

Review of the Sustainability and Climate Change Initiatives Within the Line of Investment Portfolios

Revisión de las iniciativas de sostenibilidad y cambio climático dentro de la línea de portafolios de inversión

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Abstract

The intensity and frequency of climate disasters have been increasing dramatically over the past decade with a trend that also appears to continue. The costs associated with these events are also becoming increasingly higher. Furthermore, these types of climate disasters are assumed to be closely related to the climate change we are facing. Under this scenario, the financial sector plays a key role in the way we manage the actions against climate change. Thus, the higher the impacts of climate change, the faster the actions must be implemented. However, there is a lag between the priority of the need for actions and the actions we are implementing. Some standard risk approaches have been implemented, but there is still a remarkable difficulty in understanding and modeling the uncertainty of future impacts of climate change. In this context, other kind of efforts are necessary from a multidisciplinary perspective that aims to complement the actions against climate change in the fields of finance and investments. We provide a brief of the main existing initiatives but highlight how, although there are important and significant efforts at corporate level, the resulting initiatives are aspirational and voluntary, and thereupon, insufficient regarding the mentioned need. In this sense, the article seeks to pave the pathway towards the justification of the construction of investment portfolios with principles of environmental sustainability.

Key words: Portfolio; sustainability; financial stability; ESG; climate change; climate risk.

JEL Classification: G11, G18, G28, G32.

Resumen

La intensidad y frecuencia de los desastres climáticos vienen aumentado drásticamente durante la última década, con una tendencia que parece va a continuar en ascenso. Los costos asociados a estos eventos también se incrementan cada vez más. Además, se asume que este tipo de desastres climáticos están estrechamente relacionados con el cambio climático al que nos enfrentamos como humanidad. En este escenario, el sector financiero juega un papel clave en la forma en que gestiona las acciones contra el cambio climático; por lo tanto, cuanto más fuertes sean sus impactos, más rápido deben implementarse estas acciones. Sin embargo, existe un rezago entre la prioridad de la necesidad de acciones y las acciones que realmente se están implementando. Se han presentado algunos estándares de riesgo, pero aún existe una notable dificultad en comprender y modelar la incertidumbre de los impactos futuros del cambio

climático. En este contexto, se necesitan otros tipos de esfuerzos, desde una perspectiva multidisciplinaria, que busquen complementar las acciones contra el cambio climático en el ámbito del sector financiero y las inversiones. En este trabajo se presenta un resumen de las principales iniciativas existentes, pero se destaca cómo, aunque responden a esfuerzos importantes y significativos a nivel corporativo, estas son de naturaleza aspiracional y voluntaria y, por lo tanto, insuficientes para abordar la necesidad mencionada. En este sentido, el artículo busca avanzar hacia la justificación de la construcción de carteras de inversión con principios de sostenibilidad ambiental.

Palabras clave: portafolio; sostenibilidad; estabilidad financiera; ESG; cambio climático; riesgo climático.

Clasificación JEL: G11, G18, G28, G32.

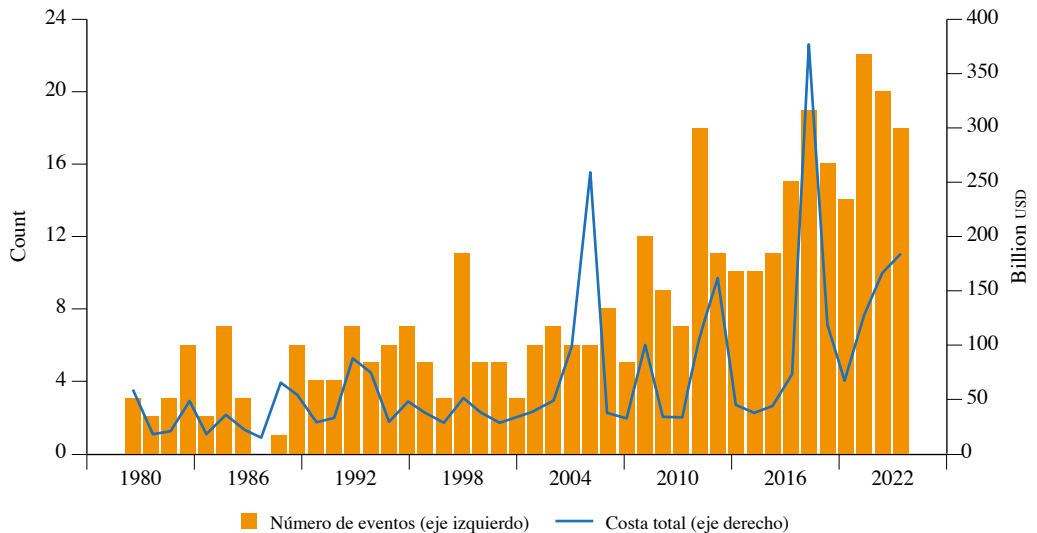
Introduction

The year 2022 was another unprecedented period for the United States given the impact of climate disasters. The budget allocated by the US government for severe climate emergencies response in 2022 reached a total of 177 billion dollars, making it, historically, the third period with the highest response costs and the third period in terms of the number of recorded disasters (NOAA, 2023). In addition to these numbers, there is also concern about the increasing frequency of high-magnitude natural disasters and the high costs associated with their response. Figure 1 shows the historical evolution in cost and number of climate disasters in the United States reported by the National Oceanic and Atmospheric Administration (NOAA) since 1980.

With the hurricane season approaching and the record of costs associated with wildfires in Hawaii, the current year (2023) could set a new record for the budget of the country. It is also estimated that these numbers of both frequency and cost will continue growing in the coming years; a pattern that will be replicated not only in the United States but also worldwide (NCA, 2018). It is not unusual that this upward marked trend in the number of climate disasters occurs just as we face a climate change crisis to which human activity has significantly contributed. Therefore, linking this kind of climate disaster events with climate change is more than necessary given the current strong evidence about how the human activity has brought about climate change and therefore these instances of climate related disasters at a significant rate. The same conclusion can also be found in several scientific studies, such as the one

by Slater et al. (2021) which demonstrates how climate change is increasing dramatically at the same time as its impacts are becoming stronger. However, what is being done to face and manage the climate change crisis?

Figure 1. Severe Climate Emergencies in the United States (1980–2022)



Source: Own construction using NOAA data. NCEI. Time Series.
Cost figures in millions of dollars.

There are various ways to address this issue, but we are concentrating on the role and responsibility of the financial sector, and more specifically on the destinations of the investment capital flows toward sustainable purposes. At this point, while the definition of climate change seems to be highly clear, the definition of sustainability seems to be a little opaque and ambiguous. The accepted definition of sustainability is that provided by the UN Brundtland Commission in 1987. According with the Commission, sustainability is defined as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). Under this reference, the sustainability definition depicts the widest classification of all initiatives, actions or activities related. Climate change, for its part, is clearer if related with the long term changes in the metrics of world weather.

In particular, the commitment for climate action calls upon all sectors, disciplines, countries, and other agents, but especially those that have contributed

more deeply to global warming. In the finance field, the call for efforts to take climate action can be summarized under the definition of Sustainable Finance.

According to Svartzman & Oman (2021) sustainable finance can be defined as policies or initiatives that seek, either directly or indirectly, to facilitate the alignment of the financial system with environmental objectives. It includes both financial sector policies, specifically financial supervision and regulation, and monetary policies, since these two affect financial markets, financial agents, financial assets, and the allocation of capital.

The first issue concerning this matter is related to global objectives on climate change. The Paris Agreement (COP21) has committed signatory countries to limit global warming to an average temperature of 2°C above preindustrial levels and to work together to achieve an aspirational goal of 1.5°C^{1 2 3}, which would significantly reduce the risks and impacts of climate change (UNFCCC, 2015). Regarding the latter deeper and controversial limit, reaching a limit of 1.5°C in global warming translates to reaching zero emissions before 2050. For this reason, the COP26 engaged 135 countries to sign Net Zero commitments and thus join efforts to be able to achieve the limit of 1.5°C.

In this line, and regarding the finance field in particular, the Paris Agreement text also mentions, as an agreed-upon objective, the commitment of the parties to ensure that financial flows are consistent with low Greenhouse Gas Emissions (GHG) objectives (UNFCCC, 2015). In the same way, the COP26 calls for the mobilization of financial flows to achieve the 1.5°C goal:

The scale and speed of the changes we need to make will require all forms of finance: public finance for the development of infrastructure we need to transition to a greener and more climate-resilient economy; private finance to fund technology and innovation, and to help turn the billions of public money into trillions of total climate investment (UNFCCC, 2021a).

1 Article 2.1 of the Paris Agreement: “hold the increase in global average temperature to well below 2°C above pre-industrial levels” and pursue “efforts to limit the temperature increase to 1.5°C” (UNFCCC, 2015).

2 The scientific technical justification of the 1.5°C aspirational goal of the Paris Agreement can be found in the Special Report “Global Warming of 1.5°C”–IPCC (2018). This special report provides evidence and forecasting about the negative effects of the 0.5°C difference in the goals of the Paris Agreement.

3 According to IPCC (2022) the group of Scientists estimated that to reach the limit of 1.5°C of global warming, the global net emissions should peak before 2025, decrease an estimated of 43% by the 2030's, and finally reach the net zero challenge in the early 2050's.

The impacts of climate change have negative effects on individuals, households, companies, and countries. At the corporate level, the impacts of climate change end up being reflected in the financial statements of companies. Moreover, this climate change risk can also affect the financial risk structure of a company: market risk, liquidity risk, credit risk, and operational risk. Henceforth, we will adopt the definition of climate risk as the financial risks linked to climate change.

This article seeks to provide an answer to the following question, what is being done at the regulatory and disclosure level? However, we always keep in mind that current actions are still insufficient and far from the true commitment needed to achieve the goals of the Paris Agreement and others in progress like the UN 2030 Agenda for Sustainable Development. Therefore, any proposal, such as the one presented here, and that supports the discussion, will always be welcome. Throughout this document, we will show the actions being undertaken in the financial field, particularly on current initiatives supporting climate action objectives at the investment portfolio level. In addition to this introduction, in the first section we will review existing risk standards, addressing the types of climate risk and the introduction of ESG criteria from the insight presented. The second section will mention the main sector initiatives addressing the assessment of climate risk impacts and the specific issue of existing portfolio policies related to climate risk. We will refer to the Net Zero initiatives in the third section. In the fourth section we will discuss the initiatives of information disclose(reporting). Finally, we present our conclusion in the fifth section.

1. Risk Standards and ESG Criteria

The materialization of climate risk can impact the financial system in multiple ways, but we can group these various avenues into three major categories: Impact on financial statements, devaluation of assets, and an increase in default events (FSOC, 2021). However, there is a strong consensus that we are still far from having a robust measure that reflects a status close to the real climate risk. From this perspective, there is a looming and growing threat to global financial stability due to the difficulty of modeling and forecasting climate risk (OFR, 2022). Several initiatives are tackling the challenge of standardizing not only processes and models, but also the standardization of reporting and disclosing related information.

According to Task Force on Climate-Related Financial Disclosures (TCFD) (2017), two types of climate risk are defined: *physical risk* or risks related to the physical impacts of climate change, and *transition risk* or risks related to the transition to a low-carbon economy⁴. Expanding on these definitions, physical risk is defined as the potential for destruction or damage to physical assets, adverse impacts on economic activity, and other losses from natural disasters and extreme weather events; while transition risk refers to the realization of risks stemming from technological advancements, changes in government policies, and shifts in consumer preferences (OFR, 2022).

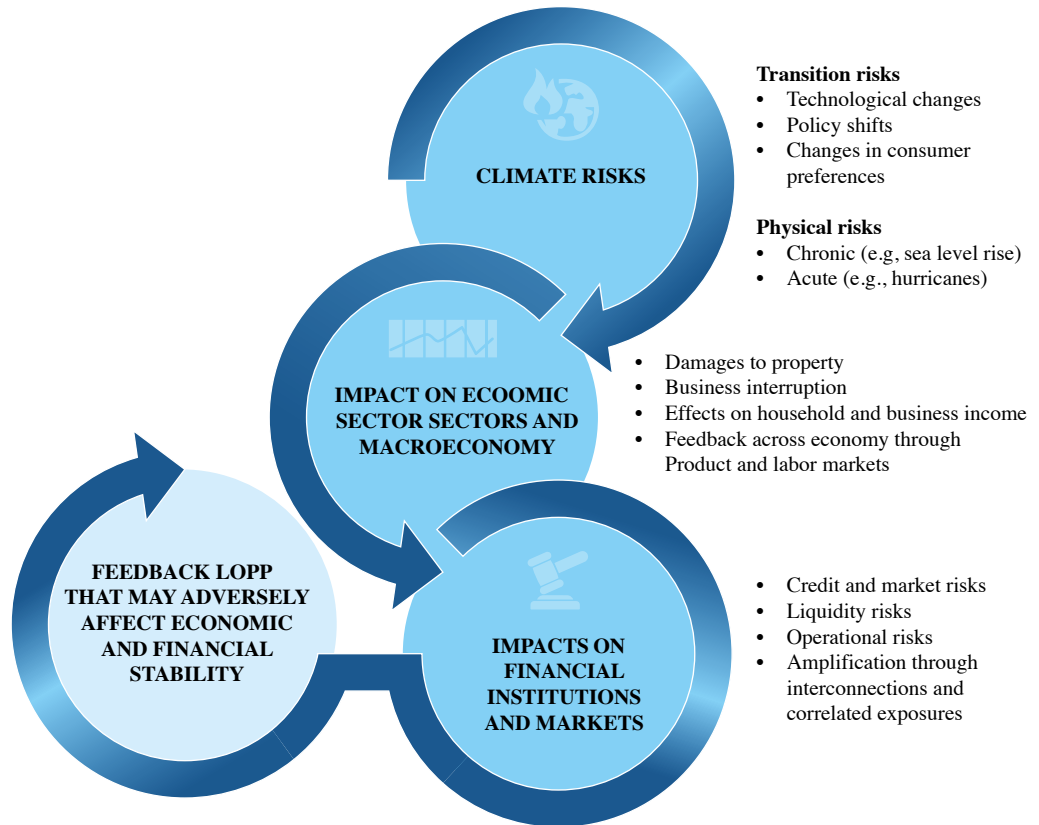
The materialization of physical and transition risks primarily manifests as standardized, traditional, and regulated risks for financial institutions such as market risk, liquidity risk, credit risk, and operational risk. It is therefore expected that both physical and transition risks will cut across all the risks that are the focus of prudential supervision and regulation (FSOC, 2021). Figure 2 outlines this cross-cutting effect on the economy and the financial sector.

Figure 2 illustrates how potential standardized risks, such as physical and transition risks, can also entail potential negative impacts on households, communities, businesses, and government. These impacts may manifest as property damage, disrupting business activities, subsequently affecting the incomes of households and companies, and therefore corporate financial statements. This ultimately leads to a feedback loop where financial institutions might curtail their credit provision, either due to illiquidity or distorted credit risk, subsequently affecting companies and households, thus amplifying the impact of climate change on economic sectors and the overall macroeconomy. The realization of this scenario would ultimately undermine the financial stability of countries (FSOC, 2021).

Given the high social and economic costs associated with the materialization of climate risk, it has become necessary to implement measures to mitigate, to some extent, the impacts of climate change and support global objectives. This includes not only the goals of the Paris Agreement but also other global objectives such as the Sustainable Development Goals (SDGs).

4 Physical risk is often divided into two main subcategories: acute and chronic; while transition risk is usually divided into four major subcategories: technological, market, reputational, and political and legal risk.

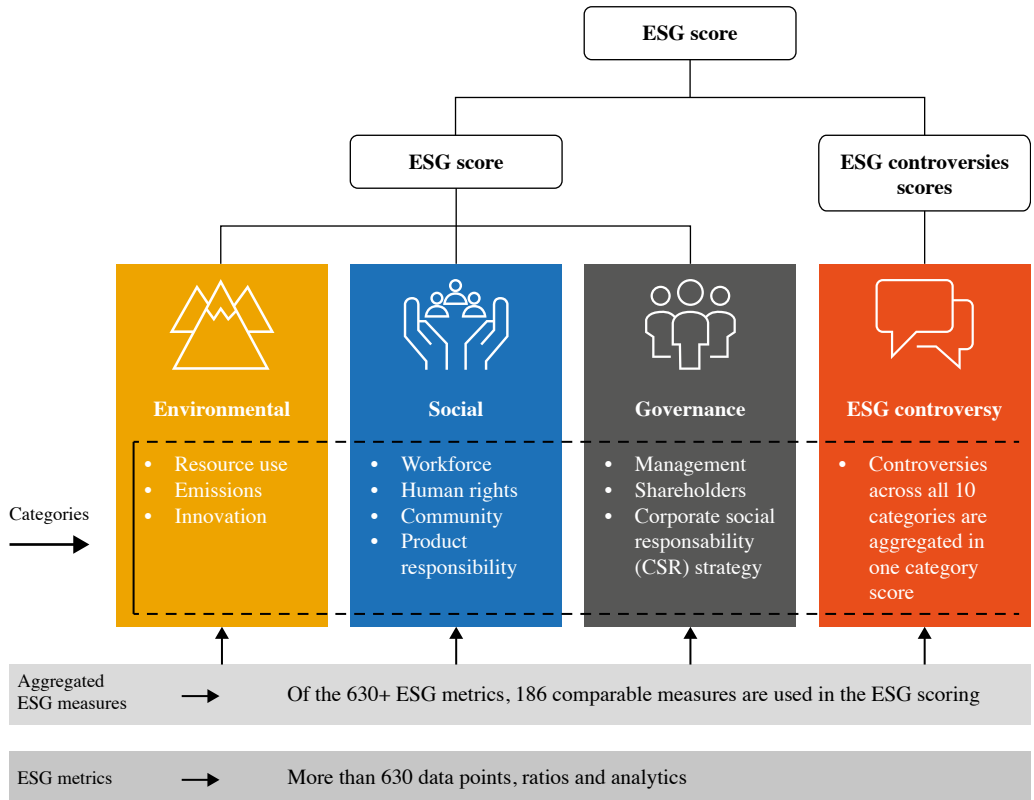
Figure 2. Transmission Channels from Climate Risk to Financial Stability



Source: Taken from FSOC (2021).

From the corporate private sector, a good initial approach is related with having a scoring metric that links these global objectives with the performance and practices of companies. Thus, Environmental, Social, and Governance (ESG) criteria are used to measure the company performance over these important affairs. Each component contains a set of evaluation categories for the policies of the companies. Additionally, in recent years, an additional vector of controversial industries has also been incorporated as a fourth exclusion criterion. Figure 3 outlines the ESG criteria and the controversial industries criterion.

Figure 3. ESG Criteria and Controversial Industries



Source: Taken from Refinitiv (2022).

While the term ESG appeared first in a report by the UN Global Compact in 2005, it was not until the concept was incorporated into the Principles for Responsible Investment (PRI) that ESG criteria gained enough relevance to be considered a standard for measuring environmental, social, and corporate governance performance. Along these lines, ESG criteria have become increasingly important as assessment criteria for good corporate sustainability practices. This evaluation is primarily carried out by external providers⁵ using corporate information, sustainability reports, and regulatory disclosure reports, among other types of information sources. Leon & Zapata (2023) exhibit a brief

5 External information providers like Bloomberg, Sustainalytics, MSCI and Refinitiv highlight are some of the most recognized information providers in the market.

summary chart with the main ESG information providers along with their methodological approaches as is shown in Figure 4.

Figure 4. ESG information Providers

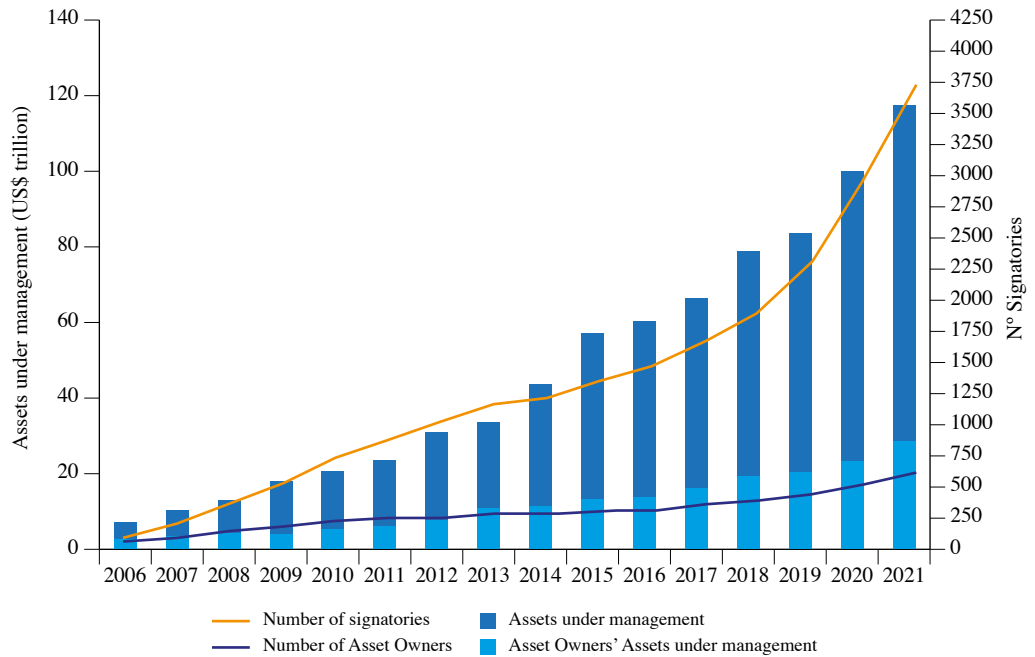
Provider	Number of companies
<i>Sustainalytics ESG Risk Ratings</i>	+20.000
<i>MSCI ESG Ratings</i>	+14.000
<i>Bloomberg ESG Disclosures Scores</i>	+11.800
<i>FTSE Russell's ESG Ratings</i>	+7.200
<i>S&P Global ESG Scores</i>	+11.500
<i>Refinitiv ASSET 4</i>	+12.000
Provider	Methodology
<i>Sustainalytics ESG Risk Ratings</i>	ESG exposure level and disclosure
<i>MSCI ESG Ratings</i>	ESG indicator on 37 relevant topics
<i>Bloomberg ESG Disclosures Scores</i>	Degree of ESG disclosure
<i>FTSE Russell's ESG Ratings</i>	ESG Risks based on disclosure and commitment
<i>S&P Global ESG Scores</i>	ESG indicator by level, dimension and CSA criteria
<i>Refinitiv ASSET 4</i>	ESG indicator for 10 categories in the 3 pillars

Source: Taken from Leon & Zapata (2023).

Translated from the original version in Spanish.

According to PRI (2021) the number of signatories of the initiatives has increased significantly since 2006 when the initiative started. As of March 2021, there were a total of 3,826 PRI signatories between investors and services providers around the world (3,404 signatories—89% and 422 signatories – 11% respectively) for a total of 121 trillion USD in assets under management. Figure 5 shows this behavior.

Figure 5. PRI Signatory Growth



Source: PRI (2021).

Thus, of the total reporting asset owners, 82% have considered ESG criteria within their selection, appointment, and monitoring processes in the year 2021 (PRI, 2021). These figures depict a growing interest in the financial sector to adopt sustainable practices in portfolio and investment management.

However, there are other related considerations such as the quality of both ESG and sustainability disclosures that can impact the performance of portfolios, which we only mention, and which are reserved for future discussions. Regarding this, other authors address the discussion about the reliability of the ratings and its impacts on the portfolios and the initiatives (e.g., Berg et al., 2020; D'Apice, 2020; Dimson et al., 2020).

2. Private Initiatives Towards Structuring Sustainable Portfolios

As a joint initiative with the United Nations Environment Programme (UNEP), financial institutions have established a global network of principles to integrate

sustainability criteria into the industry and apply them to decision making with the objective of achieving a more inclusive global financial system in terms of environmental, social, and corporate governance responsibility. Table 1 provides a summary of these principles.

Table 1. Initiatives of Corporate Sustainability within the Financial Industry – Principles of Responsibility

Initiatives/Principles	Leading Members	Summary
Principles for Responsible Investment (PRI)	Investment managers	Six principles for responsible investment to enable the integration of ESG assessment into investment portfolio policies (UNEPFI, 2023a).
Principles for Sustainable Insurance (PSI)	Insurance companies	Four principles to support a sustainable insurance industry by incorporating ESG criteria within its policies (UNEPFI, 2023b).
Principles for Responsible Banking	Banks and financial institutions	Six principles aimed at fostering a sustainable banking system and supporting the efforts from the industry to make positive contributions to society (UNEPFI, 2023c).

In particular, the Principles for Responsible Investment (PRI) have not only brought visibility to the concept of ESG but also have encouraged the implementation of better practices toward portfolio structuring. Thus, it is expected that by 2025, investments in ESG portfolios will exceed \$53 trillion, representing more than a third of the projected \$140.5 trillion in assets for the same year (Bloomberg, 2022). Given these high estimates, it is anticipated that the PRI will play an even more prominent role within the investment industry in the coming years.

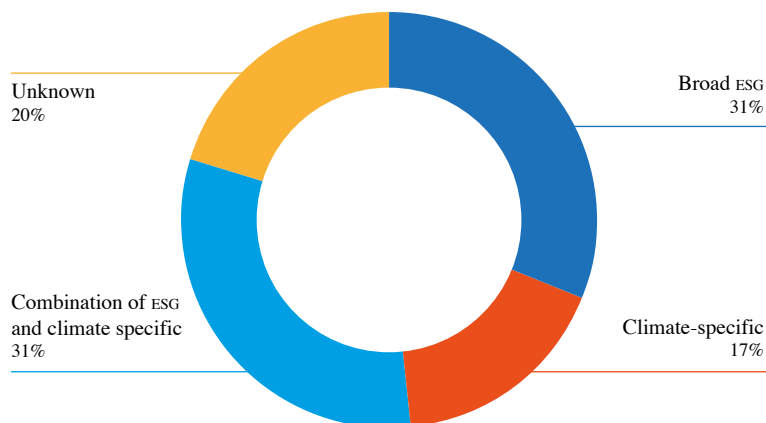
Similar to the PRI, but aimed at central banks and supervisors, the Network for Greening the Financial System (NGFS) seeks to promote the inclusion of sustainability criteria in the management of their investment portfolios. NGFS considers the adoption of Sustainable and Responsible Investment (SRI)⁶ practices by central banks and supervisory agencies, in a way that encourages other investors toward the same pathway (NGFS, 2019).

According to NGFS, an SRI focused investment does not necessarily aim to generate a positive environmental or social impact, but it can be focused on

6 SRI considers, in addition to ESG criteria, a wide range of sustainable investment strategies.

improving the Sharpe ratio of the portfolio while considering ESG criteria. This means that portfolio risk analyses with an SRI focus are linked to both types of climate risk: physical risk and transition risk (NGFS, 2019). Even more surprising are the results of the survey on the scope of SRI in central banks, which are presented in Figure 6. Although only 35 central banks were included in the survey, the results turn out to be highly optimistic regarding the challenge of sustainable investments.

Figure 6. Survey on the Scope of SRI in Central Banks' Portfolio Management



Source: Taken from NGFS (2020) (Portfolio Management Survey 2020). Percentage data.

As can be seen in Figure 6, 31% of central banks have an ESG approach, while 17% have a specific interest in climate change. 31% practice a combination of ESG and a specific interest in climate change. These results translate to an average of 80% of SRI investments pursuing a sustainability objective. According to NGFS (2020), this type of investments also claims a periodic rollover to ensure an adequate risk management of investment portfolios.

Concerning this, Bolton et al. (2020) recognize four areas (fiscal policy, responsible investment, international coordination, and accounting norms) which are not due to the responsibility or to the authority of central banks, but with which central banks may need to interact for managing the climate change risk. In this perspective, although these areas are not mandatory of central banks guidelines, they can support the efforts of global climate actions by central banks from their important position on monetary policy and the economy.

Despite the specific features of the portfolios subject to NGFS initiatives, the results and data presented reflect an optimistic view about the implementation of ESG portfolios. The current challenge for ESG portfolios lies in expanding the margin of alpha regarding the benchmark and achieving greater competitiveness compared to traditional strategies. In this regard, S&P Global (2021) analyzed 26 investment funds with more than 250 million dollars in assets under management and found that over an annual period during the pandemic (March 5, 2020 to March 5, 2021), 19 out of those 26 investment funds outperformed the benchmark (S&P 500). The increase in annual returns for the 19 portfolios ranged from 27.3% to 55%, while the S&P 500 increased by 27.1%.

Regarding the challenges for the future, we hope that this behavior will continue developing in the coming years, but despite this, it is necessary to continue joining forces in such a way that the financial and investment sector not only aligns with the objectives of the Paris Agreement but can become aligned with the policies from net zero. This behavior of corporate culture will also encourage the companies to increasingly adopt better sustainable practices.

3. Net Zero Initiatives

The so-called “race to zero” to achieve the ambitious yet realistic goal of limiting global warming to 1.5°C, had to be reasserted by the UNFCCC COP26 in Glasgow – Scotland in November 2021. The commitments, adopted by 135 countries, were to reduce their CO₂ emissions to Net Zero by 2050. A quite ambitious challenge that claims the participation of all sectors, including the private financial sector. Thus, under Decision 1 of the “Glasgow Climate Pact” in the third part (Adaptation Finance), the Pact calls to “enhance finance mobilization in order to deliver the scale of resources needed to achieve climate plans, particularly for adaptation, and encourages Parties to continue to explore innovative approaches and instruments for mobilizing finance for adaptation from private sources” (UN Conference of the Parties, 2021). In the same way, *The Climate Finance Delivery Plan: Meeting the US\$100 Billion Goal* mentions within the Collective Actions by Developed Countries the Action discussed number 10:

Investment decisions taken today could potentially lock the world into high GHG emissions and maladapted economies and financial markets. Further, a number of financial institutions have committed to taking action to align their portfolios with the goals of the Paris Agreement,

such as the Glasgow Financial Alliance for Net Zero. High debt and climate vulnerabilities lead to higher borrowing costs on international markets. Developed countries therefore intend to attach higher importance to support activities that focus to shift finance flows in accordance with Article 2.1(c) of the Paris Agreement. (UNFCC, 2021)

In this sense, several initiatives have been proposed such as the Glasgow Financial Alliance for Net Zero (GFANZ) mentioned above. Table 2 shows some of the main ones.

Table 2. Some Initiatives of the Financial Industry Aligned with the Race to Zero – COP26

Initiatives	Sector	Summary
Glasgow Financial Alliance for Net Zero GFANZ	Financial	Coalition of financial institutions committed to transitioning the global economy to net-zero greenhouse gas emissions (GFANZ, 2023).
Net Zero Banking Alliance	Banking	A group of leading global banks committed to financing ambitious climate action to transition the real economy to net-zero greenhouse gas emissions by 2050 (UNEPFI, 2023d).
Net Zero Asset Managers Initiative	Asset Management	It commits to support the goal of net zero greenhouse gas ('GHG') emissions by 2050, in line with global efforts to limit warming to 1.5°C ('net zero emissions by 2050 or sooner'). It also commits to support investment aligned with net zero emissions by 2050 or sooner (Net Zero Managers Initiative, 2023).
Paris Aligned Investment Initiative	Asset Owners	Global group of 56 asset owners, with over \$3.3 trillion in assets. They have committed to transitioning their investments to achieve net zero portfolio GHG emissions by 2050, or sooner, drawing on the Net Zero Investment Framework to deliver these commitments (Paris Aligned Asset Owners, 2023).
Net Zero Asset Owner Alliance	Asset Owners	An initiative of institutional investors committed to transitioning their investment portfolios to net-zero GHG emissions by 2050 – consistent with a maximum temperature rise of 1.5°C (UNEPFI, 2023e).
Net Zero Insurance Alliance	Insurance	It is the largest collaboration between the UN and the global insurance industry. The commitment signed by the members is accredited by the UN Race to Zero and the alliance is a member of the Glasgow Financial Alliance for Net-Zero – GFANZ (UNEPFI, 2023f).
Net Zero Financial Service Providers Alliance	Financial Service Providers	It is a global group of Service Providers committed to supporting the goal of global net zero greenhouse gas emissions by 2050 or sooner, in line with the ambition to limit the global temperature increase to 1.5°C above pre-industrial levels (Net Zero Financial Service Providers Alliance, 2023).

Source: Own construction taking information from the official web page of the initiatives mentioned.

As can be seen, there are many initiatives surrounding the Race to Zero challenge by the private financial industry. These initiatives represent a significant step forward towards the real challenge of limiting global warming to a 1.5°C average temperature in accordance with both the Paris Agreement and the commitments of COP26. However, there is an additional challenge related to the disclosure of the information and the credibility from both the corporate goals proposed and the advances observed.

4. Reporting

Regarding information disclosure, there are significant initiatives that complement the initiatives of compliance of goals that we have just discussed. These initiatives are presented as the next stage of the work and seek to give a high degree of credibility to the market agents.

The Task Force on Climate-related Financial Disclosures (TCFD) guides the discussion on climate risk in the financial sector by providing recommendations about the information that should be disclosed for climate risk assessment. It is presented as the largest private initiative in this area. Established in 2015 by the G20's Financial Stability Board (FSB), the group is composed of representatives from the private sector, both from the financial sector and other sectors of the economy. The TCFD defined the types of risks that are now recognized as standard for climate risk disclosure and risk management purposes.

Regarding ESG criteria, The Sustainability Accounting Standards Board (SASB) sets the standards for companies to disclose financial sustainability information toward investors. These standards identify the set of most relevant ESG topics for financial performance, such as the case of the largest asset manager by assets under management—BlackRock—which requests companies it seeks to invest in to disclose their corporate performance related with SASB metrics.

The International Sustainability Standards Board (ISSB) by the IFRS Foundation is another initiative of information disclosing that aims to align its recommendations with those from TCFD, SASB and CDSB. The initiative is presented as a complement to the International Accounting Standards Board (IASB) within the same IFRS Foundation, which seeks to develop high-quality, understandable, enforceable and globally accepted accounting and sustainability disclosure standards (IFRS, 2023). ISSB was launched on November 3, 2021, during the COP26 in Glasgow – Scotland.

Concerning the Climate Disclosure Standards Board (CDSB) mentioned, the consortium was created in 2007 within the World Economic Forum as a way for reporting climate information. The initiative is presented as an effort to equate the natural capital with the financial capital offering companies a framework for reporting environmental information with the same rigor as financial information. CDSB developed a climate prototype for the ISSB at the COP26, building from existing standards and to support the start of the ISSB (CDSB, 2023).

The Global Reporting Initiative (GRI) is another initiative of information disclosure, but it focuses on the impacts generated by businesses. According to GRI, the purpose of the organization is to help businesses take responsibility for their impacts, by providing them with the global common language to communicate those impacts through the GRI standards.

Finally, it is important to emphasize the role of independence in assessment. Thus, in order to achieve all their information disclosure goals and support the true sustainability challenge within the financial field, these initiatives must preserve their independence faithfully with respect to the evaluated companies. Additionally, in a similar way to the 1.5 °C challenge of the Paris Agreement these initiatives are only aspirational and not mandatory or regulatory.

5. Conclusions

In the latest Intergovernmental Panel on Climate Change (IPCC) (2023) report – AR6, the group of experts and scientists concluded that “Human activities, mainly through Greenhouse Gas (GHG) emissions, have unequivocally caused global warming, reaching a global surface temperature of 1.1 °C above 1850-1900 levels in 2011-2020” (IPCC, 2021). This means that, from a scientific standpoint, there is no doubt that humans have significantly contributed to global warming and climate change. As stated above in the first part, the present work aimed to show and support global risk mitigation objectives from an investment portfolio perspective.

The work has introduced a current state of art of main initiatives that guide investment capital decision-making considering ESG criteria for company exclusion or screening. As pointed out, private sector initiatives, despite showing significant progress in this area, keep lagging behind the actual needs demanded by the current climate change risk crisis. This situation is both normal and expected in the present day, given the high uncertainty about the impacts

that climate change may have and the difficulty on modeling and measuring the uncertainty of the phenomenon. In this sense, it can be argued that these measures are insufficient, and therefore, other types of actions by the involved parties are necessary. Not only because all initiatives are of an aspirational voluntary nature, but also because it is costly to deviate the attention from the traditional way of structuring portfolios (i.e., which ultimately reinforces the non-mandatory nature of these initiatives).

In this regard, it is well known that classical financial theory assumes that returns and their associated risk behave proportionally, such that a higher exposure to risk should yield a greater reward (returns) for taking on that risk. The resulting efficient frontier represents investment portfolios for which the risk-return relationship has been optimized according to Markowitz (1952). It is precisely within this paradigm that the constraint of asset exclusion or screening should be introduced. While this narrows down the universe of possibilities, it enables differentiated analyses based on sustainability criteria.

On the one hand, advanced computational tools like AI techniques can be used to incorporate within the modeling work the sources of the climate risk analyzed. On the other hand, it is possible to embrace the challenge while keeping company exclusion, but by exploring better portfolio optimization techniques. According to this latter approach, the problem of optimizing portfolios with ESG constraints can be tackled through advanced computing techniques allowing the generation of robust ESG portfolios that are competitive compared to traditional mean-variance portfolios. This challenge represents an extension of the present work.

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