DEUTSCHE BUNDESBANK
EUROSYSTEM

Climate-related disclosures by the Deutsche Bundesbank 2025

Part of the Eurosystem-wide climate-related disclosures

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Foreword

Dear Readers,

Climate change is advancing rapidly, with 2024 the warmest year on record. The consequences of climate change are making themselves increasingly felt in Germany, Europe and worldwide. Recent years have seen the international community attempt to curb greenhouse gas emissions and prepare for the impacts of climate change. However, some efforts at the global level have tailed off lately. Yet the scientific consensus is clear: the world needs to take further steps to combat climate change. International cooperation is a must.

Central banks are working together closely and are focusing intently on the impacts of climate change and climate policy on the economy and the financial system. The Bundesbank, for example, plays a leading role in the Network for Greening the Financial System (NGFS), one of whose tasks is to analyse how climate change and climate policy affect price developments, the growth outlook and financial stability.

We also work at the Eurosystem level to ensure that climate-related risks are sufficiently captured, considered and disclosed. Our annual climate-related disclosures, which we are publishing for the fourth year, include information on our financial investments, thus ensuring that we set a good example when it comes to transparency. This report also presents some of the Bundesbank's current analyses and research findings. Studying the impact of climate change through an academic lens makes an important contribution to fact-based climate policy.

I would like to thank everyone at the Bundesbank who is working towards better understanding climate-related risks and what this means for the economy and the financial system. Their commitment and expertise are key to our handling of one of the greatest challenges of the 21st century.

Sabine Mauderer
First Deputy Governor of the Deutsche Bundesbank

Summary

Climate change and its consequences have far-reaching implications for the economic and financial system. They can have an impact on price stability, the growth outlook and the stability of the banking and financial system. Consequently, they affect a central bank's core tasks. The Bundesbank therefore considers climate-related risks within the scope of its mandate. Nature and biodiversity loss can also have negative impacts [1)] and thus increasingly falls within the scope of the Bundesbank's studies and analyses.

Section 2 on **governance** outlines how the Bundesbank has built up its internal resources, Bank-wide governance and cross-sectional information sharing in this area in recent years. The Executive Board coordinates topics and projects centrally via the Green Finance Steering Committee (LAGFin). This committee receives subject matter input from the Green Finance Expert Group and organisational support from the Sustainability Hub.

Section 3 on **strategy** presents the climate-related focal topics of the various business units at the Bundesbank, as well as the national and international committee work for a more sustainable economic and financial system, as in the Network for Greening the Financial System (NGFS). The environmental, social and governance (ESG) Bond Monitor provides an insight into the Bundesbank's market analyses. This section also explains the Bundesbank's sustainability-related tasks in its role as fiscal agent for Germany's central and state governments. In addition, it outlines the sustainability strategies for the Bundesbank's own non-monetary policy financial investments. [2)]

Section 4 on **risk management** gives an overview of the monitoring, measurement, analysis, internal communication and management of risks to the Bundesbank arising from climate change and the transition to a net zero economy.

1 See, for example, Elderson (2024) on the relevance of nature and biodiversity loss to the Eurosystem's mandate: Taking account of nature, naturally.

2 Euro-denominated own portfolio and reserve assets, referred to as the euro portfolio.

Section 5 on **metrics** discloses greenhouse gas (GHG) and other sustainability metrics. These metrics focus on the Bundesbank's euro portfolio and foreign currency reserves. For the first time, the report also presents metrics on the Bundesbank's shares in the Eurosystem's monetary policy holdings of corporate and covered bonds. When looking at the individual portfolios, bear in mind that they are subject to different parameters and should each be considered in their own specific contexts. The main findings concerning climate and sustainability-related metrics are presented below.

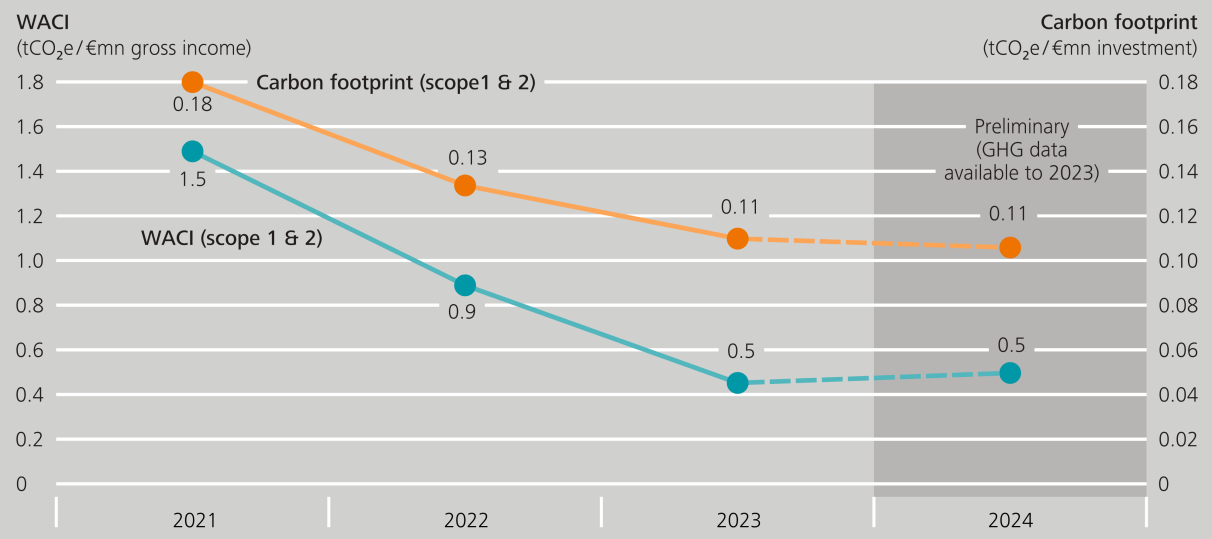
As at the end of 2024, the euro portfolio contained only covered bonds issued by banks. This means that those banks' GHG emissions are relevant to the GHG metrics of the euro portfolio. With the exception of the provisional GHG metrics[3)] for 2024, a persistent downward trend can be seen here. This applies, amongst other things, to the weighted average carbon intensity (WACI), which reflects the portfolio's GHG intensity, and to the carbon footprint, which expresses GHG emissions financed by the portfolio relative to the portfolio's volume (see Figure 1). The main reason for these declines is likely to be that banks are increasingly sourcing electricity from renewable sources and, as a result, reducing their scope 2 emissions. However, the available GHG metrics only have limited informative value, as they consist solely of scope 1 and 2 emissions which are those stemming from banks' operational activities.[4)] The GHG emissions financed by banks (part of scope 3) are of greater relevance. The data on these emissions are still insufficient, but the situation is likely to improve further in the medium term.

3 GHG data for 2024 were not yet available at the time of reporting. For this reason, banks' GHG data for 2023 are used provisionally.

4 An enterprise's emissions are generally divided into scope 1, 2 and 3 emissions. Scope 1: emissions generated directly by the enterprise; scope 2: indirect emissions generated by the production of energy purchased by the enterprise (mainly electricity); scope 3: indirect emissions up and down the value chain (excluding scope 2 emissions).

Euro portfolio: WACI and carbon footprint

Figure 1



Sources: ISS ESG and Bundesbank data and calculations.
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The Bundesbank's reserve assets comprise gold holdings, receivables from the International Monetary Fund (IMF) and foreign currency reserves. The latter include bonds issued by national and supranational promotional and development banks as well as sovereign bonds. This report contains climate-related metrics for the gold holdings (see Section 5.2.3 The Bundesbank's gold holdings) and the foreign currency reserves (see Section 5.2.1 Bonds issued by promotional and development banks and Section 5.2.2 Sovereign investments).

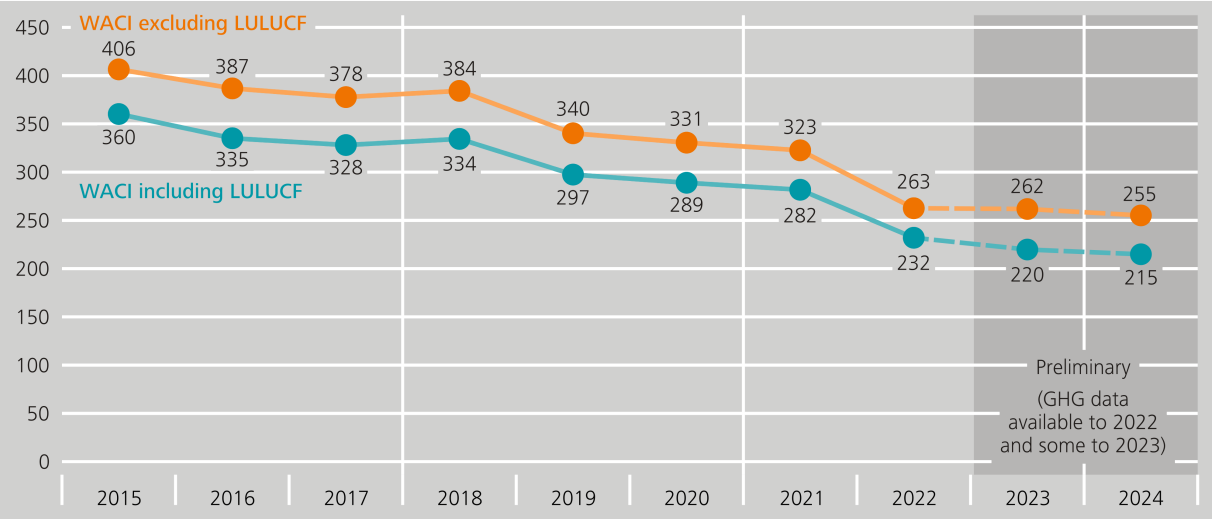
The financing activities of promotional and development banks, whose bonds are held in the foreign currency reserves, continue to have a high "green" (beneficial to the environment) share in 2024, at 18.7 %. Business activities classed as green primarily comprise the financing of renewable energy, energy efficiency measures and public transport infrastructure.

The WACI of investments in sovereigns is lower if the sector of land use, land use change and forestry (LULUCF) is included. This sector has captured greater quantities of GHG than it has emitted in the case of the sovereigns represented in the foreign currency reserves. Both including and excluding LULUCF, the WACI has declined almost continuously since 2015 (see Figure 2). In 2024, the addition of pound sterling to the foreign currency reserves, mostly invested in UK bonds, contributed to a minor decrease in the WACI. However, it should be borne in mind that the WACI relative to gross domestic product (GDP) is depicted adjusted for purchasing power parity (PPP). The latter's inflation-driven increase is thus a factor in the WACI decline. After adjusting for inflation, the reduction in the WACI is just under half as large (see Section 5.2.2.1 GHG metrics).

Sovereigns (reserve assets): WACI

Figure 2

tCO_2e/€mn PPP-adjusted GDP



Sources: UNFCCC, WRI, World Bank, EDGAR, Australian Government, Australian Bureau of Statistics, Government of Canada, Department for Energy Security and Net Zero (UK), Bundesbank data and calculations.

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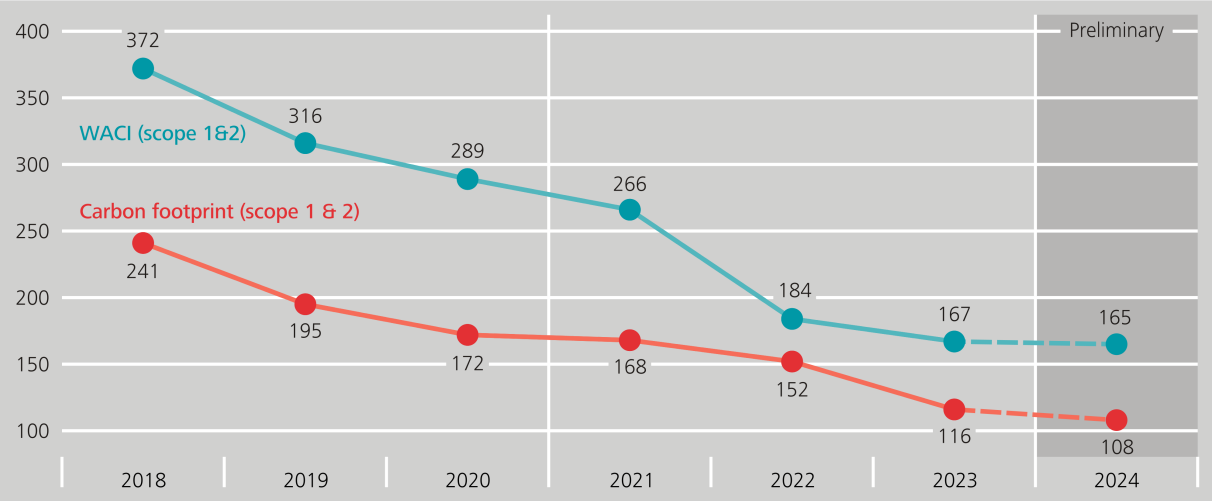
This year's report is the first time the Bundesbank is publishing GHG metrics for the Eurosystem's monetary policy holdings of corporate and covered bonds. These were calculated for the Eurosystem by the European Central Bank (ECB) using a standard methodology and provided to the national central banks. They show a recent decline in the WACI and the carbon footprint for scopes 1 and 2, in particular (see Figure 3).

Eurosystem monetary policy holdings of corporate bonds: WACI and carbon footprint of the Bundesbank's share

Figure 3

tCO_2e/€mn revenue (WACI) or tCO_2e/€mn investment (carbon footprint)



Sources: ISS ESG and ECB calculations.
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Section 6 on **targets and outlook** describes the Bundesbank's efforts going forward to consider climate-related and sustainability-related aspects in its internal and external strategy, committee and communication work. This includes its commitment to improving the availability and quality of sustainability data in the financial system as well as to further refining its own analytical and investment strategies.

1 Introduction

2024 marked the first year in which the average global temperature was 1.5°C above pre-industrial levels.[1)] Under the Paris Agreement, this threshold should not be exceeded on a sustained basis. The warming of the atmosphere, the soil and the oceans is caused by the growing concentration of GHG in the atmosphere. This mainly stems from the burning of fossil fuels such as oil, gas and coal, as well as from agriculture. The effects are being felt around the world. Acute risks are increasing due to more frequent and more severe heat waves, droughts, forest fires and floods, which can cause considerable damage to our health and to the economy. But the materialisation of chronic risks, such as rising sea levels, also constitutes a growing threat. In addition, climate change and nature and biodiversity loss are mutually reinforcing.

All of these developments are increasingly giving rise to risks to the economic and financial system, as shown, for example, by an NGFS analysis.[2)] According to this analysis, the current level of ambition of climate policy leads to climate change that would result in global economic output being more than 15 % lower by 2050 than in a hypothetical scenario with no climate change.

At the same time, the necessary transition to a net zero and more sustainable economy requires structural and long-term changes, which may also entail considerable financial risks for the real economy and financial sector.

1 See Copernicus (2025), Global Climate Highlights 2024.
2 See NGFS (2024b), NGFS Climate Scenarios for central banks and supervisors – PhaseV.

Economic and environmental challenges are closely intertwined. Extreme weather events and nature and biodiversity loss may make food, resources and raw materials more scarce.[3)] Already, they are pushing up food prices, as demonstrated in a joint study by the Potsdam Institute for Climate Impact Research (PIK) and the ECB.[4)] Monetary policy transmission channels may also be impaired. For example, climate change might lead to productivity losses or the destruction of assets, which in turn would affect the saving and investment behaviour of households and firms.[5)] Furthermore, climate change entails systemic risks that could jeopardise the stability of the financial system. This kind of scenario could occur, for instance, if a large number of financial market participants were affected by extreme weather events or changes in the regulatory framework.[6)] Last but not least, these climate-related risks can have an impact on the value and risk profile of assets on bank balance sheets as well. This is equally true for the Bundesbank's balance sheet.

Transparency and data availability in climate matters are crucial to identifying and managing financial climate-related risks. To make well-founded investment decisions and allocate capital in the most (risk) efficient way possible, it is vital that emissions are measurable and traceable. Transparency and reliable data thus form the bedrock for the transition to a net zero economy. The Eurosystem – and hence also the Bundesbank – has long been committed to promoting climate-related transparency in the economic and financial system. In 2021, it had already agreed on a common framework to make non-monetary policy portfolios more sustainable and increase its own climate-related transparency.

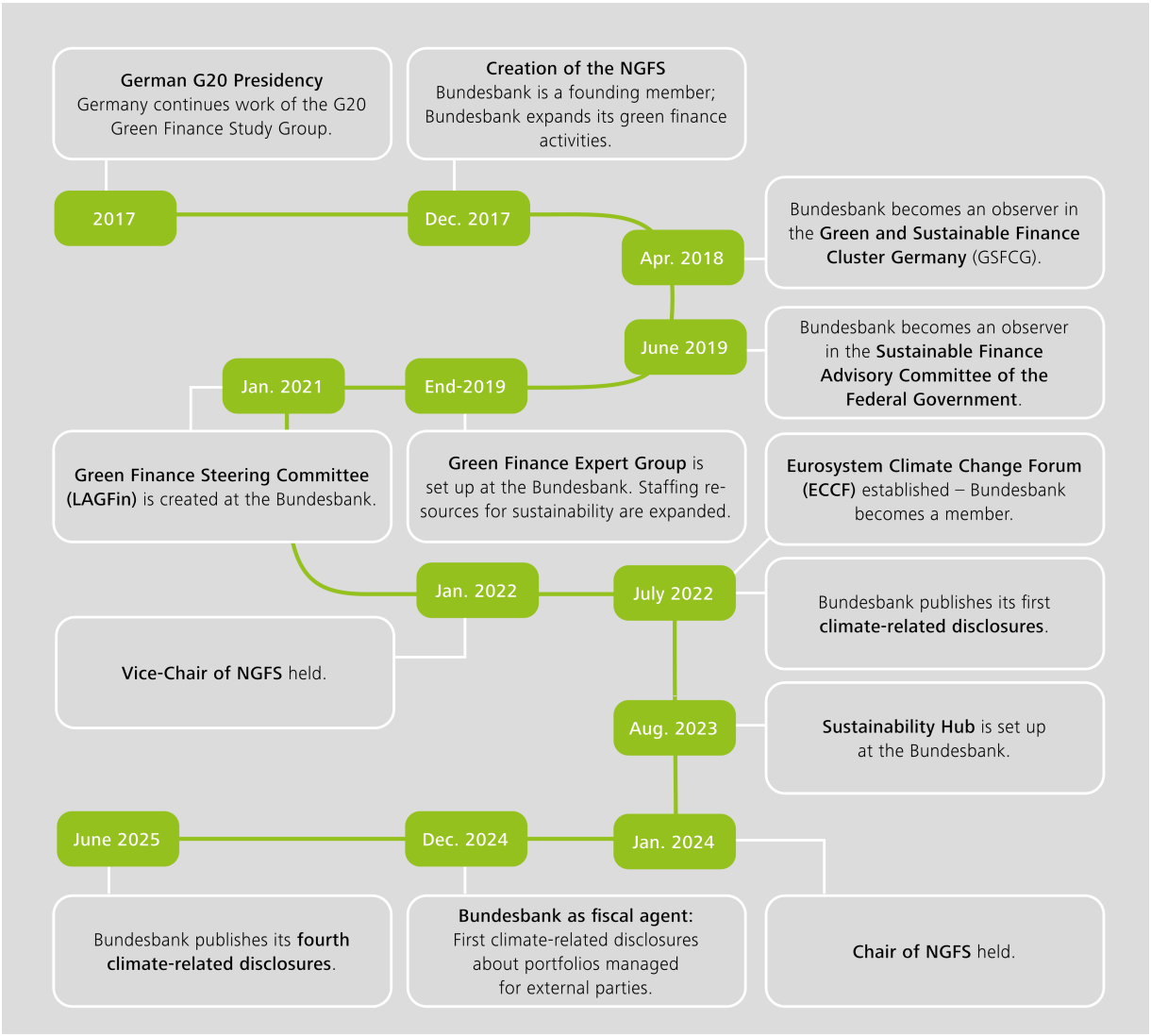
The Bundesbank's fourth annual climate-related disclosures for the first time also include GHG metrics on the Bundesbank's shares in the Eurosystem's monetary policy holdings of corporate and covered bonds. These had previously been reported solely by the ECB on behalf of the Eurosystem as a whole. In addition, the report highlights new strategic and thematic developments within the Bundesbank related to green finance.

3 See Johnson, J. et al. (2021), The Economic Case for Nature, World Bank.
4 See Kotz et al. (2024), Global warming and heat extremes to enhance inflationary pressures.
5 See NGFS (2024a), Climate change, the macroeconomy and monetary policy.
6 See, for example, Deutsche Bundesbank (2024b), Financial Stability Review 2024.

2 Governance

Within the Bundesbank, numerous business units have been addressing climate-related – and increasingly nature-related – risks in their work and analyses for a number of years now. Figure 4 provides an overview of the major milestones of the past few years in the Bundesbank's work towards a more sustainable economic and financial system.

Milestones in the Bundesbank's work towards a sustainable economic and financial system Figure 4



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Established back in 2021, the **Green Finance Steering Committee** (LAGFin) has the purpose of ensuring a consistently high level of ambition throughout the Bank as a whole and to provide strategic impetus for climate-related and nature-related work in the business units. It is headed by First Deputy Governor Dr Sabine Mauderer. President Dr Joachim Nagel and other Executive Board members regularly attend meetings, which are held every two months. Management-level staff of numerous business units and the Chief Operating Officer (COO) are permanent members. [1)] The committee can use working groups made up of staff members from different business units to handle specific sustainability-related projects. [2)] The working group leads provide regular reports during committee meetings to the participating members of the Executive Board, thus ensuring continuous project monitoring. In this way, the committee ensures that the Executive Board and the relevant business units build strong networks and are always informed about the Bank's work. At the same time, this gives Executive Board members the ability to steer analyses and projects within the various business units in a targeted way.

The Green Finance Steering Committee is flanked by the **Green Finance Expert Group**, which is a forum for regular expert-level interaction and dialogue across the Bank. Most recently, it has employed specialist lectures to provide impetus and foster capacity building within the Bundesbank. Alongside the institutionalised monthly dialogue, staff are supported in their activities by an interactive internal knowledge platform on climate-related work inside and outside the Bundesbank.

In order to better coordinate work across the Bank, the Sustainability Hub was set up in August 2023 and reports directly to the Executive Board. The hub's tasks are coordination, strategy and specialist work. It coordinates interdisciplinary projects relating to sustainability and has a communication role both inside and outside the Bank on the issue of sustainability. In addition, it advises the Executive Board on strategic issues relating to sustainability, acts as the secretariat and agenda setter for the Green Finance Steering Committee, and coordinates specialist information sharing within the Green Finance Expert Group. Through all of the above, the Bundesbank is further strengthening its sustainability credentials.

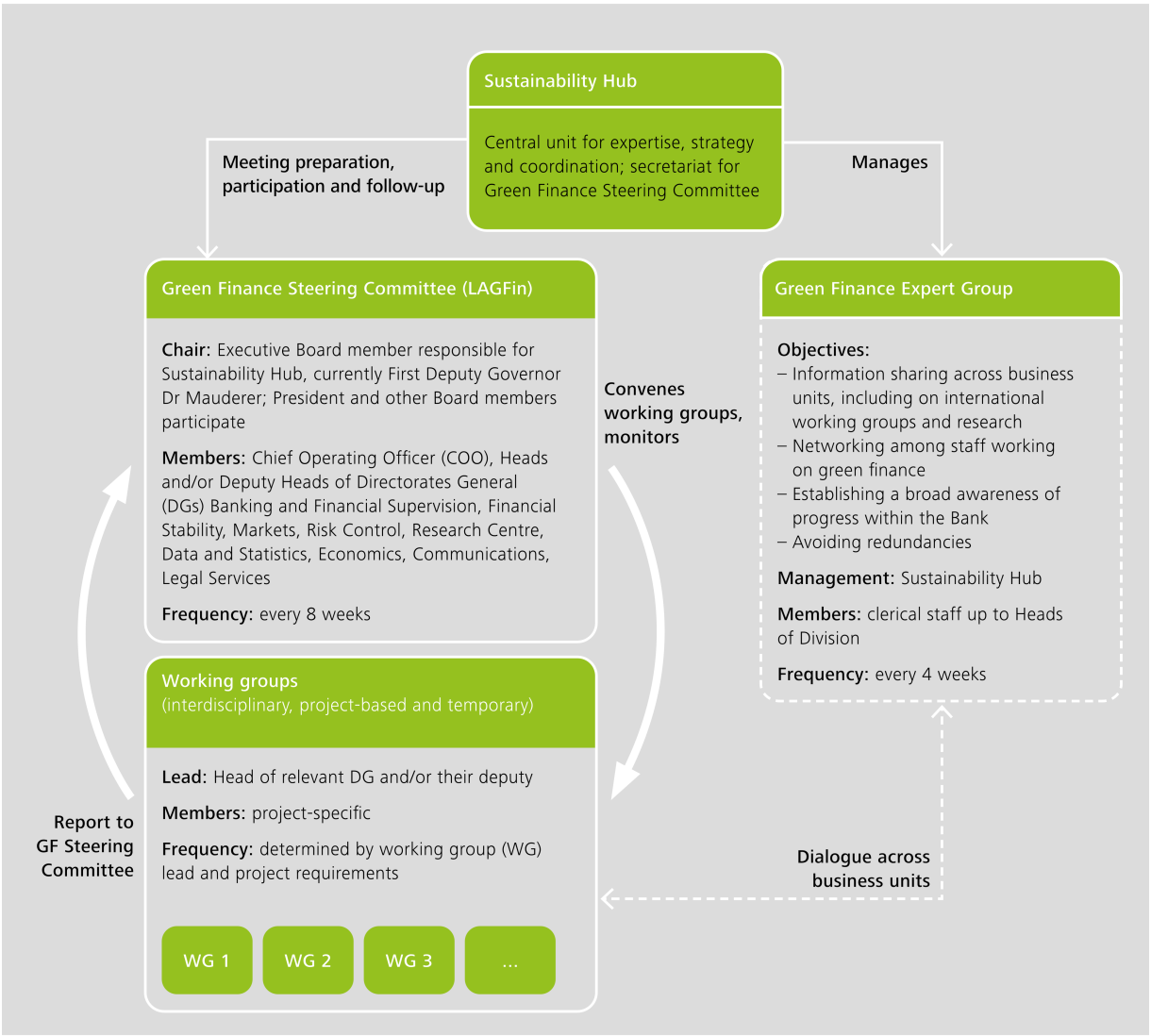
1 Business units involved: Banking and Financial Supervision, Financial Stability, Research, Communications, Markets, Legal Services, Risk Control, Data and Statistics, Economics and Sustainability.

2 Dedicated working groups have dealt with topics such as "Transition plans" and "Financing the transition to net zero".

Figure 5 gives a simplified overview of the organisational structure of green finance at the Bundesbank. Sustainability – above all, the impact of climate change and climate policy on the economic and financial system – has a bearing on almost all Bundesbank business units.

Organisational structure of green finance at the Bundesbank

Figure 5



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3 Strategy

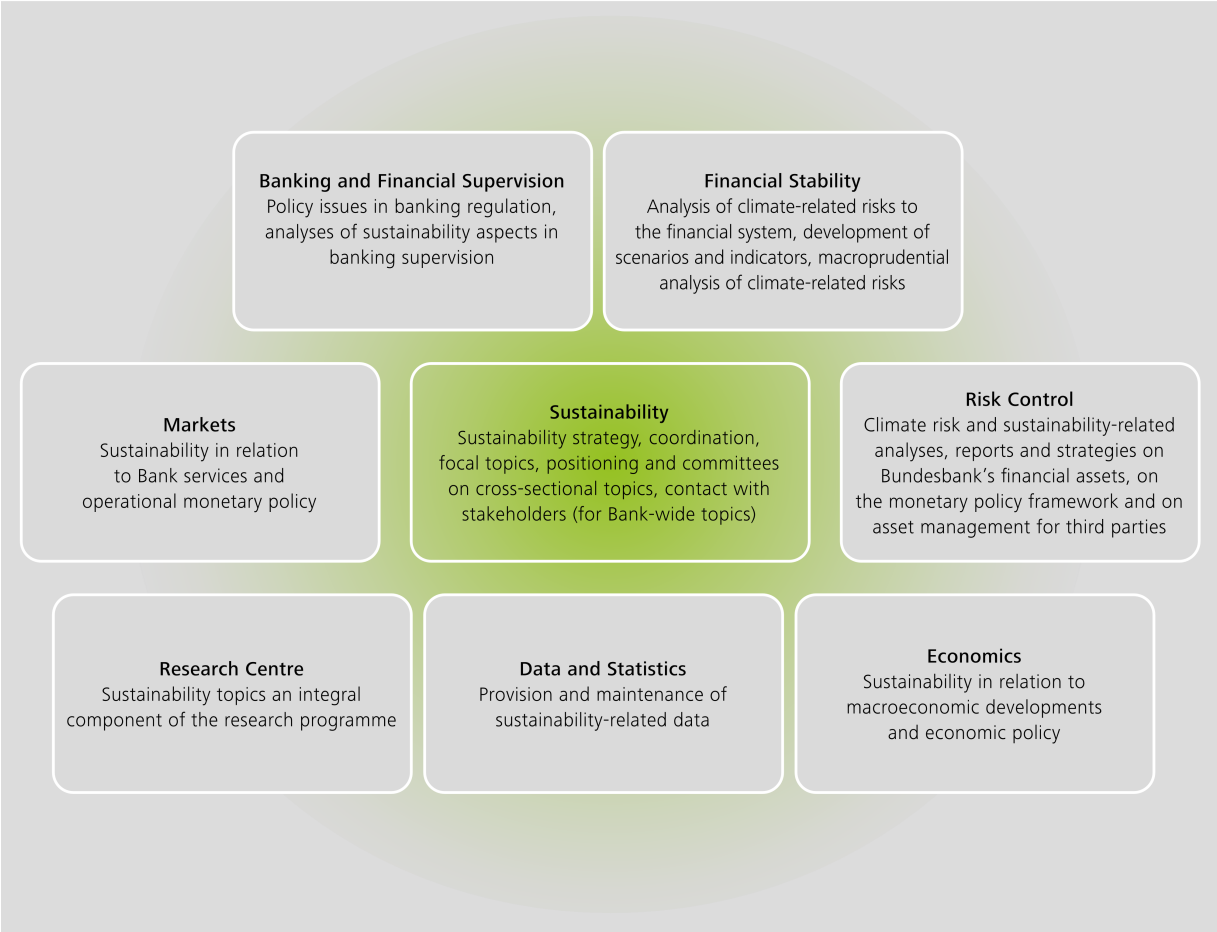
Climate change and climate policy can have an impact on key economic metrics such as inflation and growth and affect the stability of the financial system and individual banks. They consequently also have a bearing on the Bundesbank's core tasks. As a result, almost all areas of the Bundesbank are engaging with climate-related risks. The Bundesbank follows a holistic strategy to analyse and strengthen the resilience of the financial system to climate change and its consequences. It is also increasingly looking into how nature and biodiversity loss affects the economy. This section briefly explains the focal topics and Bank-wide work under this strategy, as well as the Bundesbank's work and positioning in relevant national and international committees on sustainability.

3.1 Climate-related focal topics and work

The Bundesbank takes a collaborative approach to tackling climate-related challenges. Work on the focal topics and responsibility for climate and sustainability issues are firmly embedded in the business units. This approach ensures that a wide range of expertise and perspectives are drawn upon to develop comprehensive and effective strategies. This section gives a brief overview of the specific perspectives and work on climate-related issues of the individual Bundesbank business units, which are summarised in Figure 6.

Overview of Bank-wide climate-related focal topics and work

Figure 6



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The **Sustainability Hub** plays a central role in internal strategy work, coordination and management of the Bundesbank's climate agenda, thus ensuring coherence and a common focus in the Bank's efforts (see also Governance). As part of its strategy work, the hub provides impetus and sets objectives in consultation with the business units. It is then at the discretion of the business units to translate these into objectives and tasks of their own. Among the tasks of the hub itself are analyses on the focal topics of climate policy and nature-related risks as well as the identification of trends in the subject area. As a specialist unit, it plays a part in setting the agenda for projects and analytical work and, through its own expert work, acts as an incubator for the Bank as a whole. By offering training courses, it supports the work of the business units and raises awareness around the issue among staff. The Sustainability Hub acts as the central point of contact for the public and external stakeholders in overarching matters. It uses various information channels, such as "Forum Bundesbank" or the annual Open Day, to explain why sustainability matters for central banks. In addition, it represents the Bank together with the experts from the business units in cross-sectional committees (see Section 3.2 National and international climate cooperation).

In the Directorate General **Economics**, experts examine the impact of climate change and, in particular, climate policy on macroeconomic developments. They analyse, for instance, the transmission channels of climate policy measures such as the pricing of carbon emissions.[1)] To this end, the analytical toolkit was adapted with the aim of being able to adequately study adjustment processes driven by climate change and climate policy, examining their sectoral and regional dimensions in an international context.[2)] In addition, the Directorate General is represented in international bodies such as the NGFS or G7 working groups.

The Directorate General **Financial Stability** analyses the system-wide climate-related risks to the financial system. In order to better understand these over time, the Bundesbank, together with other central banks and researchers, is developing climate scenarios, among other tools, and applying them in climate stress tests. On this basis, a policy framework for the possible use of macroprudential instruments is being developed.

1 See, inter alia, Deutsche Bundesbank (2022), Climate change and climate policy: analytical requirements and options from a central bank perspective.

2 The environmental multi-sector DSGE model EMuSe, which is one model developed at the Bundesbank, can be used in particular to analyse adjustment processes driven by climate policy in an international context and flexibly adapted to various policy questions. The manual and the programming codes for the EMuSe model are publicly available.

In **Banking and Financial Supervision**, the Bundesbank monitors whether institutions are integrating climate risks into their risk management, business and risk strategy, corporate governance and business organisation on the basis of specific regulatory requirements. At the same time, a framework needs to be established for the disclosure of information on climate risks and to strengthen market transparency in the banking and financial sector. Overarching analyses of climate-related risks for the banking system round out the work.

The Directorate General **Markets** analyses sustainability issues pertaining to monetary policy and portfolio management. Financial Research is keeping tabs on developments in new markets for sustainable financial products (see Section 3.4 Market analyses and trends: insights from the Bundesbank's ESG Monitor). **Risk Control** analyses and reports on the climate-related risks and sustainability of the Bundesbank's financial investments and of the portfolios that the Bundesbank manages as fiscal agent for its clients. For the Bundesbank's own non-monetary policy financial investments and its clients' portfolios, Markets and Risk Control develop and operationalise sustainable investment strategies (see Section 3.5 The Bundesbank as fiscal agent and Section 3.6 Sustainable investment strategy for the Bundesbank's own non-monetary policy financial assets).

The Directorate General **Data and Statistics** has created the Sustainable Finance Data Hub, a centralised unit for the provision and maintenance of sustainability-related data. Based on regular user surveys, the supplied data are constantly being updated with the aim of improving data coverage and quality. In addition, the Directorate General is an active participant in the national and international discourse on closing data gaps [3)] and publishes the Green Finance Dashboard, which provides a concise overview of data availability in Germany and in the EU-27 countries.

The Deutsche Bundesbank's **Research Centre** has made sustainability an integral part of its research programme. The box below puts a spotlight on climate-related research work at the Bundesbank:

3 The Directorate General Data and Statistics is involved in developing sustainability-related climate indicators at the macro level, for example as the co-chair of the data network in the NGFS and in the Expert Group on Climate Change Statistics of the STC (ESCB Statistics Committee).

Fokus chapter

The Research Centre develops and consolidates academic expertise at the Bundesbank. It supports the Bundesbank's decision-making processes and helps maintain its reputation both in academic circles and amongst other political institutions. The Research Centre's analyses help to evaluate the effectiveness of policy or regulatory measures and to identify potential risks at an early stage, for example. Regular surveys of households and firms capture the economic expectations of the general public and the business community as well as delivering important insights for policymaking.

As part of its activities, the Research Centre is also represented in committees and institutions concerned with the impact of climate change and climate policy on the macroeconomy and financial markets. These include, for instance, the NGFS, research groups of the Eurosystem or the European System of Central Banks (ESCB), and various collaborations with academic institutions around the world. In order to promote academic dialogue and incorporate new insights into the Bundesbank's decision-making processes, the Research Centre regularly organises conferences, workshops and seminars dealing with climate change and central banks. These events include the Bundesbank Spring Conference in 2023, the ESCB Research Cluster Workshop in 2024 and the NGFS Research Workshop in 2025.

The Research Centre's own work focuses on a wide range of issues surrounding climate change and climate policy. A number of analyses, for example, relate to **what the transition to a net zero economy should look like**. One Bundesbank discussion paper from 2024 uses a theoretical model to show that although high carbon taxes can increase the likelihood of a financial crisis in the short run, they lead to a more stable financial structure over the medium term. [1)] A new empirical study demonstrates that just the announcement of the introduction of the EU Carbon Border Adjustment Mechanism already triggered negative market responses for firms within the EU, too. [2)] One empirical analysis of transition risk shocks shows that political events that accelerate the transition do not necessarily have to be inflationary.

1 See Kaldorf and Rottner (2024), Climate Minsky moments and endogenous financial crises, Deutsche Bundesbank Discussion Paper 26/2024.

2 See Shi, Zhang and Meinerding (2025), The impact of climate policies on financial markets: Evidence from the EU Carbon Border Adjustment Mechanism, Bundesbank Discussion Paper 14/2025.

In fact, there can also be deflationary tendencies, particularly as a result of negative demand effects for various affected sectors and thus potentially for the economy as a whole as well. [3)] Another theoretical Bundesbank discussion paper demonstrates that over time the optimal carbon price (measured as a share of GDP) initially rises sharply, but also declines again in subsequent years when green technologies become more productive and their relative share in the economy exceeds a certain threshold. Economic growth therefore may weaken at first, but will actually pick up later on account of the transition. [4)]

Physical risks are another aspect of climate change that have a major bearing on the economy. These include the increased frequency and severity of climate-related natural disasters. The Research Centre analyses the economic and financial implications of events such as these. Initial findings show that climate-related natural disasters have far-reaching negative impacts on production, consumption and investment. The financial sector can also be affected if there is a sharp rise in uncertainty and risk for banks in the wake of climate-related natural disasters. [5)] German banks, for example, had to record significant impairments after the River Elbe flooded in 2013. [6)]

Developments in inflation – and the corresponding **inflation expectations** of the general public – play an important role for the Bundesbank. The Research Centre is therefore also looking into the interplay between monetary policy, advancing climate change and climate action measures with respect to inflation expectations.

3 See Meinerding, Schüler and Zhang (2023), Shocks to transition risk, Deutsche Bundesbank Discussion Paper 04/2023.

4 See Zhou and van der Ploeg (2024), Structural change and the climate risk premium during the green transition, Deutsche Bundesbank Discussion Paper 17/2024.

5 See Eickmeier, Quast and Schüler (2024), Macroeconomic and financial effects of natural disasters, Deutsche Bundesbank Discussion Paper 45/2024.

6 See Shala and Schumacher (2024), The impact of natural disasters on banks' impairment flow – Evidence from Germany.

Recent survey results show that the ECB's commitment to climate action is largely viewed positively by the general public in Germany and, at the same time, has little impact on inflation expectations.[7)] The negative effects for price stability stemming from expectation effects relating to the ECB's actions have therefore appeared minor thus far. On top of that, another study provides evidence that people who are very concerned about climate change tend to have lower inflation expectations.[8)]

Alongside these kinds of macroeconomic topics surrounding the transition to a net zero economy, the Research Centre also looks into issues in the field of **green finance** – that is, the move towards more environmental sustainability in financial markets, which is one of the major trends seen in recent years. One study by the Research Centre shows that the preferential treatment of green bonds in the collateral framework for monetary policy operations generally supports investment in sustainable projects, but as a policy measure it is no substitute for effective carbon pricing.[9)] Another study examines the holder structure of bonds classified as "green" and provides evidence of complex interactions between the holder structure and the premiums on these green bonds observed in the market, which had not previously been documented in this form.[10)]

Going forward, the Research Centre will extend its focus to other topics: developments in the insurance sector, ex post analyses of the numerous climate policy measures already implemented in Germany and the EU, and quantifying the impact of biodiversity loss on various sectors of the economy.

The insights gained from this will aid in achieving a better understanding of climate-related risks and developing appropriate policy approaches. Through empirical and theoretical research, the Research Centre endeavours to drive forward the debate on the economic and financial implications of climate change and climate policy, while at the same time delivering insights backed by research to be used in strategic decisions at the Bundesbank and in the Eurosystem.

7 See Eickmeier and Petersen (2024), The ECB's climate activities and public trust, Deutsche Bundesbank Discussion Paper 43/2024.

8 See Meinerding, Poinelli and Schüler (2023), Households' inflation expectations and concern about climate change.

9 See Giovanardi et al. (2023), The preferential treatment of green bonds.

10 See Fricke and Meinerding (2024): Who pays the greenium and why? A decomposition, Deutsche Bundesbank Discussion Paper 41/2024.

3.2 National and international climate cooperation

Cooperation at the national and international level is essential to address the global dimension of climate change. Amongst other things through its analyses and active participation in committees, the Bundesbank aims to improve the management of climate-related and nature-related financial risks and promote transparency. With the NGFS being chaired by First Deputy Governor Dr Sabine Mauderer, the Bundesbank plays a leading role in climate-related global cooperation among central banks and supervisory authorities. Active participation in international forums such as the NGFS enables the Bundesbank, together with other financial system institutions around the world, to develop and promote solutions for a resilient financial system, to provide important impetus for discussion and to support political initiatives.

3.2.1 National committees

The Bundesbank has been an observer of the Federal Government's Sustainable Finance Advisory Committee (SFB) since its establishment in the 19th legislative period in 2019 and has always played a constructive and active role in the SFB's dialogues and discussions. The SFB's final report of the 20th legislative period was published in November 2024.

Since 2018, the Bundesbank has been an observer of the Standing Committee of the Sustainable Finance Cluster. The Sustainable Finance Cluster (SFC) is the central platform for discussion and cooperation among private and public market participants on sustainable finance in Germany and aims to be the first point of contact for actors in the financial sector, the real economy, academia and politics. It pools resources, facilitates the exchange of views and experiences, and produces its own assessments and opinions with the goal of making Germany and, in particular, Frankfurt a pioneer location for sustainable finance.

3.2.2 International committees

Network for Greening the Financial System

The NGFS is a global association of now more than 140 central banks and supervisory authorities as well as 21 observers. The Bundesbank is a founding member, a permanent member of the NGFS Steering Committee and currently chairs the network. The objective of the NGFS is, within the scope of the individual mandates of its members, to analyse the impacts of climate change on the financial system and to promote a climate-friendly and environmentally compatible economic system. This is intended to support compliance with the Paris Climate Agreement. Besides facilitating expert-level analysis, the network mainly serves as a platform for sharing experiences with regard to identifying climate-related financial risks and improving the way they are managed. It also explores ways of integrating sustainability aspects into investment decisions, thereby contributing to efforts to establish international best practices wherever possible.

Building on its expertise, the Bundesbank actively contributes to the NGFS, both at the working level in various working groups of the network and at its management level. Bundesbank First Deputy Governor Dr Sabine Mauderer has chaired the NGFS since the beginning of 2024 and thus plays a key role in its strategic orientation. The Bundesbank also serves as one of the co-chairs of the NGFS Expert Network on Data and works through this channel to improve the situation concerning climate-related data.

In 2024, the NGFS launched its new work programme, which envisages a large number of new projects and revisions to existing products by the beginning of 2026. Last year, a number of publications were already produced on various topics. In addition to the long-term climate scenarios, these include, in particular, reports on the impact of physical and transition risks on macroeconomic variables and monetary policy. In addition, at the UN Climate Change Conference (COP29), the Task Force on Adaptation published an initial concept note highlighting the relevance of climate adaptation for central banks and supervisors and exploring the challenges and possibilities of financing climate change adaptation measures to strengthen financial resilience. Furthermore, the concept paper on nature-related financial risks from 2023 was revised. It contains its own framework outlining the relationships between nature-related, economic and financial risks. A number of publications devoted to the topic of transition plans also received much attention.

One important milestone for 2025 is the publication of the new short-term scenarios, in particular. These are a highly sought-after addition to the previous long-term scenarios. Last year, the NGFS was represented at COP29 on Finance Day with a series of presentations and panel discussions in the German and Australian pavilions.

G20

Within its mandate, the Bundesbank is, along with the Federal Ministry of Finance, a member of the Finance Track of the G20, a group that comprises the 20 largest economies. Amongst other things, the Bundesbank is involved in the G20 Sustainable Finance Working Group (SFWG). The SFWG was mandated by the G20 finance ministers and central bank governors to identify institutional and market barriers to sustainable finance and to develop alternatives for overcoming these obstacles. In 2025, the SFWG, under the South African G20 presidency, will focus, amongst other things, on showing ways in which enterprises can incorporate climate change adaptation and its financing into their transition plans and how markets for emissions allowance trading can be strengthened.

G7

Within its mandate, the Bundesbank also participates in discussions among the G7 finance ministries and central banks on climate change. A particular Bundesbank focus lies on improving analytical understanding of the short and long-term macroeconomic impacts of climate change and various climate policies. To this end, the Bundesbank is involved in a G7 expert network for the relevant economic modelling.

Eurosystem Climate Change Forum (**ECCF**)

At the Eurosystem level, the Bundesbank is represented on the Climate Change Forum, which was established in July 2022. This (voluntary) association of national central banks serves as a vehicle for fostering information exchange and knowledge sharing within the Eurosystem and for coordinating topics and projects relating to climate-related risks and the impact of climate change on central banks' activities. The forum leverages the Eurosystem's expertise to support the work of the national central banks and to jointly advance the Eurosystem's climate agenda. The Bundesbank plays an active role in the discussions and contributes its expertise to the joint work.

Financial Stability Board (FSB)

As a member of various working groups, the Bundesbank participates in the comprehensive roadmap for addressing climate-related financial risks published by the FSB in July 2021. Progress in the work is reported annually. Key areas of work include the analysis of cross-border vulnerabilities and the development of regular monitoring of climate-related financial risks. In early 2025, the FSB Working Group on Climate Vulnerabilities and Data (CVD) published an analytical framework for monitoring and examining physical and transition climate-related risks to the global financial system for the first time.

Joint European Central Bank (ECB)/European Systemic Risk Board (ESRB) Project Team on climate risk

The Bundesbank was represented in the Project Team on climate risk, which was founded in April 2019. This joint ECB/ESRB Project Team developed a metrics-based surveillance framework for climate-related risks, strengthened the empirical and analytical basis for climate scenario analysis, developed a macroprudential framework for managing climate-related risks and addressed the potential economic and financial implications of nature-related risks. Following publication of the project team's fourth and final report at the end of 2023, macroprudential climate issues will continue to be discussed in the existing ECB and ESRB bodies.

Payment Systems Oversight Working Group (PSOWG)

In the monitoring of payment instruments, systems and financial market infrastructures, identifying and assessing climate-related risks and taking measures to mitigate them are also becoming increasingly important. In this context, the Bundesbank participated in a first comprehensive Eurosystem survey on climate-related and environmental risks (stock take). The evaluation contains a benchmark which can be used by the surveyed entities[4)] as a basis for planning improvements in the management of climate-related risks.

4 Payment instruments, schemes and arrangements.

3.3 Eurosystem action plan to take climate change considerations into account in the implementation of monetary policy

With its strategy decision in July 2021 and its decision to adjust the monetary policy framework in March 2024, the Governing Council has enabled the Eurosystem, within its mandate, to include climate change considerations in the implementation of monetary policy. When designing monetary policy measures, the ECB may, without prejudice to the primary objective of price stability and provided that several design options are equivalent in monetary policy terms, choose the configuration that best supports the general economic policies in the European Union, in particular the transition to a green economy. Against this background, it is intended that the incorporation of climate-related aspects into structural monetary policy operations will be explored when further designing the operational framework.[5)] Previously adopted measures to account for climate aspects relate mainly to monetary policy corporate bond purchases, the collateral framework and related disclosure requirements, and risk assessment and management of potential long-term financial risks stemming from climate change.[6)] The Bundesbank contributes actively to the Eurosystem's working structures in order to improve the analytical tools for assessing and forecasting the impact of climate change and the green transformation on the macroeconomy and the management of climate-related risks for the Eurosystem's balance sheet and collateral framework.

5 See ECB Governing Council (2024), ECB press release of 13 March 2024 on changes to the operational framework for implementing monetary policy.

6 An overview of the measures and their design can be found on the ECB's website.

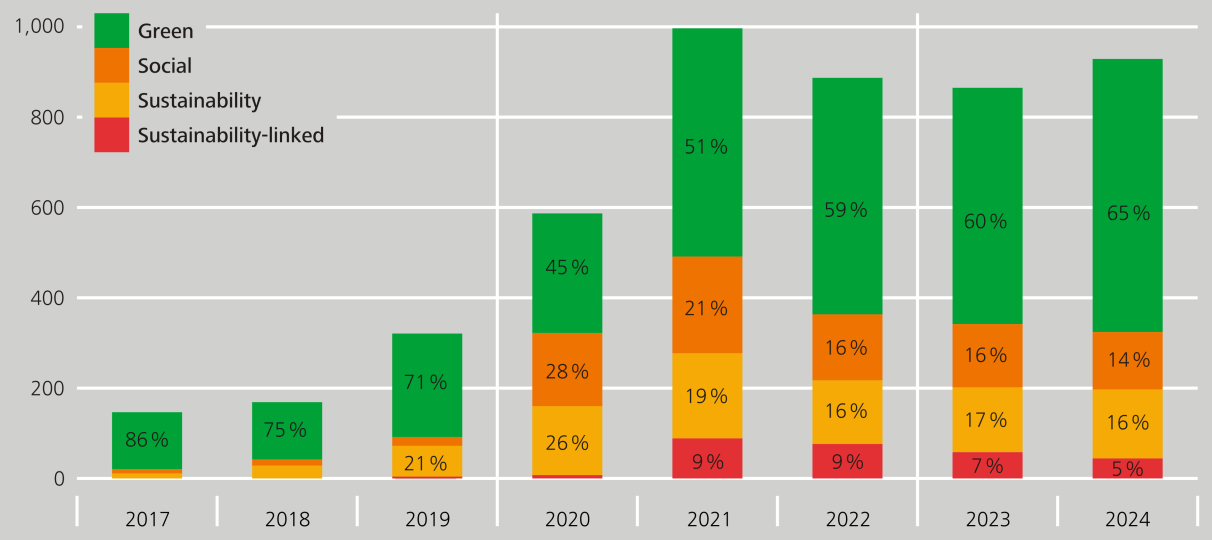
3.4 Market analyses and trends: insights from the Bundesbank's ESG Bond Monitor

The Bundesbank is active in the financial market and therefore analyses various data relevant to the financial market. The aim of this market intelligence is to gain a comprehensive picture of the market situation and to make sound assessments and decisions. This plays an important role in the context of sustainability as well. For example, the Bundesbank conducts various analyses, for example in the form of research projects (see Section 3.1 Climate-related focal topics and work). In addition, the Bundesbank's ESG Bond Monitor regularly provides an up-to-date overview of the market for sustainable bonds (see Figure 7). It examines, amongst other things, topics such as the issuance of sustainability-linked bonds and the performance of sustainable bonds compared to their conventional peers.

ESG bond issuance worldwide

Figure 7

Issuance volumes (€ bn)



Source: Eurosystem data.
Deutsche Bundesbank

In addition, each issue highlights one focal topic in more detail. For example, the issue from February 2025 analyses the holder structure of ESG-related funds in the euro area. The share of ESG funds held in custody in the euro area has been rising since 2018 and currently stands at around 9 %. The bulk of the volume in the euro area is held via conventional funds. One striking aspect is the high ESG share of ETFs held in custody in the euro area of around 25 % to 40 %, depending on the ETF indicator. [7)] Another example of a special topic is a study of yield spreads between conventional and green bonds (the green premium or “greenium”). An internal analysis by the Bundesbank from the summer of 2024 points to a greenium of 2.75 basis points.

7 The ETF indicator is used to distinguish between actively and passively managed funds. This distinction is not always completely clear-cut, which means that results may vary depending on the indicator.

3.5 The Bundesbank as fiscal agent

Pursuant to its legal mandate (Section 20 of the Bundesbank Act read in conjunction with Section 19 of the Bundesbank Act), the Bundesbank acts as a fiscal agent for central government, federal state governments and other public administrations. Its activities in this context include, in particular, passive portfolio management, trading and settlement as well as independent risk control and reporting. Passive or rules-based portfolio management for equities and bonds is provided in accordance with individual client requirements.

Recent years have seen the promotion of sustainability and climate action objectives gain a foothold as an additional investment criterion for clients' financial investments. In this context, the Bundesbank provides its clients with operational and analytical support in the implementation of customised sustainability objectives. Furthermore, the Bundesbank is steadily refining its range of services in the sustainability space to keep pace with client needs. For example, since 2024 it has also been producing reports on sustainability aspects of the managed portfolios at the request of clients.

It now considers sustainability criteria in almost all of the portfolios it manages for external clients. With regard to equity investments, many clients now use equity indices that are tailored to their intended sustainability objectives. In this context, the sustainability benchmarks as defined by the EU (the EU Climate Transition Benchmark (CTB) and EU Paris-aligned Benchmark (PAB)) are playing an increasingly important role for clients. In addition, clients are increasingly integrating bonds into their sustainable investment strategy and taking sustainability criteria into account in the bond space, including covered bonds.

3.6 Sustainable investment strategy for the Bundesbank's own non-monetary policy financial assets

Climate and sustainability risks – such as those arising from the transition to a net zero economy or serious human rights violations – can jeopardise the financial sustainability of particularly affected enterprises and sovereigns. The Bundesbank therefore takes into account the sustainability aspects of assets in its choice of investment in order to limit potential financial risks. At the same time, the Bundesbank aims to promote climate protection and sustainability within the scope of its statutory mandate. For this reason, the Bundesbank has implemented sustainable investment strategies for its own non-monetary policy financial investments (euro portfolio and foreign currency portion of reserve assets).

3.6.1 Sustainable investment strategy for the euro portfolio

The Bundesbank manages a non-monetary policy euro-denominated securities portfolio (euro portfolio) as an asset-side counterpart to its long-term provisions for civil servant pensions and healthcare assistance, capital and reserves. As a result, the target volume of the euro portfolio is predefined and the volume's share in the Bundesbank's balance sheet can be regarded as low.

The euro portfolio is currently invested in euro-denominated covered bonds from the jurisdictions of Germany, France, Finland, Belgium, the Netherlands, Norway and Sweden, as well as, since the beginning of 2025, euro-denominated unsecured bonds issued by selected non-euro area institutions. These include supranational development banks as well as national promotional banks and public sector institutions. Unsecured bonds in the portfolio have a significantly lower weighting than covered bonds. These debt securities are generally held to maturity.

Within the scope of its statutory mandate, the Bundesbank's target criteria include not only earnings, safety and liquidity but also sustainability. The sustainable investment strategy for covered bonds in the euro portfolio consists of four steps and focuses on climate change and the transition to a net zero economy (see Figure 8).

In a first step, issuers undergo negative screening for proven and serious breaches of globally recognised minimum standards: specifically, the United Nations (UN) Global Compact, the Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises, the International Labour Organization (ILO) core labour standards and international treaties on prohibited weapons. If an issuer breaches these criteria, its securities are excluded from the investable universe. Second, issuer-related indicators are defined in order to calculate a sustainability score consistent with the Bundesbank's understanding of sustainability. The indicators currently being used are the "Carbon Risk Rating" developed by the ESG data provider International Shareholder Services ESG (ISS ESG) and issuers' GHG intensity. In a third step, issuers are classified into three groups based on their sustainability score to overweight them, underweight them or declare them neutral compared to the benchmark. Finally, a tilting factor determines the degree to which issuers are over- und underweighted within the benchmark portfolio. A suitable sustainable investment strategy has also been introduced for the newly authorised asset class of unsecured bonds. This is based on the strategy used for the foreign currency reserves (see Section 3.6.2 Sustainable investment strategy for foreign currency reserves as part of reserve assets).

The intention is to gradually expand the investment strategy pursued in the euro portfolio and regularly review its suitability. This is also particularly important if the quality of the available data improves to such an extent that bond issuers' GHG emissions can be assessed more comprehensively.

3.6.2 Sustainable investment strategy for foreign currency reserves as part of reserve assets

The Bundesbank's reserve assets comprise gold holdings, receivables from the IMF and foreign currency reserves. Foreign currency investment is made in US dollars, Japanese yen, Australian dollars, Canadian dollars, Chinese yuan (renminbi), and, since 2024, also in pound sterling. The majority of this constitutes sovereign bonds. Holdings also include bonds issued by sub-sovereigns (e.g. federal states and provinces) and by national or supranational promotional and development banks (belonging to the supranationals and agencies issuer group).

In 2023, the Bundesbank implemented a sustainable investment strategy for the foreign currency portion of reserve assets in order to take greater account of climate-related financial risks and – where possible without hampering the fulfilment of its currency and monetary policy tasks – to combat climate change.

The strategy focuses on the eligibility of issuers. Since restrictions on sovereign bonds (United States, Japan, Australia, Canada, China and the United Kingdom) are virtually impossible owing to the overarching currency policy-driven requirements, the Bundesbank has developed suitable approaches for the remaining issuer groups of relevance (sub-sovereigns and promotional and development banks).

For purchasing securities issued by sub-sovereigns, the sub-sovereign has to have a better climate profile than the corresponding sovereign. The climate profile is determined by the total GHG emissions and the volumes of fossil fuels produced in the sub-sovereign region, each relative to the size of its economy. Thus, in foreign currency investment, the Bundesbank refrains from investing in sub-sovereigns with a worse climate profile than the corresponding sovereign. If a sub-sovereign has a significantly worse climate profile than the corresponding sovereign, the Bundesbank would, moreover, consider actively selling the securities holdings in question.

For purchasing bonds issued by promotional and development banks, minimum requirements in terms of a climate-focused sustainability score must be met. Sustainability scoring for issuers is based on three pillars: 1) green and/or brown shares of business activities; 2) ambition, e.g. with regard to GHG reduction targets or the exclusion of fossil energy financing; 3) transparency and/or the quality of climate-related disclosures. The results of these three pillars are weighted and merged to form an overall score, with pillar 1 being the main focus of the overall score. In foreign currency investment, the Bundesbank will therefore not invest, in particular, in promotional and development banks which provide a considerable level of funding to sectors that harm the climate and the environment, such as the fossil fuel sector. In addition, the sustainability scoring is in line with the Bundesbank's aim of creating an incentive for issuers to set themselves climate goals and to disclose climate-related information. If an issuer falls significantly short of the sustainability requirements, a sale is considered.

In addition, as for the euro portfolio, ongoing negative screening for proven and serious breaches of globally recognised minimum standards is carried out for promotional and development banks.

4 Risk management

The Bundesbank works to take climate-related risks into account over the entire risk management cycle, i.e. when identifying, analysing, measuring, communicating and managing risks. In organisational terms, the existing risk management structure is used, with Risk Control, which is segregated from risk-taking market operations units up to and including the Executive Board level, taking responsibility for the Bundesbank' s financial business risks.

The risk management perspective naturally focuses primarily on how climate policy and climate change may affect the value of the Bundesbank's balance sheet assets and how the balance sheet can be protected from climate-related financial risks, should the need arise. These risks may be transition risks associated with climate change mitigation measures such as a carbon tax or with changed consumer preferences, such as a shift towards electric vehicles. There are also physical risks stemming from climate change. These include acute risks from extreme weather events such as floods and droughts, and chronic risks such as rising sea levels.

From this risk perspective, it would theoretically be possible to narrow down the perspective to the impact of an organisation's own business activities on the climate. Climate impacts should, as appropriate, be taken into account when planning and making decisions in order for the organisation to contribute to climate change mitigation within the scope of its mandate. In practice, the two perspectives often overlap. For example, the GHG metrics outlined in the following section are used both as risk indicators and for measuring climate compatibility. The sustainable investment strategies presented in this report for the euro portfolio and foreign currency reserves held as reserve assets also combine both perspectives.

Ultimately, the Bundesbank would risk public disapproval if it did not attend in any noteworthy way to climate considerations in its own business activities, or even ignored them entirely. This could thus cause reputational damage, a matter of great importance for central banks in particular.

The ability to expand risk management in respect of climate-related financial risks hinges on the quality and availability of relevant data and the standardisation of measurement concepts. It is likely that the progress seen here so far is being helped along by regulatory requirements, e.g. in sustainability reporting, gradually becoming more widespread. To continue enhancing and refining the Bundesbank's methodological concepts, it is beneficial to facilitate in-depth expert dialogue with colleagues working in areas such as banking supervision and financial stability, who also take a risk perspective. This applies within the Bank itself and, in particular, in partnership with other central banks, financial institutions and the academic community. In areas touching upon the analysis of climate-related risks in monetary policy operations and portfolios as well as risk management options to protect the balance sheet, cooperation with other Eurosystem central banks in the relevant forums is essential.

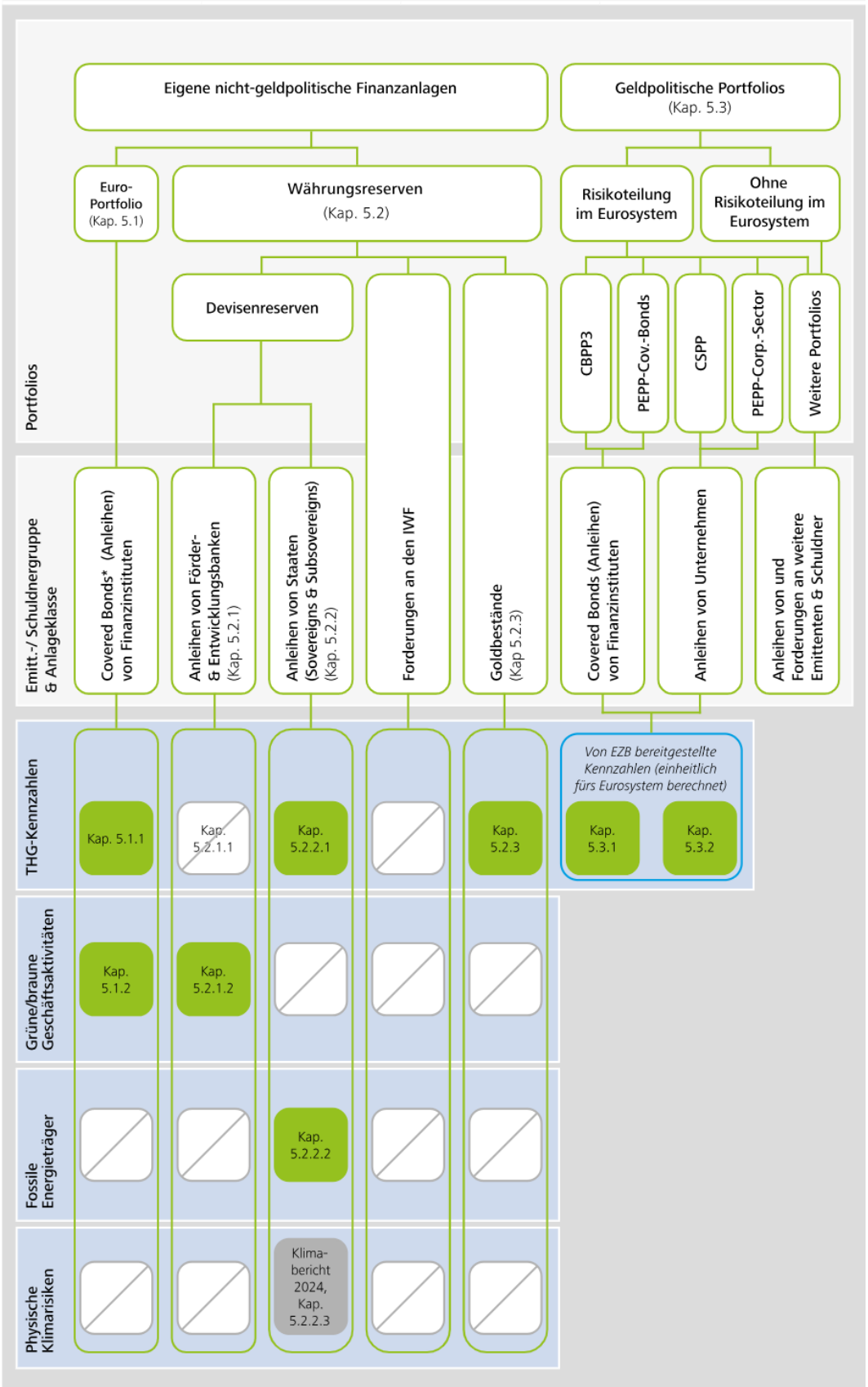
5 Metrics

In today's financial world, giving consideration to climate and sustainability-related information is increasingly becoming a strategic necessity. Like all other Eurosystem central banks, the Bundesbank discloses relevant metrics to help improve transparency about climate-related risks and impacts in the financial sector. This type of reporting also allows the Bundesbank to continuously analyse relevant aspects of its financial investments, which helps it to identify and manage risks at an early stage.

Figure 9 provides an overview of the portfolios, asset classes and metrics that are covered in this section. Reporting focuses on GHG metrics such as the **WACI**, **total carbon emissions** and the **carbon footprint**. From 2023, the calculation methods have been based on a common Eurosystem central bank disclosure framework, which is revised and updated annually. This framework is aligned with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and the Partnership for Carbon Accounting Financials (PCAF). The calculation methods are explained in detail in the Annex.

Übersicht der im folgenden Kapitel abgedeckten Kennzahlen
(zum Portfolio-Stichtag 31.12.2024)

Abbildung 9



Die Größenverhältnisse in dieser Abbildung sind unabhängig von den Portfoliovolumina.
*) Stand 28.03.2025 umfasst das Euro-Portfolio darüber hinaus Anleihen von Förder- und Entwicklungsbanken. Aufgrund des Portfolio-Stichtags 31.12.2024 spiegelt sich dies noch nicht in den nachfolgenden Kennzahlen wider.

Deutsche Bundesbank

For the first time, the Bundesbank is also reporting on **GHG metrics for the Eurosystem's monetary policy holdings of corporate and covered bonds**. The relevant metrics were calculated centrally for the Eurosystem by the ECB and provided to the Bundesbank. They are also published in the ECB's climate-related financial disclosures, together with other metrics on these and other Eurosystem monetary policy holdings.

5.1 Euro portfolio

As at the reporting date of 31 December 2024, the euro portfolio consisted exclusively of covered bonds – as was the case on the reporting dates of previous disclosures. These are bonds issued by banks, which are mainly backed by real estate mortgages. The following metrics relate to the issuers of these bonds. The decisive factor is thus the sustainability and environmental performance of the issuing banks (in relation to their business activities as a whole). Insufficient GHG data are available for the cover pools, on the other hand.

When these disclosures were prepared, the euro portfolio had already been expanded to include unsecured bonds – more specifically, bonds issued by supranational and national promotional and development banks (see Section 3.6.1 Sustainable investment strategy for the euro portfolio). However, because the reporting date is 31 December 2024, these are not yet reflected in the following metrics.

5.1.1 GHG metrics

As at 31 December 2024, the **WACI** (scope 1 & 2) of the euro portfolio was 0.5 tonnes of CO_2e per million euro of gross income (see Table 1). The GHG metrics as at the portfolio reporting date of 31 December 2023 were updated retroactively based on the GHG data that are now available for 2023. With the exception of 2024, for which GHG metrics are still based on the 2023 GHG data for the time being, the WACI has seen a persistent and significant decline since 2021. Banks' scope 2 emissions, in particular, are decreasing (see Figure 10). This is probably first and foremost because banks are increasingly purchasing electricity from renewable sources.

Table 1: Overview of GHG metrics for the euro portfolio

		Portfolio as at:			
		31.12.2021	**31.12.2022**	**31.12.2023**	**31.12.2024**
Portfolio holdings (by nominal value)		**€10.0 billion**	**€8.9 billion**	**€7.3 billion**	**€5.2 billion**
WACI (tCO_2e/€mn of gross income)	**Scope 1 & 2**	**1.49** *(86.4 %)*	**0.89** *(92.3 %)*	**0.45** *(94.1 %)*	**0.50** *(96.5 %)*
Total carbon emissions (tCO_2e)	**Scope 1 & 2**	**1,445.4** *(80.0 %)*	**1,037.0** *(87.0 %)*	**646.0** *(80.2 %)*	**535.4** *(96.5 %)*
Carbon footprint (tCO_2e/€mn of investment)	**Scope 1 & 2**	**0.18** *(80.0 %)*	**0.13** *(87.0 %)*	**0.11** *(80.2 %)*	**0.11** *(96.5 %)*

Coverage (by portfolio volume) in italics and parentheses.
Sources: ISS ESG, *Bundesbank data and calculations.*

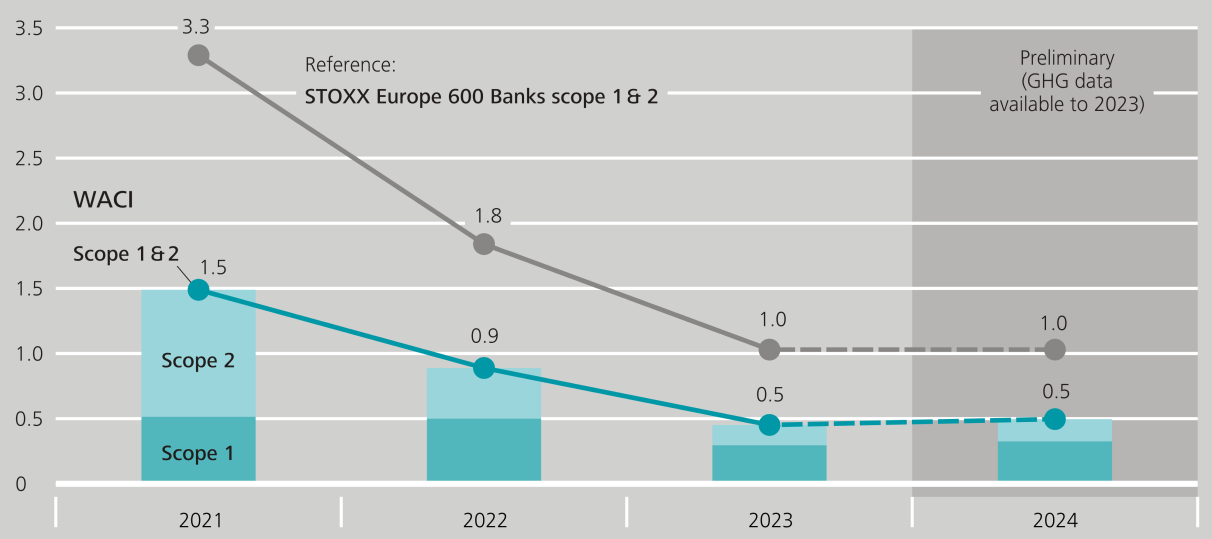
The euro portfolio is roughly half as GHG-intensive compared with the average of the 50 largest European banks by market capitalisation according to the STOXX Europe 600 Banks stock index.[1)] For the STOXX Europe 600 Banks index, too, the decline in GHG intensity is largely attributable to scope 2 emissions.

1 Bundesbank calculation based on the composition of the STOXX Europe 600 Banks index as at 12 March 2025 and GHG data from ISS ESG.

Euro portfolio: evolution of WACI (scope 1 & 2)

Figure 10

tCO_2e/€mn gross income



Sources: ISS ESG and Bundesbank data and calculations.
Deutsche Bundesbank

Total carbon emissions (scope 1 & 2) as at 31 December 2024 amounted to 535.4 tonnes of CO_2e. GHG emissions financed by the euro portfolio thus continue to decline significantly. This effect is also due to the fact that portfolio holdings declined from €10.0 billion to €5.2 billion between the end of 2021 and the end of 2024. Nevertheless, the **carbon footprint** (scope 1 & 2), which expresses total carbon emissions in relation to portfolio volume, decreased as well (from 0.18 to 0.11 tonne of CO_2e/€mn of investment from 2021 to 2024).

The aforementioned GHG metrics represent only a small part of the total GHG emissions associated with the euro portfolio, however, and therefore do not reveal the full picture. This is because neither scope 1 nor scope 2 emissions include, inter alia, GHG emissions associated with the financing activities of the issuing banks, because these form part of scope 3 emissions. However, the scope 3 data disclosed by banks rarely include their financed GHG emissions. [2)] As at the reporting date of 31 December 2024, such data are only disclosed for around 36 % of the euro portfolio volume. Despite continuous improvements, the scope 3 data thus do not provide sufficient coverage of the euro portfolio at the moment. Given this, the Bundesbank is not reporting scope 3 metrics on the euro portfolio at present.

5.1.2 Green and brown shares of business activities

The **“green” and “brown” shares** of a portfolio are dependent on the business activities of enterprises financed by the portfolio. The metrics consider green and brown business activities as a share of an enterprise’s revenue. This is based on a classification system created by ISS ESG, which classes business activities as beneficial (“green”) or harmful (“brown”) to the environment in alignment with the UN Sustainable Development Goals (SDGs). If the funded enterprises are banks (as in the case of the euro portfolio), shares of business volume (including lending and investment) rather than revenue shares are taken into account. Based on these shares, a weighted average is calculated for the portfolio along similar lines to the WACI methodology. [3)]

2 Nearly all banks disclosing such data put their financed scope 3 emissions at more than 99 % of their total scope 1, 2 and 3 emissions [see Deutsche Bundesbank (2024b). Climate-related disclosures by the Deutsche Bundesbank 2024, box 1 on page 34].

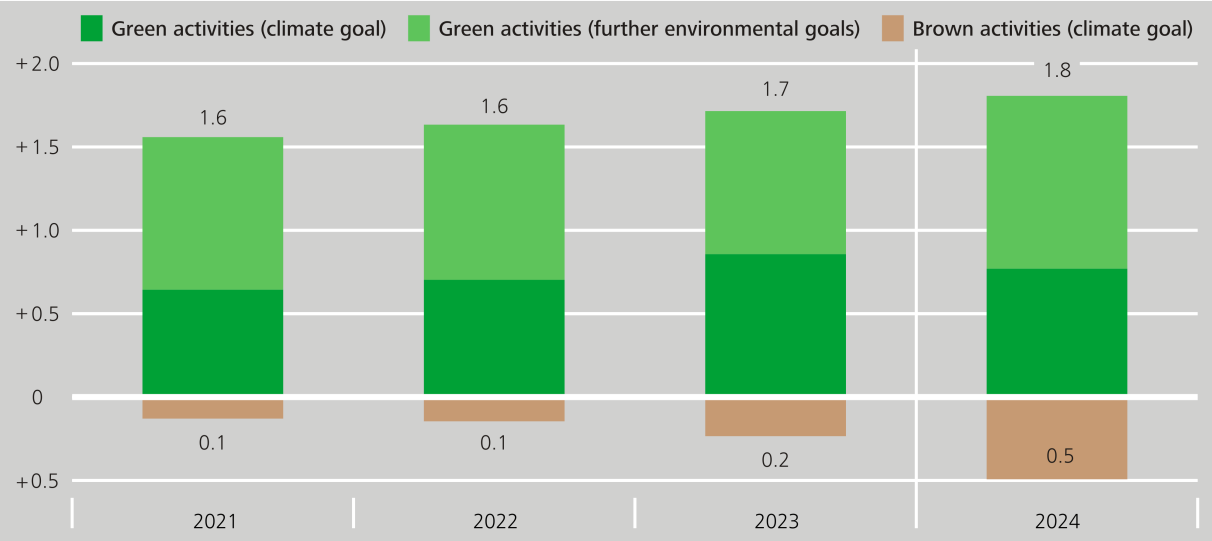
3 To avoid multiple counting, the Bundesbank counts business activities that ISS ESG assigns to multiple environmental goals only once for the green or brown share.

The **green share** for the euro portfolio comes to 1.8 % (Figure 11). It is thus higher than the average green share of the STOXX Europe 600 Banks index (0.8 %).[4)] Around half of the green share is made up of financing arrangements aimed primarily at achieving the climate goal within the meaning of the SDGs ("mitigating climate change"). This is predominantly the financing of renewable energies and energy efficiency measures. The other half of the green business activities primarily serve the environmental goal of "promoting sustainable buildings", but thus are also very much climate-related. This includes financing of real estate certified as sustainable and/or energy-efficient.

Euro portfolio: green and brown shares

Figure 11

Green/brown shares of business activities in %



Sources: ISS ESG and Bundesbank data and calculations.
Deutsche Bundesbank

The **brown share** of the euro portfolio rose from 0.2 % to 0.5 % on the year, mainly because one of the banks is involved in financing the expansion of an airport. However, the brown share of the euro portfolio continues to be below the average of the STOXX Europe 600 Banks index (1.2 %). The brown share of the latter is largely attributable to financing for purchases of vehicles with internal combustion engines. This is of very little relevance for the business activities of banks whose bonds are held in the euro portfolio.

4 Bundesbank calculation based on the composition of the STOXX Europe 600 Banks index as at 12 March 2025 and ESG data from ISS ESG.

ISS ESG does not count the majority of financing as either beneficial or harmful to the environment. However, commercial banks that issue covered bonds have very different levels of transparency when disclosing their financing activities. Potentially broadening their sustainability-related disclosures in future could therefore help to better capture financing activities that have a particular bearing on the climate and the environment.

5.1.3 Compliance with international standards and other sustainability aspects

In accordance with the sustainable investment strategy for the euro portfolio, bond issuers are screened for compliance with minimum standards on an ongoing basis. The negative screening for breaches of international standards is grounded in the norm-based assessment of entities by the ESG data provider ISS ESG. As at 31 December 2024, the euro portfolio did not include any bonds issued by entities for which ISS ESG had detected severe proven breaches of international standards. Nor did ISS ESG identify any involvement in controversial weapons for any of the entities. The euro portfolio thus meets the minimum standards set out in the sustainable investment strategy.

The sustainable investment strategy for the euro portfolio does not include any targeted purchases of green bonds or comparable forms of bonds. Accordingly, green bonds accounted for only a small share of the portfolio volume as at 31 December 2024, at 0.7 %. Comparable forms of bonds such as social bonds are not included in the euro portfolio.

5.2 Reserve assets

With regard to the Bundesbank's reserve assets, portfolio holdings are determined by currency policy-driven requirements. The reserve assets comprise gold holdings, receivables from the IMF and foreign currency reserves. The latter mainly include investments in sovereigns, of which US government bonds account for the largest share. Besides these, bonds issued by national or supranational promotional and development banks are also held in the foreign currency reserves. Assets relating to the Bank for International Settlements (BIS) are not incorporated into the calculation of the metrics.

5.2.1 Bonds issued by promotional and development banks

The calculation of the following metrics on portfolio holdings of bonds issued by national or supranational promotional and development banks (see Table 2) follows the same methodology as for the euro portfolio.

Table 2: Reserve assets: holdings of bonds issued by promotional and development banks

	At the reporting date:			
	31.12.2021	31.12.2022	31.12.2023	31.12.2024
Portfolio holdings (by nominal value, €bn)	**2.03**	**2.16**	**2.07**	**2.02**

5.2.1.1 GHG metrics

Compared with commercial banks, supranational development banks, in particular, only disclose their scope 1 and 2 emissions in isolated cases. It is therefore not currently possible to calculate GHG metrics that cover a significant proportion of the

bonds issued by promotional and development banks. For this report, therefore, no such metrics are reported. As is the case for the euro portfolio, the data available on banks' scope 3 emissions are also insufficient.

5.2.1.2 Green and brown shares of business activities

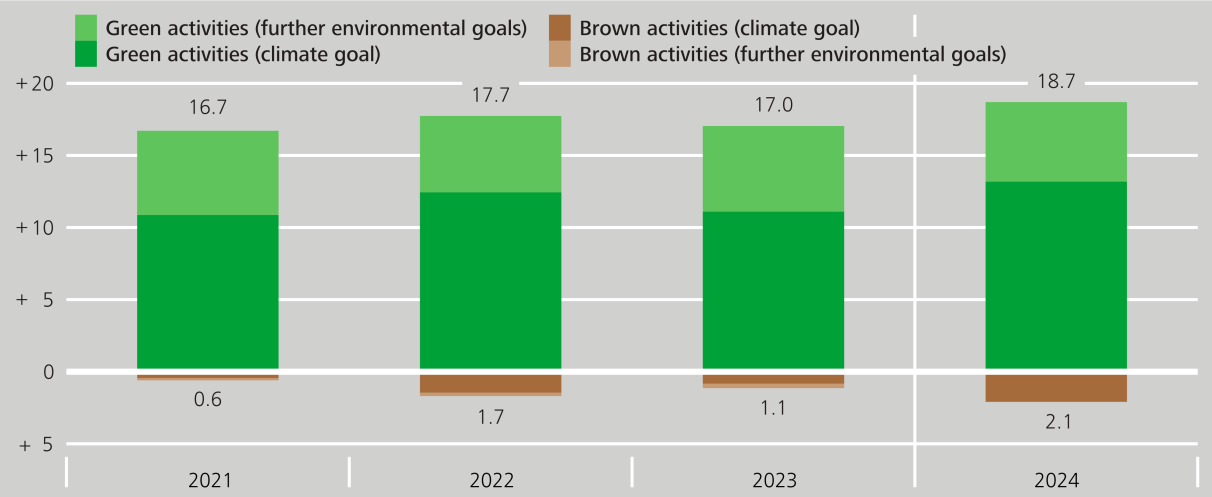
By contrast, extensive findings are available for the business activities of promotional and development banks, including their **green and brown shares**.[5)] Data availability is improved by promotional and development banks being required by their mandates to exercise a high degree of transparency surrounding their financing activities.

The **green share** of the business activities of promotional and development banks increased from 17.0 % to 18.7 % between the end of 2023 and the end of 2024 and is thus still at a considerable level (see Figure 12).

Promotional and development banks (reserve assets): green and brown shares

Figure 12

Green/brown shares of business activities in %



Sources: ISS ESG and Bundesbank data and calculations.
Deutsche Bundesbank

5 See Section 5.1.2 Green and brown shares of business activities for explanations of the calculation methods.

The bulk of the green share is made up of financing arrangements aimed primarily at achieving the climate goal within the meaning of the SDGs (“mitigating climate change”). In the interests of achieving this goal, promotional and development banks’ business activities include, inter alia, the financing of renewable energy, energy efficiency measures and public transport infrastructure.

The remaining green share mainly belongs to the environmental goal of conserving water. The financing of water treatment facilities in particular accounts for a substantial share of business volumes at promotional and development banks. Smaller shares of financing activities are assigned primarily to biodiversity and nature-related environmental goals, such as projects to protect land and water-based ecosystems.

The **brown share** remains at a low level, but has risen slightly on the year (from 1.1 % to 2.1 %). It relates to business activities that are at odds with the goal of mitigating climate change. This increase is primarily attributable to new financing from supranational development banks to expand the aviation sector in emerging market economies.

5.2.1.3 Compliance with international standards and other sustainability aspects

In accordance with the sustainable investment strategy for the foreign currency reserves in the reserve assets, promotional and development banks are screened for compliance with minimum standards on an ongoing basis. The negative screening for breaches of international standards is grounded in norm-based assessment by the ESG data provider ISS ESG. As at the reporting date of 31 December 2024, the reserve assets did not include any bonds issued by promotional and development banks for which ISS ESG had detected severe proven breaches of international standards. Nor did ISS ESG identify any involvement in controversial weapons. The bonds issued by promotional and development banks thus satisfy the minimum standards enshrined in the sustainable investment strategy.

The sustainable investment strategy for bonds issued by promotional and development banks as part of the reserve assets does not include any targeted purchases of green bonds or comparable forms of bonds. Accordingly, green bonds accounted for only a small share of the investment volume as at 31 December 2024, at 3.2 %. The portfolio shares of bonds declared by promotional and development banks as social bonds, sustainability bonds and sustainability-linked bonds are higher. However, only in a few cases are they deemed to be in line with International Capital Markets Association (ICMA) standards and verified by a second-party opinion (see Table 3).

Table 3: Reserve assets: shares of green, social, sustainability and sustainability-linked bonds among holdings of bonds issued by promotional and development banks (by nominal value)

	Green	Social	Sustainability	Sustainability-linked
All respective bonds as declared by bond issuers	**3.2 %**	**7.1 %**	**45.0 %**	**4.8 %**
Of which declared compliant with ICMA principles	**3.2 %**	**0.2 %**	**30.3 %**	**0.0 %**
Of which verified by second-party opinion	**3.2 %**	**0.0 %**	**2.0 %**	**0.0 %**

5.2.2 Sovereign investments

Sovereign investments in the reserve assets consist mainly of US government bonds, which therefore have a large impact on the climate metrics (see Table 4). Furthermore, they include deposits with the central banks of the relevant sovereigns [6)] and bonds of sub-sovereigns (regions of a country, such as federal states). Since the pound sterling has been added to the Bundesbank's reserve assets in 2024, the investments have also included government bonds of the United Kingdom (UK) and deposits with the Bank of England for the first time.

6 To calculate GHG and climate metrics, deposits with central banks are treated like, and added to, sovereign bonds. As a result, data on sovereigns are applied to both.

Table 4: Reserve assets: holdings of investments in sovereigns and sub-sovereigns

		At the reporting date:	
		31.12.2023	31.12.2024
Portfolio holdings (by nominal value, €bn)	**Total**	**25.64**	**25.12**
	United States	21.64	19.95
	Canada	1.55	1.49
	Japan	1.30	1.25
	United Kingdom	0.00	1.20
	Australia	0.88	0.94
	China	0.27	0.28

Sub-sovereigns are treated as distinct entities in the calculation of most climate metrics (with the exception of total carbon emissions and carbon footprint). This means that the corresponding regional GHG emissions and production volumes of fossil fuels are taken into account for sub-sovereigns and set in relation to regional GDP adjusted by PPP.

Compared with the investments examined above (euro portfolio; bonds issued by promotional and development banks in the reserve assets), the GHG metrics do overlap to a degree in terms of their designations and purposes. For sovereigns and sub-sovereigns, though, the variables that feed into the calculations differ in some cases (e.g. GDP adjusted by PPP rather than by revenue). The following results are therefore only comparable with other investments in governments.

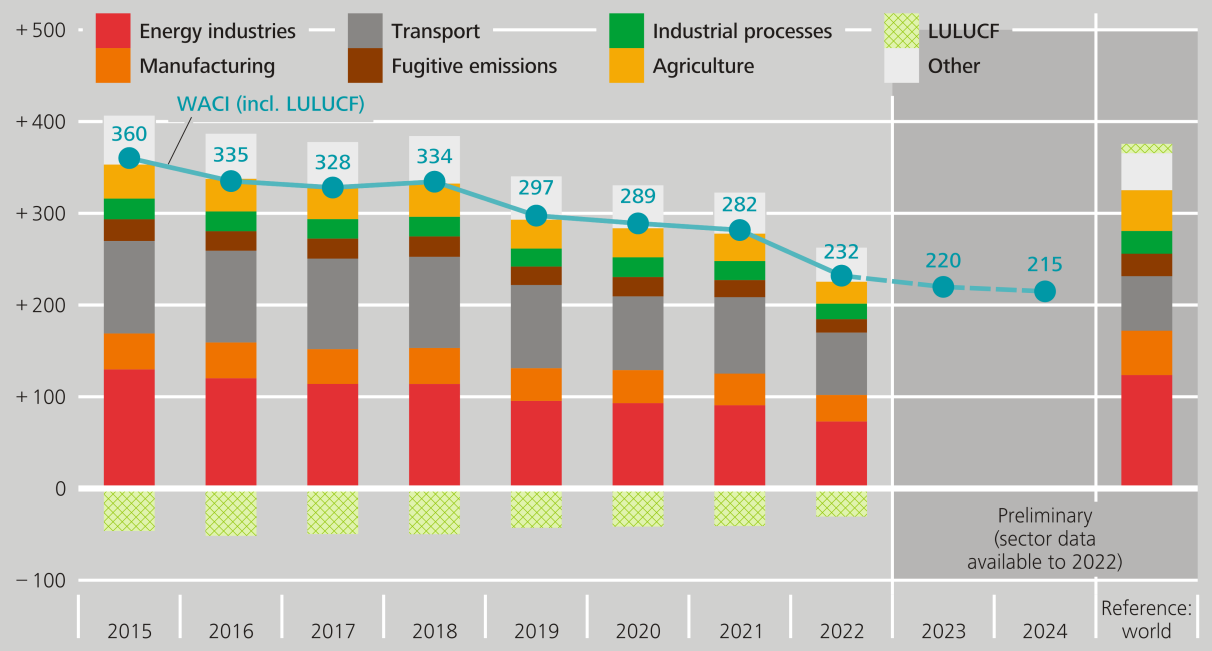
5.2.2.1 GHG metrics

Sovereign GHG data have particularly long lead times. When this report was prepared, these data were mostly available up until 2022 and, in some cases, for 2023. For 2023 and 2024, the preliminary GHG metrics are therefore largely based on data from previous years. GHG metrics are calculated both with and without the LULUCF sector. As at 31 December 2024, the **WACI** of investments in sovereigns amounted to 215 tonnes of CO_2e/€mn of PPP-adjusted GDP (see Figure 13).

Sovereigns (reserve assets): WACI breakdown by sector

Figure 13

tCO_2e / € mn PPP-adjusted GDP



Sources: UNFCCC, WRI, World Bank, EDGAR, Australian Government, Australian Bureau of Statistics, Government of Canada, Department for Energy Security and Net Zero (UK), Bundesbank data and calculations.

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The calculations are based on the net sovereign emissions, taking into account LULUCF. In the sovereigns whose bonds are held as reserve assets, LULUCF usually capture or prevent larger volumes of GHG than they emit, while the opposite is the case globally.

Other reasons for the lower WACI compared with the global GHG intensity (based on data for 2022) are emissions from the energy industries sector (which mainly arise from the generation of electricity and heat) and agriculture. Relative to the size of the sovereigns' economies, these are smaller than the global average. By contrast, relative emissions from the transport sector are higher than the global average.

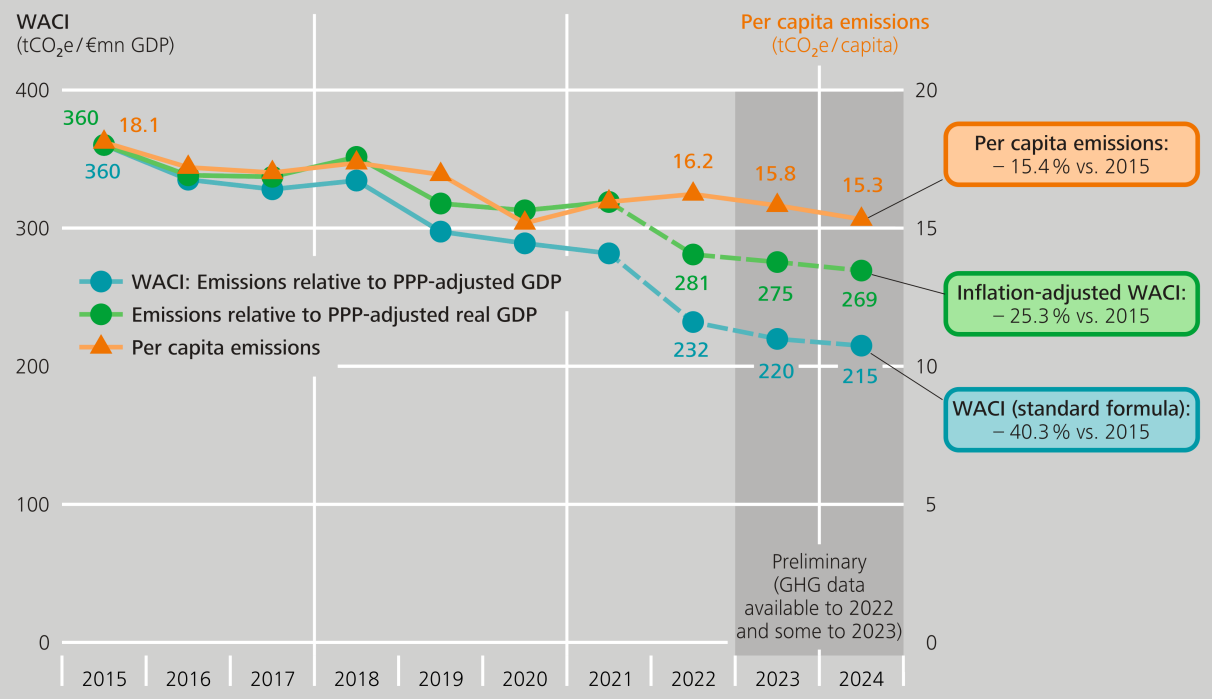
Since 2015 – the year of the Paris Climate Summit – the WACI of the sovereign bond holdings has declined steadily over time. The reductions are particularly evident in the energy industries and transport sectors, although they continue to produce the highest emissions of all sectors. As signatories to the Paris Climate Agreement, Canada, Japan, Australia, China and the United Kingdom have pledged to achieve carbon neutrality in the long term. On 20 January 2025, the United States announced its withdrawal from the Paris Climate Agreement.

When interpreting the reduction in the WACI so far, it should be borne in mind that the WACI – like other GHG metrics – may be biased downward by inflation. As a case in point, an inflation-driven increase in GDP would bring about a reduction in the WACI even though the GHG emissions themselves remain unchanged. The distortionary effects examined below also affect other asset classes. With regard to sovereigns, however, they can be identified relatively clearly based on macroeconomic data.

The method used hitherto to calculate the sovereign WACI uses GDP adjusted by PPP as a financial reference variable. PPP only reflects relative changes in purchasing power between sovereigns, however. Calculating the WACI using real GDP adjusted by PPP as well allows inflation in all the sovereigns under observation to be taken into consideration, too. 2015 is used as the base year for this purpose. If GDP is adjusted for inflation for all subsequent years using this approach, the WACI reduction up to 2024 comes to just 25.3 % in real terms rather than 40.3 % in nominal terms (see Figure 14). Much of the reduction could therefore be explained by inflation. From 2022 onwards, in particular, the sharp rise in inflation rates has led to a stronger divergence in the data.

Figure 14

Sovereigns (reserve assets): WACI reduction since 2015 only partly due to lower emissions



Sources: UNFCCC, WRI, World Bank, EDGAR, Australian Government, Australian Bureau of Statistics, Government of Canada, Department for Energy Security and Net Zero (UK), Bundesbank data and calculations.

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Per capita emissions allow GHG emissions to be viewed from another angle. If the size of the population, rather than GDP, is used as the reference variable, the WACI reduction, at 15.4 % between 2015 and 2024, is significantly smaller still. Meanwhile, divergence has increased – particularly since 2021. Per capita emissions are broadly stable compared with the WACI, which indicates that the reduction in the WACI in recent years is primarily attributable to nominal economic growth, but also to real economic growth. Looking at individual sovereigns, their GHG emissions have indeed been stagnating for the most part since 2021.

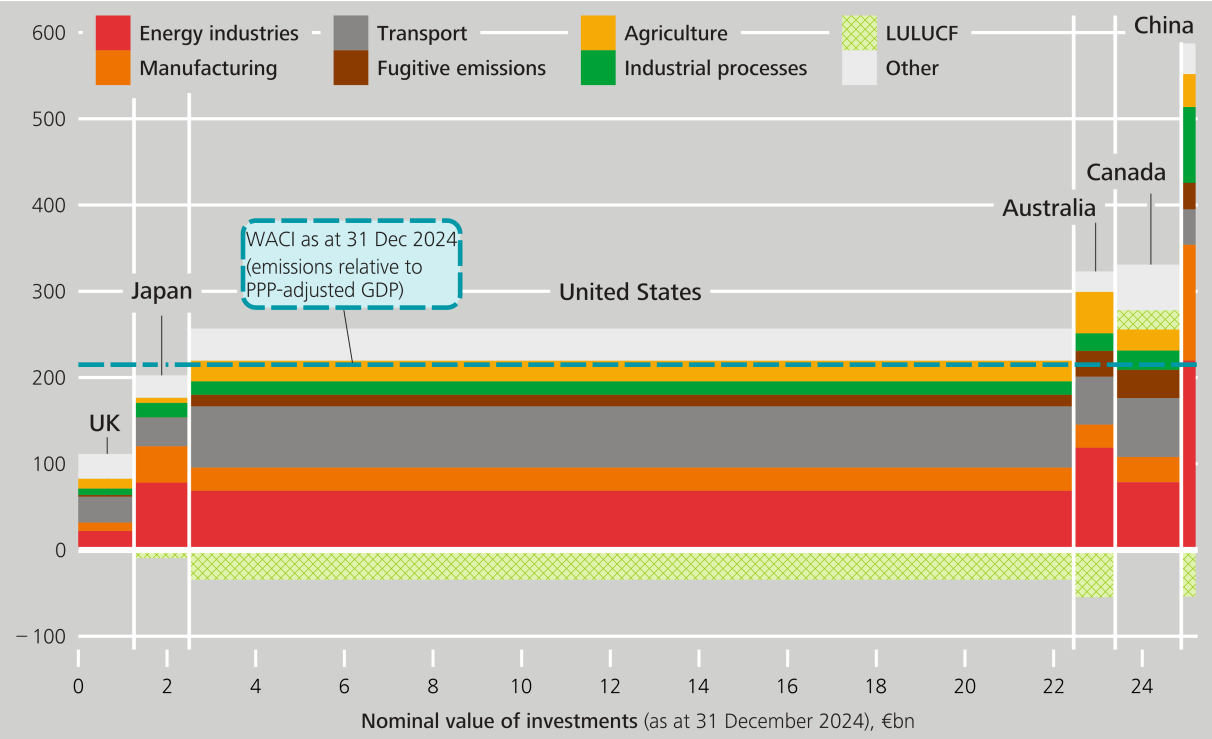
By contrast, the declines in the WACI and per capita emissions between 2023 and 2024 are clearly attributable to portfolio changes. With the exception of portfolio holdings, the metrics are still provisionally based on identical data. The small but visible declines in the metrics are mainly due to the inclusion of UK government bonds in the reserve assets and the reallocation of US government bonds for this purpose.

The breakdown of the WACI by country in Figure 15 shows that the UK's GHG intensity is well below the weighted average GHG intensity (or, in other words, the WACI) of total investment in sovereigns. However, the WACI is still dominated primarily by US government bonds, which, with a nominal converted value of just under €20 billion, account for the vast majority of sovereign investments.

Sovereigns (reserve assets): WACI breakdown by country and sector

Figure 15

GHG intensity (tCO_2e/€mn PPP-adjusted GDP) as at end-2024



Sources: UNFCCC, WRI, World Bank, EDGAR, Australian Government, Australian Bureau of Statistics, Government of Canada, Department for Energy Security and Net Zero (UK), Bundesbank data and calculations.

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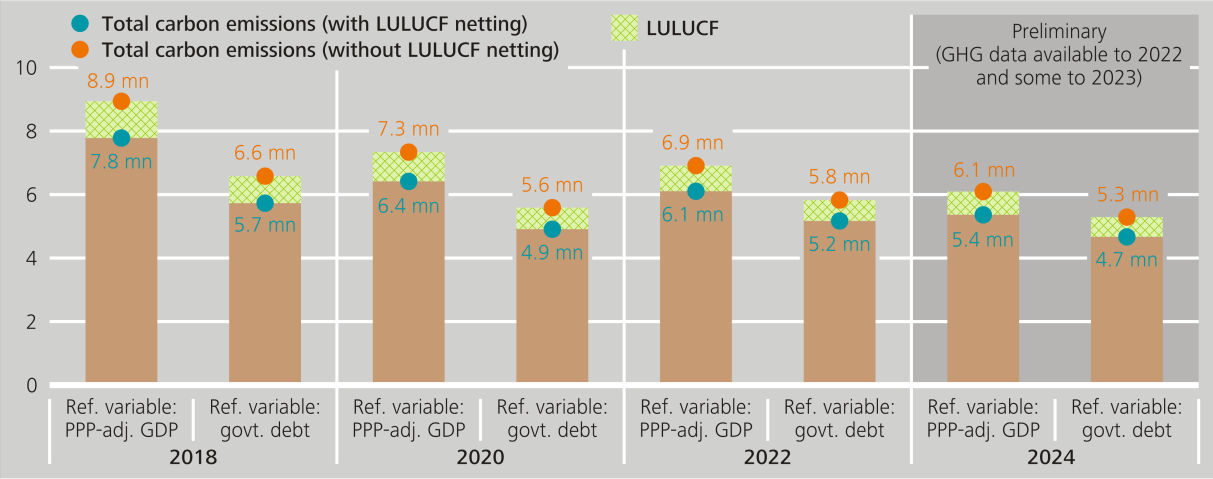
Total carbon emissions declined between 2018 and 2024 according to both calculation methods, i.e. with both GDP adjusted by PPP and government debt being used as the reference variable (see Figure 16). The **carbon footprint**, which sets total carbon emissions in relation to the portfolio volume, looks very similar, given that the portfolio volume remained broadly stable in the 2018-24 period (see Figure 17). Over the long term, PPP-adjusted GDP and government debt can be seen to converge (relatively speaking), meaning that the deviation between the calculation methods is shrinking in size.

Sovereigns (reserve assets): total carbon emissions based on different calculation methods

Figure 16

Millions tCO_2e



Sources: UNFCCC, WRI, World Bank, IMF, EDGAR, Australian Government, Australian Bureau of Statistics, Government of Canada, Department for Energy Security and Net Zero (UK), Bundesbank data and calculations.

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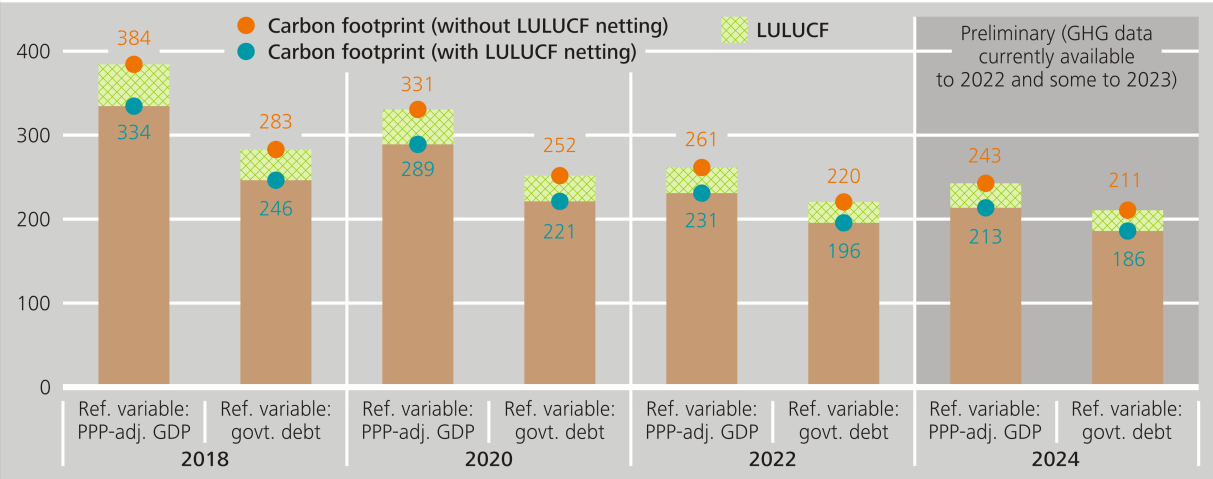
Sovereigns (reserve assets): carbon footprint based on different calculation methods

Figure 17

tCO_2e / €mn of investment



Sources: UNFCCC, WRI, World Bank, IMF, EDGAR, Australian Government, Australian Bureau of Statistics, Government of Canada, Department for Energy Security and Net Zero (UK), Bundesbank data and Bundesbank calculations.

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5.2.2.2 Production volumes of fossil fuels

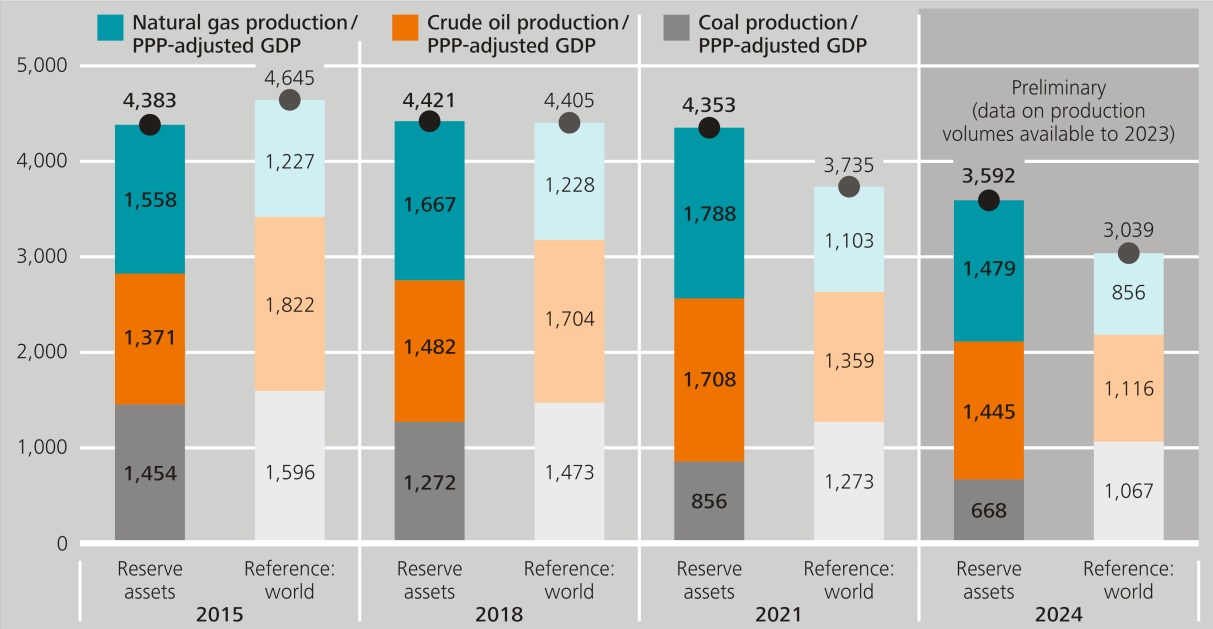
By analysing production volumes of fossil fuels, it is possible to obtain additional insights into the climate performance of sovereign investments. For one thing, exports of fossil fuels by these sovereigns involve indirect emissions that are not included in the available GHG data. For another, economic dependencies that coal, crude oil and natural gas-producing countries and regions might have on these economic sectors may give rise to financial risks.

In terms of sovereign bond holdings as at 31 December 2024, the **production volume of coal relative to the size of the economy** is significantly lower than the global average (see Figure 18). By contrast, both the **production volume of crude oil** and the **production volume of natural gas** relative to the size of the economy are higher than the global level. Looking at developments since 2015, the coal production volume has more than halved relative to the size of the economy. Compared with 2021, crude oil and natural gas production relative to the size of the economy has declined slightly, partly owing to the inclusion of UK government bonds in the reserve assets.

Sovereigns (reserve assets): production volumes of fossil fuels (relative to size of the economy)

Figure 18

Terajoule / €bn PPP-adjusted GDP



Sources: IEA, World Bank, Australian Government, Australian Bureau of Statistics, Bundesbank data and calculations.
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5.2.2.3 Further sustainability factors

The sustainable investment strategy for (sub-)sovereign investments as part of the reserve assets does not include targeted purchases of green bonds (or comparable forms of bonds). Accordingly, green bonds account for only a very small share of the investment volume as at 31 December 2024: Depending on the definition, they amount to between 0.09 % (compliance with ICMA principles verified by second-party opinion) and 0.57 % (bonds declared as green bonds by their issuers). Comparable forms of bonds such as social bonds are not among the (sub-)sovereign bonds held as part of the reserve assets.

With regard to physical climate risks, the Bundesbank was in the process of renewing and expanding its data base at the time the report was drawn up. For the results available to date, please see Section 5.2.2.3 of last year's climate-related disclosures for the time being, which contains the relevant metrics regarding sovereigns. The Bundesbank is planning to expand its analyses for future reports.

5.2.3 The Bundesbank's gold holdings

A hypothetical approach is applied to the GHG metrics shown below.[7)] This assumes an amount of gold that is equal to the Bundesbank's gold holdings and was obtained according to the global mix of today's gold production. This exercise was based on study findings and financial market reports on the GHG performance of gold production from the present day or recent past. In order to reflect the range of findings made in the literature on the GHG profile of gold production, the following metrics are shown in intervals.

7 See Deutsche Bundesbank (2024a), section 5.2.3, the calculation factors and sources were described in greater detail and a general sustainability assessment of gold as an asset class was carried out.

As at the reporting date of 31 December 2024, the Bundesbank's gold holdings amounted to 3,352 tonnes. For this amount of gold, the **absolute GHG footprint** computed according to the hypothetical approach would amount to between 52.7 and 90.7mn tCO_2e. Expressed relative to the market value of the gold holdings as at 31 December 2024 (€270.6bn), this would equate to a **carbon footprint** of between 195 and 335 tCO_2e/€mn of investment. Distributed across the average holding period of the Bundesbank's gold (currently around 62 years), the annual carbon footprint would amount to around 3 to 5 tCO_2e/€mn of investment.

Compared with the previous year, this "annualised" carbon footprint of gold holdings has declined significantly. This is, in small part, due to the lengthening holding period, but is mainly attributable to the considerable increase in the price of gold: the carbon footprint thus ascribes a higher degree of GHG efficiency to the gold holdings in terms of their value as an asset. By contrast, the (hypothetical) amount of emissions, represented by the absolute GHG footprint, is not influenced by movements in the price of gold.

5.3 The Eurosystem's monetary policy holdings of corporate bonds and covered bonds

The Bundesbank is reporting for the first time on the GHG metrics of the Eurosystem's monetary policy holdings of covered bonds and corporate bonds. The income and risks arising from these holdings are shared among Eurosystem national central banks according to their weighted shares [8)] in the ECB's capital (based on underlying capital keys). With regard to these holdings, the Eurosystem has therefore agreed that the breakdown of total carbon emissions by national central bank is also based on their capital keys.Relative GHG metrics such as the WACI and carbon footprint are reported independently of portfolio size, and are therefore identical for all Eurosystem central banks. They are calculated centrally by the ECB for the Eurosystem.

The following GHG metrics were provided to the Bundesbank by the ECB. They are also published in the ECB's climate-related financial disclosures of Eurosystem assets held for monetary policy purposes and of the ECB's foreign reserves, along with other metrics on the Eurosystem's monetary policy holdings. The underlying data on scope 1, 2 and 3 emissions are either self-reported by issuers or modelled by the data providers, with self-reported emissions preferred whenever available. With regard to scope 3, the total carbon emissions based on the most recent data are reported in the main text of this report. Scope 3 metrics for previous years are reported in Annex IV as their reliability and comparability over time are affected by data quality issues. These issues include considerable estimation uncertainty, diverging estimates across different data providers and methodological refinements over time. Despite these shortcomings, the Eurosystem decided to start reporting scope 3 total carbon emissions in the main text of the report as of 2025 and notes a steady expansion of issuers' reporting of types of activities, which will enhance comparability over time.

8 Shares in the ECB's capital are distributed among the ESCB central banks. Of this, only the Eurosystem central banks are involved in the income and risks from the monetary policy holdings considered in this section whose capital shares are "adjusted" for this purpose.

5.3.1 The Eurosystem's monetary policy holdings of covered bonds

The Eurosystem holds covered bonds under the CBPP3 (third covered bond purchase programme) and PEPP (pandemic Emergency Purchase Programme) for monetary policy purposes. Measured in terms of nominal value, the Eurosystem's holdings of such bonds peaked in 2022 and have been declining ever since (see Table 5), standing at €258.6 billion at the end of 2024. According to the Bundesbank's capital key, 26.63 % of the GHG emissions associated with these holdings can be attributed to the Bundesbank.

Table 5: Covered bonds in monetary policy CBPP3 and PEPP portfolios

		Portfolio as at:				
		31.12.2020	**31.12.2021**	**31.12.2022**	**31.12.2023**	**31.12.2024**
Eurosystem holdings (by nominal value, €bn)		**285.1**	**299.3**	**305.6**	**290.8**	**258.6**
Bundesbank's capital key		**26.36 %**	**26.36 %**	**26.36 %**	**26.15 %**	**26.63 %**
WACI of Bundesbank share (in tCO_2e/€mn of gross income)	**Scope 1 & 2**	**2.6** *(86 %)*	**2.0** *(92 %)*	**1.4** *(94 %)*	**0.9** *(93 %)*	**0.9** *(96 %)*
	Scope 3	See Annex IV – Table 7				
Total carbon emissions of Bundesbank share (in tCO_2e)	**Scope 1 & 2**	**26,611** (83 %)	**22,129** (88 %)	**17,753** (89 %)	**14,533** (90 %)	**12,324** (93 %)
	Scope 3	See Annex IV – Table 7				**23.7 million** *(93 %)*
Carbon footprint of Bundesbank share (in tCO_2e/€mn of investment)	**Scope 1 & 2**	**0.4** *(83 %)*	**0.3** *(88 %)*	**0.2** *(89 %)*	**0.2** *(90 %)*	**0.2** *(93 %)*
	Scope 3	See Annex IV – Table 7				

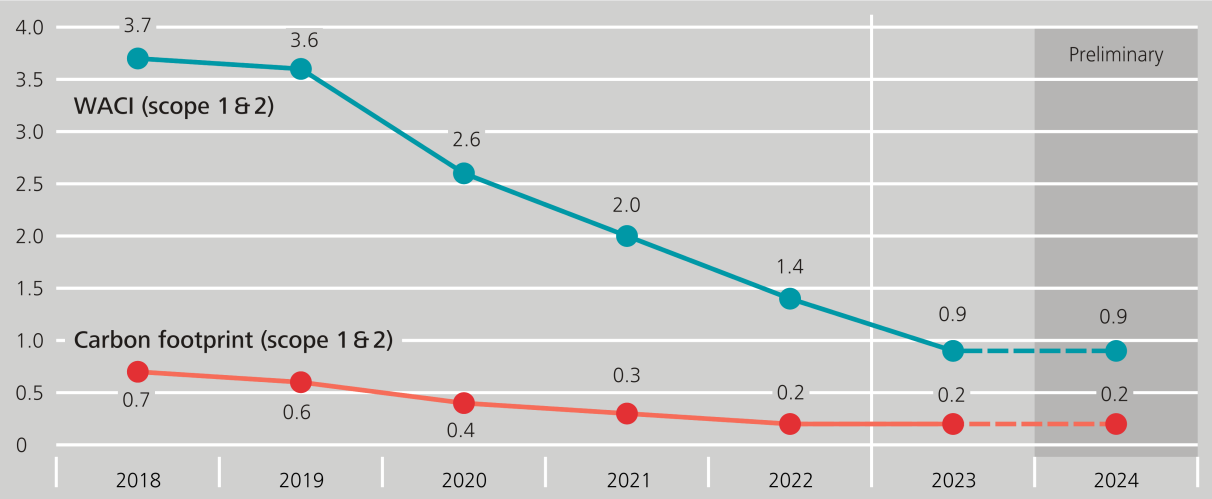
Coverage (by portfolio volume) in italics and parentheses.
Sources: ISS ESG, *ECB*and Bundesbank calculations.

Figure 19 illustrates that the WACI and the carbon footprint for scopes 1 and 2 trend significantly downwards over the long term. At the same time, the total carbon emissions show that scope 3 represents almost the entirety of emissions of the covered bond holdings in 2024 (see Table 5).

Eurosystem monetary policy holdings of covered bonds: WACI and carbon footprint of the Bundesbank's share

Figure 19

tCO_2e/€mn revenue (WACI) or tCO_2e/€mn investment (carbon footprint)



Sources: ISS ESG and ECB calculations.
Deutsche Bundesbank

5.3.2 The Eurosystem's monetary policy holdings of corporate bonds

Corporate bonds held by the Eurosystem for monetary policy purposes were purchased under the corporate sector purchase programme (CSPP) and the pandemic emergency purchase programme (PEPP). They were generally issued by firms in real economic sectors.

As with covered bonds, the Eurosystem's monetary policy holdings of corporate bonds have also declined since 2022 (see Table 6), amounting to €331.4 billion at end-2024. According to the capital key, 26.63 % of this figure is considered to be the Bundesbank's share below. Applied to the total carbon emissions (GHG) volume, this means that 8.7 million tCO_2e of scope 1 and 2 emissions and 65.3 million tCO_2e of scope 3 emissions can be attributed to the Bundesbank. Therefore, the GHG profile of the corporate bond holdings (and that of the issuing corporations) is largely shaped by scope 3 emissions, albeit to a lesser degree than that of the covered bond holdings.

Table 6: Corporate bonds in monetary policy CBPP3 and PEPP portfolios

		Portfolio as at:				
		31.12.2020	**31.12.2021**	**31.12.2022**	**31.12.2023**	**31.12.2024**
Eurosystem holdings (by nominal value, €bn)		**287.5**	**345.5**	**385.2**	**367.2**	**331.4**
Bundesbank's capital key		**26.36 %**	**26.36 %**	**26.36 %**	**26.15 %**	**26.63 %**
WACI of Bundesbank share (in tCO_2e/€mn of gross income)	**Scope 1 & 2**	**289** *(96 %)*	**266** *(96 %)*	**184** *(96 %)*	**167** *(96 %)*	**165** *(93 %)*
	Scope 3	See Annex IV – Table 8				
Total carbon emissions of Bundesbank share (in tCO_2e)	**Scope 1 & 2**	**12.5 million** *(96 %)*	**14.6 million** *(95 %)*	**14.8 million** *(96 %)*	**10.6 million** *(96 %)*	**8.7 million** *(92 %)*
	Scope 3	See Annex IV – Table 8				**65.3 million** *(92 %)*
Carbon footprint of Bundesbank share (in tCO_2e/€mn of investment)	**Scope 1 & 2**	**172** *(96 %)*	**168** *(95 %)*	**152** *(96 %)*	**116** *(96 %)*	**108** *(92 %)*
	Scope 3	See Annex IV – Table 8				

Coverage (by portfolio volume) in italics and parentheses.
Sources: ISS ESG, *and Bundesbank calculations.*

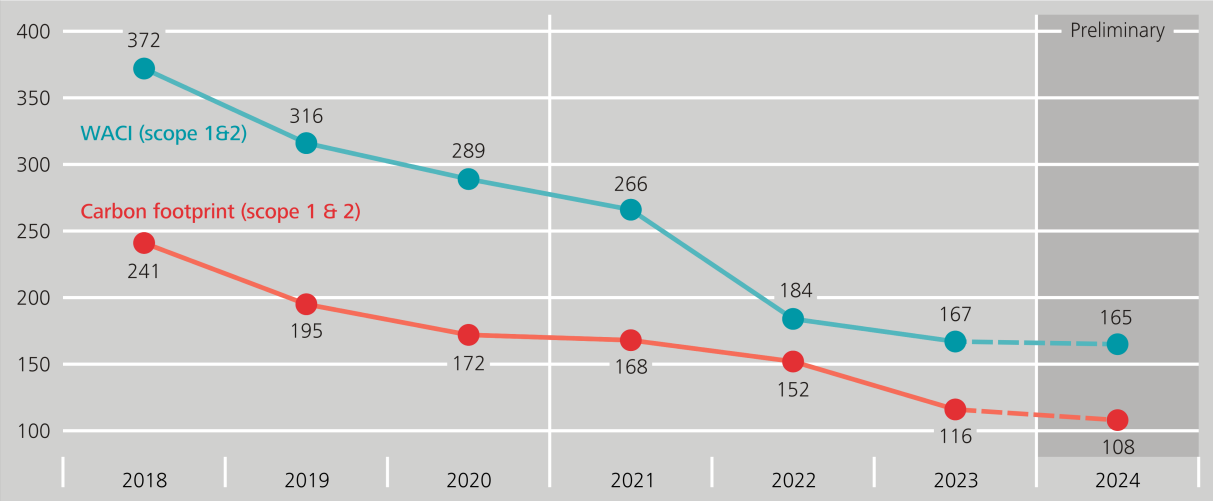
The most recent available GHG data pertain to 2023. In this year, the relative GHG metrics WACI and carbon footprint, which are identical for all Eurosystem central banks, show a downward trend in terms of scope 1 and 2 emissions (see Figure 20). With regard to WACI, the declines are largely due to reduced GHG intensities at the corporation level, and partly due to portfolio shifts between 2021 and 2024. However, nominal revenue increases caused by inflation could also contribute to the former. [9)]

9 See Section 5.2.2.1, which examines inflation-related effects on sovereigns' GHG intensities.

Eurosystem monetary policy holdings of corporate bonds: WACI and carbon footprint of the Bundesbank's share

Figure 20

tCO_2e/€mn revenue (WACI) or tCO_2e/€mn investment (carbon footprint)



Sources: ISS ESG and ECB calculations.
Deutsche Bundesbank

Figure 20

These and other findings and metrics on Eurosystem monetary policy holdings are presented in the ECB's climate-related financial disclosures of Eurosystem assets held for monetary policy purposes and of the ECB's foreign reserves, which provide the source of the GHG metrics listed above.

6 Targets and outlook

Climate change and its implications are impacting increasingly on macroeconomic variables such as the growth outlook and price stability, and may jeopardise the stability of the financial system. In view of this, the Bundesbank will continue to incorporate climate-related factors into its analyses going forward and devote more of its resources to analysing nature-related risks. Moreover, it will further refine its own sustainability strategy and derive objectives from this for the individual business units. In addition, it will build out its range of training and outreach activities, both internally and externally. On national and international committees such as the NGFS, the Bundesbank continues to advocate for a sustainable economic and financial system. With First Deputy Governor Dr Sabine Mauderer still chairing the NGFS in 2025, the Bundesbank can press ahead with setting the agenda and shaping the climate-related discourse among participating central banks and supervisors.

With the scope of its statutory mandate, the Bundesbank strives to incorporate climate and sustainability-related aspects into its own investment decisions as part of the efforts towards achieving the goals of the Paris Climate Agreement as well as the climate neutrality goals of the Federal Republic of Germany and the EU. Such aims must consistently align with the essential objectives of the Bundesbank's financial investments. It lies in the nature of foreign currency portfolios, as part of the reserve assets, that they are concentrated on specific currencies as well as secure and liquid forms of investment.

Furthermore, the potential implementation of quantitative climate-related targets requires suitable data to be available that enable target achievement to be both measured and managed. As explained in this report, the GHG metrics that are currently available, for the most part, are of limited use here in as far as they relate only to scope 1 and 2 emissions – emissions that are of secondary importance relative to scope 3 emissions. This is currently the case for the Bundesbank's euro portfolio.

Extended, mandatory sustainability reporting due to the entry into force of European directives could improve the data situation over the coming years. The Bundesbank considers market transparency through climate-related and nature-related disclosures to be essential for analysing and managing the relevant risks in terms of both the financial system as a whole and its own balance sheet. Over the short to medium term, the Bundesbank is committed to improving the availability and quality of sustainability data, particularly data on the scope 3 emissions of financial institutions and nature-related data. As part of its committee work, the Bank is pushing to ensure the consistency of disclosure requirements and to focus on relevant data. In addition, by taking the lead in various procurement processes on behalf of the ESCB, it makes a vital contribution towards ensuring that the sustainability data available to ESCB members meet the highest standards in terms of quality and are as comprehensive and granular as possible. To this end, the Bundesbank also takes note of developments in the data situation.

The Bank is striving to refine its analytical activities as well as the sustainable investment strategies for the euro portfolio and the foreign currency portion of the reserve assets so as to keep pace with advances in these areas. In this context, the Bundesbank's annual climate-related disclosures play an important role in monitoring and disclosing progress.

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Annex

I. GHG and climate metrics: background information and methods

“Carbon” as a synonym for GHG

In this report, “carbon” is used as a synonym for GHG emissions, in line with widespread use in the area of GHG metrics. However, the term “carbon” is misleading, as the GHG metrics do not cover carbon dioxide (CO_2) alone but also other GHG within the meaning of the Kyoto Protocol, such as methane (CH_4) and nitrous oxide (N_2O).

GHG	Share of global emissions (expressed as CO_2e) [1)]	Examples of key sources
Carbon dioxide (CO_2)	73.6 %	• Burning of fossil fuels • Manufacture of cement
Methane (CH_4)	17.7 %	• Agriculture: cattle farming • Natural gas: leaks during extraction, transport
Nitrous oxide (N_2O)	6.2 %	• Agriculture: use of fertilisers
Other	2.6 %	

CO_2e as a unit for GHG

The various GHGs are measured by their GHG or warming effects in CO_2e or tCO_2e.

1 **World Resources Institute (WRI) data on global GHG emissions in 2021.**

Quantities of GHG emissions worldwide and in Germany

Annual global GHG emissions are around 50 billion tCO_2e.[2)] In Germany, they amount to around 760 million tCO_2e. This means that average per capita emissions in Germany are just under 9 tCO_2e.

2 World Resources Institute (WRI) data on global GHG emissions in 2021.

II. GHG and climate metrics on the euro portfolio and bonds issued by promotional and development banks

Source of GHG data

To calculate GHG metrics for Bundesbank investments in banks, GHG data derived from the banks' disclosures (e.g. sustainability reports) are used. The Bundesbank obtains relevant data from the ESG data provider ISS ESG. When calculating GHG metrics, the Bundesbank does not use data on GHG emissions modelled or estimated by data providers. [3)]

Lead times for GHG data and retroactive updates of GHG metrics from previous portfolio reference dates

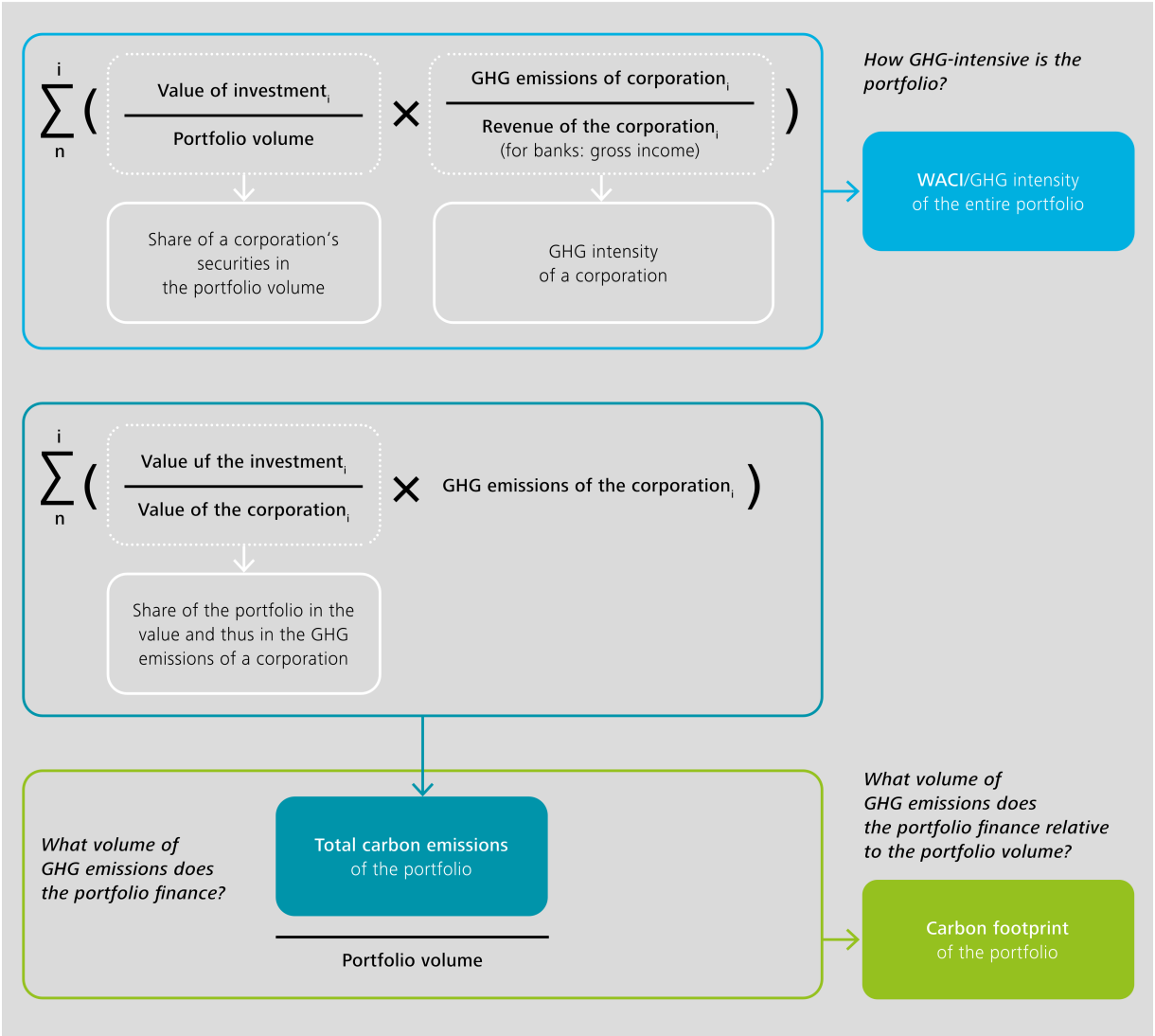
In principle, the aim is to ensure that portfolio holdings and GHG data relate to the same year, data availability permitting. However, for the reporting dates of both 31 December 2023 and 31 December 2024, the GHG metrics are based on data on banks' GHG emissions in 2023. These were the latest available GHG data when this report was prepared, which is why they were also used for the portfolio reference date of 31 December 2024. For next year's climate-related disclosures, the plan is to retroactively adjust these calculations using GHG data for 2024. Following the same principle, the calculations as at 31 December 2023 reported in this document have been adjusted to reflect the GHG data for 2023 (having been based on the 2022 data in last year's disclosures).

3 This results in lower data coverage than would be the case if data providers' modelled GHG data were included. However, depending on the methodology used by the data providers, such data may exhibit larger deviations from each other and from actual GHG emissions, especially for banks. Data uncertainty is significantly greater here than, say, in the case of modelled GHG data on sovereigns for which macroeconomic data can be used as a modelling basis.

Scope 1, 2 and 3 GHG emissions

Category	Comprises	Examples of sectors with comparatively high emissions
Scope 1	Direct GHG emissions	• Electricity producers • Producers of cement, steel • Airlines
Scope 2	Indirect GHG emissions from the production of purchased energy (primarily electricity)	• Heavy industry • Chemical companies
Scope 3		
Upstream	Indirect GHG emissions along the value chain (except scope 2)	• Retail • Food companies
Downstream		• Oil and gas producers • Manufacturers of cars, aircraft • Banks

Formulas for GHG metrics



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III. GHG and climate metrics for sovereign investments

Sources and measurement approaches for GHG data

The GHG data on sovereigns used in this report are mostly obtained from the United Nations Framework Convention on Climate Change (UNFCCC) data interface, where the UNFCCC lists GHG data recorded by sovereigns and reported to the UNFCCC. In cases where no recent GHG data are available for a given sovereign in the UNFCCC data interface, GHG data from the World Resources Institute (WRI) modelled for this report are used. The data are obtained using the production-based, or territorial, measurement approach: sovereigns are assigned those GHG emissions that occur within their borders or in their jurisdiction.

Production-based/territorial GHG emissions are also used for sub-sovereigns or federation members/regions. The respective national authorities (e.g. statistical offices) serve as data sources.

GHG data based on the consumption-based measurement approach are not yet included in this report. This approach draws on foreign trade data. Unlike in the production-based approach, sovereigns are not allocated GHG emissions from exported goods but are additionally allocated GHG emissions from imported goods. However, a number of consumption-based methods have so far led to – in some cases – large discrepancies in GHG levels. This report therefore focuses on the well-established production-based approach.

Lead times for GHG data and retroactive updates of GHG metrics from previous portfolio reference dates

In principle, the aim is to ensure that portfolio holdings and GHG data relate to the same year, data availability permitting. However, GHG data on sovereigns have longer lead times than GHG data on companies. At the time of reporting, the majority of the latest available GHG data refer to 2022 or 2023. In most cases, then, the GHG data

merely serve as a provisional basis for the GHG metrics as at the portfolio reference dates of 31 December 2023 and 31 December 2024. To nonetheless provide a meaningful picture of developments in sovereigns' GHG profiles over time, longer periods are considered for the GHG metrics (WACI, total carbon emissions and carbon footprint) than for amounts that are not invested in sovereigns.

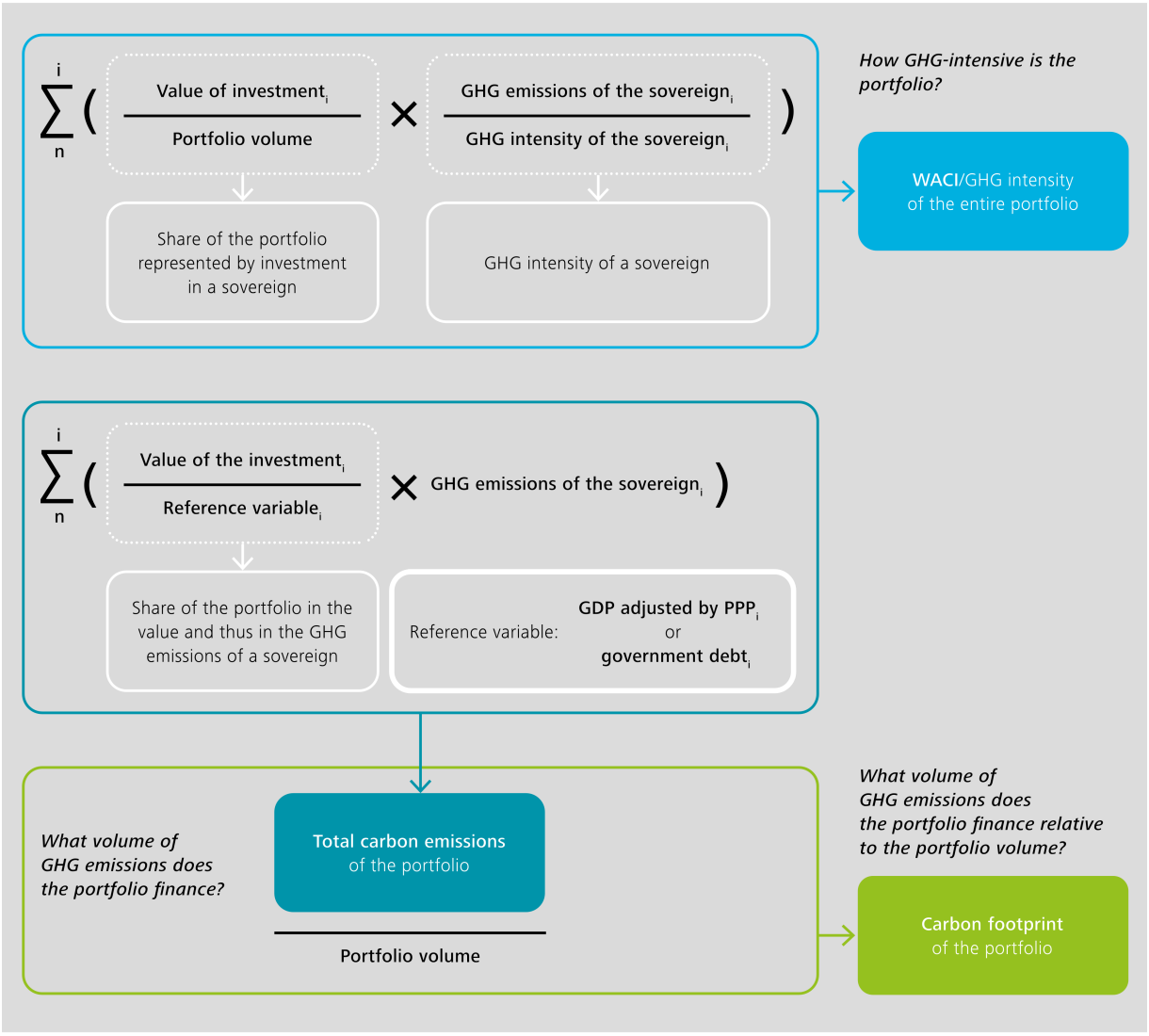
LULUCF as a GHG sector

Measurements of sovereign GHG emissions often differ in whether they include the land use, land use change, and forestry (LULUCF) sector. For example, LULUCF can be a major – and sometimes the largest – source of GHG in densely wooded regions given deforestation. By contrast, reforestation may lead to negative emissions, resulting in an improved GHG profile. LULUCF then constitute GHG sinks.

LULUCF thus play an important role in many national and international climate objectives. However, in view of the complicated accounting of LULUCF, climate researchers still have reservations concerning the quality and comparability of such data.

The GHG metrics in this report are shown both with and without LULUCF.

Formulas for GHG metrics



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Methodological caveats concerning the total carbon emissions and carbon footprint of sovereign investments

The methods for calculating the total carbon emissions and carbon footprint are not as well established for investments in sovereigns as they are for investments in companies. Methodological challenges notably include adequately capturing which

sovereign shares and thus which GHG emissions are financed by investments in the portfolio.

Early climate-related disclosures often took **sovereign debt** as the reference variable. Government bonds (held in a portfolio) do indeed account for a part of sovereign debt. However, sovereigns and their GHG emissions are not financed through sovereign debt alone. Under this approach, the financed emissions would therefore be overstated.

The PCAF recommends using GDP adjusted by PPP as the reference variable instead. Unlike sovereign debt, GDP adjusted by PPP is clearly related to a sovereign's GHG emissions. However, the relationship between government bonds (held in a portfolio) and GDP adjusted by PPP is unclear.

Both approaches therefore have substantial downsides. Despite these reservations, this report includes the total carbon emissions and carbon footprint based on both approaches in order to contribute to the discussion of methodological developments and to identify differences in results.

Production volumes of fossil fuels: methodology for the indicators

Production volumes of coal, crude oil and natural gas are measured by energy content in terajoules (TJ),[4)] and are set in relation to the size of the economy (GDP adjusted by PPP), analogously to the WACI methodology. Weighted averages of the intensity of coal, crude oil and natural gas production volumes are calculated for sovereign investments on this basis.

4 In accordance with the International Energy Agency (IEA)'s standard for countries' energy balances.

IV. The Eurosystem's monetary policy holdings – additional metrics

Table 7: Covered bonds in monetary policy CBPP3 and PEPP portfolios: scope 3 GHG metrics

		Portfolio as at:				
		31.12.2020	31.12.2021	31.12.2022	31.12.2023	31.12.2024
WACI of Bundesbank share (in tCO_2e/€mn of gross income)	**Scope 3**	**454** *(86 %)*	**797** *(92 %)*	**1,587** *(94 %)*	**1,78** *(93 %)*	**1,725** *(96 %)*
Total carbon emissions of Bundesbank share (in tCO_2e)	**Scope 3**	**3.7 million** *(83 %)*	**8.6 million** *(88 %)*	**18.1 million** *(89 %)*	**28.1 million** *(90 %)*	**23.7 million** *(93 %)*
Carbon footprint of Bundesbank share (in tCO_2e/€mn of investment)	**Scope 3**	**59** *(83 %)*	**124** *(88 %)*	**254** *(89 %)*	**409** *(90 %)*	**370** *(93 %)*

Coverage (by portfolio volume) in italics and parentheses.
Sources: ISS ESG, ECB and Bundesbank calculations.

Table 8: Corporate bonds in monetary policy CBPP3 and PEPP portfolios: scope 3 GHG metrics

		Portfolio as at:				
		31.12.2020	**31.12.2021**	**31.12.2022**	**31.12.2023**	**31.12.2024**
WACI of Bundesbank share (in tCO_2e/ €mn of gross income)	**Scope 3**	**1,414** *(98 %)*	**1,344** *(99 %)*	**1,077** *(97 %)*	**1,201** *(97 %)*	**1,237** *(94 %)*
Total carbon emissions of Bundesbank share (in tCO_2e)	**Scope 3**	**71.2 million** *(96 %)*	**77.6 million** *(95 %)*	**88.6 million** *(96 %)*	**78.3 million** *(96 %)*	**65.3 million** *(92 %)*
Carbon footprint of Bundesbank share (in tCO_2e/ €mn of investment)	**Scope 3**	**980** *(96 %)*	**894** *(95 %)*	**912** *(96 %)*	**853** *(96 %)*	**803** *(92 %)*

Coverage (by portfolio volume) in italics and parentheses.
Sources: ISS ESG, ECB and Bundesbank calculations.