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# EUROSYSTEM CENTRAL BANKS' CLIMATE-RELATED FINANCIAL DISCLOSURES OF NON-MONETARY POLICY PORTFOLIOS

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***Abstract:*** *This article explores the climate-related financial disclosures of Eurosystem central banks' non-monetary policy portfolios, focusing on adherence to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). Through an analysis of disclosures from 20 central banks in the euro area, it investigates governance structures, reporting practices, and metrics used to assess climate risks and opportunities. Findings reveal significant variability in transparency levels, particularly regarding governance and the frequency of climate issue reporting to boards. The mandatory metrics, including Weighted Average Carbon Intensity, Total Carbon Emissions, and Carbon Footprint, were commonly disclosed, while voluntary metrics remained underutilized. The study highlights gaps in standardized reporting and emphasizes the need for enhanced disclosure practices to support effective climate risk management within central banks. Recommendations include more comprehensive reporting aligned with TCFD guidelines, improved transparency in governance disclosures, and adopting additional metrics for a clearer understanding of climate-related risks. These findings contribute to the growing literature on sustainable finance, offering insights that may guide future policy development in central banks' climate risk management practices.*

***Keywords:*** *central banks; climate risk; disclosure; non-monetary portfolios.*

## INTRODUCTION

The Paris Agreement and the 2030 Agenda for Sustainable Development have catalyzed a global shift towards sustainability, greatly impacting initiatives worldwide. Institutions are increasingly aligning with these goals, such as the objective to limit global warming to below 2°C (Eliza, 2024). Sustainable investments, which incorporate Environmental, Social, and Governance (ESG) factors, demand a sophisticated risk assessment approach. Research shows that integrating ESG factors enhances risk management and stabilizes financial performance, with companies emphasizing ESG often achieving better long-term returns and higher investor confidence (Eliza, 2024). However, challenges in ESG data quality, measurement, and comparability create obstacles to informed investment decisions (Yunus & Nanda, 2024). Additionally, the lack of standardized ESG reporting

frameworks and regulatory inconsistencies intensifies these challenges, underscoring the need for improved data quality and regulatory alignment (Yunus & Nanda, 2024).

Environmental risks pose distinct challenges, frequently complicating the risk-return balance in investment strategies. Institutional investors play a vital role in mitigating these risks by influencing ESG performance in their portfolio companies, thus optimizing risk-adjusted returns (O'Sullivan, 2024). Infrastructure projects, for example, apply risk assessment tools to manage uncertainties while balancing economic, environmental, and social goals (Canesi & Gallo, 2024; Coskun et al. (2023)).

Although sustainable investments offer financial and social benefits, they require a thorough understanding of associated risks. Enhancing ESG data quality and fostering cross-disciplinary collaboration between finance, sustainability, and regulatory policy is essential for navigating the complexities of sustainable finance (Yunus & Nanda, 2024). In the financial sector, climate change presents both risks and opportunities. Habib et al. (2024) highlighted sustainable investment practices as a means for effective capital management, while financial regulators increasingly incorporate climate risks into risk management systems.

Globally, institutions are increasingly exploring how they can contribute to sustainability. Climate change remains one of the most pressing risks for organizations, as the warming of our planet is recognized as having and continuing to have, profound economic and social impacts. The primary goal of the Paris Agreement is to maintain the global average temperature rise below 2°C above pre-industrial levels.

In finance, climate change introduces both opportunities and challenges. Financial institutions increasingly prioritize climate risk in their assessments, often identifying it as one of the most critical risks to manage. New regulatory requirements for banks bring further challenges in climate risk management. This presents a significant research gap, as few tools are available to assess and manage the impacts of climate change. Banks also face difficulties quantifying climate risks, which are complex to incorporate into existing risk management frameworks while adhering to each institution's risk appetite.

The interest in sustainable investments continues to grow. Many financial institutions actively manage sustainable assets and aim to support the green economy. Recently, central banks, as major financial players, have begun considering sustainable investments in their foreign reserves management. Other financial market participants also seek to integrate sustainable investments into their portfolios. Although sustainable financial products may seem like an easy way to promote sustainability, a short history, limited liquidity, and complex risk management requirements challenge the market for sustainable investments. The lack of sustainable investment risk management research makes this an important and novel topic for science and practice.

Uncertainty regarding the extent, scope, and timing of climate change's economic impacts translates into financial risks, affecting markets, asset classes, institutions, businesses, households, and governments. Therefore, research in this area is critical for developing new tools for climate risk assessment and credit risk management within the banking sector.

As sustainable considerations gain importance, there is an increasing need to invest in and support companies that contribute to sustainable economies. Various financial instruments,

including mutual funds and exchange-traded funds, are emerging that adhere to strict sustainability criteria.

Climate risk plays an increasingly central role in today's economy, attracting attention from academics, the banking sector (central and commercial banks), other financial institutions, businesses, and investors (Campiglio et al. (2018), Chenet et al. (2021), Engle et al. (2020), Stroebel & Wurgler (2021), Ma et al. (2022). This type of risk and its management is becoming a crucial challenge across sectors. Studies have found that climate risk affects financial stability (Campiglio et al., 2018b), energy price volatility (Liang et al., 2022), stock price fluctuations (Khalfaoui et al., 2022), exchange market volatility (Bonato et al., 2023), and influences decision-making in companies and among investors (Chenet et al., 2021b). Research also indicates that climate risk impacts various economic factors, with some authors exploring how it affects inflation across countries, revealing that some nations are more sensitive to climate risks than others (Zhang, 2023). This variance may also be seen in the banking sector, where climate-related risks have been found to affect audit fees (Yang et al., 2023), credit risk, and sovereign ratings (Sun et al., 2023). Practical findings suggest that climate vulnerability and preparedness are now emerging factors in sovereign rating assessments, alongside traditional economic, political, and external factors, with climate readiness positively impacting sovereign ratings.

Curcio et al. (2023) examined the relationship between climate change and systemic financial risk, focusing on the banking and insurance sectors. They emphasized the need for appropriate policies to address climate-related disasters' increasing frequency and severity. Their findings have implications for banks and insurers, reinforcing the importance of risk management frameworks tailored to climate-related risks.

This research supports the creation of a robust climate risk management framework within the banking sector, highlighting that effective risk management relies on a well-defined framework. The main goal of this research is to investigate the level of climate-related information disclosure on non-monetary portfolios among Eurosystem central banks based on TCFD recommendations governance and metrics areas. Climate-related disclosures aim to improve stakeholder understanding of the distribution of carbon-intensive assets and the financial industry's vulnerability to climate change risks.

Theoretical challenges in this area stem from varying interpretations and classifications of climate risk and sustainable investments. A key theoretical issue is the diverse understanding of financial risks and the concept of "green" finance. Climate-related metrics disclosure also remains an area of concern.

Empirical challenges involve the availability of sustainable investment data and limited historical information. However, as this field evolves rapidly, improvements in climate risk disclosure and data quality are anticipated, enabling future studies to incorporate more extensive time series and data reflecting periods of growing demand.

This paper is organized as follows: Section 2 gives insights into our research methodology, focusing on 3 level approach. Section 3 focuses on research results and discussion, and finally, we present our conclusions and recommendations.

## METHODOLOGY

This chapter focuses on the methodology of disclosing climate-related information on non-monetary policy portfolios based on TCFD recommendations for governance and metrics. The Task Force's guidelines are organized into four key themes representing fundamental aspects of organizational operations—governance, strategy, risk management, metrics, and targets. In the first stage of the research, we will focus on two main aspects – governance and metrics. This study analyzed 20 central banks in the euro area to determine how they disclose climate-related information on non-monetary policy portfolios following TCFD recommendations for governance and metrics.

The initiation of the Task Force on Climate-related Financial Disclosures (TCFD) by the Financial Stability Board (FSB) in December 2015 (Task Force on Climate-related Financial Disclosures, 2017) represented a significant industry-led move to foster climate-related disclosures that would inform decisions in investments, lending, and insurance underwriting processes. The objective was to provide stakeholders with a more transparent view of carbon asset concentrations and the financial sector's vulnerability to climate change risks. Access to reliable data is the starting point for addressing climate change. Accurate data is critical for assessing the influence of central banks on the climate and understanding the associated risks. This essential information paves the way for central banks to implement meaningful and practical actions.

The reporting by central banks offers detailed insights into the carbon footprint and climate-related risks tied to the assets managed by the European Central Bank (ECB) and the national central banks of the euro area, collectively referred to as the Eurosystem. This improved transparency facilitates a more nuanced understanding of their portfolios' impact on the climate, thereby enhancing the decision-making process concerning the climate goals of central banks and aiding others in comprehending climate-related risks and impacts.

Beginning in 2023, the European Central Bank (ECB) and the Eurosystem central banks have pledged to release climate-related financial disclosures annually. These disclosures demonstrate their initiatives to reduce carbon emissions from their portfolios following the objectives set by the Paris Agreement. Additionally, these disclosures act as instruments to track their advancement and guide any required modifications to their strategies.

Eurosystem central banks' initiatives significantly enhance openness and responsibility in how financial institutions manage and disclose climate risks. Given their significant potential environmental impact, concentrating on non-monetary policy portfolios is crucial. The yearly frequency of these disclosures enables continuous oversight and adaptation, addressing the dynamic nature of climate-related challenges and policy goals. This movement is part of a broader global shift towards incorporating environmental factors into the financial industry, aligning with international frameworks such as the Paris Agreement.

Currently, the Eurosystem framework mandates members to publish metrics based on three emission allocation methods: emissions within a country’s physical borders ("production emissions"), emissions related to domestic consumption ("consumption emissions"), and emissions associated with government institutions and expenditures ("government emissions").

Mandatory reporting of production and consumption emissions is advantageous for the Eurosystem. Production emissions form the foundation of countries’ decarbonization efforts as

defined in their nationally determined contributions (NDCs), while consumption emissions address the effects of carbon leakage. These two types of emissions are the most relevant and widely reported sovereign emission categories. The mandatory reporting of government emissions has both benefits and drawbacks, influenced mainly by specific factors and preferences of central banks.

The calculations for mandatory metrics are placed below:

Weighted Average Carbon Intensity

$$WACI = \sum_{n}^{i}\left(\frac{current\ value\ of\ investment_i}{current\ portfolio\ value}\right) x \left(\frac{issuer's\ GHG\ emissions_i}{issuer's\ €M\ revenue\ or\ GDP, population, total\ consumption\ expenditure}_i\right) \quad (1)$$

Total Carbon Emissions

$$TAE = \sum_{n}^{i}\left(\frac{current\ value\ of\ investment_i}{EVIC\ or\ GDP_i} x\ issuer's\ GHG\ emissions_i\right) \quad (2)$$

Carbon Footprint

$$CF = \frac{\sum_{n}^{i}\left(\frac{current\ value\ of\ investment_i}{EVIC\ or\ GDP_i}\right) x\ issuer's\ GHG\ emissions_i}{current\ portfolio\ value\ (€M)} \quad (3)$$

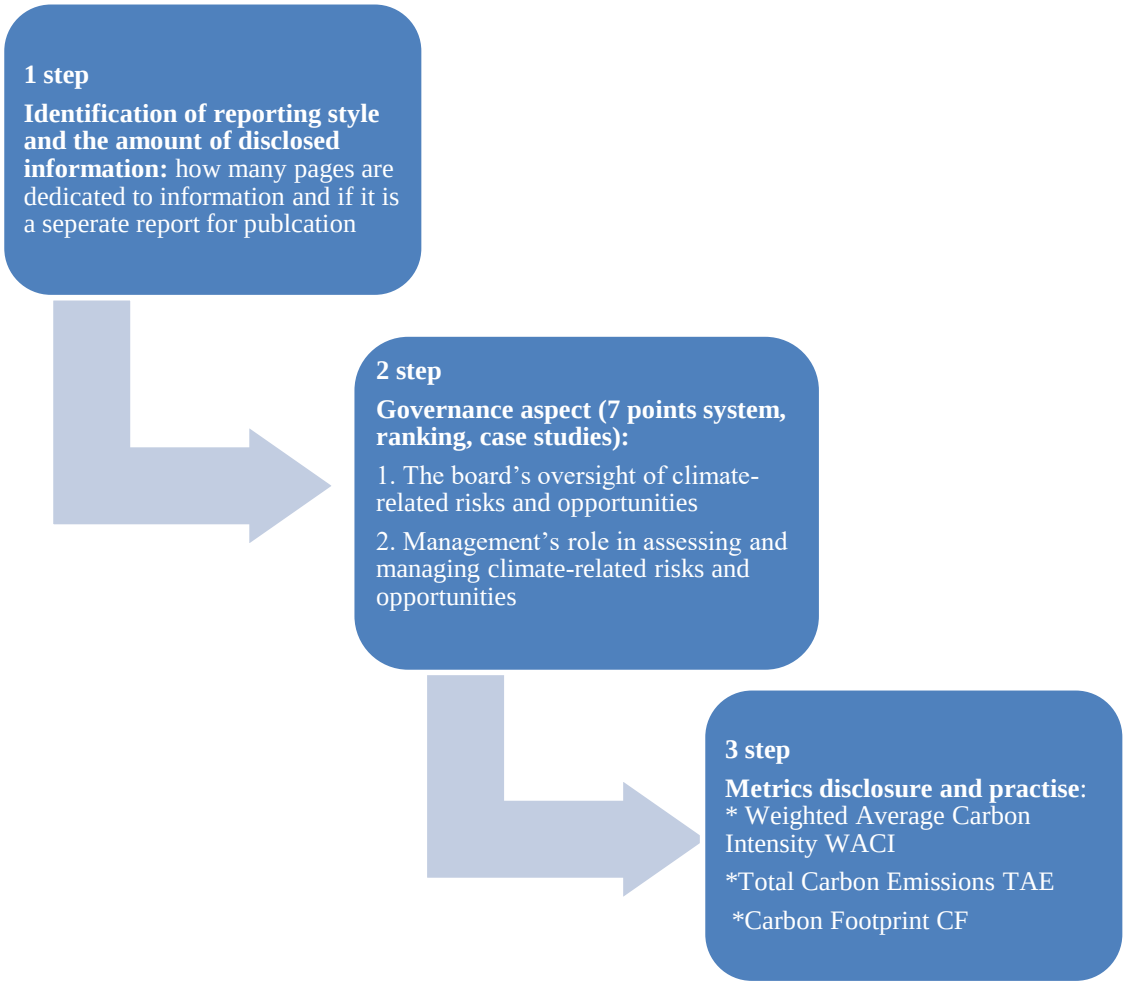
The Weighted Average Carbon Intensity (WACI) (formula 1) measures a portfolio's exposure to carbon-intensive issuers and acts as a proxy for climate transition risks. WACI is a normalized metric, making it comparable across different portfolio sizes and over time, as it adjusts issuers' emissions relative to their economic activity. (ECB, 2023)

In contrast, the total carbon emissions metric (formula 2) measures the absolute emissions associated with a portfolio, serving as a proxy for its contribution to global warming and environmental impact. Unlike the other metrics, it is not normalized and is influenced by changes in portfolio values, limiting its usefulness for comparisons over time or between portfolios of different sizes. The carbon footprint metric (formula 3) addresses this by normalizing total carbon emissions by the portfolio's value, enabling better comparability. (ECB, 2023)

Our research design is placed in Figure 1.

**Figure 1**

*Methodological framework*




Source: Done by authors

**RESULTS AND DISCUSSION:**

In this research, 20 central banks of the euro area were analyzed to identify how these central banks disclose climate-related information based on TCFD recommendations for governance and metrics.

The disclosures adhere to the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) across four categories: "Governance," "Strategy," "Risk Management," and "Metrics and Targets," including the TCFD's supplemental guidance for asset owners. The Eurosystem has developed a common disclosure framework for the "Metrics and Targets" category, establishing minimum standards for each member. In creating this framework, the Eurosystem also incorporated recommendations from the Partnership for Carbon Accounting Financials and the Network of Central Banks and Supervisors for Greening the Financial System (NGFS).

**Table 1**

*Results of Eurosystem central banks climate-related financial disclosures of non-monetary policy portfolios reporting style.*

| It has a separate report | Name of the report | The length of the report in pages | Announce in yearly report together with other information. |
|---|---|---|---|
| Austria | „Climate-related financial disclosures by the Oesterreichische Nationalbank 2022 “. Sustainability issues are also analyzed in the yearly report too. | 13 | |
| Belgium | „Climate-related Disclosures for non-monetary policy portfolios 2022“. Also has a Sustainable and Responsible Investment Charter, Annual report also covers climate issues, and Climate Dashboard. | 25 | |
| | „Climate report“ as a chapter in a yearly report. | 6 | Croatia |
| Cyprus | „Climate-related financial disclosures of the Central Bank of Cyprus EUR non-monetary policy portfolios“. | 12 | |
| | Has a chapter in Annual report „Climate-related sustainable investment at Eesti Pank. | 5 | Estonia |
| Finland | „Bank of Finland’s Annual Report on Responsible Investment“. | 27 | |
| France | „Responsible investment report“. | 45 | |
| Germany | „Climate related disclosures by the Deutsche Bundesbank 2023“. | 43 | |
| Lithuania | „Climate-related disclosures of the Bank of Lithuania’s non-monetary policy portfolios“. | 13 | |
| Greece | „Climate footprint of the euro-denominated non-monetary policy portfolios of the Bank of Greece“. | 10 | |
| Ireland | „Central Bank of Ireland’s climate-related financial disclosures 2023“. | 27 | |
| Spain | “Climate-related aspects of the Bando de Espana’s non-monetary policy portfolios”. | 22 | |
| Italy | „Annual report on sustainable investments and climate-related risks“. | 52 | |
| Latvia | „Climate-related disclosures of Latvijas Banka’s non-monetary policy portfolios“. | 13 | |
| Luxembourg | „Climate-related disclosures of the BCL’s non-monetary policy portfolios”. | 15 | |
| Malta | „Climate-related financial disclosures of the central bank of Malta‘s non-monetary policy portfolios“. | 40 | |
| | In Annual report. „De Nederlandsche Bank N.V. 2022 Annual Report. Information is very unstructed., other climate related information is mixed with other topics. | 5 | The Netherlands |
| Portugal | „Climate-related financial disclosures of the Banco de Portugal’s own financial assets“. | 14 | |
| Slovakia | „Climate-related disclosures of Národná banka Slovenska’s non-monetary policy portfolio“. | 16 | |
| Slovenia | “Climate-related disclosure of Banka Slovenije’s own financial assets“. | 23 | |

Source: Done by authors using central banks’ reports published online.

**Table 2**

*The results of governance disclosure in euro area central banks based on TCFD recommendations***.**

| **Describe the board's oversight of climate-related risks and opportunities** | LT | IE | AT | BE | EE | EL | ES | IT | CY | HR | LV | LU | MT | NL | PT | FR | SK | SI | FI | DE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – processes and frequency by which the board and/or board committees (e.g., audit, risk, or other committees) are informed about climate-related issues | no | no | no | yes[1] | no | no | yes[3] | no | yes | no | yes | yes | yes | yes | yes[3] | yes | no | yes | yes[3] | yes |
| – whether the board and/or board committees consider climate-related issues when reviewing and guiding strategy, major plans of action, risk management policies, annual budgets, and business plans as well as setting the organization's performance objectives, monitoring implementation and performance, and overseeing major capital expenditures, acquisitions, and divestitures | yes | yes | yes | yes | no | no | yes | yes | yes | no | yes | yes | yes | yes | yes | yes | no | yes | yes | yes |
| – how the board monitors and oversees progress against goals and targets for addressing climate-related issues | no | no | no | yes | no | no | yes | no | yes | no | no | yes | yes | yes | no | yes | no | no | no | yes |
| **Describe management's role in assessing and managing climate-related risks and opportunities** | | | | | | | | | | | | | | | | | | | | |
| whether the organization has assigned climate-related responsibilities to management-level positions or committees; and, if so, whether such management positions or committees report to the board or a committee of the board and whether those responsibilities include assessing and/or managing climate-related issues | yes | no | yes | yes | no | no | yes | yes | yes | no | yes | yes | yes | yes | yes | yes | no | yes | yes | yes |
| – a description of the associated organizational structure(s) | no | no | no | yes[2] | no | no | yes[2] | yes[4] | yes[2] | no | no | yes | yes | yes[2] | no | yes | no | yes[2] | yes[2] | yes |
| – processes by which management is informed about climate-related issues | no | no | no | yes | no | no | yes | no | yes | no | no | yes | yes | yes | yes | yes | no | yes | yes | yes |
| – how management (through specific positions and/or management committees) monitors climate-related issues | no | no | no | yes | no | no | yes | no | yes | no | no | yes | yes | yes | no | yes | no | no | no | yes |

*Notes: [1]on regular basis;[2]there is no organizational chart, but explained functions quite well;[3]lack of frequency, process clear;[4] good and clear organizational structure; *the best practice in disclosing*

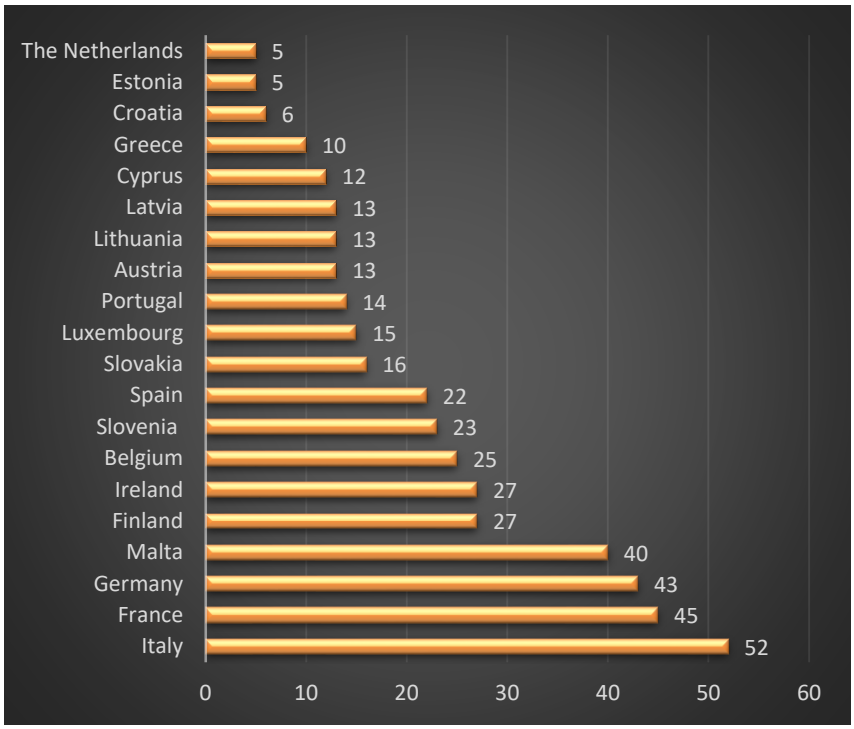
Source: Done by authors using central banks' reports published online.

### Governance

Table 1 and Table 2 present the analysis of 20 Euro Area Central Banks' reports on sustainable investments and climate-related risks. The results show that reports are not very transparent, as we see a lot of information that central banks do not disclose.

**Figure 2**

*Countries ranked by pages of climate-related information disclosure*




Source: Done by authors using central banks' reports published online.

Based on our research presented in Figure 2, we can group all countries into four groups based on information about climate change impact disclosure in their reports. In the first group, we can add Italy, France, Germany, and Malta as countries presenting the most information. We can also consider that central banks in these countries are the most transparent regarding climate-related information disclosure of non-monetary portfolios. For the second group of transparency, we can appoint Finland, Ireland, Belgium, Slovenia, and Spain, so the central banks of these countries are a bit less transparent in disclosing climate-related information about non-monetary portfolios. The third group comprises Slovakia, Luxembourg, Portugal, Austria, Lithuania, Latvia and Cyprus central banks. And the fourth group (Netherlands, Estonia, Croatia, Greece) of central banks are with very short reports and a poor amount of climate related information in their non-monetary portfolios.

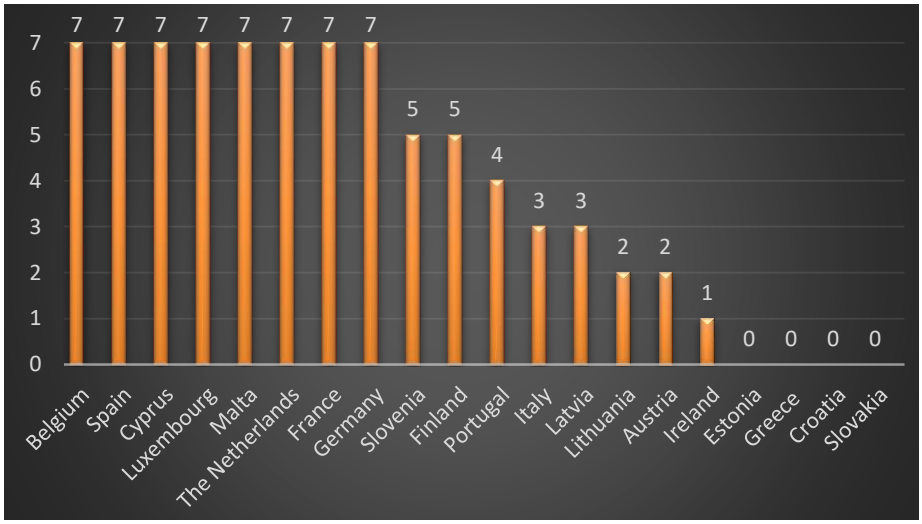
After analyzing all the reports, we tried to evaluate the quality of governance disclosure based on TCFD recommendations. We decided to rank all the central banks from 0 to 7 based on the disclosure aspects which are presented in Table 2. The ranking results are placed in Figure 3.

From the results in Figure 3, we can see that some countries disclosure all recommended information (Belgium, Spain, Cyprus, Luxembourg, Malta, Netherlands, France, and Germany) about the governance while others do not disclosure all main aspects (Estonia, Greece, Croatia, Slovakia).

Looking at the length of reports and the level of the disclosure of information about climate risk governance, we can see that countries with concise reports do not focus on the disclosure of governance aspects. The only exception was the Netherlands, where all recommended aspects were disclosed, and the report of climate-related information about nonmonetary portfolios was very short and concentrated (Figure 4).

**Figure 3**

*Countries ranked by the level of governance disclosure.*

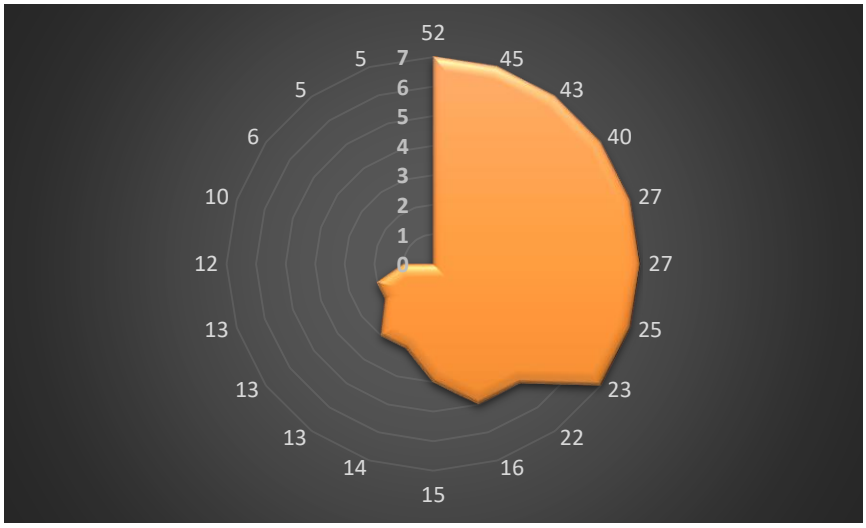



*Note: 7 points – the highest level of governance information disclosure, 0 – the lowest level of governance information disclosure*

Source: Done by authors using central banks' reports published online.

**Figure 4**

*Relationship between the length of climate-related information disclosure report and the level of governance information disclosure*




Source: Done by authors using central banks' reports published online.

After a deep analysis of the reports, we can conclude that the governance part in disclosure about climate risk is fragile, with no precise frequency for reporting to the Board. The best governance disclosure practices are identified in Malta, France, and Germany.

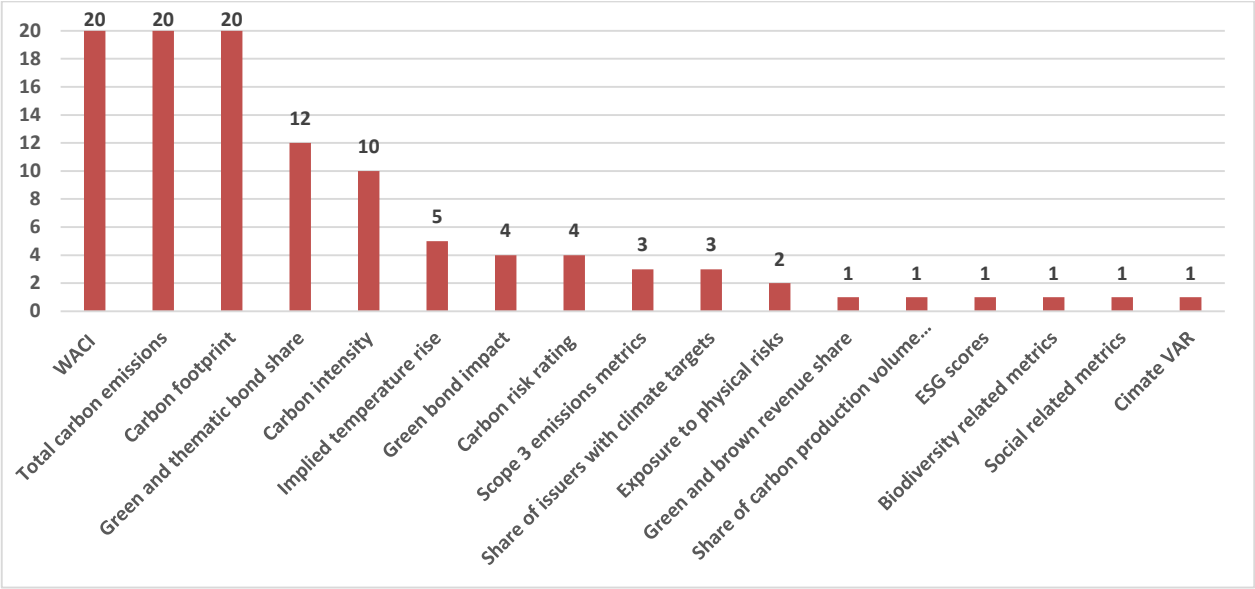
**Metrics**

After analyzing all the reports of central banks, we have summarized the results in Figure 5. Based on the ECB rules, WACI, Total carbon emissions, and Carbon footprint are mandatory metrics, so all central banks disclose them. All other metrics are disclosed voluntarily.

Table 3 shows the results of metrics disclosed by euro area central banks. The required metrics are only three: weighted average carbon intensity (WACI), total carbon emissions, and carbon footprint. Two extra metrics are disclosed in half of all central banks: green and thematic bond share and carbon intensity. Other measures are disclosed only in some banks. From the reports, it was clear that central banks tend to disclose more metrics next year, so the results for 2023 can be better with more efforts for disclosing information.

**Figure 5**

*Metrics used to assess and manage relevant climate-related risks and opportunities in euro area central banks*




Source: Done by authors using central banks' reports published online.

**Table 3**

*Calculated metrics at the bank level*

| Metric | Banks | |
|---|---|---|
| WACI | 20 | All euro area central banks |
| Total carbon emissions | 20 | All euro area central banks |
| Carbon footprint | 20 | All euro area central banks |
| Green and thematic bond share | 12 | Ireland (thematic and green), Italy (green), Belgium, Slovenia, Slovakia, Portugal, Malta, Luxembourg, Spain, Germany, Netherlands, Finland |
| Carbon intensity | 10 | Finland, Croatia, Cyprus, France, Greece, Italy, Ireland, Portugal, Malta, Spain |
| Implied temperature rise | 5 | France, Belgium, Finland, Germany, Malta |
| Green bond impact | 4 | Malta, Germany, France, Belgium |
| Carbon risk rating | 4 | Belgium, Germany, Slovenia, Malta |
| Scope 3 emissions metrics | 3 | Belgium, Finland, Germany |
| Share of issuers with climate targets | 3 | Finland, Slovenia, Malta |
| Exposure to physical risks | 2 | France, Germany |
| Green and brown revenue share | 1 | Germany |
| Share of carbon production volume to GDP | 1 | Germany |

| | | |
|---|---|---|
| ESG scores | 1 | France |
| Biodiversity related metrics | 1 | France |
| Social related metrics | 1 | France |
| Climate VAR | 1 | Italy |

Source: Done by authors using central banks' reports published online.

Central banks tend to report minimum metrics to assess climate-related risks and opportunities. Most metrics of climate issues are explained in the central banks of France and Germany reports. Eurosystem members were encouraged to enhance their disclosures with voluntary metrics, and in their 2023 reports, they included 14 different categories of such metrics. These voluntary metrics were both backward-looking and forward-looking. The most commonly reported backward-looking metrics included the shares of green and thematic bonds and carbon intensity. Among the forward-looking metrics, the most popular were the implied temperature rise, carbon risk rating, and the share of issuers with climate targets.

Introducing mandatory carbon intensity metrics could enhance reporting for certain central banks. These metrics provide additional insights into the emissions associated with holdings by normalizing emissions relative to the level of financed economic activity (i.e., revenue). Carbon intensity metrics are widely used in the financial sector and preferred by some investors for tracking portfolio decarbonization. Most NMPP portfolios should have sufficient data availability, and the calculation process is operationally straightforward. But at the moment, for the 2022 reporting year, only half of all central banks disclosed and calculated this metric.

However, the added value of carbon intensity depends on specific investment strategies, raising questions about its usefulness as a mandatory metric. The TCFD recommends disclosing precise, comparable, and consistent information about climate-related risks and opportunities. Portfolio managers select climate metrics based on their investment strategies and the applied scope. Adequate climate-related metric disclosure aids understanding; thus, adding the complex carbon intensity metric to the already mandatory WACI, Total Carbon Emissions, and Carbon Footprint metrics might complicate reporting without significantly increasing informative value. PCAF (Partnership for Carbon Accounting Financials) does not explicitly recommend the carbon intensity metric.

Integrating forward-looking metrics into the reporting framework is desirable, but the lack of methodological standardization currently weakens the case for inclusion. While these metrics enrich reporting and are conceptually appealing, ongoing debates about methodological aspects and the lack of standardization argue against their mandatory inclusion at this stage. The availability and standardization of data should improve with the implementation of the CSRD (Corporate Sustainability Reporting Directive). Central banks are encouraged to share their experiences to define best practices for voluntary reporting of forward-looking metrics.

Reporting on green bond-avoided emissions remains challenging. Three distinct approaches for reporting avoided emissions—relying on data provider estimates, collecting issuer impact reports, and collecting third-party impact reports—each has pros and cons. Current guidance and data are insufficient to ensure accurate estimates for green bonds' avoided emissions. Among the three approaches, relying on data provider estimates appears superior in terms of practicality and feasibility, but data coverage must improve before collective disclosure by the Eurosystem. Harmonizing methodologies used by data providers would also enhance metric quality.

Reporting portfolios' green bond share could enhance transparency about portfolios' contribution to the low-carbon transition, stimulating the supply of crucial transition financing. Green bonds are a popular tool for fixed-income investors to support low-carbon projects. Several central banks already report the share of green bond holdings in their portfolios. Identifying green bonds is straightforward, as Bloomberg provides a classification flag based on the Green Bond Principles (GBP) of the International Capital Market Association (ICMA), reducing greenwashing risks.

Addressing the impact of inflation on financial data remains unresolved. Financial measures such as revenue and EVIC are affected by inflation, which can lead to "artificial" greening over time. While correcting for inflation in metrics is theoretically desirable, it is complex in practice. PCAF (Partnership for Carbon Accounting Financials) does not recommend adjusting for inflation to maintain comparability across institutions. The EU climate benchmark regulation prescribes an "enterprise value inflation adjustment factor," which does not distinguish between causes of enterprise value fluctuations. This metric is complicated to correct for inflation's impact, but it should be reviewed in the future due to its relevance for setting interim targets.

Biodiversity aspects are likely to gain prominence in climate reporting. The Taskforce on Nature-related Financial Disclosure (TNFD), announced in July 2020, released its complete framework for market adoption on 18 September 2023. EU environmental standards being developed by EFRAG (E4 – Biodiversity) build on TNFD recommendations. If deemed material, the CSRD will require major EU companies to report on certain nature-related KPIs starting in 2025. While biodiversity disclosures should remain voluntary for now, it should be considered to include them in the standard reporting framework later.

Metrics should be updated retroactively as new climate data becomes available. Emissions and financial data for issuers typically have a delay of one to two years, causing reference year mismatches in recent portfolio reporting. We recommend making these limitations transparent and updating metrics in the next reporting round when new data with matching reference years becomes available. Most recent metrics would likely need only one update.

Because of calculation challenges, most central banks at the moment do not want to make other metrics to disclosure mandatory and tend to remain voluntary.

## CONCLUSIONS

After analyzing 20 central banks‘ climate-related financial disclosure reports, it can be concluded that euro area central banks do not disclose transparent processes by which the bank boards are informed about climate-related issues. The other important point is that most central banks do not identify the reporting frequency.

Monitoring climate-related issues for central banks is essential, and if the central banks have no transparent processes, they can face difficulties in managing climate risk and adding value to sustainable development.

In climate-related financial disclosure reports, central banks explain how the board supervises and manages risks and opportunities related to climate change. At the same time, it outlines how management evaluates and handles risks and opportunities associated with climate change. Small central banks based on foreign reserves portfolios tend to make concise reports about governance without profound explanation.

Central banks, from 2023, have to disclose metrics by which they assess climate-related risks and opportunities. The research has shown that most central banks tend to disclose only metrics based on minimum requirements (WACI, Total carbon emissions, Carbon footprint), especially small central banks. By disclosing other metrics, there is no transparent system of providing information.

The main recommendation for central banks would be to report more transparent disclosures in governance, focusing on TCFD recommendations. Processes and frequency by which the board and/or board committees (e.g., audit, risk, or other committees) are informed about climate-related issues are essential to ensure proper climate risk management in the organization. The other aspect for central banks is to have a transparent monitoring of climate-related issues system.

The other recommendation is to include more measures than the minimum in disclosing climate-related risks and opportunities and present it clearly by explaining the calculation and targets for the future.

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