

Climate footprint of the euro-denominated non-monetary policy portfolios of the Bank of Greece

As a member of the Eurosystem, the Bank of Greece has adopted the Common Stance decided by the Eurosystem regarding the application of sustainable and responsible investment principles in the euro-denominated non-monetary policy portfolio management by central banks.¹ In this context, the Bank of Greece, along with the other Eurosystem central banks, discloses on its website, for the first time, data related to the climate footprint of its non-monetary policy portfolios. These disclosures are based on the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) of the Financial Stability Board (FSB),² regarding the Metrics and Targets. In developing this reporting framework, the Eurosystem took into account the recommendations of the Partnership for Carbon Accounting Financials (PCAF)³ and of the Network of Central Banks and Supervisors for Greening the Financial System (NGFS).⁴

Based on quantitative data from independent climate data providers selected by the Eurosystem and used jointly by Eurosystem members⁵ and macroeconomic data from the World Bank,⁶ climate footprint metrics were calculated for the non-monetary policy portfolios of the Bank of Greece (for a detailed description of the metrics, see also Annex 2).

This publication presents carbon emission metrics for the euro-denominated bond portfolios that are not related to monetary policy for 2022, as well as their evolution over the period 2020-2022. Given that climate data are only available with a lag, the relevant end-2020 data have been used for the metrics of all years. Moreover, macroeconomic data for 2020 have been used in the analysis for that year, and data for 2021 in the analyses for the years 2021 and 2022. It is pointed out that the metrics for

¹“Eurosystem agrees on common stance for climate change-related sustainable investments in non-monetary policy portfolios”, press release, ECB, 4 February 2021.

² <https://www.fsb-tcfid.org/>

³ <https://carbonaccountingfinancials.com/>

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

⁵ Institutional Shareholder Services AG, Germany (ISS), and Carbon4 Finance Group Ltd, France (C4F).

⁶ <https://data.worldbank.org/>, World Bank (gross domestic product adjusted for purchasing power parity, population, and general government expenditure).

the climate footprint may be revised over time, in line with the increasing availability and quality of climate-related data, the evolution of measurement methods and improved expertise in dealing with climate-related risks.

The Bank of Greece aims to reduce climate-related risks and actively supports the achievement of the Paris Agreement goal, as well as the European Union's goal of climate neutrality by 2050. To this end, the Bank of Greece may, if necessary and as appropriate, adjust its approach or revise its estimates, in accordance with its investment framework and the limitations arising from it.

1. Climate footprint metrics for the euro-denominated non-monetary policy portfolios

The four climate footprint metrics used in this report were those selected by the Eurosystem as the most appropriate for transparently and accurately reflecting the climate footprint of euro-denominated non-monetary policy portfolios, and the results are consistent with the methodology and the data available at the time of disclosure.⁷

The metrics used are the following:

(i) Weighted Average Carbon Intensity (WACI)

The WACI is the key metric of the climate footprint of portfolios under the TCFD recommendations, as it measures a portfolio's exposure to carbon-intensive issuers, and is expressed in tonnes of carbon dioxide equivalent emissions (tCO₂e)⁸ per EUR million PPP-adjusted GDP of the country issuing the government bonds. It serves as a proxy for a portfolio's exposure to climate transition risks.

(ii) Total Carbon Emissions (TCE)

The TCE metric measures the absolute emissions associated with a portfolio and is affected by portfolio size, as issuers' emissions are not normalised by portfolio size. It is expressed in tonnes of CO₂ equivalent (tCO₂e).

⁷ The formulas for calculating the metrics are provided in Annex 2.

⁸ Carbon dioxide equivalent (CO₂e) is used to compare the emissions from various greenhouse gases on the basis of their respective global warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

(iii) Carbon Footprint (CF)

The CF metric normalises the total carbon emissions (TCE) by portfolio size, thereby ensuring comparability across different portfolios or the same portfolio across different points in time. It is expressed in tonnes of CO₂ equivalent (tCO₂e) per million euro invested.

(iv) Carbon Intensity (CI)

The CI metric is used to measure the absolute emissions associated with a portfolio, normalised by the weighted GDP of the country issuing the government bonds included in the portfolio. By using weighted GDP, the emissions figure is adjusted with a view to measuring the carbon efficiency of the issuers of the portfolio assets relative to GDP. It is expressed in tonnes of CO₂ equivalent (tCO₂e) per million euro GDP.

The calculations for each of the four metrics were carried out according to three different methods for allocating emissions to sovereign issuers: (a) the production approach (“production”), whereby carbon emissions are allocated to the country in whose territory the emissions-generating production activity takes place; (b) the consumption approach (“consumption”), whereby carbon emissions are allocated to the country within which the products or services are consumed; and (c) the government approach (“government”), referring to carbon emissions from government activities.⁹

The size of the euro bond portfolio was around EUR 12 billion at the end of December 2022, consisting exclusively of eurozone government bonds. Therefore, the reduction of emissions associated with this portfolio is related to the extent of compliance by the relevant governments with their emission reduction commitments under the Paris Agreement.

Reported below are the carbon footprint metrics of the euro-denominated non-monetary policy portfolio of the Bank of Greece for the year 2022 (Table 1); the historical evolution of the WACI metric over the period 2020-2022 based on all three emission allocation methods (Chart 1); and the historical evolution of the other three metrics (TCE, CF, CI) using the production emissions allocation method (Chart 2).¹⁰

⁹ For the definitions of the three emissions allocation methods, see Annex 3.

¹⁰ The historical evolution of all four metrics over 2020-2022 is detailed in Annex 1.

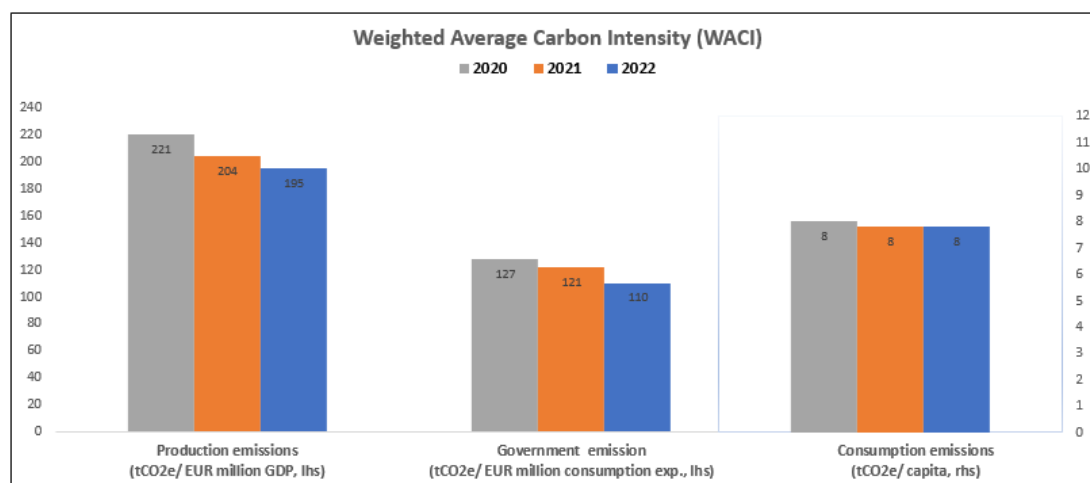
Table 1
Climate footprint metrics of the euro bond portfolio of the Bank of Greece for 2022

Portfolio size € 12,246 bn	Sovereign bonds		
	Production Method	Consumption Method	Government Method
Weighted average carbon intensity (tCO ₂ e/€M GDP/population/€M consumption exp.)	195 (100%)	8 (100%)	110 (100%)
Total carbon emissions (tCO ₂ e)	2,386,168 (100%)	2,755,478 (100%)	286,423 (100%)
Carbon footprint (tCO ₂ e per € M invested)	195 (100%)	225 (100%)	23 (100%)
Carbon intensity (tCO ₂ e/€M GDP/population/€M consumption exp.)	195 (100%)	8 (100%)	110 (100%)

Sources: ISS, Carbon4 Finance Group, World Bank, Bloomberg and Bank of Greece calculations.

Notes: The size of the portfolio is expressed in nominal value, in billion euros. WACI and Carbon Intensity metrics are expressed in tCO₂e (tonnes of carbon dioxide equivalent) per EUR million GDP (production method), per capita consumption (consumption method) and per EUR million of government expenditure (government method). Total carbon emissions are expressed in tCO₂e. Carbon footprint is expressed in tCO₂e per EUR million invested. Metrics are calculated using nominal values for government bonds. Percentages below each metric indicate data availability, calculated as the percentage of investments for which all required data are available (emissions and macroeconomic data).

Chart 1
Historical evolution of WACI over 2020-2022, calculated with all three allocation methods (production, consumption, government)

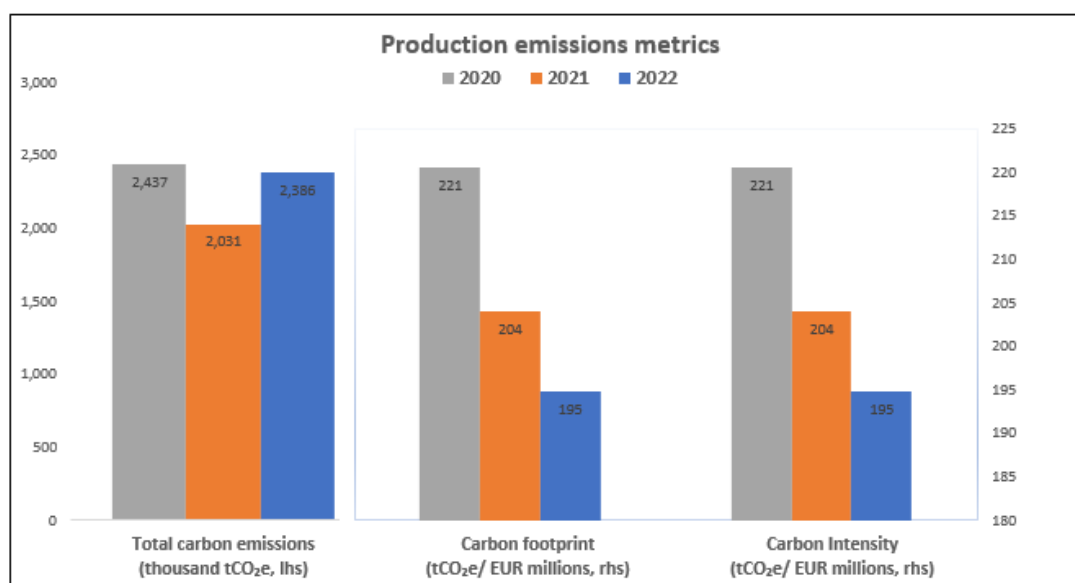


Sources: ISS, Carbon4 Finance, World Bank, Bloomberg and Bank of Greece calculations.

Notes: WACI is expressed in tCO₂e per EUR million of GDP (production method), tCO₂e per EUR million of government expenditures (government method) and tCO₂e per capita consumption (consumption method). The metric is calculated using nominal values for government bonds.

Chart 2

Historical evolution of the Total Carbon Emissions, Carbon Footprint and Carbon Intensity metrics over 2020-2022, calculated using the production method



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

Notes: The chart shows the historical evolution of TCE, CF and CI using the production method only. The metrics are calculated using nominal values for government bonds. Total carbon emissions are expressed in tCO₂e (tonnes of carbon dioxide equivalent). Carbon footprint is expressed in tCO₂e e (tonnes of carbon dioxide equivalent) per EUR million invested. Carbon Intensity is expressed in tCO₂e (tonnes of carbon dioxide equivalent) per EUR million GDP. Metrics are calculated using nominal values for government bonds.

As can be seen from the charts above, the metrics declined or remained broadly unchanged during the period under review, with the sole exception of TCE, which by definition evolves in line with the size of the portfolio.

The results should be interpreted with caution, as the exogenous factor of the pandemic and its impact on carbon emissions and on the macroeconomic data of government issuers during that period affected the metrics.

2. Green Investments in the Bank of Greece own funds portfolio

The climate-sustainable investments of the portfolios held by the Bank of Greece for non-monetary purposes are an important priority of its investment strategy. The long-term goal is to make a positive contribution to a climate-neutral European economy by 2050 and to reduce the exposure of the Bank of Greece portfolio to risks related to climate change.

Starting from 2019, the Bank of Greece has been moving towards the gradual integration of sustainable and responsible investment (SRI) criteria into the management of its own funds portfolios, which are not related to monetary policy. For

this reason, it has invested a part of the portfolios in “green bonds” issued by governments and supranational organisations, as well as in other green investment instruments, such as the USD green bond fund of the Bank for International Settlements (BIS).

In 2022, efforts to integrate criteria related to climate change into the management of the Bank of Greece own funds continued and investments in green assets increased, while distinct portfolios of green investments were created.

3. Targets

The Bank of Greece aims to align investments related to non-monetary policy portfolios with the EU’s climate neutrality objectives and the goals of the Paris Agreement. The EU’s targets are set out in its long-term strategy for 2050, aiming for climate neutrality so as to limit the global temperature increase well below 2°C and step up efforts to limit the increase to 1.5°C.

The Bank of Greece success in achieving its above-mentioned aim will depend on the extent to which governments comply with their commitments under the Paris Agreement on climate change, given that, due to the nature of the Bank of Greece activities and under the current constraints, most of the Bank’s own funds are invested in government bonds.

As part of this effort, the Bank of Greece is to set an intermediate decarbonisation target for its own funds portfolios. The specific target will be decided and reported in due course, following the increasing availability of climate data, optimisation of methodology and increasing expertise in handling climate-related risks.

However, it should be noted that the path of reducing the CO₂ emissions of the portfolios depends also on international developments, as well as on exogenous factors that are outside the direct control of the Eurosystem, such as the alignment of issuers with international standards in accordance with their commitments, bond market conditions, and corporate bond issuance standards.

The annual disclosure of the climate footprint of the portfolios will enable the Bank of Greece and the Eurosystem to reassess the disclosure framework as a whole and, if deemed necessary, adjust its key parameters, should significant deviations from the initial long-term targets be identified.

Annex 1

Historical evolution of climate footprint metrics of the euro bond portfolio over 2020-2022

EUR portfolio 2020-2022		Sovereign bonds		
		Production Method	Consumption Method	Government Method
Portfolio size (€ bn)	2022	12.246		
	2021	9.952		
	2020	11.048		
Weighted average carbon intensity (tCO ₂ e/€M GDP/population/€M consumption exp.)	2022	195 (100%)	8 (100%)	110 (100%)
	2021	204 (100%)	8 (100%)	121 (100%)
	2020	221 (100%)	8 (100%)	127 (100%)
Total carbon emissions (tCO ₂ e)	2022	2,386,168 (100%)	2,755,478 (100%)	286,423 (100%)
	2021	2,030,756 (100%)	2,288,196 (100%)	255,811 (100%)
	2020	2,437,285 (100%)	2,716,361 (100%)	314,284 (100%)
Carbon footprint (tCO ₂ e per € M invested)	2022	195 (100%)	225 (100%)	23 (100%)
	2021	204 (100%)	230 (100%)	26 (100%)
	2020	221 (100%)	246 (100%)	28 (100%)
Carbon intensity (tCO ₂ e/€ M GDP/population/€M consumption exp.)	2022	195 (100%)	8 (100%)	110 (100%)
	2021	204 (100%)	8 (100%)	122 (100%)
	2020	221 (100%)	7 (100%)	129 (100%)

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

Notes: The size of the portfolio is expressed in nominal value, in EUR billions. WACI and Carbon intensity are expressed in tCO₂e (tons of carbon dioxide equivalent) per million euros of GDP (production method), per capita consumption (consumption method) or government expenditure (government method). Total carbon emissions are expressed in tCO₂e. Carbon footprint is expressed in tCO₂e per million euro invested. Measurements use nominal values for government bonds.

Annex 2

Elements of the Eurosystem disclosure framework for the TCFD category “Metrics and targets”¹¹

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

In addition to the elements of the Eurosystem disclosure framework, the Bank of Greece discloses the carbon intensity metric, which is defined as:

Carbon Intensity

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

¹¹ TCFD formulas are provided [here](#). For the Eurosystem disclosure framework, they have been adjusted where necessary to reflect latest PCAF guidance and cover additional asset classes.

Annex 3

Carbon emissions allocation methods, normalisation factors and attribution factors

Allocation

Issuer type	Factor	Remarks	Unit
Corporate Supra & Agency	Scope 1 & 2 emissions	Scope 1 comprises direct GHG emissions that occur from sources that are controlled or owned by an organisation (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 comprises indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling.	tCO ₂ e
Sovereign	Production emissions	Emissions produced domestically within a country's physical borders, including domestic consumption and exports. This definition follows the territorial emissions approach adopted by United Nations Framework Convention on Climate Change (UNFCCC) for annual national inventories.	
	Consumption emissions	Emissions related to domestic demand, accounting for trade effects. This metric provides a broader view of a sovereign's emissions and tackles the issue of carbon leakage that arises due to production shifts from countries where goods are consumed later.	
	Government emissions	Direct emissions (e.g. from buildings, vehicles) and indirect emissions (e.g. emissions related to energy consumption, but also expenditures, subsidies, and investments) of the central government.	

Normalisation

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

Attribution

Asset class	Factor	Remarks	Unit
Sovereign bonds	PPP adj. GDP	See description of “PPP adj. GDP” in normalisation factor.	EUR
Equities	EVIC	The sum of the market capitalisation of ordinary shares at fiscal year end, the market capitalisation of preferred shares at fiscal year-end, and the book values of total debt and minorities’ interests.	
Supra & Agency bonds			
Corporate bonds			
Covered bonds			