



Sustainability and Climate Risk Data: A New Era for Investment Decision-Making in the Age of Climate Change

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Abstract

As economic actors face increasing pressure to be socially responsible and environmentally conscious, investors look beyond traditional financial metrics and seek data to support their decision-making. Measuring and reporting sustainability and climate risks is a relatively new discipline with several interrelations to economic, financial, risk management, and other cognitive study areas such as climate sciences, and have come a long way in the last couple of years. We are in the middle of the evolutionary process, as data availability and coverage are much better than a decade ago. However, there is still a lot to do until the new metrics and indicators are fully embedded in risk management frameworks and decision-making processes, similar to traditional risk measures. In our essay, we will explore the role of third-party data vendors for sustainability, ESG, and climate risk-related information, their importance in the modern investing world, and review the major challenges. We give an insight into the evolution of the market of data vendors and also the regulatory landscape. Finally, we explore the unique roles of central banks and their challenges in implementing actions in sustainability.

Keywords

climate risk data, ESG data vendors, carbon emissions, sustainability

1. Introduction

It is no doubt anymore that climate change is one of the most significant challenges of our times. Even to an ordinary person not working in the field of climate sciences, it is now getting clearer and clearer that extreme weather events are growing, with increasingly severe consequences on the economy, value chains, and the entire society. In addition, it is enough to think about air pollution in big cities, plastic pollution, oil spills, biodegradation, and deforestation to understand that the environment around us is seriously deteriorating, which makes our economic systems unsustainable.

Due to the increased pressure from the public to mitigate the consequences of climate change, politics and regulations are also changing. For example, 196 countries signed the Paris Agreement in 2015, intending to limit the warming of the global average temperature to 1.5 °C above pre-industrial levels. Later, the European Green Deal was announced in 2019 to achieve carbon neutrality by 2050, with an interim goal of reducing greenhouse gas (GHG) emissions by 40% by 2030 compared to 1990.

The targets are ambitious, and tremendous financial investment must be channelled into the green transformation to achieve them. That is why the financial system and its regulators will play an essential role. Consequently, the world of investing is also changing, and today, ESG (Environmental, Social, Governance) factors – among which environment, more specifically climate-related risks – are coming to the forefront of investors' minds (*Bokor, 2022*). One exciting piece of evidence, for example, is that the interest in web searches on ESG has been consistently growing (*Figure 1*).

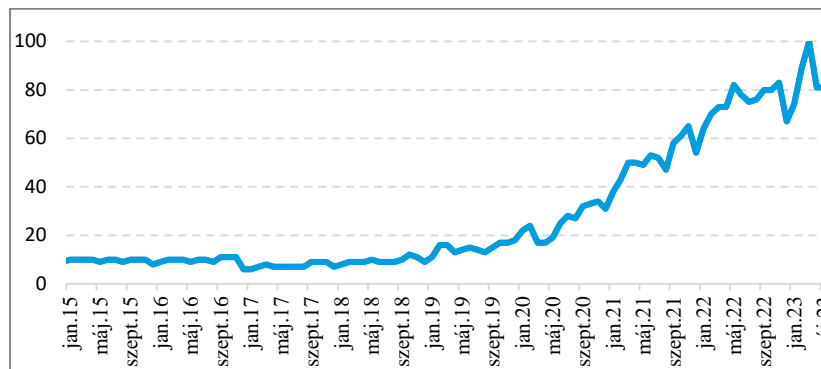


Figure 1: Google search trends for ESG
(source: Google Trends - <https://trends.google.com/home>)

It is also a good indication of the importance of the topic that more and more investors declare some dedication to sustainability goals. For example, the signatories to the United Nations’ Principles of Responsible Investment (UN PRI) reached the level of 4000, representing more than \$120 trillion in Assets under Management (Figure 2):

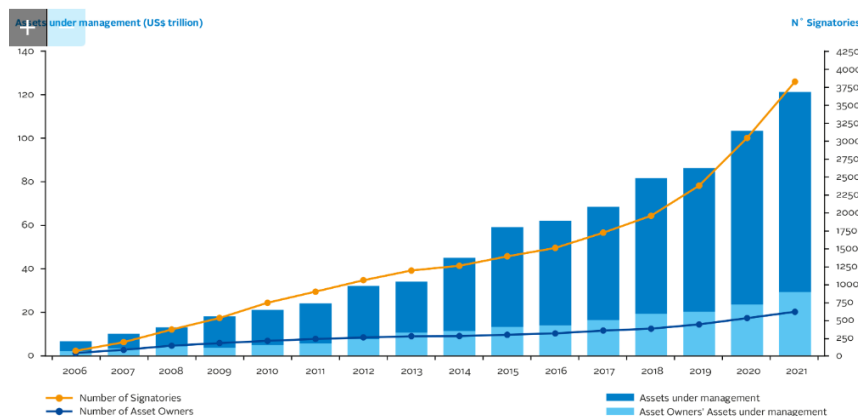


Figure 2: Number of signatories and Assets under Management to United Nations Principles for Responsible Investment
(source: <https://www.unpri.org/annual-report-2021/how-we-work/building-our-effectiveness/enhance-our-global-footprint>)

However, although sustainability topics are popular and driven higher up on the agenda, serious obstacles exist when implementing practical investment strategies dedicated to supporting the green transition. This article is about sustainable climate risk management. We hypothesise that a new era is yet to come for investment decision-making. Considerable change will appear due to climate change, where the bank sector has an important role.

2. Importance of Robust and Reliable Data

In market-based economies, businesses need to be transparent to allocate resources effectively. In the past, transparency mostly meant that investors demanded companies to be open about risk and rewards and to present how investments can be turned into cash (Kolozsi *et al.*, 2022). Climate change’s impact varies in degree and manner affecting every economic player. As the issue of sustainability gains more prominence, economic actors are increasingly expected to demonstrate their commitment to sustainable practices. Investors want to evaluate business sustainability and seek ways to incorporate such factors into risk models, return expectations, and prices of financial products.

“There may be unique recipes and different solutions for a green transition, but it is beyond dispute that green transformation will not happen without measurement” (MNB, 2022a). To accurately identify and assess climate-related risks, it is essential to have access to reliable, well-organised input data, among others, the following:



- **Emissions data:** greenhouse gas (GHG) emissions, carbon footprint, and other pollutant emissions from the company's operations and supply chain.
- **Energy usage data:** energy consumption across the company's operations, including electricity, heat, and transportation fuels.
- **Water usage data:** the amount of water the company uses in its operations and the quality and availability of water resources at its locations.
- **Social impact data:** the company's labour practices, human rights violations, stakeholder engagement, and community impact
- **Financial data:** the company's revenues and expenditures, e.g., the share of "green" CAPEX or revenues from "brown" activities.
- **Climate-related financial risk data:** potential financial impacts of climate-related risks such as extreme weather events, changes in government regulations, and physical risks to assets.
- **Supply chain data:** the environmental and social impacts of the company's suppliers, including their emissions, energy usage, and labour practices.
- **Environmental impact data:** the company's impact on ecosystems and biodiversity, such as deforestation, pollution, and waste generation.
- **Climate scenario analysis** involves modelling the potential impacts of different climate scenarios on the company's operations and financial performance.

Overall, a thorough analysis of corporate sustainability and climate risk exposure requires inputs from multiple sources, including the company's operations, supply chain partners, and the broader environmental and social context in which it operates. It is essential to see that investors are interested not just in backwards-looking data (e.g., historical data on emissions), as it does not give a complete picture of entities' sustainable practices. Therefore, forward-looking analysis techniques are also necessary.

In most cases, investors usually do not have the resources (time, expertise, etc.) to collect and synthesise data and develop models and methodologies for all the companies and financial variables around the globe. That is why they usually "outsource" the related processes and tasks, i.e., they rely on the services of third-party data vendors and rating agencies. The market of service providers in the "classic" economic areas is well established, with vendors covering a broad set of services, data (e.g., Bloomberg, Reuters), and some specialists. Data and modelling also have a long history. For example, traditional credit rating agencies already have approximately a hundred years of history.

3. The Emergence and Evolution of the Vendors' Market

Measuring and reporting climate and sustainability risks constitute a relatively new discipline that has come a long way in recent years. About ten years ago, such topics were not the focus of the investor community. However, in the middle of the last decade, with the ramp-up of green bonds (bonds that aim to support climate-specific, sustainability-related special environmental projects), a new market emerged, as the increasing demand for information by investors and policymakers is driving growth in the market of sustainability/ESG/climate risk data vendors.

In many instances, dozens of players in the market operate in a complex ecosystem (*Figure 3*), with interrelated services and relations to each other. Different vendors provide diverse products and services, from raw data and reports covering multiple ESG aspects to highly advanced analytical platforms. Their focal points include stock screening, competitive benchmarking, portfolio construction and analysis, risk management, evaluating green bond frameworks, drafting second-party opinions, conducting scenario and controversy analysis, and offering ratings and rankings.

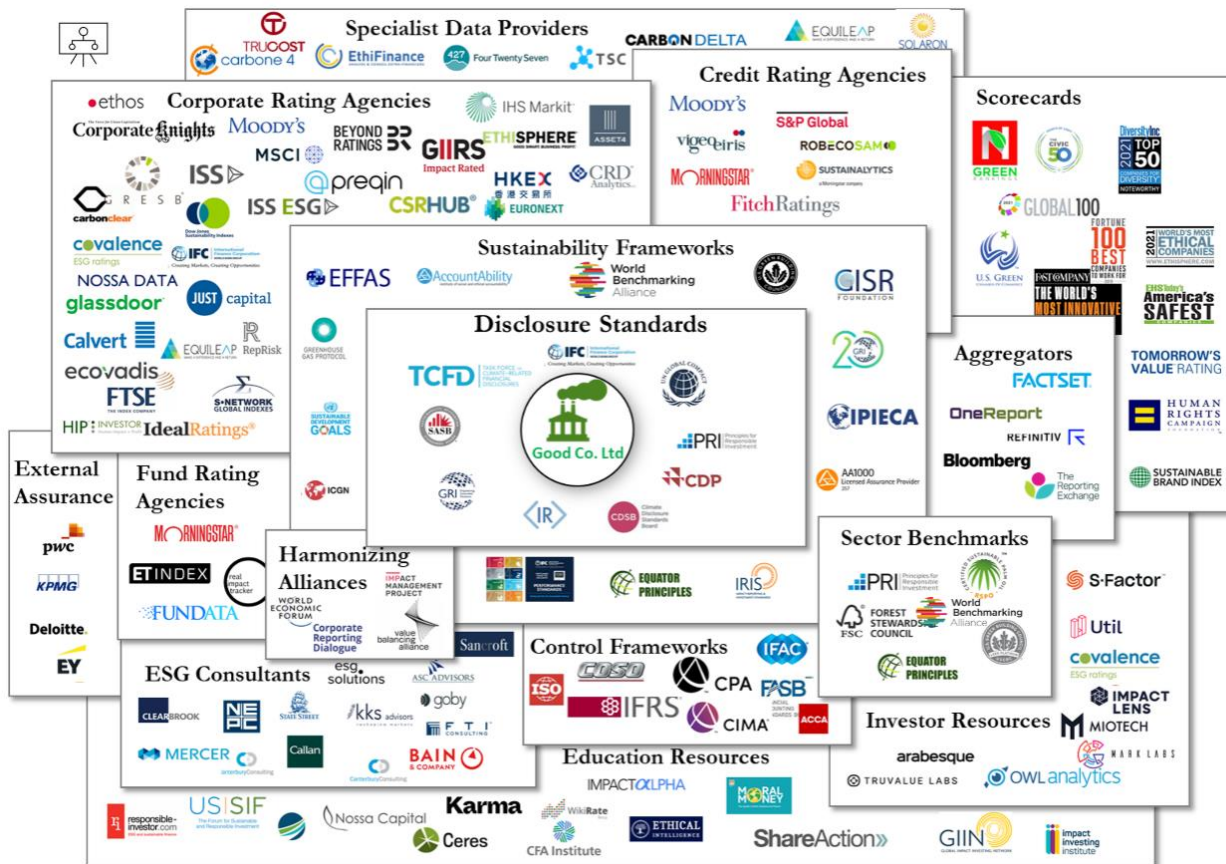


Figure 3: Most important players in the ESG ecosystem
(source: <https://www.tsc.ai/the-esg-playbook>)

Despite the difficulty in overviewing the ecosystem's structure, the players can be classified into four main, simpler categories. (Mittal et al., 2022).

- 1) **Data providers with a global focus:** wide coverage in terms of geography, asset classes, and metrics (e.g., MSCI, SnP, Fitch, ISS).
- 2) **Classic market data vendors:** providers of financial market data, enhanced with ESG/climate risk as one of the offerings (e.g., Bloomberg, Refinitiv).
- 3) **Specialists:** vendors focusing on a specific topic (e.g., on climate risk only: Carbon 4 Finance, green bonds: FGM).
- 4) **Platform providers:** data and tech companies offering platforms, often using third-party input data (e.g., State Street).

3.1 Forces affecting the vendors' market

To understand the current events and put the trends into context, first, we assess the market state using Porter's Five Forces framework (Mähner, 2021). Investors can differentiate between data and analytics vendors by considering various factors such as their market coverage, quantity and quality of indicators and metrics, and methodology. However, due to the diversity of solutions and general uncertainties around the data and methodologies, trust and credibility play the most crucial role when selecting a third-party vendor. Building a reputation in this market requires specialised expertise, access to comprehensive data sources, and a track record of reliable and accurate assessments. That is why it is not by chance that the market is dominated by giant institutions like Moody's, MSCI, Fitch, Bloomberg, and S&P. Although



there are several start-ups and newcomers, entering into the “Class A” league is cumbersome due to the above-mentioned reasons. Hence, we consider the threat of new entrants relatively low (*Avetisyan and Hockerts, 2017*).

The bargaining power of buyers is mixed. Large global corporations, and multilateral institutions, have more bargaining power due to their ability to demand customised services or negotiate pricing. Large institutional investors can even develop in-house capabilities. However, smaller companies may have limited leverage, mainly if they heavily rely on ESG ratings to do their business.

The bargaining power of suppliers is relatively low. As mentioned above, the most significant providers are usually quite huge companies which can negotiate on their terms. Also, those which renowned rating agencies own can utilise the data collected or generated by the group. On the other hand, smaller ESG rating agencies have a weaker position when negotiating with their suppliers.

The threat of substitute services is relatively low. ESG ratings are highly specialised and distinct from other financial or non-financial assessments. While alternative approaches, such as self-assessment frameworks or industry-specific certifications, exist, they do not offer the same level of comprehensive evaluation as the big agencies.

As opposed to the views of *Avetisyan and Hockerts (2017)*, we believe that, despite the market being dominated by the big players, the competitive rivalry among them is fierce. They try to differentiate themselves from each other by using different methodologies and approaches and try to enhance credibility by increasing transparency in their methodologies. However, they face the challenge of protecting their intellectual property (*UNEP FI, 2022*). More prominent players have a clear advantage here because of their better efficiency of scale, better brand recognition, and longer-standing relationships with clients.

3.2 Consolidation as a major trend

A significant and reputable traditional rating agency often owns sustainability data vendors. However, this was not always the case. The present landscape results from mergers and acquisitions over the past few years (*Avetisyan and Hockerts, 2017*).

Many traditional rating agencies have decided to enter the market by acquisition. For example, S&P Global bought Trucost, a provider of environmental data and ESG analytics, in 2016 and acquired The Climate Service (TCS) and its integrated climate risk platform in 2022. Moody’s acquired Vigeo Eiris in 2019 and purchased RMS and Four Twenty-Seven, a data research firm focusing on physical risk analyses. Morningstar bought Sustainalytics in 2020, while Intercontinental Exchange acquired Urgentem in 2022. In addition, several partnerships were made. For example, BlackRock established cooperation with Rhodium Group, Quantis joined BCG, and recently, Moody’s and McKinsey announced cooperation in sustainability topics (*UNEP FI, 2022*).

Based on recent experiences, the industry consolidation may continue. Most smaller players will likely either be bought or merged with other big players. As the industry matures, cost efficiency will play a more significant and prominent role. If a smaller actor wants to stay independent, he must specialise.

3.3 Challenges

Investors are increasingly interested in sustainable investing; therefore, ESG has become an essential tool for evaluating businesses’ performance. To support investors in making sound decisions, input data must satisfy at least the following criteria:

1. **Accuracy** - Data should be precise and error-free.
2. **Relevance** - Data should be related to the specific needs of the user.
3. **Comprehensive** - The data collected must be complete and include all relevant information.
4. **Consistency** - Data should be consistent and comparable across different sources.
5. **Cost-effectiveness** - The cost of data collection and maintenance should be reasonable.

Despite the evolution in the market, climate risk and ESG data vendors face several challenges; there are critics associated with almost all of the above criteria.



A survey by *Blackrock (2021)* arrived at a similar finding. When looking at challenges integrating ESG risks, most of the interviewed banks marked data-related considerations as the main obstacles and the absence of standardised approaches and varied definitions of ESG risks (*Figure 4*). Another survey yielded a similar result: the institutional investors who responded stated that the main challenge to speeding ESG adoption for their company is the lack of reliable and consistent data (*Kumar et al., 2020*).



Figure 4: Challenges in the adaptation of ESG
(source: *Blackrock, 2021*)

Third-party data providers are quite divergent in their approaches, leading to high uncertainty when one is trying to figure out how to implement sustainable strategies. Given the above-mentioned challenges, it is not surprising that there is high pressure from investors for transparency on coverage, methodologies, and chosen metrics when choosing a third-party vendor (*Figure 5*):



Figure 5: The most important factors to consider when choosing vendors
(source: *UNEP FI, 2022*)

Investors already use a range of approaches when integrating sustainability and climate risks into their decision-making. One easy way is tilting the investment portfolio from brown companies to greens, i.e., excluding those with higher GHG emissions and replacing them with lower emitters. The effectiveness of these actions in promoting the transition to a sustainable economy depends on the reliability of the input data. While certain companies provide regular reports on their environmental data, this is not the case for all players; data vendors may provide estimated emission data with their proprietary models. The prevalent notion among investors is that estimated emissions can be a feasible alternative to reported data, indicating an underlying belief that data providers have effectively bridged the gap in data accessibility. Inaccurate data, however, represents a significant risk in various scenarios. Using GHG data that is not comprehensive or reliable can cause investors mistakenly identify brown companies as green companies and vice versa.



Also, there are similar concerns with ESG ratings that try to compress an assessment of the impact of environmental, social, and governance factors on a company into one figure. It is important to understand that a rating – similar to traditional credit ratings - never measures the risk levels perfectly (*Cantor and Packer, 1995*).

Several critics say, for example, that ESG ratings are difficult to understand as E, S, and G factors are not measuring interrelated risk factors (*Lopez et al., 2020; Jacobs and Levy, 2022*), and there is a limited correlation between ratings on the same issuer across various agencies. All these inconsistencies can lead to incorrect information being presented to investors. It is also a threat that some companies may intentionally manipulate their ESG data to present a more positive image. For example, a company may select only its most sustainable operations to report on while ignoring less flashy practices.

Even if ESG ratings are perfect both on a micro and a macro level under any scenario, an environmental disaster can still happen if models are flawed. Missing risk factors, inaccurate data, and inadequate risk weights can lead to misjudged risk assessments and decisions. This is especially crucial for missing risk components. In this case, a company trying to improve the ESG rating in good faith can quickly increase the environmental harm related to the ignored factor.

The risks above are even greater if investors are overreliant on the ESG ratings. We argue that although these indicators are very useful in understanding some aspects of environmental harm, they are imperfect in measuring all important dimensions of sustainability. If we consider these values as a perfect measure, it is conceivable that instead of reducing the risks, we will dramatically increase the ignored risks.

Similarities to traditional credit rating agencies can be our cautionary tale (*Harper, 2011*). The systemic risk in ESG ratings is that they could be subject to the same conflicts of interest and failures of oversight that plagued credit rating agencies in the lead-up to the 2007–2008 financial crisis. ESG rating agencies could become too reliant on fees from companies they are meant to evaluate objectively, which could compromise the integrity and accuracy of their ratings. Moreover, as more investors incorporate ESG factors into their decision-making, there is a risk that companies could engage in “greenwashing” by manipulating their ESG scores to look better on paper rather than making substantive changes in their practices (*de Freitas Netto et al., 2020*). These risks highlight the need for transparency, accountability, and due diligence in the ESG ratings industry.

It is important to highlight that when we give an overview of critics, we do not suggest that data providers or rating agencies are doing a bad job or are negligent in any manner, e.g., in collecting or estimating data. Instead, these services are the most accurate they can provide due to the limited access to information and general unavailability of data.

4. Overview of the Regulatory Landscape

To address the challenges mentioned previously, the regulatory landscape surrounding sustainability and ESG reporting is also rapidly evolving and becoming increasingly important in many countries worldwide. While certain countries have been quicker to adopt and implement regulations, others are catching up.

EU has been at the forefront of ESG regulation with initiatives such as the Sustainable Finance Disclosure Regulation (SFDR) and the Taxonomy Regulation. The SFDR requires financial market participants to disclose how they incorporate ESG risks and opportunities into their investment decision-making, while the Taxonomy Regulation provides a classification framework to help identify which economic activity shall be regarded as environmentally sustainable (*Figure 6*):

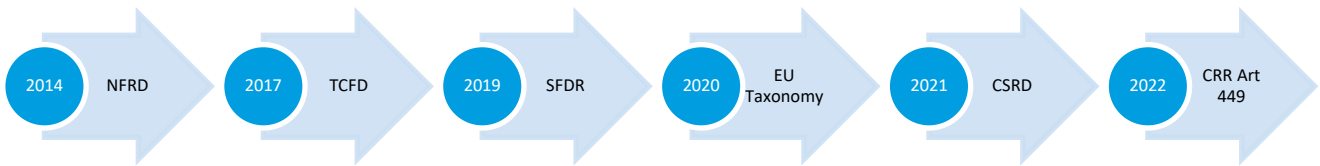


Figure 6: The most important milestones of policymaking affecting sustainability reporting

The new regulation, the Corporate Sustainability Reporting Directive (CSRD), addresses the flaws of the Non-Financial Reporting Directive (*NFRD, 2014*), which proved insufficient. CSRD introduces a more detailed reporting requirement on companies' impact on the environment, human rights, and social standards. All large corporates that are operating in the EU (both listed and non-listed) will be gradually subject to the reporting requirements. This will significantly add to the data availability and decrease greenwashing, as more than 50,000 companies are affected, as opposed to the 11,700 under the scope of the previous directive.

The European Banking Authority (EBA) released one of the most recent regulations in early 2022, reflecting on the banks' role as a credit provider to retail, SMEs (Small and medium sized enterprises), and corporate borrowers. It focuses on the banks' corporate and real estate lending to identify carbon-intensive sectors and borrowers. Banks and financial institutions are required starting in 2023, to disclose information to their stakeholders on how they identify, measure, manage, and monitor ESG risks and opportunities, with a special focus on climate-related risks such as physical and transition risks,

The new disclosure will provide information on ESG risk both in qualitative and quantitative terms. The first three tables give qualitative insight and transparency on how well the banks have incorporated ESG risks into their business strategies and governance structure, covering Environmental, Social, and Governance risks separately. The most important part is the ten sheets for quantitative disclosures, covering transition risks, specifically energy efficiency and carbon intensity of the loan books, physical risks, and mitigation actions. By 2024, Green Asset Ratio and total Scope 3 emissions must also be reported.

Table 1 - Qualitative information on Environmental risk
Table 2 - Qualitative information on Social risk
Table 3 - Qualitative information on Governance risk
Template 1: Banking book - Climate Change transition risk: Credit quality of exposures by sector, emissions and residual maturity
Template 2: Banking book - Climate change transition risk: Loans collateralised by immovable property - Energy efficiency of the collateral
Template 3: Banking book - Climate change transition risk: Alignment metrics
Template 4: Banking book - Climate change transition risk: Exposures to top 20 carbon-intensive firms
Template 5: Banking book - Climate change physical risk: Exposures subject to physical risk
Template 6. Summary of GAR KPIs
Template 7 - Mitigating actions: Assets for the calculation of GAR
Template 8 - GAR-(%)
Template 9 - Mitigating actions: BTAR
Template 10 - Other climate change mitigating actions that are not covered in the EU Taxonomy

Figure 7: Pillar 3 prudential disclosures on ESG risk - Article 449a CRR
(source: EBA, 2022)

Article 449a CRR represents important progress in ESG disclosure and aims to improve data availability, robustness, and comparability in a standardised way. However, there are still a couple of deficiencies (*Peacock and Marino, 2022*).

- (1) the disclosure provides a point-in-time assessment only
- (2) some part of the data will likely rely on estimates (there are already several third-party vendors providing dedicated solutions for banks for Pillar 3 reporting), and given the general difficulties of assessing such information (e.g., Scope 3



emissions), methodologies will likely differ between banks and as a consequence, it will be still challenging to compare the disclosed information, or at least there will be some degree of uncertainty.

- (3) it is still challenging to measure how lending, climate risk, and credit risk are related.
- (4) certain assets, such as the trading book, are excluded

We consider the new Pillar 3 disclosure requirement as a good starting point. We anticipate that investor attention will initially focus on the simpler indicators, e.g., exposures to the top 20 carbon-intensive firms and industry concentrations. We also expect that after a few reporting periods EBA will evaluate the received information and fine-tune the reporting requirements.

5. Practices from a Central Bank Perspective

The level of involvement of central banks in sustainability and climate risk agenda has also changed in the past couple of years. A decade ago, such topics barely appeared among the top focuses of central banks. There was a fierce debate about whether central banks had to deal with it. Many argued that the responsibility associated with climate change lies with the elected governments and raised concerns that central banks' core functions, such as monetary policy, might be compromised if they are given an additional mandate for which they have no specific tools (*Bingham et al., 2023*).

As years passed, several professional debates clarified the picture, and now the mainstream view is that central banks have an important role in promoting sustainability. This position is even derivable from their primary mandates because of the potential for disturbances to price stability, stability of the financial system, the well-being of companies, payment systems – these may be all affected by the change in climatic conditions. Central banks have special, multiple roles. On the one hand, they are investors due to their role in managing foreign exchange reserves and maintaining asset purchase programs. On the other hand, many central banks have the role of financial supervisory authority, in which function they want to understand the financial sector's resilience to climate risk and may require various data reporting. Last but not least, central banks also try to lead by example and demonstrate their dedication by disclosing information on their operations (e.g., TCFD report). Challenges associated with measurement, backtesting, and data availability exist in all the above roles.

5.1 Central banks in the role of an investor

Green bonds as a convenient investment strategy in reserve portfolios

Increasing the share of green bonds in their foreign exchange reserve portfolios has been one of the central banks' most commonly used impact strategies. Concerning such products, investors are interested mainly in two pieces of information: clear identification of the green label and measurement of the impact. All these assessments require a significant amount of data and analysis. Therefore, impact reports have been increasingly prevalent in recent years. The purpose of an impact report is to provide investors with meaningful information about the environmental benefits of the projects financed by the proceeds of green bonds. These reports are typically created by the issuer of the bond or by a third-party verification company. The report's credibility rests on consistent measurement, reliable data, frequent publication, and integration into the company's reporting framework. Impact reporting is still in its infancy, with several problems that may lead to inaccuracies or misleading information. One issue is the lack of a common definition of a green project and no standard methodology for calculating the environmental impacts. This can make it difficult for investors to compare different projects and may result in investors making decisions based on incomplete or inaccurate information (*Manasses et al., 2022*).

Another problem is the lack of transparency. Some issuers may provide limited information about the project being financed or may only report on specific aspects of the project's environmental impact. This can make it difficult for investors to understand the project's full impact and to assess whether it meets their own environmental criteria. There is also a risk of "greenwashing", where issuers may exaggerate the environmental benefits of a project in order to attract investors. This can be especially problematic for smaller issuers who may lack the resources to conduct rigorous impact assessments. Finally, there is the issue of verification. While some issuers may use third-party verification companies to assess the environmental impact of their projects, there is no guarantee that these companies are truly independent.



Sometimes, the verification company may have a financial relationship with the issuer or be pressured to provide a positive assessment to maintain the relationship. There has been progress that was addressing the above challenges. For example, Climate Bonds Initiative (CBI) was the first to develop a taxonomy and methodology on the subject, followed by the ICMA Green Bond Principles (GBP) and the Nordic Position Paper (NPSI). As a result, the breadth of metrics and approaches has increased, but it is an important issue that standards are heterogenous and not mandatory. Transparency issues may exist, as methodologies and data sources are sometimes not public. The EU Green Bond Standard (EUGBS), which is on its way, is intended to complement the current standards, and is expected to improve the situation with increased data requirements. Challenges are still abundant as impacts are often ex-ante and based on estimates by issuers or third-party experts. Ex-post reporting is also important. The actual impact may differ from ex-ante estimates. Ex-post assessment is still not that widespread. Some relevant impacts are not even quantifiable. Notwithstanding their remaining shortcomings, impact reports are already a game changer in measuring investments' climate impact. Further improvements and standardisation, potentially accelerated by regulatory requirements, could make green bonds more attractive to impact investors and central banks.

Asset purchase portfolios are on the way to net zero.

In the period following the global economic crisis that erupted in 2008, QE – quantitative easing – became the main element of the monetary policy toolkits. Central banks purchased government securities, mortgage bonds, and corporate bonds and increased their balance sheet significantly with the objectives of conducting monetary easing and achieving inflation targets. Due to different focus and lack of methodologies, sustainability and climate risk considerations did not play a role when building these portfolios.

Things have changed significantly since the introduction of the first asset purchases. For example, several investors globally declare some dedication to sustainability goals and announce their commitment to reducing the carbon footprint of their holdings to net zero by 2050. Despite new asset purchases being stopped recently due to tightening monetary policy conditions, resulting in decisions being practically narrowed to reinvestments, central banks are also trying to investigate how they can integrate sustainability criteria into their portfolios ex-post and reach a better alignment with Paris Agreement.

One method for decarbonising a portfolio is “tilting”, i.e., the adjustments of investments during rebalancing by transitioning from higher emitters towards lower emitters (*Giese et al., 2021*).

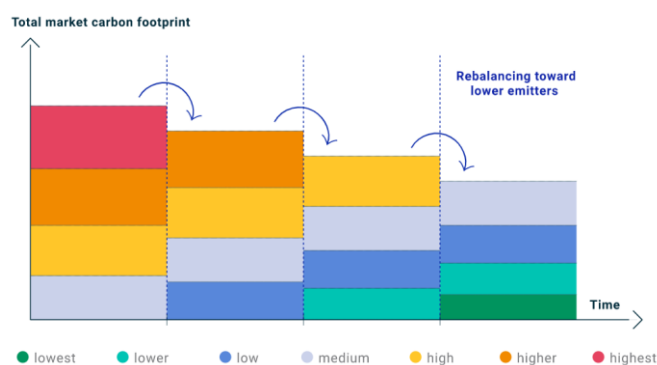


Figure 8: Stylised portfolio with a periodic rebalancing toward lower emitters
(source: MSCI ESG Research – <https://www.msci.com/www/blog-posts/constructing-net-zero/02768215423>)



The approach is seemingly easy; however, some practical issues must be considered; for example, what approach do we use to determine if a company has a high carbon footprint? If they are “brown” based on high past emissions and are excluded, financing may become more expensive for them, making the green transition more difficult, contrary to the original idea. If we consider forward-looking indicators too (for example, we look at the green commitment and decarbonisation plans of the company management), it can give a more accurate picture (assuming that we truly believe those plans have explanatory power for decreasing future carbon footprints), but the analysis and implementation of these plans is quite time-consuming (Marczis, 2022). Despite the challenges, some pioneering central banks, e.g., Central Bank of Sweden, ECB and Bank of England, announced that their corporate bond holdings would “tilt” to reflect climate consideration.

ECB is trying to decarbonise its portfolio with issuer-specific climate scores that combine the evaluation of backwards-looking emissions and forward-looking targets and assessing the quality of the issuer’s climate disclosures (for further info please visit: <https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220919~fae53c59bd.en.html>). It is interesting that despite its proactive position, ECB received criticism for its tilting exercise NGOs (for further info please visit: <https://greencentralbanking.com/2022/09/27/ngos-criticise-ecb-asset-decarbonisation-plan>), and the lack of transparency behind the methodology was one of the reasons. Another demand by activist groups was the complete exclusion of the issuers with the highest carbon emissions, such as companies in the coal sector.

ESG considerations in central bank investing

Integrating ESG considerations into the investment process is even more difficult than portfolio decarbonisation due to the numerous other factors (such as S and G) influencing ESG ratings. While impact investing is relatively straightforward, the main goal of ESG integration needs to be established, as this approach is a risk management tool. It helps integrate ESG factors into the investment process, which would not be taken into account otherwise, helps avoid ESG controversies, etc., but it is not necessarily the best tool to mitigate climate change. Some central banks have already integrated ESG factors into their investment processes (e.g., Banca d’Italia, ECB pension funds). This has been more widespread in equity portfolios, where in some cases, the investments are passive and „only” the benchmark needs to be replaced using some ESG equity index. At the same time, some have started considering ESG factors in their fixed-income portfolios but mostly only for information purposes, not necessarily influencing security selection yet.

ESG integration is much less straightforward than impact investing. Some challenges include a lack of reliable and decision-useful ESG data and ESG ratings still too heterogeneous. It is also unclear which integration strategies help avoid ESG risks, which may be impactful and encourage companies to improve their sustainability performance, etc.

5.2 Central banks in the role of financial supervisors

In many instances, central banks have the role of financial supervisory authority, too and are responsible for the oversight and regulation of financial institutions and markets. They play a crucial role in safeguarding the financial system from various risks related to sustainability and climate change.

In recent years, there has been growing concern that extreme weather events and changing climatic conditions can seriously affect businesses and industries, leading to financial losses and instability. Therefore, supervisory authorities now recognise the importance of incorporating climate risk into their regulatory framework.

One way they address climate risk is by encouraging financial institutions to disclose their exposure to environmental risks, which will significantly contribute to the data challenges addressed in the previous chapters (e.g., see EBA Pillar 3 disclosure on ESG risks). Moreover, authorities promote sustainable finance by providing guidance and incentives for financial institutions to invest in sustainable projects and businesses. For instance, the Central Bank of Hungary introduced preferential capital requirements on loans with energy-efficient home purposes. Additionally, regulators are incorporating climate risk into their stress-testing methodologies to assess the resilience of financial institutions under various scenarios. Given that the applicability of methodologies based on purely historical data is limited, these stress tests, as forward-looking metrics, can help identify potential vulnerabilities and guide supervisory actions (MNB, 2022b).



5.3 Central banks in the role of a reporter

The Task Force on Climate-Related Financial Disclosures (TCFD) in 2017 released recommendations to support companies and other institutions to publish structured information on climate risk to the public. Over the past five years, there has been significant growth in the number of companies and other organisations that adopted the TCFD framework (TCFD, 2022).

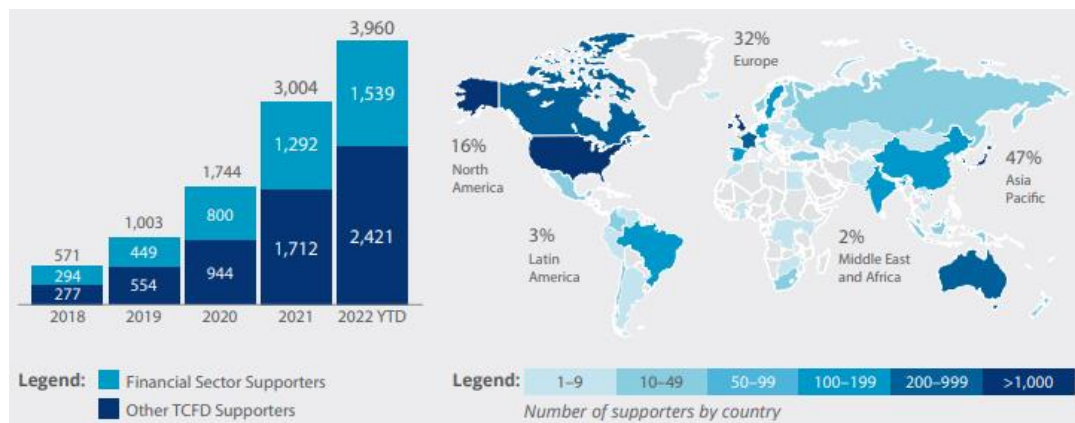


Figure 9: Number and Geographic Distribution of TCFD Supporters
(source: TCFD, 2022)

In addition to the above-mentioned activities, many central banks aim to lead by example and demonstrate their dedication to sustainability by disclosing climate risk-related information on their assets and operating activities (for further info please visit: <https://www.ecb.europa.eu/ecb/climate/climate-related-financial-disclosures/html/index.en.html>). Preparing a TCFD report is not easy, as it requires an in-depth overview of one's exposures and activities, a set of input data is also necessary, and a meaningful selection of indicators.

6. Summary

We aimed to give a broad overview of how we reached a world hungry for sustainability and climate risk-related data. Ten years ago, interest in ESG-related topics was somewhat limited. However, since the beginning of the last decade, the change in climatic conditions has become evident even for ordinary people. Due to the increased pressure from the public, policymakers, regulators, and the world of investing started to change. More and more players aim to understand their exposure to climate risk, and the pressure to disclose one's impact on nature is increasing.

Initially, data were mainly scarce and unstructured, hard to use to support any accurate decisions. Although several vendors started to collect non-financial information on companies (e.g., emissions), the data were mainly voluntarily, and coverage was available for large global companies. Service providers came up with methodologies to model unavailable data points, but the early models were rather rough estimations based on industry and revenue inputs, with a high degree of uncertainty on real emissions. Since then, decent progress has been made in both physical and transition risk assessment. Now there exist not only backwards-looking models but also forward-looking approaches; raw data, ratings, and even more sophisticated methodologies similar to value-at-risk.

Despite the progress, there is still criticism about sustainability, climate risk, and ESG data, which is not attributable to the inadvertence of vendors but rather to the regulatory background, i.e., reporting of ESG risk has been so far non-mandatory.

Due to the uncertainties around methodologies and difficulties in comparing metrics across data vendors, credibility, trust, and brand recognition have become important selection criteria. That is why the industry started to consolidate. Several mergers and acquisitions have been observable recently. We expect this trend in the industry to continue in the future. Most smaller players will be bought or merged with other ESG rating agencies. As the industry matures, cost



efficiency will play a more significant and prominent role. If a smaller actor wants to stay independent, he must specialise.

The regulatory landscape has also come a long way. In the early years, there were only recommendations for the industry. However, realising the problems, and not incidentally the push from market players, regulators started to catch up with the trends, and now with the introduction of the EU Taxonomy, NFRD, CSRD, and most recently, EBA's Pillar 3 disclosure requirements on ESG risk will bring a new era where hopefully data availability, coverage will significantly improve.

We gave an insight into central banks' unique role in sustainability and climate risk topics. On the one hand, central banks appear on the map with a role as an investor, and they need data to integrate sustainability and climate risk considerations into their investment decisions. On the other hand, they also need data when they are in the role of the financial supervisory authority trying to understand the financial sector's resilience to climate risk. Last but not least, central banks also try to lead by example and demonstrate their dedication by disclosing information on their operations (e.g., TCFD report).

7. References

- Avetisyan, E., Hockerts, K. (2017). The consolidation of the ESG rating industry as an enactment of institutional retrogression. *Business Strategy and the Environment*. 26(3), 316–330. DOI: <https://doi.org/f9w8rh>
- Blackrock (2021), European Commission, Directorate-General for Financial Stability, Financial Services and Capital Markets Union. *Development of tools and mechanisms for the integration of ESG factors into the EU banking prudential framework and into banks' business strategies and investment policies – Final study*. Publications Office. DOI: <https://data.europa.eu/doi/10.2874/220248>
- Bokor, L. (2022). Regulatory-market trends for ESG bonds and funds and some of the associated risks for sovereigns. [in Hungarian: ESG-kötvények és -alapot szabályozói-piaci trendjei, valamint a szuverének-egyek kapcsolódó kockázatai]. *Financial And Economic Review*. [in Hungarian: *Hitelintézeti Szemle*].21(4):152–181.
- Cantor, R., Packer, F. (1995). The credit rating industry. *The Journal of Fixed Income*. 5(3), 10–34. DOI: <https://doi.org/fjr6h5>
- de Freitas Netto, S. V., Sobral, M. F. F., Ribeiro, A. R. B., Soares, G. R. D. L. (2020). Concepts and forms of greenwashing: A systematic review. *Environmental Sciences Europe*. 32(1), 1–12. DOI: <https://doi.org/ghckdd>
- European Banking Authority (EBA) (2022). *Final draft implementing technical standards (ITS) on Pillar 3 disclosures on ESG risks*. URL: <https://www.eba.europa.eu/eba-publishes-binding-standards-pillar-3-disclosures-esg-risks>
- Fisher, P.G. (2020). Making the Financial System Sustainable. *Cambridge University Press*. ISBN: 9781108908269 p330.
- Giese, G., Nagy Z., Cote, C. (2021). Constructing Net-Zero Portfolios: Three Approaches. *MSCI ESG Research*. URL: <https://www.msci.com/www/blog-posts/constructing-net-zero/02768215423>
- Harper, S. (2011). Credit rating agencies deserve credit for the 2007–2008 financial crisis: An analysis of CRA liability following the enactment of the Dodd-Frank Act. *Washington & Lee Law Review*. 68(4). URL: <https://scholarlycommons.law.wlu.edu/wlulr/vol68/iss4/8>
- Jacobs, B. I., Levy, K. N. (2022). The Challenge of Disparities in ESG Ratings. *The Journal of Impact and ESG Investing*, 2(3):107–111. DOI: <https://doi.org/kg3p>
- Kalesnik, V., Wilkens, M., Zink, J. (2022). Do Corporate Carbon Emissions Data Enable Investors to Mitigate Climate Change? *The Journal of Portfolio Management*. 48(10), 119–147. DOI: <https://doi.org/kg3q>
- Kolozsi, P. P., Ladányi, S., Straubinger, A. (2022). Measuring the Climate Risk Exposure of Financial Assets – Methodological Challenges and Central Bank Practices. *Financial and Economic Review*. 21(1), 113–140. DOI: <https://doi.org/j363>
- Kumar, R., Wallace, N., Funk, C. (2020). Mainstream: ESG at the Tipping Point. Harvard Law School Forum on Corporate Governance, January 13, 2020. URL: <https://corpgov.law.harvard.edu/2020/01/13/into-the-mainstream-esg-at-the-tipping-point/>



- Lopez, C., Contreras, O., Bendix, J. (2020). Disagreement among ESG rating agencies: Shall we be worried? URL: <https://mpira.ub.uni-muenchen.de/103027/>
- Mähner, M. (2021). Porter's 5 Forces, Analysis of the SaaS ESG Tracking / Reporting Industry. URL: <https://silasmahner.medium.com/porters-5-forces-analysis-of-the-saas-esg-tracking-reporting-industry-15263b4eb25a>
- Manasses G, Tapaszti A., Paulik É (2022). Green Bond Impact Report as an indispensable next step in market development, [in Hungarian: Zöldkötvény-hatásjelentés mint elengedhetetlen következő lépés a piaci fejlődésben]. *Credit Institutions Review* [in Hungarian: Hítelinézeti Szemle], 21(4):182–206. DOI: <https://doi.org/kg3s>
- Marczis D. (2022). A 12.000 milliárd dolláros kérdés, avagy a jegybanki devizatartalékok zöldítésének dilemmái [The \$12,000 billion question, or the dilemmas of greening central bank foreign exchange reserves]. *Economania*. URL: <https://economaniablog.hu/2022/11/15/a-12-000-milliard-dollaros-kerdes-avagy-a-jegybanki-devizatartalekok-zolditesenek-dilemmai/>
- Mittal, R., Dordoeva, B., Ohlale, H. (2022). Mapping the ESG Landscape: Complexities, Complications and Considerations. *Synechron*. URL: https://www.synechron.com/sites/default/files/2022-04/Mapping-the-ESG-Landscape_TL.pdf
- MNB (2022a). *The Magyar Nemzeti Bank's climate-related financial disclosure*. URL: <https://www.mnb.hu/letoltes/tcf-d-jelente-s-2022-en.pdf>
- MNB (2022b). *Green Finance Report*. URL: <https://www.mnb.hu/en/publications/reports/green-finance-report>
- NFRD – The Non-Financial Reporting Directive) (2014). URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0095&from=EN><https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014L0095&from=EN>
- Peacock, A. I, Marino I (2022). New pillar 3 ESG risks requirements to offer a partial snapshot of banks' transition. *Natixis Green and Sustainable Hub*. URL: https://gsh.cib.natixis.com/api-website-feature/files/download/12246/new_pillar_3_esg_risks_requirements_to_offer_a_partial_snapshot_of_banks_transition.pdf
- TCFD – Task Force on Climate-related Financial Disclosures (2022). 2022 Status Report. URL: <https://assets.bbhub.io/company/sites/60/2022/10/2022-tcf-d-status-report.pdf>