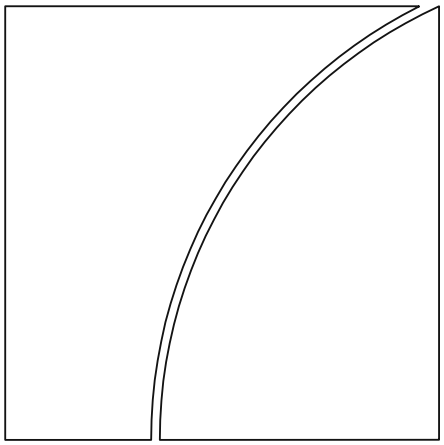
Consultative Group on Risk Management



Incorporating climate-related risks into international reserve management frameworks

July 2022

BIS Representative Office for the Americas

BANK FOR INTERNATIONAL SETTLEMENTS

This publication is available on the BIS website (www.bis.org).

ISBN 978-92-9259-548-7 (online)

Foreword

This report, *Incorporating climate-related risks into international reserve management frameworks*, is the outcome of work conducted by BIS member central banks in the Americas within the recently established Consultative Group on Risk Management (CGRM). The CGRM conducts its activities under the auspices of the Consultative Council for the Americas (CCA), an advisory body that consists of the Governors of BIS member central banks in the Americas. It meets regularly to discuss risk management topics and execute projects of common interest to strengthen risk management.

One area where interest is growing rapidly is how central banks can incorporate environmental, social and governance (ESG) considerations into their risk management frameworks, if they desire and if it is within their mandates to do so. Last year, the CGRM created a task force, led by Isabela Ribeiro Damaso Maia from the Central Bank of Brazil, with a focus on data and methodological challenges central banks may face when incorporating climate-related considerations into their international reserve management frameworks. This report marks the successful completion of this project and is published for the benefit of the wider central bank community and the public.

Joshua Rosenberg

Chair, CGRM, Federal Reserve Bank of New York

Alexandre Tombini

BIS Chief Representative for the Americas

BANK FOR INTERNATIONAL SETTLEMENTS

Consultative Group on Risk Management

Incorporating climate-related risks into international reserve management frameworks

Task force report

April 2022

Executive summary

Society faces the challenge of managing climate change risks. To play their part, central banks across the globe created the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) with the aim of contributing to effective climate-related risk management and the transition to a sustainable economy.[1] While many central banks do not have a formal mandate to incorporate sustainability issues into their mission, some have noted that doing so is consistent with existing mandates. These central banks may decide to incorporate climate-related risks into their risk frameworks and, thus, improve their decision-making processes given the impact of climate risks on their mission and/or objectives.

Central banks may have a more direct role to play through their international foreign reserves, where they hold portfolios of sovereign and other assets that may be exposed to both physical and transition risks associated with climate change. This report focuses on the methodological and data challenges faced by central banks as they consider climate-related risks as part of their reserve management frameworks. A significant methodological challenge is the difficulty in modelling climate factors and their connection to portfolio risk and return characteristics. The lack of comprehensive, timely and accurate climate risk data is another key challenge for reserve managers. Additionally, incorporating environmental social, and governance (ESG) considerations into international reserve management frameworks would need to be aligned with the pillars of safety, liquidity and profitability and also be consistent with central banks' legal mandates. Despite these challenges, some reserve managers are gradually adding climate-related risk metrics into their risk management frameworks and are improving the disclosure.

Introduction

International reserve management and climate risk

Central banks manage international reserves for multiple purposes, including funding foreign exchange intervention activity, executing payments for goods and services, executing government payments, granting emergency liquidity assistance, supporting domestic monetary policy, underpinning investor confidence in the country and investing excess reserves.[2] In the risk management process, reserve

[1] See NGFS (2020a).

[2] See Fender et al (2020) for a description of seven economic uses of reserves identified in the literature.

managers typically make investment decisions based on three investment objectives (pillars): safety, liquidity and profitability. The safety and liquidity objectives are typically prioritised over the profitability objective due to the precautionary role of international reserves as a form of self-insurance. In line with these objectives, reserve managers may find it worthwhile to consider financial climate-related objectives to improve the portfolio's risk-return profile.[3]

Task force background, objectives and activities

Aiming to contribute to the ongoing discussion on incorporating sustainability considerations in international reserve management frameworks, the Consultative Group on Risk Management (CGRM), at its August 2021 meeting, set up a task force on "incorporating climate-related risks into international reserve frameworks". Note that, while ESG risks comprise a broader set of risks than just climate-related risks, the scope of the task force was limited to climate-related risks and how they link to the financial objectives in the management of international reserves. The participants of the task force included representatives from the central banks of Brazil, Canada, Chile, Colombia, Mexico, Peru and the United States, as well as from the BIS.

Following discussions at the CGRM on which specific climate-related risk issues members were seeking to focus, the task force was asked to assess gaps in data and methodologies. The project had the following main objectives:

- draw up a list of the data required to assess and monitor climate-related risks;
- identify data sources that could meet these requirements;
- identify methodologies that could be used to assess and monitor these risks; and
- discuss ways of summarising and reporting these risks.

The task force organised technical meetings, a survey and a webinar that included speakers from both the private sector and the public sector. This report presents the task force's findings on the challenges faced by central banks when incorporating climate-related considerations in international reserve management decisions.

Summary of findings

- Many task force members plan to consider climate-related risks for their international reserve portfolios.
- There are substantial methodological and data challenges in implementing climate-related considerations into reserve investment decisions.
- Methodological challenges include: difficulty mapping climate risk factors to portfolio risk and return characteristics; and methodological limitations in constructing portfolios with climate-related objectives.
- A lack of comprehensive, accurate and timely data is also a major challenge.
- Some central banks are already disclosing or planning to disclose information on climate-related risks in their international reserve portfolios.

This report is organised into six sections. Section A discusses survey findings on how some task force members are currently incorporating climate risk considerations in the management of their international reserve portfolios. Section B discusses the inclusion of climate-related risks into international reserve management processes, in line with the central banks' mandates and with the three pillars of

[3] NGFS (2019a) refers to financial SRI and extra-financial SRI objectives. Since this report focuses on climate risk, we refer to financial climate-related objectives and extra-financial climate-related objectives. See NGFS (2020b) for a progress report on the implementation front.

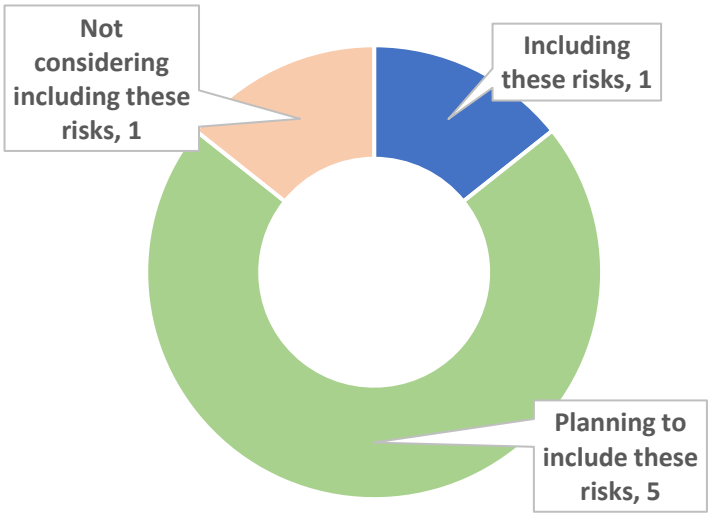
investment: safety, liquidity and profitability. Section C discusses methodological challenges for climate-related reserve management, while Section D discusses data challenges. Section E is dedicated to climate-related risk disclosure. Section F summarises the findings. Note that while this report focuses on climate-related risks, some broader ESG aspects are also discussed.

A. Survey findings

The task force organised a survey of ESG Task Force members with the aim to identify the current and future status of climate-related risk considerations in their international reserve portfolios. The survey results reflect the situation in mid-2021 and ignores changes since then. Moreover, the small number of participating institutions limits any inference about the central bank community at large.

Figure 1 presents the results to the following survey question: "With respect to monitoring climate-related risks in international reserves, does the central bank include, or plan to include, or not consider to include these risks?".

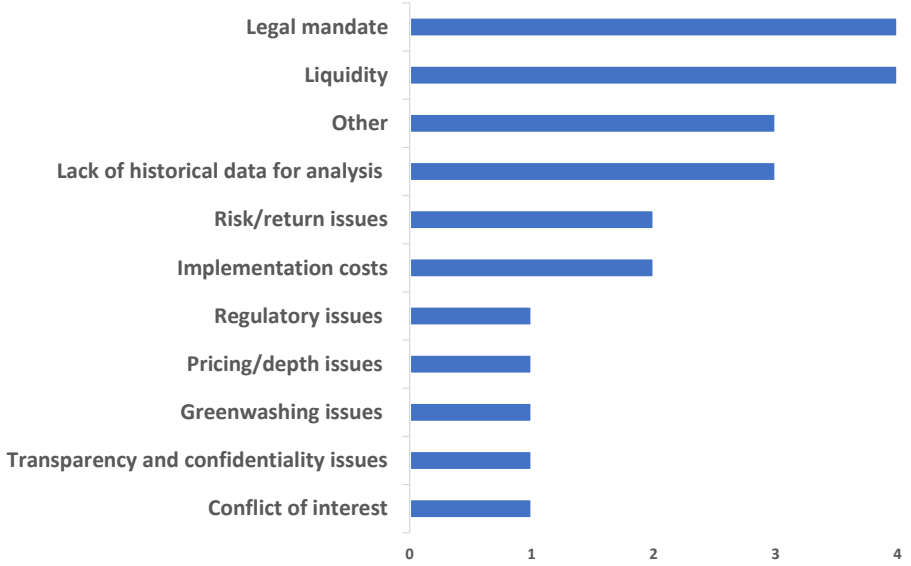
Figure 1: CGRM task force survey responses to "With respect to monitoring climate-related risks in international reserves, does the central bank…"



Source: CGRM ESG Task force.

In the survey, the institutions reported the reasons why they have zero or a limited amount of ESG-related investment in their portfolios (Figure 2). Since the question did not reference objectives, the respondents' interpretation could encompass both financial and non-financial objectives. However, task force discussions after the survey focused on the financial climate-related objectives of international reserve investments.

Figure 2: CGRM task force survey responses to "Reasons behind zero or a small allocation to ESG-related investment in international reserve portfolios"

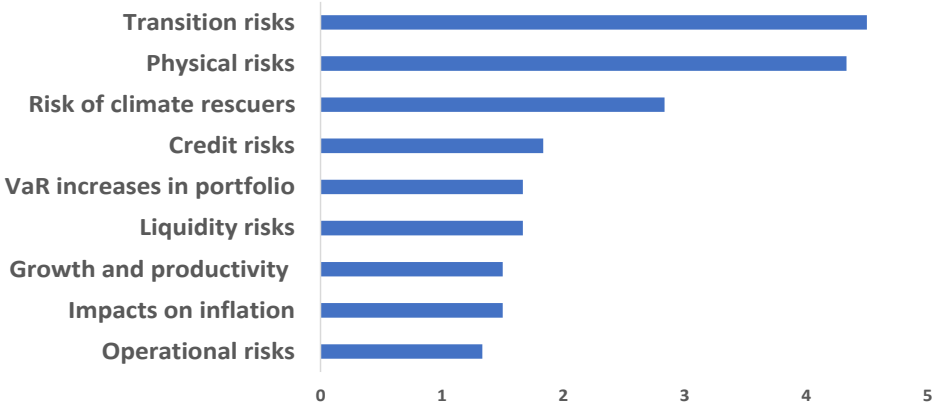


Source: CGRM ESG Task Force.

From this point forward, the survey findings and figures reflect answers from the seven respondents that include or plan to include monitoring of climate-related risks in their international reserve management frameworks.

Some institutions in the task force reported that climate change can create numerous risks, albeit of different relative importance. They evaluated the extent of their worries about climate-related risks in international reserves management on a scale of 1 to 5 (5 being maximum worry) in the survey (Figure 3). "Risk of climate rescuers" refers to the risk of central banks becoming "climate rescuers of last resort" and buying a large set of stranded assets, triggered by green swan events (Bolton et al (2020)).

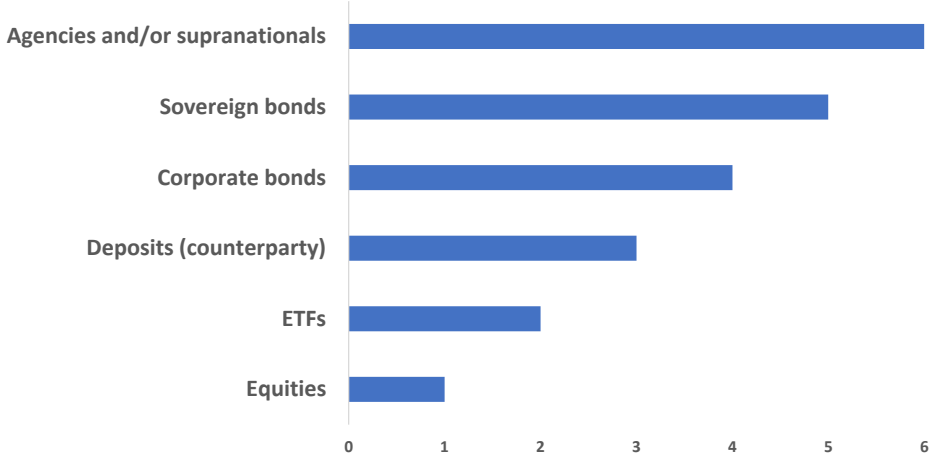
Figure 3: CGRM task force survey responses to "How much should central banks worry about climate-related risks in international reserve management, on a scale of 1 to 5 (5 = maximum worry)"



Source: CGRM ESG Task Force.

Figure 4 presents the survey results of the institutions that answered the survey question about which asset classes and financial instruments will or could be monitored.

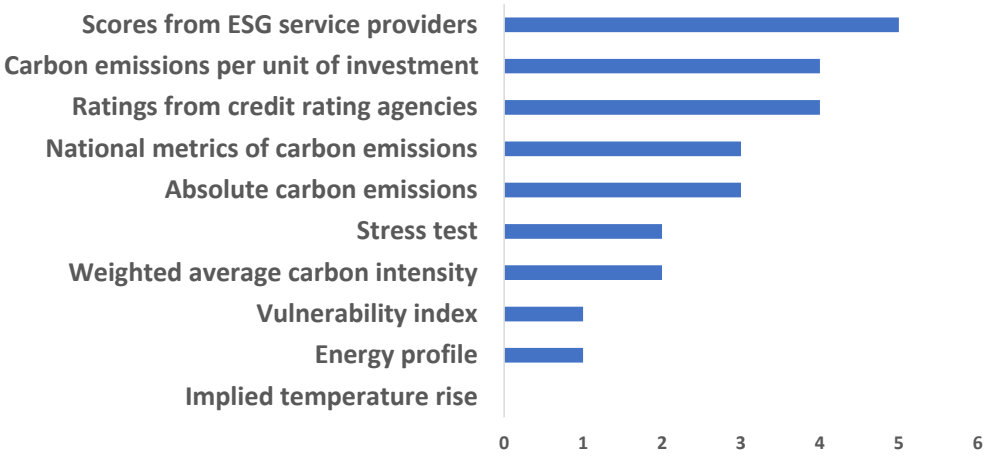
Figure 4: CGRM task force survey responses to "Which asset classes and financial instruments have climate-related risks monitored or planned to be monitored?"



Source: CGRM ESG Task Force.

As part of the survey, some members of the task force highlighted what metrics they use or plan to use to incorporate ESG considerations into their reserve management frameworks (Figure 5).

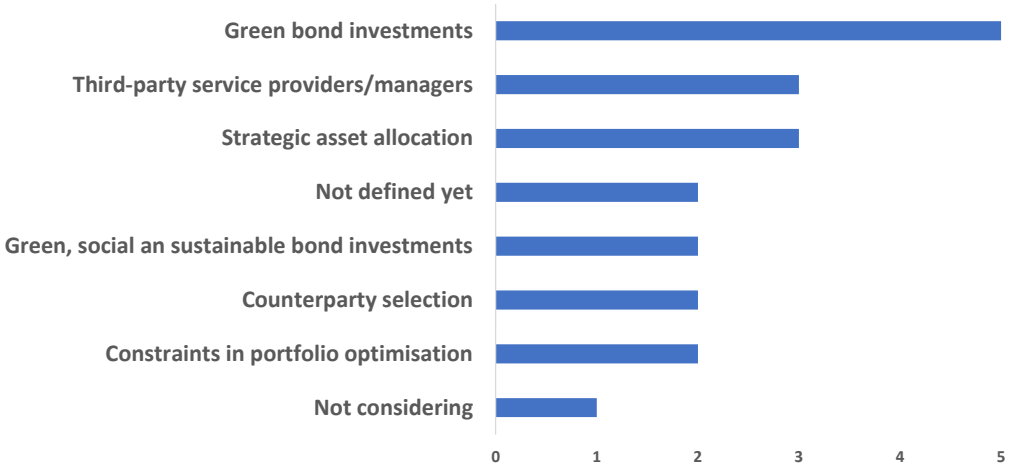
Figure 5: CGRM task force survey responses to "What kind of metrics does the central bank use/plan to use to monitor climate-related risks in its portfolios?"



Source: CGRM ESG Task Force.

Figure 6 presents potential approaches to consider climate-related risks indicated by survey responses from some institutions.

Figure 6: CGRM task force survey responses to "How does the central bank consider or plan to consider climate-related data in the international reserve management?"



Source: CGRM ESG Task Force.

Main takeaways from this section:

- Most central bank task force members plan to consider climate-related risks affecting their international reserve portfolios.
- Central banks' mandates, liquidity concerns and lack of data are leading reasons for low or no climate-related investment in international reserve portfolios.
- Most task force members plan to monitor climate risks for agencies, supranationals and sovereign bonds in their international reserve portfolios. The most commonly used metrics are ESG scores, credit ratings and carbon emission metrics.

B. Central banks' mandate and international reserve investments

Central banks' international reserve investment decisions are commonly based on three pillars: safety, liquidity and profitability. The introduction of climate-related considerations into the investment decisions for international reserves would need to be aligned with these three pillars and also be consistent with central banks' legal mandates.[4] While some central banks are planning to monitor climate-related risks and other ESG metrics in their international reserve investments, task force members highlighted that central banks' mandates would determine the extent to which they could take these risks into account in their strategic decision-making process. Nevertheless, the central banks recognise that financial risks and climate-related risks are interconnected. For example, climate-related risks may impact prices and affect credit quality and asset liquidity. Therefore, addressing the impact of climate-related risks and/or ESG-related risks on the financial objective of central banks' portfolio management could be aligned with the central banks' existing mandate. The task force did not address extra-financial objectives of central banks.[5]

NGFS (2019a) highlights that key motivations for socially responsible investments among central banks include protection against sustainability risks (including climate-related financial risks) and

4 See Fender et al (2020).

5 See NGFS (2019a) for a discussion of high-level objectives for central banks' portfolio management. That document discusses financial and extra-financial objectives.

enhancement of the risk-return profile. These two motivations are driven by the desire to protect or improve financial performance.

Despite the challenges of incorporating climate related risks in the decision-making, some central banks are gradually adding climate-related risk metrics into their risk management frameworks and are improving the disclosure of these risks in their international reserve reports. In doing so, they contribute to the global discussions on how to assess and manage climate-related risks and reflect the increasing concerns of climate change and its impact on economies – which may in turn affect international reserve investments. During this process, some member central banks looked at existing metrics and methodologies, evaluated their strengths and weaknesses (eg data quality, consistency and costs) and discussed alternatives.

Main takeaways from this section:

- Incorporating ESG considerations in international reserve management would need to be aligned with the pillars of safety, liquidity and profitability, and be consistent with central banks' legal mandates.
- Despite the challenges, some central banks are gradually adding climate-related risk metrics into their risk management frameworks and are improving the disclosure.

C. Methodological challenges for climate-related international reserve management

Some reserve managers construct reserve portfolios by balancing risk and return using mean-variance optimisation (ECB (2004)), usually in conjunction with screening criteria to meet credit and liquidity objectives. For example, a reserve manager may use certain credit and liquidity criteria to screen sovereign bonds, and then determine portfolio holdings using an optimisation with constraints.

Reserve management with a financial climate-related objective aims to optimise risk-adjusted returns in alignment with the three investment objectives of safety, liquidity and profitability, which includes linkages between portfolio risk, return and climate change. For example, BCBS (2021a) shows that physical risks and transition risks transmit to traditional financial risk categories such as market risk, credit risk, sovereign risk and liquidity risk.

As discussed earlier (Figure 3), some survey respondents are primarily concerned with the physical and transition risks associated with climate change. Physical risks are those from extreme weather events such as hurricanes, droughts, floods, and from shifts such as rising sea levels and ocean acidification, as well as any other events associated with climate change. Transition risks arise from the shift towards a low-carbon economy, with drivers including changes in public sector policies, technology, and market and customer sentiment (BCBS (2021a)).

Research is at an early stage on how physical and transition risks affect portfolio risk and return characteristics (BCBS (2021a)). Among the issues to be investigated are:

- Market risk may be affected by the negative impact on the value of financial assets caused by climate risk drivers. For example, a rising sea level may affect coastal real estate prices and mortgage lending markets. Also, climate risk drivers may cause uncertainty about financial assets' future payoffs, which may increase risk premia.
- Credit risk may be affected by the income and wealth effects caused by physical and transition risks. The income effect refers to the effect on the borrowers' ability to repay and service debt. The wealth effect refers to the effect on a bank's ability to fully recover the loan value due to the reduced collateral value. Sovereign credit risk may be affected via tax, spending and productivity

channels. For example, physical risk events may impair firms and reduce household income, which may lower tax revenues. Also, the efforts to transition to a low-carbon economy may cause higher government spending.

- Liquidity risk here refers to funding liquidity risk. Climate risk drivers may affect banks' ability to raise funds or liquidate assets. They may also affect bank customers' demands for liquidity, which will impact banks' liquidity indirectly.

Therefore, incorporating climate risks into reserves portfolio management requires modelling climate change (physical and transition risks) as well as the impact of climate change on portfolio characteristics (market, credit and liquidity risk). Both are challenging.

Modelling physical risks involves significant uncertainties due to the complex nature (eg non-linearities, feedback loops and uncertainty on the temporality of events) of climate change.[6] These uncertainties are further compounded when modelling transition risks that are based on individual, private sector and government responses to climate change. Forecasting approaches for climate change are rapidly changing and evolving.

In this context, mapping uncertain physical and transition risks to portfolio risk and return characteristics is particularly challenging. Typical approaches using historical data are not feasible in this case due to the absence of sufficient data to model the impacts of climate change. In addition, our understanding of the transmission channels from climate-related risks to financial risks is still incomplete.

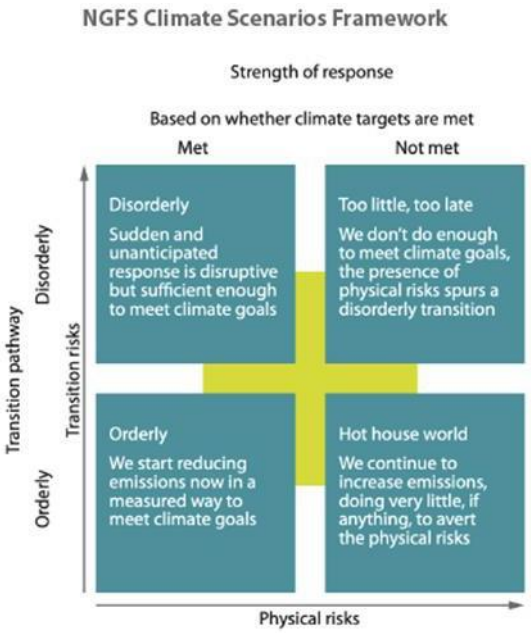
In addition, mean-variance optimisation over relatively short horizons, such as one year, may not adequately capture tail risks due to extreme climate events (large impact and low frequency). Therefore, scenario analysis or stress testing may be a useful tool for reserve managers.

The NGFS presents a scenario analysis framework for central banks and supervisors to assess climate-related risks (Figure 7). Four scenarios were developed. The "orderly" scenario assumes emissions reductions start now and follow a path sufficient to meet climate goals. The "disorderly" scenario incorporates sudden and unanticipated emission reductions of sufficient size to meet climate goals. The "too little, too late" scenario implies high transition and physical risks, without meeting climate goals. Finally, the "hothouse world" implies increasing emissions and no actions to avert the physical risks (NGFS (2019b)).[7]

[6] See BCBS (2021b).

[7] See also Smith (2021) and NGFS (2021a) for overviews in scenario analysis.

Figure 7: NGFS scenario analysis framework for central banks and supervisors to assess climate-related risks



Source: NGFS (2019b).

Lancesseur and Moussavi (2021) estimate the financial impact of climate risk on sovereign bonds using scenario analysis. They argue that while physical risks could start to affect sovereign bond returns as early as 2030 (followed by transition risks a few years later), by 2050 the projected declines in returns would be globally comparable in both the "hothouse world" and the "disorderly transition" scenarios. According to the authors, advanced economies seem to be the ones most exposed to the risks of a disorderly transition. Additionally, the number of defaulting economies is higher under the "hothouse world" scenario. They also evaluate that up to 10 economies could experience episodes of financial stress.

Further methodological challenges include determining how to incorporate climate-related risks into portfolio construction, as well as selecting metrics that best match investment and portfolio optimisation objectives.

As described in NGFS (2019a), one approach for portfolio formation using an extra-financial objective is selecting assets using climate-based screening criteria. For example, portfolio managers can exclude issuers that have lower sustainability metrics. Applying screening approaches may be challenging for portfolios with a small number of issuers, which is often the case for reserve portfolios. It is possible that this type of screening may affect the risk-return profile negatively by reducing diversification benefits (NGFS (2019a)). On the other hand, Fender et al (2020) find that adding green bonds may potentially improve the risk-adjusted returns of sovereign bond portfolios. While true in terms of diversification, the current global green bond market of eligible assets is only a small portion of the total bond issuance, rendering this technique not fully scalable for reserve portfolios. This is also a challenge, as demand for green bonds has risen globally and it is hard to get them in the secondary market (many buyers hold them until maturity). In practice, this means that the proportion of green bonds in many reserve portfolios is not significant.

Screening approaches usually rely on metrics that rate issuers based on sustainability, such as ESG scores, carbon footprint or implied temperature rise. ESG scores measure the long-term readiness of an entity to face disruptions associated with ESG risks. Usually, ESG scores combine geographic and industry metrics, as well as the firm's disclosure about its governance, strategy and risk management of climate- and social-related risks.

The carbon footprint metric is a backward-looking measure of climate impact based on past carbon emissions, on the assumption that entities that have emitted more carbon in the past will also face higher losses during the transition to a lower carbon economy. Carbon footprint metrics are appealing owing to their simplicity and the intuitive relationship between carbon emissions and climate change.

Implied temperature rise is a forward-looking measure of climate impact based on the output of a climate model. In particular, the implied temperature rise associated with a portfolio evaluates to what extent the portfolio is aligned with the Paris Agreement and the commitment to keep global temperature rise well below 2°C (with efforts for a temperature increase of no more than 1.5°C) above pre-industrial levels.[8]

Main takeaways from this section:

Some of the main methodological challenges are:

- There are significant uncertainties in modelling climate factors (physical and transition risks) and mapping these factors to portfolio risk and return characteristics.
- The relative short horizons usually considered for mean-variance optimisation approaches pose a challenge to adequately capturing tail risks from extreme climate events (large impact and low frequency).
- Scenario analysis and stress testing may be useful tools for reserve managers. But they are data-intensive, require a wide range of assumptions and are complex to implement.

D. Data challenges for climate-related international reserve management

Implementation of climate-related reserve management approaches requires comprehensive, accurate and timely data. This section discusses data requirements and challenges with currently available data.

The optimisation approaches that some reserve managers use to balance risk and return require asset-level data, including yields, returns and volatilities. In addition, data on credit ratings, turnover and bid-ask spreads are needed for the safety and liquidity objectives. This type of data is widely available.

However, to incorporate a financial climate-related objective, additional data are needed on asset sensitivities to climate factors including physical and transition risk. Credit ratings that incorporate default risk due to ESG factors are currently the main type of available data that link climate to financial risk, and do so only from the credit risk perspective. Metrics that connect climate risk to market risk or liquidity risk do not appear to be widely available.

In addition, some credit rating agencies have created specific metrics to measure how important each ESG factor is in the resulting credit rating of an entity.[9] ESG factors that affect the creditworthiness of an issuer directly are also called ESG credit factors (S&P Global Ratings (2021)), which are intersections of ESG factors and credit factors.

Several research papers have examined relationships between climate risk and sovereign ratings and find that ratings incorporate climate risks to some extent. For example, Çevik and Jalles (2020) use the climate change vulnerability and resilience evaluation of the Notre Dame Global Adaptation Institute index to assess the relationship between climate-related physical risks and credit ratings. They found that, while climate change vulnerability affects ratings of developing countries, it has no significant impact on those of advanced economies. Climate change resilience, by contrast, is found to have a statistically significant

[8] Implied temperature metrics are calculated by estimating the global temperature rise associated with the expected future emissions of a selected entity by assuming that all other entities follow the same ambition.

[9] The Statement on ESG in credit risk and ratings of the PRI's ESG in Credit Risk and Ratings Initiative recommends that investors should consider the potential financial materiality of ESG factors in a strategic and systematic way.

positive effect on sovereign credit ratings in both advanced and emerging market economies. That said, the magnitude of this effect is almost three times greater in emerging markets than in advanced economies.

Gratcheva et al (2022) study the relationship between sovereign ESG scores and sovereign credit ratings. They find different patterns across country income groups. Sovereign ESG scores and sovereign credit ratings are highly correlated for high-income countries. But there is no clear relationship between the two for low-income countries. They also assess sovereign credit ratings with sustainability considerations. They find that sovereign credit ratings generally do not reflect the natural capital portion of a country's wealth, and are not necessarily correlated with a country's transition risk exposure, but are correlated with resilience scores for high-income countries.

Central banks aiming to manage the climate-related risks of the international reserve portfolio may use carbon footprint metrics, implied temperature rise or ESG scores, despite the existing challenges related to these three metrics.

Carbon footprint metrics for sovereign bonds rely on countries' historical carbon emissions.[10] They can be calculated by multiplying the relative allocations of international reserves to a particular country by its carbon emissions data, perhaps standardised by GDP or population. Carbon footprint measures are relatively simple to implement. However, historical carbon emissions may not adequately capture the current exposure of an entity or a country to transition risks (eg by not accounting for future adaptation policy and measures).

Country-level carbon emission is a commonly used metric to assess climate-related sovereign risk. In particular, the weighted average carbon intensity (WACI) of a country is calculated as the product of its portfolio weight and carbon emissions, normalised by either GDP or population. Normalising by GDP emphasises output efficiency and a commitment to meet an emissions target. Normalising by population focuses on the emissions per capita, which considers that transition risks could have a higher impact in countries with higher emissions and a lower population. The normalisation procedure raises questions about which would be the best approach to calculate the portfolio carbon intensity.

There are challenges as there are some inconsistencies in carbon emission data. According to NGFS (2021b), some studies have warned about incomplete, inaccurate or missing data in corporate disclosure of carbon emissions.

There are many methodologies to measure implied temperature rise of a portfolio (Raynaud et al (2020) and Emin et al (2021)). The metric may be calculated by data providers or by using publicly available data on implicit temperature changes associated with individual countries. The results from these calculations can then be used to compute a weighted average temperature of the portfolio. While intuitive to understand, the complexity in the methodologies and the inherent uncertainty present significant challenges for investors to implement and compare these measures.

ESG scores are a third source of data. Data providers use different methodologies to generate a score that allows the construction of an ESG ranking of issuers. A significant challenge in using ESG scores is the lack of consistency among distinct ESG scores by different providers. For example, Annex I presents a comprehensive ESG score analysis with a focus on the environment pillar. It shows how wide the dispersion of ESG scores for the same issuer can be across multiple data providers. Therefore, reserve managers may need to further understand ESG score construction (and green bond certification) to ensure alignment with their sustainability objectives.

[10] The scope of a country's emissions can be measured using various approaches. A common one is to use territorial emissions (eg emissions embedded in domestic production). Alternatively, various adjustments to account for trade can be applied, eg by considering "consumption-based" emissions, which consider emissions embedded in domestic consumption and imported goods and services.

The table below is a non-exhaustive list of examples of data and possible providers. The list can be used as a starting point for evaluating metrics and their usage in climate-related risk management frameworks for international reserves.

Table 1 – Examples of data and sources for climate-related risk management

Data	Source	Link
Carbon emissions	International Energy Agency	www.iea.org/data-and-statistics/data-browser/?country=WORLD&fuel=CO2%20emissions&indicator=CO2BySource
	Worldometer	www.worldometers.info/co2-emissions/co2-emissions- by-country/
	European Commission (EDGAR)	edgar.jrc.ec.europa.eu/report_2021
Energy supply	International Energy Agency	www.iea.org/data-and-statistics/data-browser/?country=WORLD&fuel=Energy%20supply&indicator=TESbySource
ESG scores	Sustainalytics	www.sustainalytics.com/esg-ratings
	MSCI	www.msci.com/our-solutions/esg-investing/esg-ratings
Credit ratings	S&P Global	www.spglobal.com/ratings/en/
	Fitch	www.fitchsolutions.com/
	Moody's	esg.moodys.io/
Climate adaptation	University of Notre Dame	gain.nd.edu/
Implied temperature	Climate Action Tracker	climateactiontracker.org/global/temperatures/
	MSCI	www.msci.com/our-solutions/climate-investing/net- zero-solutions/implied-temperature-rise
Green bonds	Climate Bond Initiative	www.climatebonds.net/

Main takeaways from this section:

Some of the main data challenges are:

- Credit ratings that incorporate ESG factors are currently the main type of available data that directly link climate to financial risk.
- Reserve managers aiming to manage the portfolio climate-related risks may use carbon footprint metrics, implied temperature rise or ESG scores. There is a lack of consistency among distinct ESG scores by different providers and challenges in constructing other relevant climate-risk metrics.
- There are data gaps across risk factors, regions and industries. For instance, gaps are observed in Scope 3 emissions data and in the granularity of geographical and issuer-specific data.[11]

[11] See NGFS (2021b).

E. Disclosure of climate-related risks

This section discusses principles for climate-related risk disclosures and provides some examples of disclosures.

The Task Force on Climate-related Financial Disclosures (TCFD) presented a set of recommendations that central banks can use for disclosing international reserves exposure to climate-related risks (TCFD (2017)).[12] The TCFD recommends disclosure of information on governance, strategy, risk management, metrics and targets. A significant number of organisations, including the NGFS, have pledged support to the TCFD recommendations.

One important issue related to ESG disclosure is whether to publish a specific ESG report or to simply include ESG information in existing reports. World Economic Forum (2020) recommends that institutions disclose ESG information following four distinct pillars: Principles of Governance, Planet, People and Prosperity. Recommendations from the TCFD are part of the Planet pillar.

Central banks that intend to adopt TCFD recommendations should also consider what type of information to include in their reporting. For example, they may consider whether to focus on climate-related risks or instead adopt a broader approach and address other ESG risks as well. Furthermore, information may focus only on financial disclosures or also consider different ESG aspects across all business lines (regulation, supervision, monetary policy etc).

The Bank of France, Bank of England and Central Bank of Brazil (BCB), for instance, have launched their reports on climate-related financial disclosure using different approaches:

- The Bank of France reports climate-related risks of its own funds portfolio and pension fund portfolio.
- The Bank of England reports information about climate-related risks of the asset purchase facility, the pension fund portfolio, its own fund holdings and its physical operations.
- The Central Bank of Brazil reports climate-related risks associated with the international reserve investments.[13]

These three central banks refer to the TCFD framework for disclosure by presenting different sets of metrics, including data related to carbon emissions and other ESG-related considerations. The presentation of different metrics reflects the above-mentioned fact that data, metrics and methodologies are still evolving, and these central banks contribute to this development by disclosing a range of information based on tools that are currently available. Additionally, some central banks may be adding climate disclosures to demonstrate to the public that they are aware of their exposures to climate-related risks and enhance transparency by disclosing their risk management approaches. Box 1 shows some details from the Central Bank of Brazil *Report on social, environment and climate-related risks and opportunities*, released in September 2021 and available on the BCB's website.

[12] NGFS (2021c) also provides guidance on climate-related disclosure.

[13] See BCB (2021), Bank of England (2021) and Bank of France (2021).

Box 1 – Climate-related risk management approach for Brazilian international reserves, Central Bank of Brazil

The BCB's mission is to ensure the stability of the currency's purchasing power; to foster a sound, efficient and competitive financial system; and to promote the economic well-being of society. The BCB is committed to gradually including ESG principles and variables in all its decision-making processes, regardless of their complexity. Socio-environmental responsibility is among the BCB's values, and sustainability is one of the BCB's strategic objectives for 2020–23.

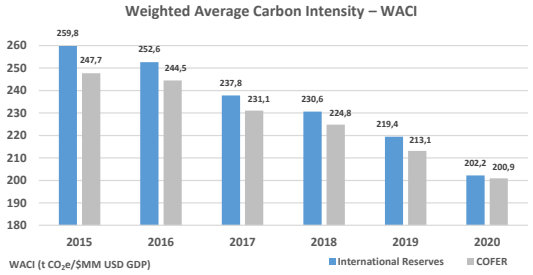
The ESG approach to portfolio management is aligned with the BCB mandate and the main pillars of BCB's investment strategy: safety, liquidity and profitability. In its *Report on social, environmental and climate-related risks and opportunities*, launched in 2021, the BCB disclosed its ESG approach using the framework of the World Economic Forum and the TCFD recommendations. For the international reserve portfolio, the information disclosed according to the TCFD is summarised below.

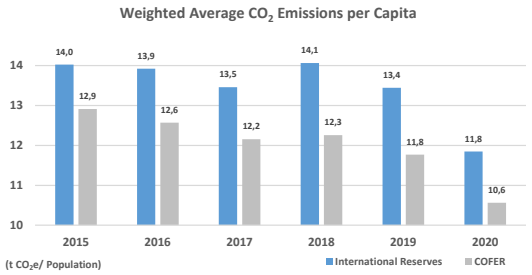
Governance: It is up to the Board of Directors, acting as the BCB's Governance, Risks and Controls Committee (GRC), to establish the strategic objectives and the risk and return profile of the country's international reserves. Among the strategic allocation criteria, parameters related to environmental and climate risks are gradually being introduced in the decision-making process.

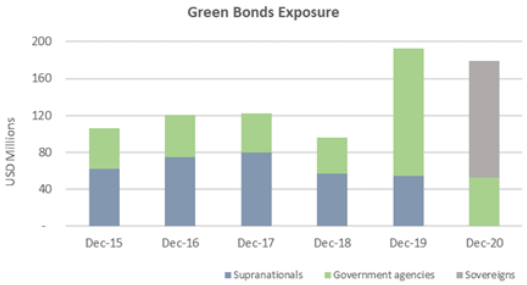
Strategy: There are still no consolidated methodologies and metrics in the literature and in the international market as the best practices for climate risk assessment to building investment portfolios. On the other hand, an effort is under way for investors and institutions to monitor and disclosure the climate risks of their financial positions based on existing standards, in order to contribute to building a consensus on the best form of measurement. Optimisation exercises for a strategic allocation of international reserves consider various asset classes, including those associated with green bonds.

Risk management: The different risks taken in the investment of the international reserves are monitored daily by the BCB. Besides financial risks such as market, credit and liquidity risks, the records of operational incidents are also monitored as well as metrics associated with greenhouse gas emissions that are constructed based on CO_2 equivalent emissions (CO_2e).

Metrics: The academic literature still does not offer a single metric for evaluating the investments of the international reserves in terms of sustainability. Thus, given the absence of a consensus and aiming to increase transparency and contribute to the discussion on the topic, this report uses alternative measurements in an exploratory way.







Sources: International Energy Agency, International Monetary Fund, Central Bank of Brazil

Main takeaways from this section

- Disclosure provides transparency of international reserves' climate-related risks.
- Concerns about comparability and standardisation coexist with flexible formats of disclosure.
- By disclosing their climate-related risks, some central banks are already contributing to the development of best practices and the harmonisation of approaches.

F. Key findings and next steps

The incorporation of climate-related risks into reserve management is still in its early stages. This report explores methodological and data challenges for implementation with the intention of inspiring additional work on solutions.

Motivated by the Task Force on Climate-related Financial Disclosures (TCFD), some central banks are already disclosing or planning to disclose information on climate-related risks faced by their international reserve portfolios. In doing so, they contribute to the global discussions on how to assess and manage climate-related risks, accelerate the development of methodological standards and improve transparency on climate-related risk management practices.

As a next step, the task force recommends continuing collaboration between central banks to advance practices for climate-related reserve management.

References

Bank of England (2021): *The Bank of England's climate-related financial disclosure 2021*.

Bank of France (2021): *Rapport d'investissement responsible 2020*.

Basel Committee on Banking Supervision (2021a): *Climate-related risk drivers and their transmission channels*.

——— (2021b): *Climate-related financial risks – measurement methodologies*.

Bolton, P, M Despres, L Pereira Da Silva, L Samama and R Svartzman (2020): *The green swan – central banking and financial stability in the age of climate change*, BIS.

Central Bank of Brazil (2021): *Report on social, environmental and climate-related risks and opportunities*, v. 1.

Çevik, S and J Jalles (2020): "Feeling the heat: climate shocks and credit ratings", *IMF Working Paper*, WP/20/286.

Emin, G, N Lancesseur, N Emeric and L Clements (2021): "How to measure the temperature of sovereign assets", FTSE Russel.

European Central Bank (2004): *Risk management for central bank foreign reserves*.

Fender, I, M McMorrow, V Sahakyan and O Zulaica (2020): "Reserve management and sustainability: the case for green bonds?", *BIS Working Papers*, no 849.

Gratcheva, E, B Gurhy, A Skarnulis, F Stewart and D Wang (2022): *Credit worthy: ESG factors and sovereign credit ratings*, World Bank.

Lancesseur, N and J Moussavi (2021): "Anticipating the climate change risks for sovereign bonds", FTSE Russel.

NGFS (2019a): *A sustainable and responsible investment guide for central banks' portfolio management*.

——— (2019b): *A call for action – Climate change as a source of financial risk. Network for Greening the Financial System, First comprehensive report*.

——— (2020a): *Charter of the Central Banks and Supervisors Network for Greening the Financial System*.

——— (2020b): *Progress report on the implementation of sustainable and responsible investment practices in central banks' portfolio management*.

——— (2021a): *A progress report on global supervisory and central bank climate scenario exercises*.

——— (2021b): *Progress report on bridging data gaps*.

——— (2021c): *Guide on climate-related disclosure for central banks*.

Raynaud, J, S Voisin, P Tankov, A Hilke and A Pauthier (2020): The alignment cookbook – A technical review of methodologies assessing a portfolio's alignment with low-carbon trajectories or temperature goal, Institut Louis Bachelier.

Smith, P (2021): *The climate risk landscape: a comprehensive overview of climate risk assessment methodologies*, UNEP FI.

S&P Global Ratings (2021): *ESG credit factors – A deeper dive*.

Task Force on Climate-related Financial Disclosures (TCFD) (2017): *Recommendations of the Task Force on Climate-related Financial Disclosures*.

World Economic Forum (2020): *Measuring stakeholder capitalism: towards common metrics and consistent reporting of sustainable value creation*.

Annex I – ESG rating analysis – A practical example with a focus on the E pillar*

Antonieta Campa Rojas (Bank of Mexico)

*** The views and opinions expressed in this box are those of the author and do not necessarily represent official policy or position of the Bank of Mexico**.

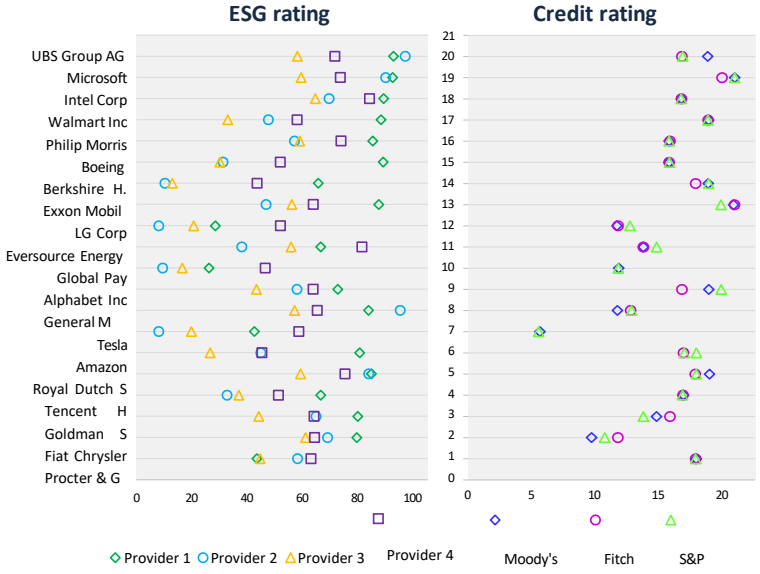
Globally, there are currently multiple providers of ESG data and ratings in the market, each of which uses a proprietary methodology to capture data and determine ESG ratings. The wide availability of ESG data and ratings is an opportunity for different types of investors to access information on those aspects that they consider most relevant. However, as shown in Table A1, the significant variability in the number of key indicators considered by each provider, together with a lack of clarity on the details on how they are incorporated into methodologies, may pose challenges for investors wanting to derive conclusions from ESG ratings and compare them across issuers operating on different sectors and geographies.

Table A1. Some examples on the diversity in ESG rating methodologies

Provider (# of key factors)	Provider 1 (34)	Provider 2 (178)	Provider 3 (>300)	Provider 4 (>120)
E (Environmental)	• Climate change • Natural capital • Pollution and waste • Environmental opportunities	• Resource use • Emissions • Innovation	• Biodiversity • Climate change • Pollution and resources • Water withdrawal	• Carbon emission • Climate change • Pollution • Water withdrawal
S (Social)	• Human capital • Product liability • Shareholders' disagreement • Social opportunities	• Workforce • Human rights • Community • Responsible product	• Workforce • Human rights • Health and safety	• Supply chain • Diversity • Human rights • Community impact
G (Governance)	• Corporate governance • Corporate behaviour	• Management • Investors • Social responsibility strategy	• Risk management • Corporate governance • Corruption and bribery	• Executive compensation • Board diversity and structure • Shareholders' rights

While most of the ESG rating providers consider information from publicly available sources, several international studies have revealed that ESG scores can vary greatly from one ESG provider to another. These results contrast with the case of credit ratings, where the assessment of one credit rating agency tends to be within one notch of the other agencies' ratings (Figure A1).

Figure A1. Comparison of ESG ratings and credit ratings for some issuers



Source: OECD (2019). ESG Investing. Practices, progress and challenges

The variability in ESG ratings from different providers may be linked to different factors, including:

a. *Diverse data sources and collection process:* ESG rating agencies retrieve information from companies' annual reports, sustainability reports, surveys, interviews, web pages and other sources of information. Whereas several international standards to guide companies on what constitutes material ESG information have been launched, the information available from many issuers is not yet sufficiently standardised.

b. *Variability in the key indicators considered:* Different ESG providers include diverse aspects and indicators evaluated according to their own methodology. Even when the same factor is being evaluated, providers may choose different quantitative or qualitative indicators to assess it, as shown in the following table.

Table A2. Example of indicators for board diversity/equality

Indicator	Female members on board	# of female members in board	% of female members in Board	Equal salary for female members in board
Scale	Yes/No	0-all	0–100%	% difference

c. *Proprietary methodologies:* ESG providers design their own methodologies, and they often consider different measurement methods of similar variables and assign different weights to ESG factors.

From an investment and risk management perspective, these results highlight the importance of the choice of an ESG rating provider for the construction of investment portfolios with ESG considerations. The results of our empirical analysis[14] on ESG ratings and their drivers, particularly for the E pillar, are consistent with international research on this subject, and can be summarised in the following considerations:

1) *An ESG rating should not be confused with an environmental rating*. Indeed, analytically, an ESG rating is a weighted average of the scores for each of the three pillars: $\mathrm{ESG} = w_1\mathrm{E} + w_2\mathrm{S} + w_3\mathrm{G}$. Our empirical analysis of the weights assigned by two providers to the E pillar showed that the average weight w_1 of E was 20% for Provider 1 and around 30% for Provider 2, subject to large variations (weights range from 0 to 60%) depending on the industry of the issuer. Thus, high/low ESG ratings do not necessarily correspond to the environmental pillar score of an issuer.

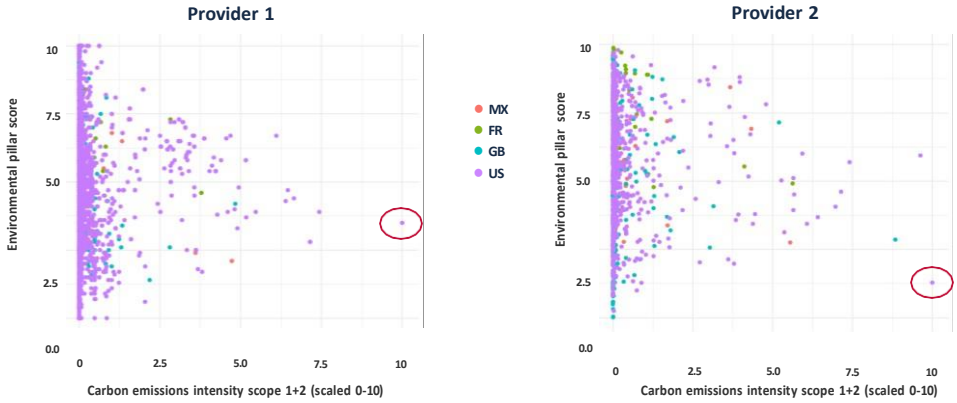
2) *Looking at E scores (when available) does not solve the issue of rating variability among providers.* Our analysis shows that only 29% of issuers hold an E score in the same range from two different providers. There is a large dispersion between environmental pillar scores from any two different providers; on a scale of 0 to 10, the average E score is close to 5 for Provider 1 and around 2.2 for Provider 2, and the distribution of the latter is clearly skewed towards lower scores. This might be explained by the fact that the E score (like each of the three pillar scores) is a weighted average of the topics that comprise it, and each of the topics considers different key factors and weightings for each of them, depending on the providers' perspective.

3) *Current carbon emissions are not, in general, the main driver of environmental scores.* Building an investment portfolio considering issuers with high E scores does not necessarily translate into a portfolio with lower CO_2 emissions. Our analysis revealed a wide dispersion on E scores when

14 Our analysis considered two providers and 5,056 issuers (covered by both providers) in four countries: the United States, the United Kingdom, France and Mexico. The distribution of issuers in our analysis by country is as follows: 88% are located in the United States, 8% in the United Kingdom, 3% in France and 1% in Mexico.

compared with carbon emissions, especially for those issuers with relatively low carbon emissions. This was also the case when considering carbon intensity,[15] though for issuers higher on the scale in terms of carbon intensity there seemed to be a tendency towards lower E ratings as their carbon intensity increased. Still, some of these large CO_2 intensity issuers showed a higher E score as compared with some issuers ranging lower in the carbon intensity scale.

Figure A2. Carbon emissions intensity compared with environmental pillar score



4) *Not all ESG rating providers use the same rating scale.* Careful analysis of methodological documents is recommended prior to defining policies that cut off issuers below a certain ESG rating level. This is particularly relevant when considering external asset managers or entities that will verify compliance of investment policies, so that a particular ESG provider can be agreed upon as primary data source, or so that mappings between different providers' scales can be determined ex ante.

A final consideration is that it may be worthwhile to reflect on the role of credit ratings for the purposes of assessing ESG behaviour of issuers. Credit rating agencies have increased their transparency on how ESG factors deemed relevant and material for the issuer's credit profile are being integrated into their credit rating assessments. This usually includes an ESG classification nomenclature/system for each of the three pillars, including aspects similar to the ones used by the ESG scoring providers (as shown in Table A1).

Nevertheless, integrating ESG factors in credit ratings is fundamentally different from providing ESG ratings. In practice, this means that entities with strong creditworthiness do not necessarily have strong environmental or climate characteristics; conversely, it is possible for entities which are engaged in green activities, such as renewable energy projects, to have a poor credit profile.

15 Carbon intensity reflects an issuer's scope 1 + scope 2 greenhouse gas emissions normalised by its sales in millions of US dollars, therefore adjusting for the size of companies.

Annex II – Task Force members

Central Bank of Brazil	Isabela Ribeiro Damaso Maia (Chair) Head of the Corporate Risks and Benchmarks Department
	Antonio Francisco de A da Silva Junior Head of the Financial Risk Division
	Douglas Pereira Financial Risk Management Advisor
Bank of Canada	Marc Larson Director, Financial Risk Office
	Craig Logan Principal Analyst
Central Bank of Chile	Christian Ferrada Head of Financial Risk Department
Central Bank of Colombia	Diego Rodriguez Financial Risk Management Director
Bank of Mexico	Antonieta Campa Risk Manager, Risk Strategy and Project Management Division
	Ana Laura Gutiérrez Member of the risk unit
	Hector Reséndiz Member of the risk unit
Central Reserve Bank of Peru	Zarella López Suarez ESG investments for the central bank's portfolio
	Marco Salazar Senior Portfolio Manager
Federal Reserve Bank of New York	Li He Portfolio Risk and Valuation Team
Bank for International Settlements	Jeta Limani Risk analyst
	Jessica Phalafala Risk analyst