are classified as sovereign bonds. In implementing the APP and PEPP and for regular reporting, bonds issued by the EU are treated as EU supranational securities.

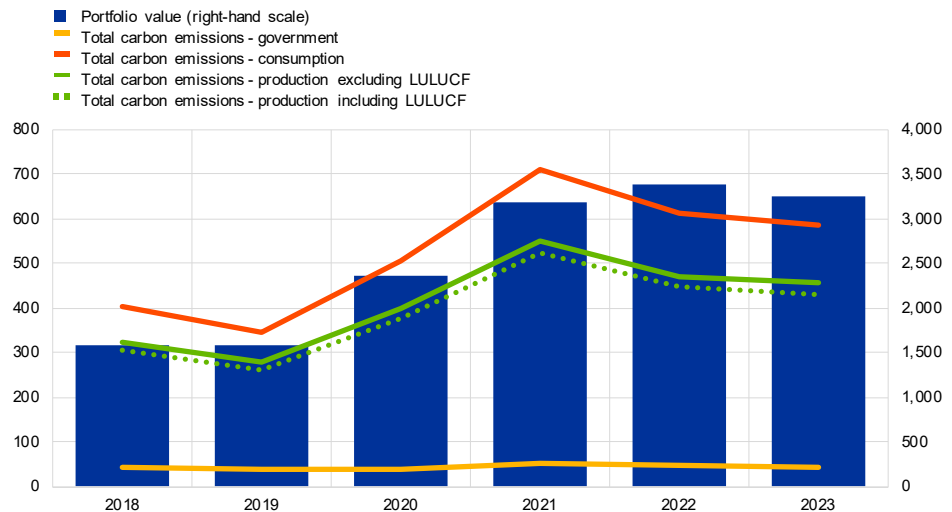
pandemic. The data will be revised once the emissions data matching the reference year become available. Moreover, the further improvement in the metrics for 2022 and 2023 may be partially driven by inflation, as the data is not adjusted for this.

In contrast to the WACI, the total carbon emissions associated with sovereign bond holdings have increased meaningfully over the reporting period from 2018 to 2023, driven mostly by increasing portfolio size (Chart 5). The inclusion of LULUCF lowers production emissions by 5% on average over the reporting period. The drop in the metrics that can be observed from 2021 to 2023 should not be overinterpreted, as it is related to a mismatch in the reference years, whereby the latest available emissions data used is from 2021, while the GDP data is for 2022, following the pick-up in economic activity and inflation). This mismatch will be corrected retrospectively. In addition, the improvement from 2022 to 2023 is entirely due to a decrease in portfolio holdings, as the emissions and GDP data used for the 2022 and 2023 metrics are identical. It is worth noting that the level of consumption emissions exceeds that of production emissions, which shows that the sovereign bonds held under the PSPP and PEPP are, on aggregate, those of euro area countries that are net carbon importers. The emissions directly attributable to government activity are low compared with production and consumption emissions.

Chart 5

Evolution of total carbon emissions and portfolio value for sovereign bond holdings in the PSPP and PEPP

(left-hand scale: millions tCO₂e; right-hand scale: € billions nominal value)



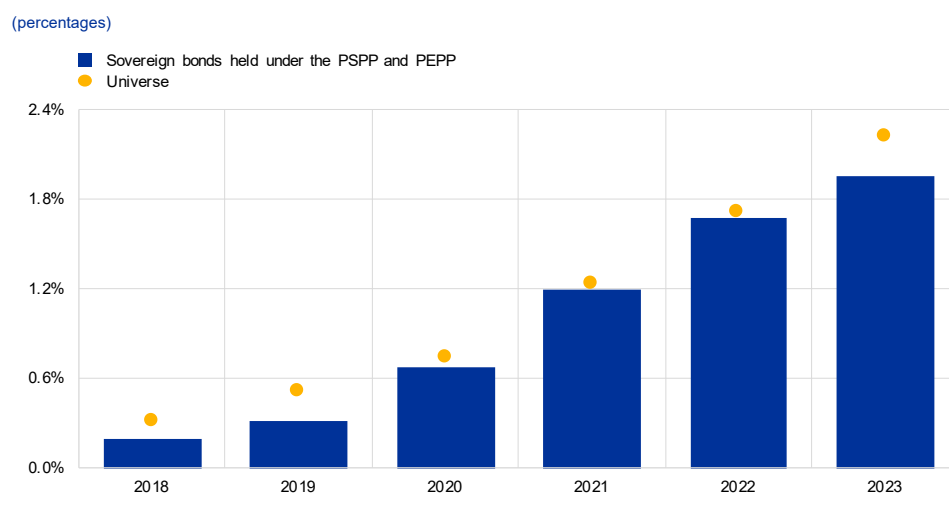
Sources: ISS, Carbon4 Finance, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: Production and government emissions are based on data provided by ISS; consumption emissions are based on data provided by Carbon4 Finance. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). Metrics are calculated using bonds' nominal values. Underlying holdings refer to year-end values.

The availability of climate data for sovereign bonds has improved in recent years, reflecting a broader market trend towards enhanced climate-related reporting. Production, consumption and government emissions cover all sovereign issuers. Data gaps remain for sub-sovereign issuers, for which consumption and government emissions are unavailable. The lack of specific climate data for sub-sovereign issuers is overcome by assigning the data for the sovereign.

Green bonds contribute to the transition to a low-carbon economy and provide targeted financing for projects with a positive environmental impact. Moreover, they can create funding advantages for issuers compared with funding via conventional bonds. The share of green bonds in sovereign bond holdings under the PSPP and PEPP has gradually increased over the years. In 2018-2019 it was below the green bond share of the eligible universe for two reasons: the prohibition on monetary financing which prohibits the Eurosystem from conducting primary market purchases of sovereign bonds²⁶ and lower secondary market liquidity of green bonds owing to a higher share of hold-to-maturity investors and lower outstanding volumes. The green bond share in the portfolio then grew in line with the expansion of the market and improvement in liquidity. Up to the end of 2022, it was close to the green bond share of the eligible universe (Chart 6). In 2023 the share of green bonds in the eligible universe increased further. However, the portfolio's green bond share could not increase to the same extent owing to limited reinvestment volumes and more limited secondary market liquidity of green bonds.

Chart 6
Share of green bonds in the sovereign bond holdings under the PSPP and PEPP



Sources: ICMA and ECB calculations.

Notes: The chart shows the share of green bonds in the sovereign bond holdings under the PSPP and PEPP over time, compared to the universe. To identify green bonds, the ECB relies on the labelling applied by the International Capital Market Association (ICMA). The calculation is based on bonds' nominal values. Underlying holdings refer to year-end values.

Supranational and agency bonds

Supranational and agency bonds account for 14% of public sector bond holdings. Chart 7 shows changes in the key metrics for supranational and agency bond holdings. In contrast to emissions associated with sovereign bonds, the emissions associated with agency bonds (panel a) have increased in recent years, mostly in response to rising exposure to individual, high-emitting issuers. By contrast, emissions associated with supranational bonds (panel b) have declined.

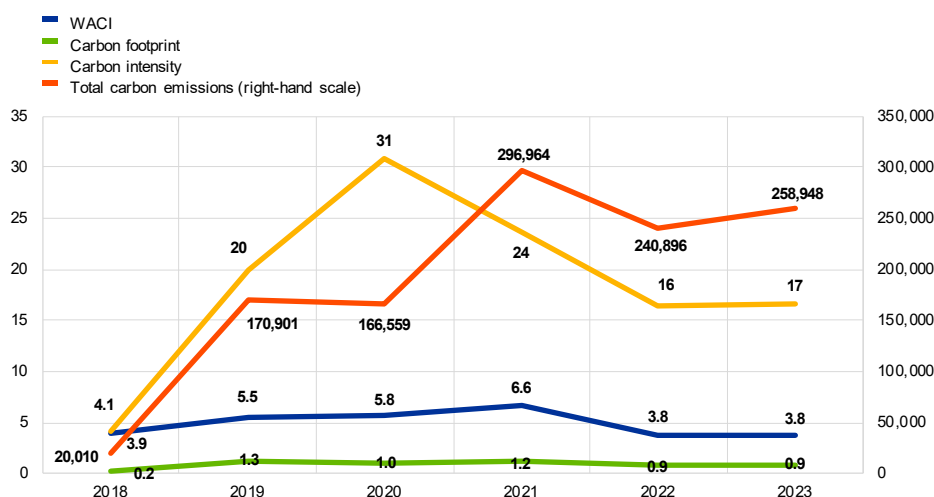
²⁶ In accordance with Article 123(1) TFEU.

Chart 7

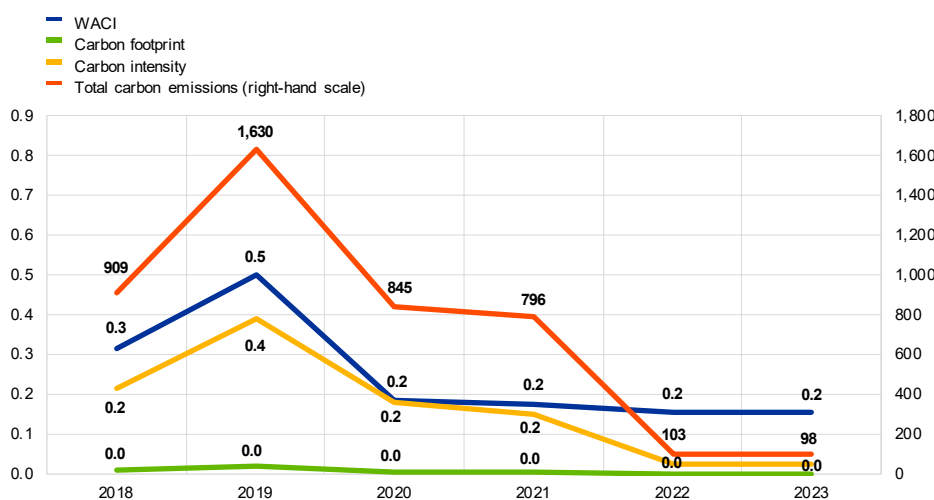
Evolution of key metrics for supranational and agency bond holdings under the PSPP and PEPP

a) Agency bonds

(left-hand scale: tCO₂e/€ millions; right-hand scale: tCO₂e)



b) Supranational bonds



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg and ECB calculations.

Notes: The chart shows historic values for the four key metrics used for supranational and agency holdings based on issuers' scope 1 + 2 emissions. Metrics are calculated using bonds' nominal values. Emissions normalisation in the WACI and the carbon intensity is based on revenue (in € millions); and in the carbon footprint based on the investment amount (in € millions). Underlying holdings refer to year-end values.

The availability of climate data for supranational and agency issuers fluctuates over time, depending on coverage-related decisions by the climate data providers. This complicates the interpretation of changes in the key metrics over time, as sudden jumps may reflect changes in data coverage rather than meaningful trends.

The share of green bonds in agency and supranational bond holdings under the PSPP and PEPP has also gradually increased over time, but remains below the share of green bonds in the eligible universe (Chart 8). Similarly to sovereign bonds, this is because 1) the monetary financing prohibition means that the Eurosystem may not

conduct primary market purchases for this asset class, 2) limited secondary market liquidity, and 3) the sharp increase in green supranational bond issuance in 2022 and 2023, when the portfolio's green bond share could not increase to the same extent owing to limited reinvestment volumes.

Chart 8

Share of green bonds in the agency and supranational bond holdings under the PSPP and PEPP and PEPP

(percentages)



Sources: ICMA and ECB calculations.

Notes: The chart shows the share of green bonds in the agency and supranational bond holdings under the PSPP and PEPP over time, compared to the universe. To identify green bonds, the ECB relies on the labelling applied by the International Capital Market Association (ICMA). The calculation is based on bonds' nominal values. Underlying holdings refer to year-end values.

5.1.2 Corporate bond metrics

Corporate bonds account for 8% of the total APP and PEPP holdings as at the end of 2023. Metrics in this section are based on issuer self-reported scope 1 and 2 emissions data as defined in the Greenhouse Gas Protocol.²⁷ Metrics based on scope 3 emissions are disclosed, on a best-effort basis, in Annex 4.²⁸

The Eurosystem continues to call on corporates to set and deliver on their emissions reduction targets and in line with the goals of the Paris Agreement. The fulfilment of announced forward-looking commitments by issuers, together with corporate disclosures and data on emissions, are important elements for the Eurosystem's emission reduction strategy to deliver on its objectives and transparency commitments.

Evolution of key climate metrics within the corporate sector portfolios

At the end of 2023 the corporate holdings within the asset purchase programme (APP) comprised approximately 88% of the Eurosystem's corporate sector assets held for

²⁷ The Eurosystem uses market-based scope 2 emissions data if these are available and reliable. Location-based scope 2 emissions might be used when market-based reporting is not available.

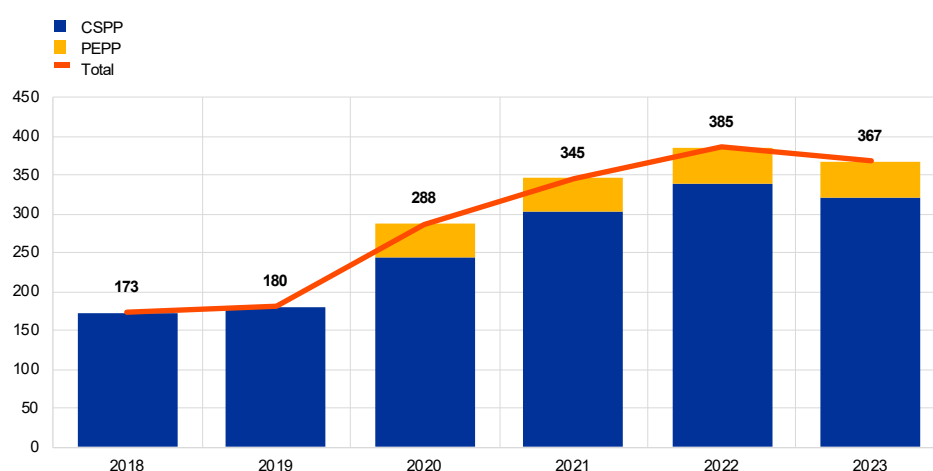
²⁸ The ECB has integrated scope 3 emissions at the sector level into the climate scoring tool used to tilt its purchases of corporate sector bonds.

monetary policy purposes, with PEPP holdings accounting for the remaining 12%. While the level of corporate sector assets held by the Eurosystem for monetary policy purposes increased substantially over the period covered by climate-related disclosures (Chart 9), in 2023 the holdings of the corporate portfolios declined for the first time since the inception of the CSPP. This was due to monetary policy stance considerations, which led to the Governing Council’s decision to cease reinvestments in all the purchase programmes within the APP.

Chart 9

Historical evolution of the Eurosystem’s corporate sector holdings and portfolio breakdown

(€ billions, nominal amounts)



Source: ECB calculations.
 Note: Underlying holdings refer to year-end values.

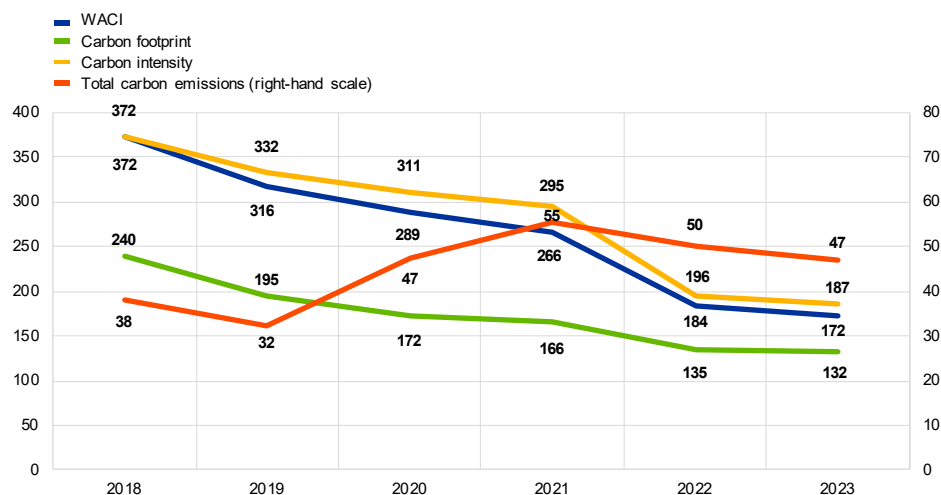
Chart 10 shows the evolution of key climate and financial metrics for corporate sector holdings. All three normalised metrics – WACI, carbon footprint and carbon intensity – follow a continuous gradual decarbonisation trajectory since 2018. In 2022, the first year in which the tilting framework was active and the latest year for which the Eurosystem has a full set of issuers’ climate data, the normalised metrics show an acceleration of the portfolios’ emission reduction. Total carbon emissions, which started to increase in 2019, peaked in 2021 and have since continued to decline.

The fluctuations in total carbon emissions mainly result from changing portfolio size over time. From the beginning of 2020 to the start of partial reinvestments in 2023, the Eurosystem purchased a total nominal amount of €226 billion of corporate securities under the APP. Purchases under the PEPP, which the ECB commenced in March 2020 in response to the monetary policy challenges triggered by the pandemic, amounted to €98 billion as at the end of 2023. As the portfolios’ holdings peaked around mid-2022 and started to decline with the end of APP reinvestments, the total carbon emissions associated with the corporate sector portfolios accelerated their declining trend.

Chart 10

Evolution of key metrics for the Eurosystem's corporate sector portfolios from 2018 to 2023

(left-hand scale: tCO₂e/€ million; right-hand scale: million tCO₂e)



Sources: ISS, Bloomberg and ECB calculations.

Notes: The chart shows historic values for the four key metrics used for corporate sector holdings based on issuers' scope 1 + 2 emissions. Metrics are calculated using bonds' nominal values. Emissions normalisation in the WACI and the carbon intensity is based on revenue (in € millions); and in the carbon footprint based on the investment amount (in € millions). Underlying holdings refer to year-end values.

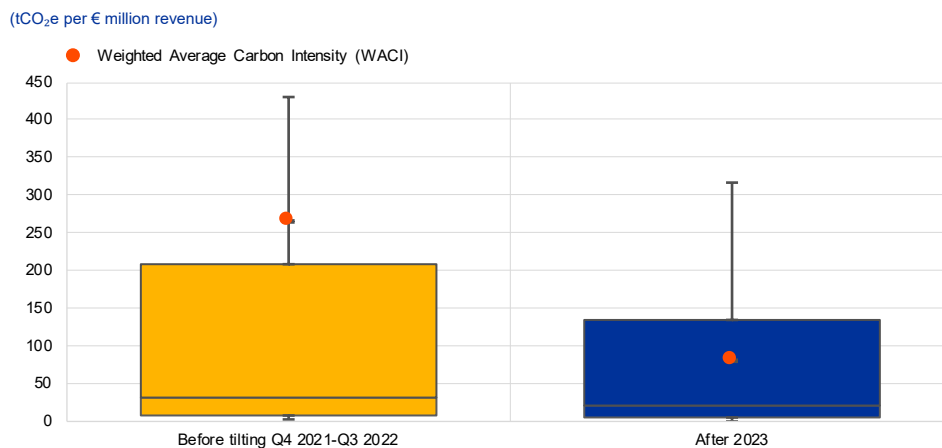
The full vintage of issuer self-reported climate data for 2022 confirmed that normalised metrics of carbon intensity declined significantly between 2021 and 2022. In this period, issuers on aggregate became more carbon-efficient owing to a combination of declining emissions and an increase in the respective normalisation factors such as revenues. Some sectors that make a large contribution to the financed emissions of the corporate sector portfolios (for example “energy and basic resources”) benefitted from a significant increase in weighted average revenues of up to 60% year-on-year.

In October 2022 the Eurosystem started to incorporate climate change considerations into its corporate sector purchases and tilted its new transactions towards issuers with improved climate performance. The tilting of purchases and the redemption of carbon-intensive bonds and commercial paper have since contributed to the decline in the metrics.

Chart 11 shows that the carbon intensity of reinvestments has declined significantly since the introduction of the tilting framework. The WACI of purchases conducted in 2023 declined by 70% compared with the year that preceded the implementation of the tilting framework.

Chart 11

Distribution of the carbon intensity of corporate bond purchases before and after incorporation of climate change considerations



Sources: ISS and ECB calculations.

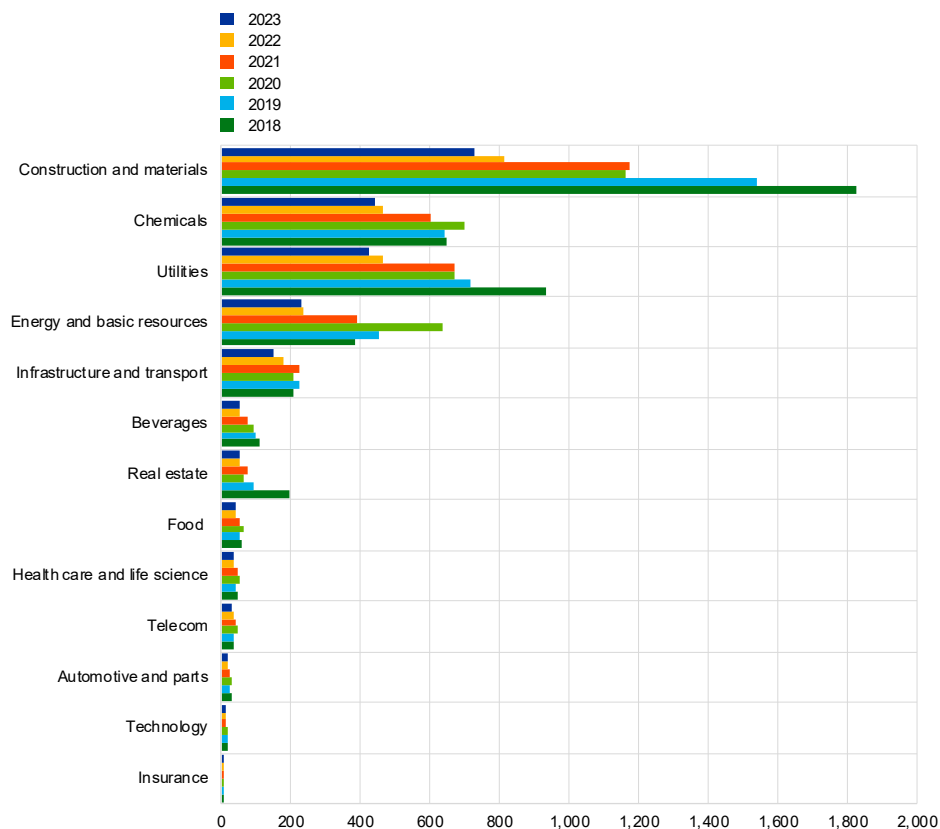
Notes: The interquartile box range represents the 75th to 25th percentiles of the carbon intensity of each corporate sector purchase conducted within the period. The straight lines within the boxes represent the median carbon intensity for each period, while the whiskers comprise the 90th and 10th percentiles. The orange dot represents the WACI of trades conducted within the period. Climate data used to calculate these figures are expected to be revised in subsequent reports in the light of issuers' disclosures on emissions for the year. Metrics are based on issuers' scope 1 + 2 emissions.

Chart 12 shows that the sector-specific climate performance of issuers in the corporate portfolios, particularly in the most carbon-intensive sectors, continued to improve in 2022. The sectoral declines in the WACI in 2023 currently result only from capital reallocation effects. When full issuer climate data is available for 2023, the Eurosystem expects to see a change in sectoral emissions and will revise the numbers accordingly. The companies grouped under the construction and materials, chemicals, and utilities sectors remain the most emission-intensive on average when normalised on a revenue basis.

Chart 12

Evolution of the WACI of the corporate portfolios by sector from 2018 to 2023

(tCO₂e per € million revenue)



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg and ECB calculations.

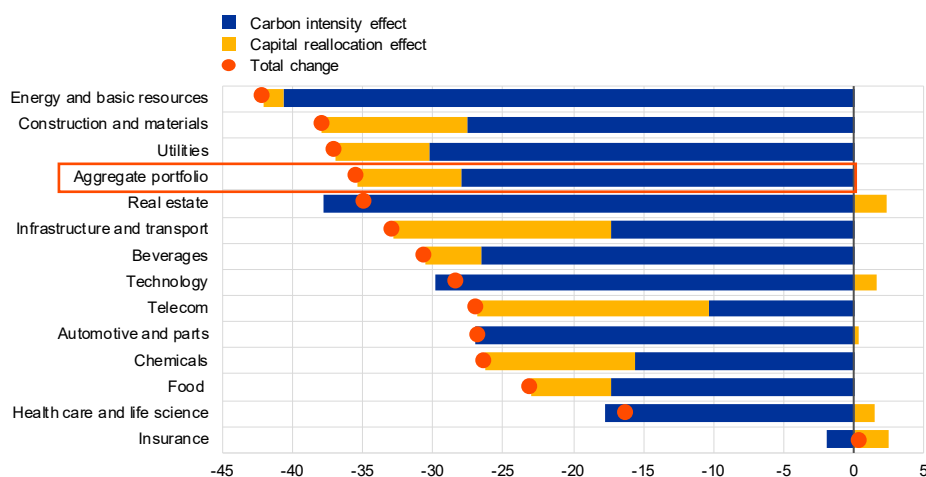
Note: Sectors are sorted according to the highest WACI for 2023 (top) to the lowest WACI for 2023 (bottom).

Two factors contribute to changes in the sectoral WACI over time: (i) changes in issuers' carbon intensity (issuers' emissions normalised by revenue), and (ii) capital reallocation. Capital reallocation includes the impact from the Eurosystem's tilted purchases and the redemption of securities. Chart 13 isolates the contribution of both factors to the realised sectoral decarbonisation between the end-of-year values for 2021 and 2023. The yellow bars show that the tilting of Eurosystem reinvestment purchases towards issuers with better climate scores has improved the WACIs in most sectors, in particular those responsible for a significant contribution to the portfolios' financed emissions.

Chart 13

Attribution of the changes in sectoral WACI between the end of 2021 and the end of 2023 to the capital reallocation effect and the carbon intensity effect

(percentages)



Sources: ISS and ECB calculations.

Notes: To isolate the capital reallocation and the capital intensity effect, we apply a Marshall-Edgeworth-type decomposition which uses the simple average of the previous and present period values.

Overall, issuers' decarbonisation and increased carbon efficiency was responsible for most of the decrease in the portfolios' financed emissions. The ECB is aware that inflation had a positive impact on issuers' carbon efficiency, which could lead to a downward bias of inflation-unadjusted metrics such as the WACI over time. Currently, there is no widely used methodology available to robustly adjust for the impact of inflation. The ECB will work with standard-setting bodies to seek metrics that more accurately capture decarbonisation at issuer level.

In addition, capital reallocation effects were responsible for about 20% of the substantial decarbonisation observed for the end-of-year values between 2021 and 2023. The tilting policy was active for 15 out of the 24 months in this period and affected €23.7 billion in reinvestments.

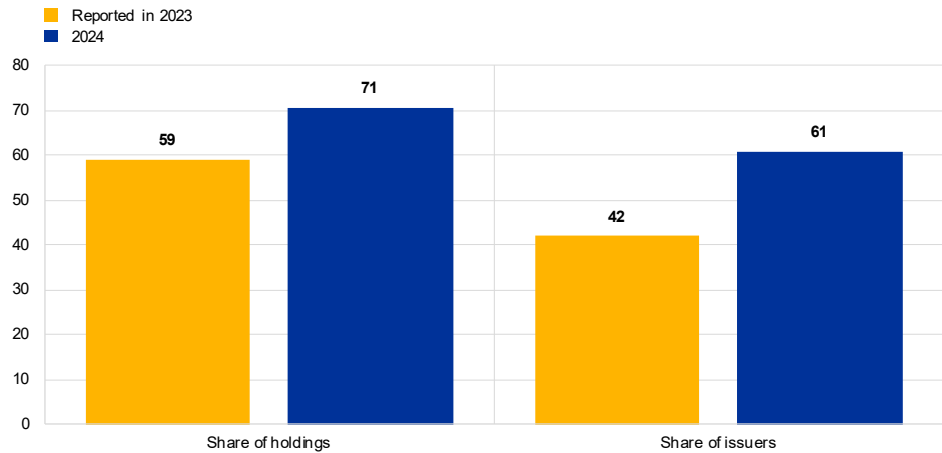
With regard to corporates' forward-looking climate targets, as at the end of 2023, 71% of the corporate sector portfolios' financial exposure was invested in assets of issuers with certified science-based carbon emission reduction targets.²⁹ As only 61% of all eligible issuer groups have carbon reduction targets, the portfolios' corporate holdings continue to be skewed towards more ambitious issuers (Chart 14). The portfolios' share of assets associated with verified targets increased to 71% compared with 59% at the end of 2022). This increase is primarily driven by the tilting framework, which assigns higher forward-looking sub-scores to issuers with science-based and verified ambitious targets, as well as by a growing number of issuers setting such targets (61% compared with 42% as at the end of 2022).

²⁹ Science-based targets provide a clearly defined pathway for companies and financial institutions to reduce greenhouse gas emissions. Targets are considered "science-based" if they are in line with what the latest climate science deems necessary to meet the goals of the Paris Agreement, i.e. limiting global warming to 1.5°C above pre-industrial levels. The Science-Based Targets initiative (SBTi) is a partnership between the CDP, the United Nations Global Compact, World Resources Institute and the World Wide Fund for Nature.

Chart 14

Share of holdings and issuers in the corporate sector portfolios with science-based carbon reduction targets

(percentages)



Sources: ISS, SBTi, issuers' annual reports and climate reports, and ECB calculations.

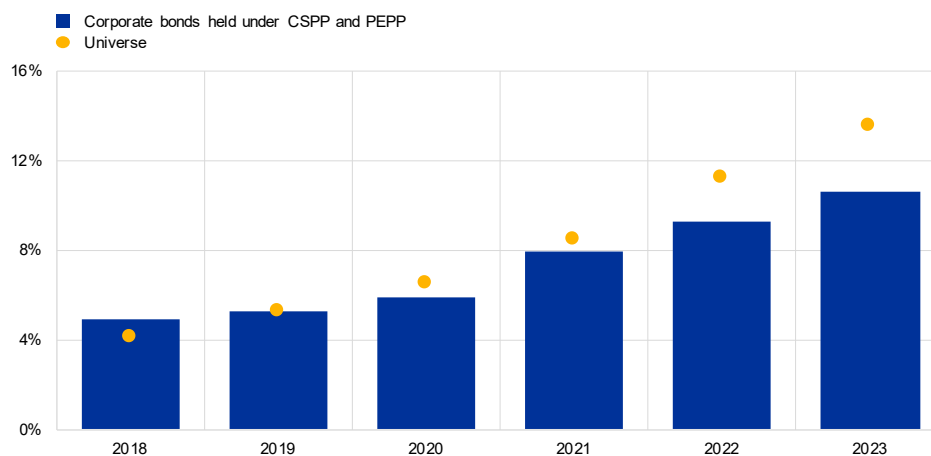
The share of green bonds in the corporate sector portfolios has gradually increased but remains below the share of the eligible universe (Chart 15). There are two reasons for this relative under-allocation. First, a large share of corporate green bonds are issued by corporates in the industrial sectors (for example utilities), which have a high number of government-owned entities. The prohibition on monetary financing prevents the Eurosystem from placing primary market bids in bonds from such entities. Second, limited reinvestments of maturing bond proceeds from March 2023 onwards prevented a catch-up with the share of green bonds in the eligible universe, which kept on increasing.

Since the inception of the tilting framework, the Eurosystem has placed more frequent primary market bids for eligible green bonds. After the end of APP reinvestments in July 2023, reinvestments only take place for the PEPP, and the primary market activity of the Eurosystem is concentrated on qualifying green and regular bonds from issuers with a strong climate performance. These measures have helped increase the share of green bonds in the portfolios.

Chart 15

Share of green bonds in the corporate bond holdings under the CSPP and PEPP between 2018 and 2023

(percentages)



Sources: ICMA and ECB calculations.

Notes: The chart shows the share of green bonds in corporate bond holdings under the CSPP and PEPP over time, compared to the universe. To identify green bonds, the ECB relies on the labelling applied by the International Capital Market Association (ICMA). The calculation is based on bonds' nominal values. Underlying holdings refer to year-end values.

5.1.3 Covered bond metrics

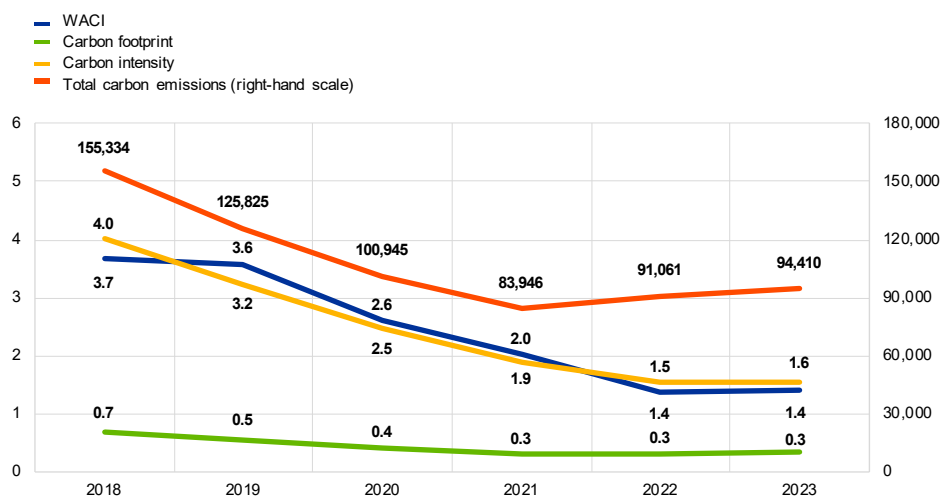
Covered bonds account for 7% of the total APP and PEPP holdings as at the end of 2023. The metrics presented in this section cover scope 1 and scope 2 emissions of covered bond issuers. Since cover pool-specific emissions data remains fragmented, emissions financed by the issuing banks via their investments and loans are not included in the analysis. Cover pool-related emissions will be included in the analysis as soon as data availability and quality allow. Self-reported data from covered bond issuers on climate metrics on cover pools would provide investors with the necessary information to properly assess climate-related risks.

Chart 16 shows that covered bond holdings are on a trajectory towards decarbonisation. Between 2018 and 2023 the WACI declined by 62%, the carbon footprint by 50% and carbon intensity by 61%. These declines were driven by decarbonisation at issuer level, which offset the effects of an increasing portfolio size, as can be seen from the drop in total carbon emissions to 39%. The increase in total carbon emissions, in particular from 2021 is predominately driven by a large decline in the enterprise value of one issuer.

Chart 16

Evolution of key metrics for covered bond holdings under the CBPP3 and PEPP between 2018 and 2023

(left-hand scale: tCO₂e/€ millions; right-hand scale: tCO₂e)



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg and ECB calculations.

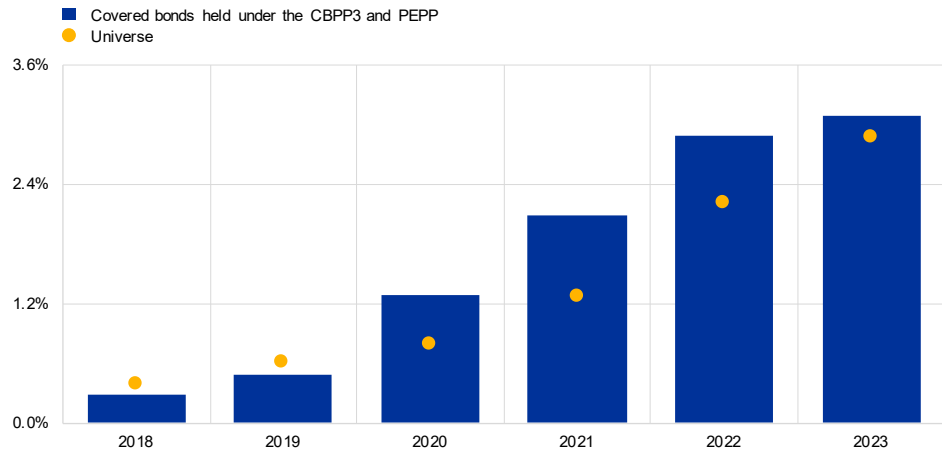
Notes: The chart shows historic values of the key metrics for the covered bond holdings held for monetary policy purposes under the CBPP3 and PEPP, based on issuers' scope 1 + 2 emissions. Metrics are calculated using bonds' nominal values. Emissions normalisation in the WACI and the carbon intensity metrics is based on revenue in € millions; in the carbon footprint metric, emissions normalisation is based on the investment amount in € millions. Underlying holdings refer to year-end values.

The share of green bonds in the covered bond holdings under the CBPP3 and PEPP has gradually increased (Chart 17) and slightly exceeds the share of green bonds in the eligible universe (3.1% compared with 2.9% in December 2023). Although their share in the overall green bond market is still relatively modest, green covered bonds have been on a growth path since 2021. This trend is driven by political and regulatory developments in Europe (for example the EU Covered Bond Directive and taxonomies) aimed at channelling investments towards environmentally sustainable assets. Issuers of green covered bonds benefit from higher primary market deal coverage ratios.

Chart 17

Share of green bonds in covered bond holdings under the CBPP3 and PEPP from 2018 to 2023

(percentages)



Sources: ICMA and ECB calculations.

Notes: The chart shows the share of green bonds in covered bond holdings under the CBPP3 and PEPP over time, compared to the universe. To identify green bonds, the ECB relies on the labelling applied by the International Capital Market Association (ICMA). The calculation is based on bonds' nominal values. Underlying holdings refer to year-end values.

5.1.4 Targets

The Eurosystem does not define targets for its public sector and covered bond holdings under the APP and PEPP. Sovereign bond holdings are expected to decarbonise in line with action by national governments to deliver on their emission reduction pledges under the Paris Agreement and as required by the European Climate Law. The ECB calls upon governments to deliver on these pledges. Supranational, agency and covered bond holdings will mirror the emission reductions achieved by their respective issuers.

Meanwhile, targets continue to fulfil an essential forward-looking role in the tilting framework for corporate bond holdings. Targets reflect the Eurosystem's commitment to reduce the portfolios' exposure to climate-related risks as well as their environmental footprint. Importantly, climate-related targets for the corporate bond holdings can only be pursued without prejudice to the ECB's monetary policy objectives and are therefore conditional on and thus constrained by monetary policy considerations.

By reducing the emissions of its corporate bond holdings, the Eurosystem aims to address the financial risks associated with climate change in its monetary policy operations and to place the holdings on a path that supports the goals of the Paris Agreement and the EU's climate neutrality objectives. In doing so, the Eurosystem is targeting a decarbonisation trajectory consistent with limiting global warming to well below 2° Celsius (while pursuing efforts to limit it to 1.5° Celsius).

In May 2024 the Governing Council agreed that interim emission reduction targets will be set for the corporate portfolios in the APP and PEPP. These interim targets will take

into account, as guidance, the requirements of the [EU Benchmarks Regulation](#) and accompanying [Commission Delegated Regulation](#). At this stage, these targets will be used internally to monitor the corporate portfolios' emission reduction trajectory. If deviations from the desired trajectory are identified, remedial actions will be assessed, within our mandate, on a case-by-case basis.

The expected decarbonisation path of the corporate bond holdings depends on several developments that are outside of the Eurosystem's control. These include issuers' effectiveness in decarbonising their operations as indicated in their plans, corporate bond market conditions and corporate bond issuance patterns.

While certain assumptions are important in order for the expected trajectory to materialise, the annual review of the rate of decarbonisation of the CSPP portfolio, including potential triggers for the corporate sector portfolios, will allow the Governing Council to reassess and adjust the key parameters of the framework and decide on further measures in the event of meaningful deviations. Furthermore, the annual publication of the portfolios' climate-related disclosures will continue to ensure a high level of transparency and accountability towards the public.

The Governing Council is committed to regularly reviewing the relevant measures to ensure, within its mandate, that the ECB's corporate bond holdings remain on a decarbonisation path that supports the goals of the Paris Agreement and the EU's climate neutrality objectives.

5.2 The ECB's foreign reserves

As at the end of 2023, the ECB's foreign reserves had a total euro equivalent value of €87.7 billion held in foreign currency portfolios, physical gold and special drawing rights (Chart 18).³⁰ The three currencies included in the reserves are the United States dollar (USD), the Japanese yen (JPY), and the Chinese renminbi (CNY). These portfolios can be further broken down into sovereign bonds, supranational and agency bonds, as well as cash and cash equivalents.

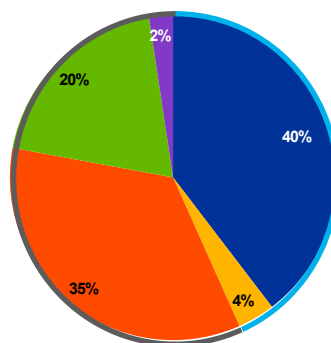
³⁰ Special drawing rights (SDRs) are an international reserve asset created by the International Monetary Fund (IMF) to supplement the official reserves of its member countries. It is a potential claim on the freely usable currencies of IMF members. A basket of currencies defines the SDR: US dollar, euro, Chinese renminbi, Japanese yen, and the British pound.

Chart 18

The ECB's foreign reserves by asset class

(percentages)

- Sovereign bonds
- Supranational and agency bonds
- Gold
- Cash and cash equivalents
- Special Drawing Rights (SDRs)
- Portfolios in scope of this report
- Portfolios out of scope of this report



Source: ECB calculations.

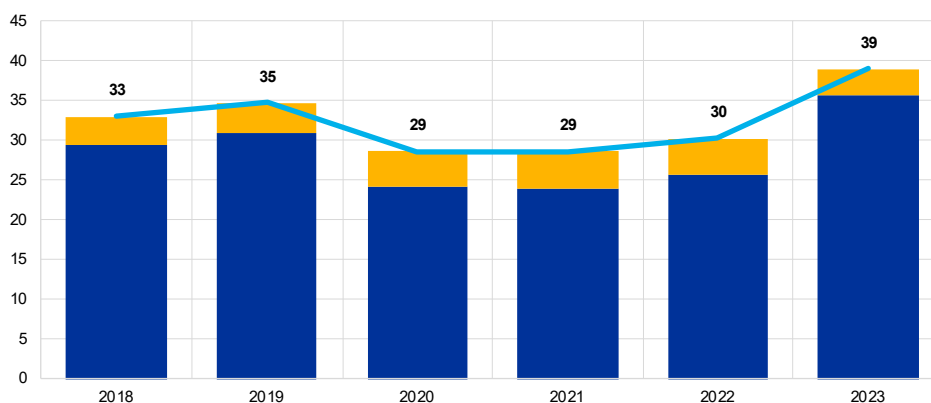
Note: The chart shows the allocation of the ECB's foreign reserves across asset classes, expressed at market value.

The bond holdings in all three currencies amount to a total of €39 billion nominal value equivalent as at the end of 2023, of which 91% corresponds to sovereign bonds, 6% to supranational bonds and 2% to agency bonds (Chart 19). Physical gold, SDRs, and cash and cash equivalents are excluded from the climate-related reporting and the chart owing to a lack of guidance on their methodological treatment. Cash investments in sovereign bonds drove the increase in holdings in 2023.

Chart 19

Historical evolution of the ECB's foreign reserves

- Sovereign bonds
- Supranational and agency bonds
- Total



Source: ECB calculations.

Notes: The chart shows the allocation of the ECB's foreign reserves across the asset classes covered in this report, expressed at nominal value. Underlying holdings refer to year-end values.

Table 2 shows the key metrics for the ECB's foreign reserves as at the end of 2023, while Annex 5 contains a comprehensive overview of historic key metrics for the reserves based on scope 1 and scope 2 emissions. Annex 6 shows metrics based on scope 3 emissions on a best-effort basis which are not interpreted in greater detail in this section.

Table 2

Key climate-related metrics for the ECB's foreign reserves portfolios in 2023

FX Reserves	Sovereign issuers				Other issuers		
	Sovereign and sub-sovereign bonds				Total	Agency bonds	Supranational bonds
	Production		Consumption	Government			
	excl. LULUCF	incl. LULUCF					
Portfolio value (EUR billion nominal value)	36				3.3	0.9	2.4
WACI	259	231	19	305	2.2	0.4	3.3
Total carbon emissions	9,225,570	8,227,934	10,255,826	1,338,731	134	7.2	127
Carbon footprint	259	231	288	38	0.1	0.0	0.1
Carbon intensity	259	231	18	284	2.0	0.7	2.7

Sources: ISS, Carbon4 Finance, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: The table shows key metrics for the ECB's foreign reserves. For sovereign bonds, metrics are separately provided for the production, consumption and government emissions. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). For supranational and agency bonds, metrics are provided based on issuers' scope 1 + 2 emissions. Portfolio value is expressed in € billions nominal value. The WACI and carbon intensity are expressed as tCO₂e per € million revenue (agency and supranational issuers), PPP-adjusted GDP (sovereign issuers and production emissions), per capita (sovereign issuers and consumption emissions), or final consumption expenditure (sovereign issuers and government emissions). Total carbon emissions are expressed as tCO₂e. Carbon footprint is expressed as tCO₂e per € million invested. Metrics are calculated using bonds' nominal values. Underlying holdings refer to year-end values.

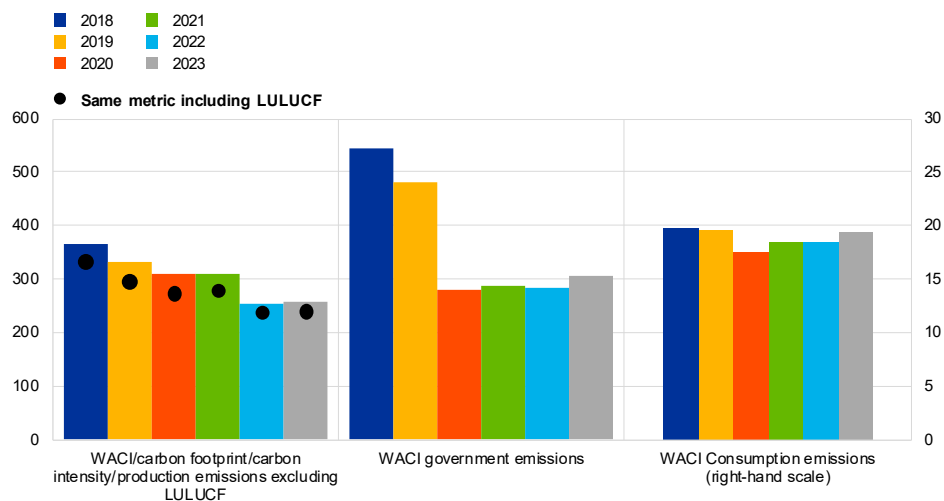
5.2.1 Sovereign bond metrics

Chart 20 shows the WACI for the sovereign bond holdings in the ECB's foreign reserves. Since 2018 the WACI has declined for production, consumption and government emissions. Despite somewhat higher emissions in 2023 there is still a clear trend towards lower emissions. As signatories of the Paris Agreement, the United States, Japan and China have committed to decarbonising their economies over time. A comparison of the metric excluding and including the effects of LULUCF shows that the WACI based on production emissions (which is equal to the carbon footprint and the carbon intensity metrics) declined similarly. The generally lower level of the WACI including the effects of LULUCF indicates a net carbon absorbing effect of direct human-induced land use, land-use change and forestry activities in the United States, Japan and China, on portfolio aggregate. The most pronounced decline in government emissions (by 42%) took place between 2019 and 2020 as a result of the pandemic.

Chart 20

Evolution of the WACI for sovereign bond holdings in the ECB's foreign reserves

(left-hand scale: tCO₂e per € million; right-hand scale: tCO₂e per capita)



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: The WACI is illustrated for production-, consumption-, and government emissions. Production and government emissions are based on data provided by ISS; consumption emissions are based on data provided by Carbon4 Finance. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). The WACI is denominated in tCO₂e per € million GDP (production emissions), tCO₂e per € million government consumption (government emissions) and tCO₂e per capita (consumption emissions). Metrics are calculated using bonds' nominal values. Underlying holdings refer to year-end values.

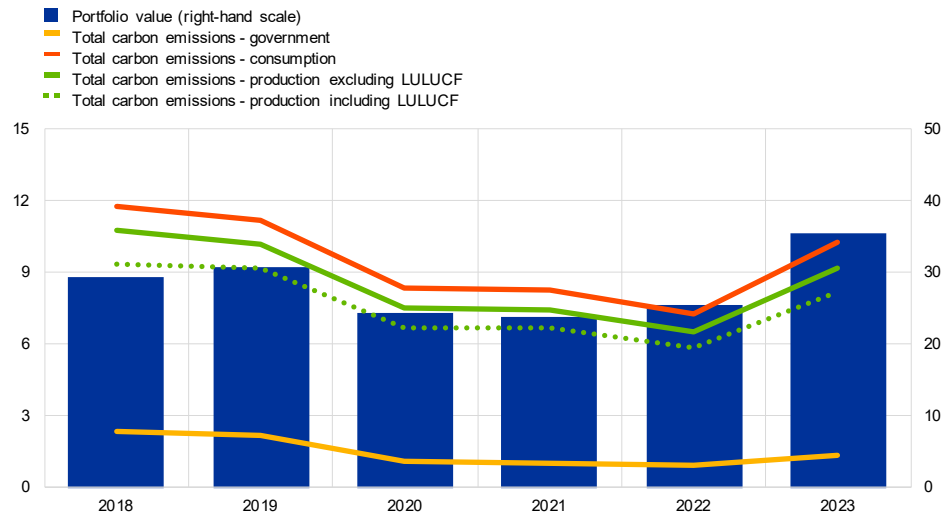
Total carbon emissions declined until 2022 but increased because of cash investments in sovereign bonds (Chart 21). This predominantly reflects changes in portfolio size and sovereigns' emissions, while the effect of changes in portfolio composition is limited. The effects of land use, land-use change and forestry lowered production emissions by on average around 11% over the reporting period. The level of consumption emissions exceeds that of production emissions, which shows that the three countries represented in the ECB's foreign reserves are net carbon importers when weighted by their portfolio share. The emissions directly attributable to government activity are comparably small.

The overall decarbonisation trend may be overstated, as emissions data are only available up to 2021. In the absence of more up-to-date emissions data, the data presented for 2022 to 2023 are based on 2021 emissions and the macroeconomic data reflecting the subsequent increase in economic activity. There are no sovereign green bonds held in the ECB's foreign reserve portfolio owing to a lack of green bonds in the eligible investment universe.

Chart 21

Evolution of total carbon emissions and portfolio value for sovereign bond holdings in the ECB's foreign reserves between 2018 and 2023

(left-hand scale: millions tCO₂e; right-hand scale: € billions nominal value)



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: Production and government emissions are based on data provided by ISS; consumption emissions are based on data provided by Carbon4 Finance. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF). Metrics are calculated using bonds' nominal values. Underlying holdings refer to year-end values.

5.2.2 Supranational and agency bond metrics

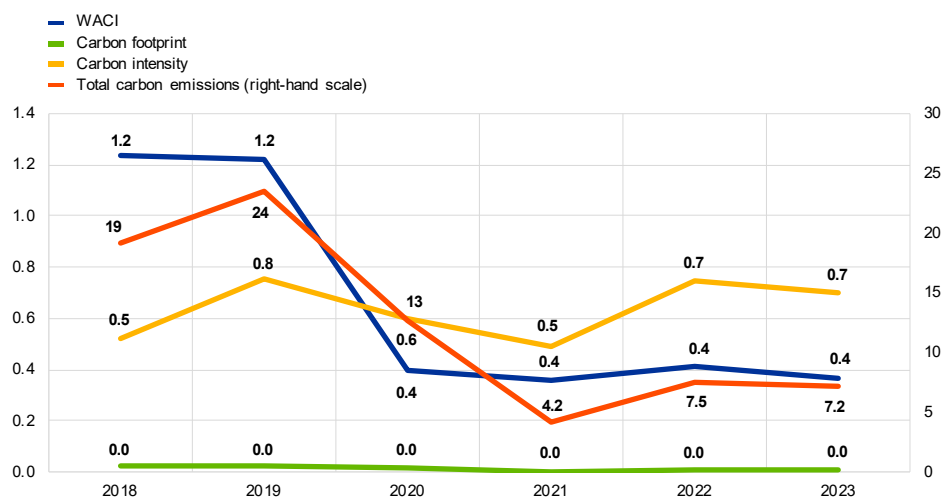
Emissions associated with supranational and agency bond holdings account for a minor part of the ECB's foreign reserves. Chart 22 shows a declining trend in all four key metrics over the reporting period. Declining total carbon emissions reflect a slight reduction in the allocation towards supranational and agency bonds, while the declines in the WACI, carbon intensity and carbon footprint are mostly driven by decarbonisation at issuer level. Owing to the low levels of the metrics for these holdings, small year-on-year changes may appear large when expressed in percentage terms. Neither green supranational nor green agency bonds are held in the ECB's foreign reserve portfolio owing to a low number of green bonds in the eligible universe.

Chart 22

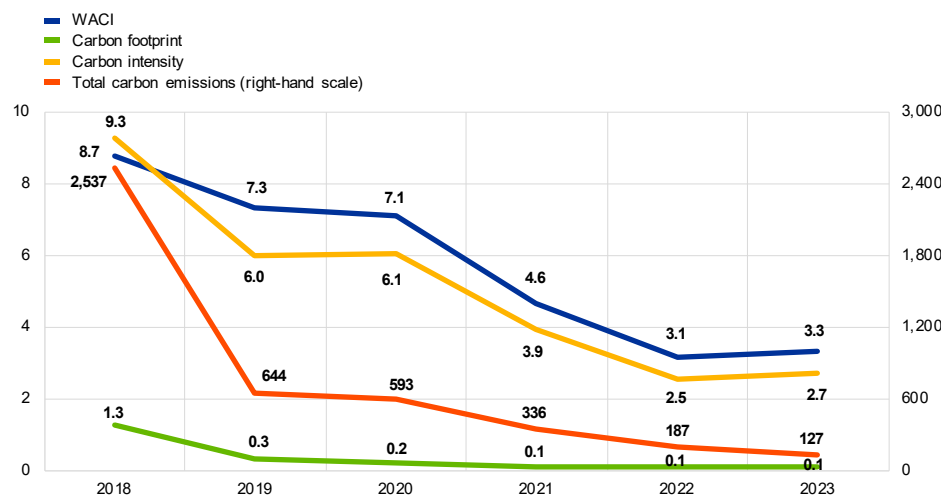
Evolution of key metrics on supranational and agency holdings in the ECB's foreign reserves between 2018 and 2023

a) Agency holdings

(left-hand scale: tCO₂e/€ millions; right-hand scale: tCO₂e)



b) Supranational holdings



Sources: ISS, Carbon4 Finance, World Bank, Bloomberg and ECB calculations.

Notes: The chart shows historic values of the key metrics for the agency and supranational bond holdings held in the ECB's foreign reserves, based on issuers' scope 1 + 2 emissions. Metrics are calculated using bonds' nominal values. Emissions normalisation in the WACI and the carbon intensity is based on revenue in € millions; and in the carbon footprint based on investment amount in € millions. Underlying holdings refer to year-end values.

5.2.3 Targets

The ECB does not define emission reduction targets for its foreign reserves. Sovereign bond holdings are expected to decarbonise in line with national governments delivering on their commitments under the Paris Agreement. Supranational and agency holdings will mirror the decarbonisation of their respective issuers.

Annexes

Annex 1

Elements of the Eurosystem disclosure framework for the TCFD category “Metrics and targets”

Element	Details
Weighted average carbon intensity (WACI)	$= \sum_n^i \left(\frac{\text{current value of investment}_i}{\text{current portfolio value}} \right) \times \left(\frac{\text{issuer's carbon emissions}_i}{\text{issuer's revenue, PPP adj. GDP, population, or final consumption expenditure}_i} \right)$
Total carbon emissions	$= \sum_n^i \left(\frac{\text{current value of investment}_i}{\text{EVIC or PPP adj. GDP}_i} \times \text{issuer's carbon emissions}_i \right)$
Carbon footprint	$= \frac{\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{EVIC or PPP adj. GDP}_i} \right) \times \text{issuer's carbon emissions}_i}{\text{current portfolio value}}$
Green bond share	Of fixed-income portfolios based on ICMA's Green Bond Principles.
Portfolio size	Expressed in € billions.
Asset classes	All asset classes of the portfolio, with metrics to be shown per asset class.
Data availability	Indicated in brackets as a percentage for each metric and asset class.
Data sources	Such as the names of the (climate) data providers.
Target	At least one broadly defined long-term target covering all NMPPs under management control of the central bank, that is aligned with the goals of the Paris Agreement and the EU's climate neutrality objectives. Targets can be set at portfolio level, central bank level, or a combination of both. Targets should ideally be quantitative, and long-term targets should ideally be enriched by interim targets.

Notes: TCFD formulas are provided [here](#). For the Eurosystem disclosure framework, they have been adjusted where necessary to reflect latest PCAF guidance and cover additional asset classes.

In addition to the elements of the Eurosystem disclosure framework, the ECB publishes the carbon intensity metric, which is defined as:

$$\text{Carbon Intensity} = \frac{\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{EVIC or PPP adj. GDP}_i} \right) \times \text{issuer's carbon emissions}_i}{\sum_n^i \left(\frac{\text{current value of investment}_i}{\text{EVIC or PPP adj. GDP}_i} \right) \times \frac{\text{issuer's revenue, PPP adj. GDP, population, or final consumption expenditure}_i}{\text{population, or final consumption expenditure}_i}}$$

Annex 2

Carbon emissions allocation methods, normalisation factors and attribution factors

Allocation

Issuer type	Factor	Remarks	Unit
Corporate, supranational and agency	Scope 1, 2 and 3 emissions	Scope 1 comprises direct carbon emissions that occur from sources that are controlled or owned by an organisation (e.g. emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 comprises indirect carbon emissions associated with the purchase of electricity, steam, heat, or cooling. Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.	tCO ₂ e
Sovereign	Production emissions	Emissions produced domestically within a country's physical borders, including domestic consumption and exports. This definition follows the territorial emissions approach adopted by United Nations Framework Convention on Climate Change (UNFCCC) for annual national inventories. Production emissions are reported excluding and including the effects of land use, land-use change and forestry (LULUCF).	tCO ₂ e
	Consumption emissions	Emissions related to domestic demand, accounting for trade effects. This metric provides a broader view of a sovereign's emissions and tackles the issue of carbon leakage that arises due to production shifts from countries where goods are consumed later.	tCO ₂ e
	Government emissions	Direct emissions (e.g. from buildings, vehicles) and indirect emissions (e.g. emissions related to energy consumption, but also expenditures, subsidies and investments) of the central government.	tCO ₂ e

Normalisation

Issuer type	Factor	Remarks	Unit
Corporate, supranational and agency	Revenue	The total amount of income generated by the sale of goods and services related to the primary operations of the business. Commercial revenue may also be referred to as sales or as turnover.	€ millions
Sovereign	Production: PPP-adjusted GDP	GDP is the sum of gross value added by all resident producers plus any product taxes and minus any subsidies not included in the value of the products. The purchasing power parity (PPP) conversion factor is a spatial price deflator and currency converter that eliminates effects of differences in countries' price levels.	€ millions
	Consumption: Population	Total population of a country.	People
	Government: Final consumption expenditure	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security but excludes government military expenditures that are part of government capital formation.	€ millions

Attribution

Asset class	Factor	Remarks	Unit
Sovereign bonds	PPP-adjusted GDP	See description of factor "PPP-adjusted GDP" in "Normalisation".	€
Supranational and agency bonds Corporate bonds Covered bonds	EVIC	The sum of the market capitalisation of ordinary shares at fiscal year-end, the market capitalisation of preferred shares at fiscal year-end, and the book values of total debt and minorities' interests.	€

Annex 3

Climate-related TCFD metrics of the Eurosystem's APP and PEPP portfolios for 2018 to 2023 – scope 1+2

Portfolio value (EUR billion nominal value)

APP and PEPP	Sovereign issuers				Other issuers				
	Sovereign and sub-sovereign bonds				Total	Agency bonds	Supra-national bonds	Covered bonds	Corporate bonds
	Production		Consumption	Government					
	excl. LULUCF	incl. LULUCF							
2023	3,260				1,187	298	231	291	367
2022	3,386				1,243	298	254	306	385
2021	3,189				1,161	262	254	299	345
2020	2,355				1,018	201	245	285	288
2019	1,587				782	148	196	258	180
2018	1,584				764	141	194	256	173

WACI (tCO₂e / EUR million revenue, GDP, consumption exp., or per capita)

2023	140	133	9.9	64	55	3.8	0.2	1.4	172
	100%	100%	100%	100%	96%	95%	100%	93%	96%
2022	140	133	10	64	59	3.8	0.2	1.4	184
	100%	100%	100%	100%	96%	95%	100%	94%	96%
2021	173	164	10	77	89	6.6	0.2	2.0	266
	100%	100%	100%	100%	88%	98%	62%	92%	96%
2020	169	159	9.2	73	97	5.8	0.2	2.6	289
	100%	100%	100%	100%	82%	83%	61%	86%	96%
2019	175	166	10	122	87	5.5	0.5	3.6	316
	100%	100%	100%	100%	79%	90%	43%	91%	92%
2018	203	193	10	141	105	3.9	0.3	3.7	372
	100%	100%	100%	100%	75%	80%	42%	87%	91%

Total carbon emissions (in tCO₂e)

2023	455,163,384	432,390,453	588,175,323	44,331,173	47,091,767	258,948	98	94,410	46,738,311
	100%	100%	100%	100%	83%	87%	48%	89%	96%
2022	472,650,271	449,288,533	610,658,082	46,018,094	50,594,613	240,896	103	91,061	50,262,553
	100%	100%	100%	100%	82%	87%	48%	89%	96%
2021	551,252,874	524,155,641	712,078,596	53,672,721	55,585,043	296,964	796	83,946	55,203,337
	100%	100%	100%	100%	81%	89%	47%	88%	95%
2020	398,449,771	374,840,014	506,535,398	38,194,066	47,583,955	166,559	845	100,945	47,315,607
	100%	100%	100%	100%	77%	79%	46%	83%	96%
2019	277,711,921	262,903,417	347,679,549	38,842,523	32,434,532	170,901	1,630	125,825	32,136,176
	100%	100%	100%	100%	76%	84%	43%	87%	92%
2018	321,479,563	305,229,209	402,622,297	44,895,616	38,256,411	20,010	909	155,334	38,080,158
	100%	100%	100%	100%	75%	79%	42%	87%	91%

Carbon footprint (tCO₂e per EUR million invested)

APP and PEPP	Sovereign issuers				Other issuers				
	Sovereign and sub-sovereign bonds				Total	Agency bonds	Supra-national bonds	Covered bonds	Corporate bonds
	Production		Consumption	Government					
	excl. LULUCF	incl. LULUCF							
2023	140	133	180	14	48	0.9	0.0	0.3	132
	100%	100%	100%	100%	83%	87%	48%	89%	96%
2022	140	133	180	14	49	0.9	0.0	0.3	135
	100%	100%	100%	100%	82%	87%	48%	89%	96%
2021	173	164	223	17	58	1.2	0.0	0.3	166
	100%	100%	100%	100%	81%	89%	47%	88%	95%
2020	169	159	215	16	61	1.0	0.0	0.4	172
	100%	100%	100%	100%	77%	79%	46%	83%	96%
2019	175	166	219	24	54	1.3	0.0	0.5	195
	100%	100%	100%	100%	76%	84%	43%	87%	92%
2018	203	193	254	28	66	0.2	0.0	0.7	240
	100%	100%	100%	100%	75%	79%	42%	87%	91%

Carbon intensity (tCO₂e / EUR million revenue, GDP, consumption exp., or per capita)

2023	140	133	10	64	72	17	0.0	1.6	187
	100%	100%	100%	100%	83%	87%	48%	89%	96%
2022	140	133	10	63	75	16	0.0	1.5	196
	100%	100%	100%	100%	82%	87%	48%	89%	96%
2021	173	164	10	77	109	24	0.2	1.9	295
	100%	100%	100%	100%	81%	89%	47%	88%	95%
2020	169	159	8.9	73	116	31	0.2	2.5	311
	100%	100%	100%	100%	77%	79%	46%	83%	96%
2019	175	166	10	120	97	20	0.4	3.2	332
	100%	100%	100%	100%	76%	84%	43%	87%	92%
2018	203	193	10	139	105	4.1	0.2	4.0	372
	100%	100%	100%	100%	75%	79%	42%	87%	91%

Sources: ISS, C4F, World Bank, Bloomberg, UNFCCC and ECB calculations.

Notes: Percentages below each metric indicate data availability, calculated as the percentage of holdings for which all required data (i.e. emissions data and financial data) are available. One supranational issuer has been excluded from the calculation of metrics in 2021 owing to a data error.

Annex 4

Climate-related TCFD metrics of the Eurosystem's APP and PEPP portfolios for 2020 to 2023 – scope 3

WACI (scope 3 in tCO₂e / EUR million revenue)

	Total	Agency bonds	Supranational bonds	Covered bonds	Corporate bonds
2023	1,179	1,188	893	1,560	1,066
	96%	95%	100%	93%	97%
2022	1,180	1,196	886	1,587	1,057
	96%	95%	100%	94%	97%
2021	790	330	325	797	1,344
	89%	98%	62%	92%	99%
2020	734	351	344	454	1,414
	83%	83%	61%	86%	98%

Total carbon emissions (scope 3 in tCO₂e)

2023	409,784,241	10,232,922	5,918,451	88,737,641	304,895,228
	83%	87%	48%	89%	96%
2022	414,016,905	9,775,918	6,201,078	88,499,516	309,540,392
	82%	87%	48%	89%	96%
2021	332,954,889	4,190,967	1,766,231	32,768,967	294,228,723
	81%	89%	47%	88%	95%
2020	287,534,117	1,816,219	1,668,724	13,970,791	270,078,383
	77%	79%	46%	83%	96%

Carbon intensity (scope 3 in tCO₂e/EUR million revenue)

2023	1,169	657	1,541	1,460	1,218
	83%	87%	48%	89%	96%
2022	1,184	668	1,541	1,491	1,204
	82%	87%	48%	89%	96%
2021	877	335	335	734	1,573
	81%	89%	47%	88%	95%
2020	846	336	355	344	1,774
	77%	79%	46%	83%	96%

Carbon footprint (scope 3 in tCO₂e per EUR million invested)

2023	402	36	26	327	849
	83%	87%	48%	89%	96%
2022	390	35	24	310	819
	82%	87%	48%	89%	96%
2021	339	16	11	118	864
	81%	89%	47%	88%	95%
2020	359	11	11	57	962
	77%	79%	46%	83%	96%

Sources: ISS and ECB calculations.

Notes: Percentages below each metric indicate data availability, calculated as the percentage of holdings for which all required data (i.e. emissions data and financial data) are available. The time series starts in 2020 only (while reporting on scope 1 and 2-based metrics starts in 2018) owing to a significant methodological change which makes cross-year comparison of metrics pre-2020 and post-2020. One supranational issuer has been excluded from the calculation of metrics in 2021 owing to a data error.

Disclaimer: Scope 3 emissions are reported on a best-effort basis to contribute to transparency in this regard. Scope 3 emissions data remain subject to considerable quality issues which limit the reliability of metrics. Substantial revisions to the disclosures are therefore possible in the future.

Annex 5

Climate-related TCFD metrics of the ECB's foreign reserves portfolios for 2018 to 2023 – scope 1 + 2

Portfolio value (EUR billion nominal value)

FX reserves	Sovereign issuers				Other issuers		
	Sovereign and sub-sovereign bonds				Total	Agency bonds	Supranational bonds
	Production		Consumption	Government			
	excl. LULUCF	incl. LULUCF					
2023	35.6			3.3	0.9	2.4	
2022	25.6			4.7	1.3	3.4	
2021	24.0			4.7	1.2	3.5	
2020	24.3			4.4	1.0	3.4	
2019	30.9			3.9	1.3	2.5	
2018	29.3			3.7	1.2	2.5	

WACI (tCO₂e / EUR million revenue, GDP, consumption exp., or per capita)

2023	259	231	19	305	2.2	0.4	3.3
	100%	100%	100%	100%	69%	92%	59%
2022	256	230	18	284	2.2	0.4	3.1
	100%	100%	100%	100%	72%	92%	64%
2021	311	279	18	290	3.4	0.4	4.6
	100%	100%	100%	100%	87%	89%	86%
2020	311	277	17	280	5.7	0.4	7.1
	100%	100%	100%	100%	95%	88%	97%
2019	331	299	20	483	5.5	1.2	7.3
	100%	100%	100%	100%	79%	68%	84%
2018	368	325	20	546	8.0	1.2	8.7
	100%	98%	100%	100%	61%	18%	82%

Total carbon emissions (in tCO₂e)

2023	9,225,570	8,227,934	10,255,826	1,338,731	134	7.2	127
	100%	100%	100%	100%	64%	77%	59%
2022	6,552,951	5,887,744	7,304,429	927,551	194	7.5	187
	100%	100%	100%	100%	62%	55%	64%
2021	7,451,592	6,694,924	8,304,592	1,056,473	340	4.2	336
	100%	100%	100%	100%	82%	72%	86%
2020	7,559,427	6,725,369	8,398,452	1,066,299	606	13	593
	100%	100%	100%	100%	80%	80%	80%
2019	10,213,230	9,231,365	11,179,749	2,193,910	667	24	644
	100%	100%	100%	100%	79%	68%	84%
2018	10,785,885	9,372,649	11,804,324	2,341,492	2,556	19	2,537
	100%	98%	100%	100%	61%	18%	82%

Carbon footprint (tCO₂e per EUR million invested)

FX reserves	Sovereign issuers				Other issuers		
	Sovereign and sub-sovereign bonds				Total	Agency bonds	Supranational bonds
	Production		Consumption	Government			
	excl. LULUCF	incl. LULUCF					
2023	259	231	288	38	0.1	0.0	0.1
	100%	100%	100%	100%	64%	77%	59%
2022	256	230	285	36	0.1	0.0	0.1
	100%	100%	100%	100%	62%	55%	64%
2021	311	279	347	44	0.1	0.0	0.1
	100%	100%	100%	100%	82%	72%	86%
2020	311	277	346	44	0.1	0.0	0.2
	100%	100%	100%	100%	80%	80%	80%
2019	331	299	362	71	0.2	0.0	0.3
	100%	100%	100%	100%	79%	68%	84%
2018	368	325	402	80	1.1	0.0	1.3
	100%	98%	100%	100%	61%	18%	82%

Carbon intensity (tCO₂e / EUR million revenue, GDP, consumption exp., or per capita)

2023	259	231	18	284	2.0	0.7	2.7
	100%	100%	100%	100%	64%	77%	59%
2022	256	230	17	256	2.1	0.7	2.5
	100%	100%	100%	100%	62%	55%	64%
2021	311	279	17	274	3.1	0.5	3.9
	100%	100%	100%	100%	82%	72%	86%
2020	311	277	16	267	4.8	0.6	6.1
	100%	100%	100%	100%	80%	80%	80%
2019	331	299	18	466	4.4	0.8	6.0
	100%	100%	100%	100%	79%	68%	84%
2018	368	319	19	528	8.4	0.5	9.3
	100%	98%	100%	100%	61%	18%	82%

Sources: ISS, C4F, World Bank, Bloomberg, UNFCCC and ECB calculations.

Note: Percentages below each metric indicate data availability, calculated as the percentage of holdings for which all required data (i.e. emissions data and financial data) are available.

Annex 6

Climate-related TCFD metrics of the ECB's foreign reserves portfolios for 2020 to 2023 – scope 3

WACI (scope 3 in tCO₂e/EUR million revenue)

	Total	Agency bonds	Supranational bonds
2023	1,450	1,398	1,480
	69%	92%	59%
2022	1,303	1,098	1,420
	72%	92%	64%
2021	324	329	323
	87%	89%	86%
2020	349	341	352
	95%	88%	97%

Total carbon emissions (scope 3 in tCO₂e)

2023	78,036	16,058	61,978
	64%	77%	59%
2022	104,671	15,623	89,048
	62%	55%	64%
2021	29,822	2,873	26,949
	82%	72%	86%
2020	38,737	6,199	32,539
	80%	80%	80%

Carbon intensity (scope 3 in tCO₂e/EUR million revenue)

2023	1,398	1,551	1,321
	64%	77%	59%
2022	1,297	1,553	1,209
	62%	55%	64%
2021	319	336	313
	82%	72%	86%
2020	324	292	333
	80%	80%	80%

Carbon footprint (scope 3 in tCO₂e per EUR million invested)

2023	35	19	44
	64%	77%	59%
2022	34	13	41
	62%	55%	64%
2021	7.6	2.6	9.0
	82%	72%	86%
2020	9.3	7.1	9.9
	80%	80%	80%

Sources: ISS and ECB calculations.

Notes: Percentages below each metric indicate data availability, calculated as the percentage of holdings for which all required data (i.e. emissions data and financial data) are available. The time series starts in 2020 only (while reporting on scope 1 and 2-based metrics starts in 2018) owing to a significant methodological change which makes prevents cross-year comparison of metrics pre-2020 and post-2020.

Disclaimer: Scope 3 emissions are reported on a best-effort basis to contribute to transparency in this regard. Scope 3 emissions data remain subject to considerable quality issues which limit the reliability of metrics. Substantial revisions to the disclosures are therefore possible in the future.

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PDF ISBN 978-92-899-6778-5, ISSN 2811-7026, doi:10.2866/464997, QB-02-24-643-EN-N