

Haute Ecole

« ICHEC – ECAM – ISFSC »



Enseignement supérieur de type long de niveau universitaire

**Is there a significant difference in the extra-financial performance of  
Socially Responsible Funds? A comparison on ESG indicators  
between traditional, Socially Responsible Investment and impact  
funds**

Mémoire présenté par :

**Florian HELLIN**

Pour l'obtention du diplôme de :

**Master en gestion de l'entreprise**

Année académique 2024-2025

Promotrice :

**Christel DUMAS**

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Fait à Bruxelles, le 13 août 2025

Signature : Florian Hellin 170495

*«Sustainability is no longer about doing less harm. It's about doing more good.»*

Jochen Zeitz

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## List of acronyms

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AUM	Assets Under Management
BEAMA	Belgian Asset Managers Association
CapEx	Capital Expenditures
CRA	Credit Rating Agency
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
CSRD	Corporate Sustainability Reporting Directive
CTB	Climate Transition Benchmark
EFRAG	European Financial Reporting Advisory Group
EMH	Efficient Market Hypothesis
EOC	Event Oversight Committee
ERSIS	Ethibel Research on Sustainable Investments and Savings
ESAs	European Supervisory Authorities
ESG	Environment, Social, Governance
ESMA	European Securities and Markets Authority
ESRS	European Sustainability Reporting Standards
EUROSIF	European Sustainable Investment Forum
FMP	Financial Market Participant
GHG	Greenhouse Gas
GIIN	Global Impact Investing Network
GRI	Global Reporting Initiative
GSIA	Global Sustainable Investment Alliance
HLEG	High-Level Expert Group on sustainable finance
II	Impact Investing Institute
IMP	Impact Management Project
IOSCO	International Organization of Securities Commissions
IPCC	Intergovernmental Panel on Climate Change
IPSF	International Platform on Sustainable Finance
KIID	Key Investor Information Document
MiFID	Markets in Financial Instruments Directive
NAV	Net Asset Value
NFRD	Non-Financial Reporting Directive
NGOs	Non-Governmental Organizations
NZBA	Net-Zero Banking Alliance
OECD	Organisation for Economic Co-operation and Development
OpEx	Operating Expenditures
PAB	Paris-Aligned Benchmark
PAI	Principal Adverse Impact
PRB	Principles for Responsible Banking
PRI	Principle for Responsible Investment
PRIs	Program-Related Investments
PSF	Platform on Sustainable Finance
RCF	Relative Carbon Footprint
RTS	Regulatory Technical Standards
SDG	Sustainable Development Goals
SF	Sustainable Finance

SFDR	Sustainable Finance Disclosure Regulation
SFI	Sustainable Finance and Investment
SIFMA	Securities Industry and Financial Markets
SII	Social Impact Investing
SIITF	Social Impact Investment Taskforce
SME	Small and Medium-sized Enterprise
SRI	Socially Responsible Investment
TCFD	Task Force on Climate-related Financial Disclosures
TEG	Technical Expert Group
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
UNGC	United Nations Global Compact
US	United States
US SIF	United States Sustainable Investment Forum
WACI	Weighted Average Carbon Intensity
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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## Introduction

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The latest report of the Intergovernmental Panel on Climate Change (IPCC, 2023) raises increasing concerns about the adverse impacts of climate change on our economies and ecosystems. Human related activities over the past century have led to a global warming of 1.1°C and it will be very difficult to contain it under 2°C by the end of the 21st centuries. The consequences of this increase in the global temperature are already being felt. This situation is particularly dire as the most affected communities by environmental issues are paradoxically the least responsible for them. The IPCC calls for an imminent and deep mitigation of our CO<sub>2</sub> emissions, as any delayed actions would result in higher losses and damage to our ecosystems and communities.

The Paris Agreement and the 2030 Agenda for Sustainable Development already acknowledged that economy and sustainability could no longer be considered separately. They underscored the urgent necessity of rethinking how we consume and produce. These international events laid down a path and set goals to mitigate the adverse impacts of current societal challenges. For instance, the Paris Agreement aims to limit global warming below 1.5°C by reducing greenhouse gas emissions. The Sustainable Development Goals (SDGs) introduced an action plan across 17 indivisible objectives to “free humankind from poverty and return the planet to the path towards sustainability” by 2030 (SDG, 2024). These objectives reflect the three dimensions of sustainable development, namely the economy, social and environmental aspects and are accompanied by 169 targets and 241 indicators to measure the progress towards the different societal issues.

At the European level, the Commission launched the European Green Deal in 2019 aiming to reduce GHG emissions by 55% by 2030 and make Europe the first climate-neutral continent by 2050. These events at both the global and European level have emphasized the importance of transitioning to a more sustainable and responsible economy and provided a guideline and sustainable targets for businesses to strive toward.

However, to achieve their transition, companies require substantial funding that cannot solely rely on governments support. Given its financing role and a market valued at €231 trillion (SIFMA, 2023), finance has the power to redirect necessary capital towards the transition of companies or to those that are already contributing to these goals. Yet, according to the IPCC report (2023), financial flows in terms of climate adaptation and warming mitigation are still largely insufficient. For example, UNCTAD (2023) identified an annual investment gap of \$4 trillion in achieving the Sustainable Development Goals, especially in developing countries. Thus, the success of this transition to a more responsible economy for people and the environment heavily depends on the financial sector's ability to drive more sustainable investments.

This part of finance, which integrates environmental, social and governance considerations into investment decisions, is known as sustainable finance. The concept first appeared in the 1970s and has continuously grown since then. However, some concerns have started to appear among investors about the actual sustainability aspect and the contribution to current societal issues of these so-called sustainable products. These concerns of greenwashing and impact washing are holding back the development of a more sustainable finance, which is crucial in the economic transition. To address these issues, Europe has tightened its regulations on non-financial information disclosure in order to increase transparency and standardize practices. With this objective, the Sustainable Finance Disclosure Regulation (SFDR) entered into force in 2021, requiring Financial Market Participants (FMP) and financial advisors to communicate information proving and justifying the sustainability aspect of their products.

The goal of this thesis is to determine whether sustainable funds outperform traditional funds on average when evaluated against non-financial criteria. To address this research question, the study compares the extra-financial performance of three categories of funds, differentiated by the degree of sustainability integration.

The first group comprises Socially Responsible Investment (SRI) funds, which promote some environmental or social characteristics within their products through various sustainable investment strategies. The second group consists of impact funds. These funds are also part of sustainable finance but place sustainability at the core of their investment strategy. Through their investments, impact funds seek to address defined social or environmental issues. This is why they tend to have a higher level of sustainability than Socially Responsible Investment funds. Finally, the third group includes traditional funds, which incorporate minimal levels of sustainability consideration into their investment process. This group serves as a baseline, representing the minimum level of non-financial performance against which the results of SRI and impact funds are evaluated.

Sixteen non-parametric Kruskal-Wallis tests are conducted to determine whether statistically significant differences exist in the average extra-financial performance among the three fund categories. The statistical analyses are organized into two main sections.

The first section evaluates extra-financial performance based on ten sustainability indicators, analyzed at three distinct levels; a general level using an overall ESG rating, a level per pillar (E, S and G) taken separately and a more specific level composed of 6 targeted ESG metrics (Scope 1, 2, 3 GHG emissions, carbon footprint, gender pay gap, percentage of female board members, UNGC Principles/OECD Guidelines Violations and PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved). Conducting Kruskal Wallis tests on three different levels, from the most global to the most precise, will refine the comparison with progressively more specific indicators.

The second section adopts a different perspective by evaluating the extra-financial performance of the funds through the lens of controversy. In this context, “controversy” refers to incidents, actions, or behaviors associated with a company that raise ethical, legal, environmental, or social concerns. To measure the exposure of the fund to controversies, the composition of the fund is analyzed across six severity levels, using Morningstar data: the Percent of Asset Under Management (AUM) with No Controversies, the Percent of AUM with Low Controversies, the Percent of AUM with Moderate Controversies, the Percent of AUM with Significant Controversies, the Percent of AUM with High Controversies and the Percent of AUM with Severe Controversies.

Ultimately, the statistical analyses aim to determine whether the professed sustainability efforts of Socially Responsible Investment and impact funds are reflected in superior non-financial performance across diverse ESG and controversy indicators. The findings will provide valuable insights into the prevalence of greenwashing within sustainable finance and the extent to which sustainable funds contribute meaningfully to addressing ESG-related challenges.

This research topic is particularly relevant given the limited amount of scientific research devoted to the topic of non-financial performance. Until recently, most scientific studies comparing sustainable and traditional funds focused on financial performance, investigating whether sustainable consideration affected financial returns and if it was financially worthwhile investing in them. Numerous studies have now shown that sustainable funds perform as well as or sometimes even outperform traditional funds financially. For instance, a meta-analysis by Friede and Busch (2015) found that the vast majority of studies indicated that integrating ESG criteria had a neutral or positive influence on companies' financial performance. More recent studies, such as the meta-analysis by Atz, Van Holt, Zoe Liu and Bruno (2022), confirm these findings, showing similar financial performance for ESG investments compared to

traditional investments, with a third of the studies indicating superior performance. Therefore, in recent years, some studies have started to switch their focus on the measurement of the extra-financial performance of sustainable funds. That's why I wanted to learn more about how sustainability, its risks, its measures and the non-financial information could be integrated within the financial sector. I was also interested in the role that finance could play in addressing current environmental and social issues.

To write down this thesis, I started to describe the context. In this part, the concept of sustainable finance will be defined, along with the related terms surrounding it. Then, through the spectrum of capital, the historical evolution of finance from the 16th century until today will be reviewed. It will explain the apparition of sustainable finance and the major investment approaches. Next, the growth of the international, European and Belgian sustainable investment market will also be presented to understand the market trends by region. Additionally, the role of finance in our lives and in the contribution to sustainability will be discussed. This part will demonstrate how financial institutions, and legislation can transform the financial sector to be more aligned with sustainability.

The chapter will then present the principal sustainable investment strategies employed by investors to integrate ESG considerations into their investment processes. Particular attention will be devoted to impact investing, a distinct subset of sustainable finance in which the pursuit of measurable social or environmental outcomes takes precedence over financial returns.

Subsequently, the chapter will explore the concept of greenwashing as it applies to the financial sector. It will provide a concise overview of its various forms and assess the implications of greenwashing for both sustainable finance and broader sustainability objectives. In light of the risks associated with greenwashing, the final section of the chapter will review the academic literature on the actual contribution of sustainable investment funds to sustainability-related goals. This section will also offer practical recommendations for investors seeking to enhance the positive impact of their investment activities.

The next chapter will be devoted to the state of the information on the non-financial performance of financial products and companies in the financial market. It will start by reviewing the European regulations on sustainable information disclosure to clarify what information must be published. Particular attention will be given to the Sustainable Finance Disclosure Regulation (SFDR), which requires certain disclosure requirements on financial intermediaries to justify the sustainability of their product.

The last part of the thesis will be dedicated to statistical analyses. It will detail the methodology, the different hypotheses, explain the sample fund creation and the indicator selection. This section will then present the results of the nine Kruskal Wallis tests and will try to provide an answer to the initial research question. The findings will be compared with the related scientific literature. Before concluding the thesis, we will discuss the limitations of the methodology and present some recommendations for future scientific studies.

## Chapter 1: The context

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The first chapter aims to introduce the theoretical ground of this thesis. It begins by defining the concept of sustainable finance and outlining the broader landscape that surrounds it. Then, it explores the origins and the evolution of sustainable finance through the lens of the spectrum of capital, tracing its development over time. It will provide an overview of the range of investing approaches that coexist in the market and introduce the different approaches to sustainable investing. Then, the size of the international and the Belgian sustainable finance markets will be analyzed to grasp the importance and the exponential growth of the market. This chapter will be concluded by analyzing the pivotal role of finance in advancing sustainability objectives and how the regulation can support this transition.

### 1.1 Definition of sustainable finance

Sustainability is inherently subjective, making the concept of sustainable finance difficult to define with precision. Every organization has its own interpretation of sustainability based on its values, its beliefs and cultural context. All these factors influence the minimal threshold for an investment to be deemed sustainable. For some, the consideration of the impact on the environment and society is sufficient for an investment to be considered as sustainable. For others, investments must actively contribute to the transition toward a fairer, more sustainable economy or address environmental or social challenges.

This diversity of views has led to the emergence of a multitude of investment approaches such as responsible investing, ESG investing, ethical finance, Socially Responsible Investing, impact investing or social impact investing. These investment approaches all fall under the broader concept of Sustainable Finance as they pursue objectives that extend beyond the sole achievement of financial returns.

Although this diversity of terminology reflects the richness and the possibilities of sustainable finance, it also generates significant conceptual ambiguity. In practice, some of these terms are used interchangeably by financial market participants and even by academic researchers, which can lead to confusion among investors and the general public. Despite their similarities, each term possesses its own specificities (Roncalli, 2025).

This issue has been emphasized by Migliorelli (2021), who warns that such proliferation of definitions and overlapping concepts may be detrimental to the development of the field and increase the risk of practices such as greenwashing, where financial products are marketed as sustainable without delivering meaningful societal or environmental benefits. This lack of precise criteria for what constitutes a sustainable investment could allow certain actors to “rebrand” conventional financial instruments as sustainable, despite lacking true societal impact.

Figure 1.1: Many words, one concept



**Figure 1:** Concepts surrounding sustainable finance

Source: Roncalli, 2025. *Handbook of Sustainable Finance*.

In light of these concerns, it is essential for the field of sustainable finance to establish clearer standards, definitions and regulatory frameworks to ensure that sustainability claims are both credible and verifiable.

Currently, there is no universally accepted definition of sustainable finance. However, one of the most frequently cited definitions is provided by the European Commission, which defines sustainable finance as:

*“... the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects. Environmental considerations might include climate change mitigation and adaptation, as well as the environment more broadly, for instance the preservation of biodiversity, pollution prevention and the circular economy. Social considerations could refer to issues of inequality, inclusiveness, labour relations, investment in people and their skills and communities, as well as human rights issues. The governance of public and private institutions – including management structures, employee relations and executive remuneration – plays a fundamental role in ensuring the inclusion of social and environmental considerations in the decision-making process.”* (European Commission, n.d., para.1).

This definition is intentionally broad, encompassing a wide range of societal and environmental issues. Those challenges can be classified in 3 categories: Environment, Social and Governance (ESG) factors. Nonetheless, this definition is fairly criticized as it restricts sustainable finance to the integration of ESG criteria within the investment or financing process. Such a limitation may lead investors to mistakenly equate ESG investing with sustainable investing, although ESG investing represents only a part of sustainable finance, which reinforces existing ambiguity surrounding all these appellations. In response to this concern, Kumar and al. (2021) propose to extend the scope of sustainable finance to *“encompass all activities and factors that would make finance sustainable and contribute to sustainability”* (Kumar and al., 2021, p.1071).

The policy-related definition provided by the European Union is more aligned with this point of view as it states that:

*“Sustainable finance is understood as finance to support economic growth while reducing pressures on the environment to help reach the climate- and environmental objectives of the European Green Deal, taking into account social and governance aspects”* (European Commission, n.d., para.2).

This definition illustrates a significant shift in how sustainability is conceptualized within the financial sector. Initially, sustainable finance was only viewed as the integration of sustainability-related considerations into the investment decision-making process in order to mitigate financial risks. Nowadays, sustainable finance is increasingly regarded as a proactive tool for directing capital towards the transition to a more responsible and inclusive economy, alignment with global initiatives such as the Paris-Agreement, the Sustainable Development Goals and the European Green Deal. This expanded role is what Migliorelli (2021, p.1) refers to as *“finance for sustainability”*. This change of perception towards sustainable finance testifies that sustainability is a concept that can evolve over the years.

Migliorelli (2021) further argues that defining sustainable finance requires the consideration of two fundamental components. First, it is necessary to answer the question *“What is sustainability?”* (Migliorelli, 2021, p.10), that it to identify all the issues that fall under sustainability. Second, it is essential to assess which sectors, which business activities or projects have the potential to address or improve these challenges. This element helps establish clear criteria for determining which entities should be financed to contribute meaningfully to a more sustainable world. Based on this framework, Migliorelli defines sustainable finance as the *“finance to support sectors or activities that contribute to the achievement of, or to the improvement in, at least one of the relevant sustainability dimensions”* (Migliorelli, 2021, p.10).

## 1.2 History of sustainable finance through the development of the spectrum of capital

The origin of modern finance can be traced back to the 16<sup>th</sup> century with the emergence of the first banks in Italy. At the time, the primary function of these banks was to connect individuals possessing a surplus of funds who sought to earn interest on their money with those in need of financing to launch or manage their business. During this period, financial practices were highly dictated by the catholic religion. Banks had to comply with a strict list of money lending and interest guidelines. For instance, banks were permitted to lend only to individuals who demonstrated diligence and responsible conduct. Additionally, loans intended for luxury consumption were generally discouraged and measures were put in place to avoid excessive interest rates (prevention of usury). Some institutions even enforced ceilings on the interest rates that could be charged (Weber, 2012).

One prominent example of early sustainable banking practices is the Monte di Pietà, one of the largest financial institutions of the time. This bank adhered to a number of principles that reflected a responsible and community-oriented approach to finance. These included:

- Closing regional links by lending primarily to borrowers from the local community
- Granting loans in proportion to the collateral that is offered by the borrower
- High creditworthiness of the borrowers
- Engaging in local social activities
- Providing interests for deposits
- Lending to public bodies in times of crisis
- Promoting mortgages



Responsibility (CSR). However, some people were reductant to this change of paradigm. Notably, Milton Friedman (1970), one of the highest influential economists of the 20th century, who argued in a notorious article of the New York Times in 1970 that: “The social responsibility of business is to increase its profits” as he believed that CSR was incompatible with the pursuit of making profits (Roncalli, 2025). Even though Friedman was against CSR, his vision highlighted something crucial: if shareholders can push companies to generate more profits, they can also raise awareness about societal issues and push them to adopt more sustainable practices.

On the opposite side of the spectrum “*program-related investments*” (PRIs) emerged around the same period. This strategy was introduced by the Ford Foundation. PRI are low-interest loans that support organizations with social purposes. This approach is typically employed by philanthropic foundations to perceive some returns on their investments, which can be then reinvested into new projects and ultimately achieve a higher societal impact. Simultaneously, it helps social organizations to prove their creditworthiness and emancipate them from donations. A similar investment approach is the concept of Venture Philanthropy. This concept works similarly to PRI, although there are some differences. First, venture philanthropy is mainly used by venture capital firms. Then, returns on their investments are not entirely reinvested in other social projects, which is systematic with PRIs (Ford Foundation, 2023). Finally, engagement with the investee is a key component of venture philanthropy. They provide non-financial support like expertise, competence and consulting in order to increase the impact of their investments (Hayes, 2022). PRIs are placed further right along the spectrum of capital, as they are more inclined to assume greater risks or accept even lower interest.

The next significant evolution within the spectrum of capital emerged in the late 1990s and early 2000s with the introduction of what is now commonly referred to as sustainable investing. Some investors began to realize that: “*if one can do just as well by investing to avoid certain negative social or environmental factors, might one do equally well or better by affirmatively choosing investments on the basis of social or environmental considerations?*” (Trelstar, 2016, p.7). This marked a shift from traditional negative screening, focused on excluding controversial companies or sectors, towards a more proactive strategy that involved the positive selection of companies demonstrating strong Environmental, Social and Governance performance. Initially, this approach was known as “responsible investing.” However, as attention increasingly centered on ESG criteria, the term “ESG investing” gained prominence. Over time, this evolved into the broader concept of “sustainable investing,” which more accurately captures the long-term, comprehensive nature of sustainability-related concerns (Roncalli, 2025). This progression highlights that the conceptualization of sustainable finance has permanently evolved and continues to do so, supporting the fact that sustainable finance is a continuously evolving concept (cf. supra p.23). Today, sustainable finance encompasses a wide range of investment strategies that extend beyond the initial principles of negative screening and the “do no harm” approach. These evolving strategies will be examined in greater detail in the following chapter (cf. infra p.36).

The most recent development along the spectrum emerged around the same period in the 2000s with the introduction of the concept of “impact investing”. These investments aim to finance companies that address societal issues alongside financial returns. In certain cases, investors are even willing to tolerate lower returns in exchange for greater societal or environmental impact (Trelstar, 2016).

With the spectrum of sustainable investment now fully outlined, it is essential to emphasize the appellation spectrum. Indeed, all these approaches exist along a continuous gradient, with some variations in how they are interpreted and implemented in practice by financial institutions. There are no rigid boundaries separating one strategy from another. While the absence of defined standards allows for flexibility in interpreting what qualifies as sustainable or impactful, it also introduces risks such as greenwashing and impact washing. Additionally,

the diversity of perspectives and the overlaps between investment approaches further complicate the establishment of clear, standardized definitions and criteria within the field. Further details on the key milestones that have shaped the development of sustainable finance can be found in Appendix 1.

Furthermore, it is noteworthy that traditional investing, SRI and ESG investing share similar financial expectations, as they all seek to achieve market-rate returns. However, these approaches differ in the incorporation of sustainability considerations. As traditional investment is solely focused on financial returns and has no impact intention, it is not part of sustainable finance. On the other end of the spectrum, Impact Investing, Venture Philanthropy, PRIs and traditional philanthropy all aim to contribute to solutions. These approaches are differentiated by their financial return expectations and the level of risk they are willing to accept in achieving their impact-oriented objectives. While Venture Philanthropy, PRIs and traditional philanthropy are all approaches that contribute meaningfully to societal and environmental goals, they are not comprised within sustainable investing as they do not align with the core principle of sustainable investing, which seeks to integrate ESG factors into investment decision-making while still targeting competitive financial returns.

### 1.3 The rise of sustainable finance: A quantitative analysis of the market

#### 1.3.1 The international and European sustainable markets

This section will analyze the growth of the sustainable finance market between 2016 and 2022 through the report published by the Global Sustainable Investment Alliance (GSIA) in 2023.

**Table 1:** The global sustainable investment market in 2022

REGION	2016	2018	2020	2022
Europe	12,040	14,075	12,017	14,054
Canada	1,086	1,699	2,423	2,358
Australia & New Zealand	516	734	906	1,220
Japan	474	2,180	2,874	4,289
<b>Sub-total (USD Billions)</b>	14,115	18,688	18,220	21,921
% change		32%	-3%	20%
United States	8,723	11,995	17,081	8,400
<b>Total (USD Billions)</b>	22,838	30,683	35,301	30,321
% change		34%	15%	n/a

Note: 2022 not applicable due to a change in methodology

In 2022, the total sustainable assets<sup>1</sup> under management (AUM) across Europe, Canada, Australia, New Zealand, Japan and the United States amounted to \$30,321 billion USD. This represents a 14% decrease compared to 2020. This surprising decrease can be attributed to a change in the methodology<sup>2</sup> used by the Sustainable Investment Forum of the United States (US SIF) in the computation of the sustainable AUM in the United States market, which fell from \$17,081 billion in 2020 to \$8,400 billion in 2022.

*Source:* GSIA. (2023). *Snapshot of global sustainable investing assets, 2016-2022 (USD billions).*

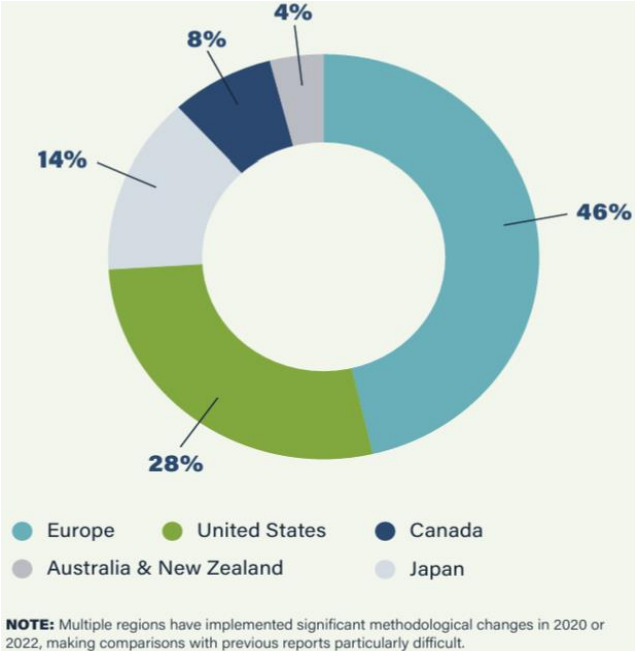
<sup>1</sup> Under the GSIA report “sustainable investments” are referred to as investments that consider ESG criteria within their portfolio selection and management through sustainable investment strategies.

<sup>2</sup> The revised methodology does not include the AUM of investors who stated that they practice firmwide ESG integration but did not provide information on any specific ESG criteria they used (such as biodiversity, human rights or tobacco) in their investment decision-making.

When excluding the US market for this period, the combined sustainable AUM for the remaining regions reaches \$21,921 billion USD. This reflects a 20% increase over the last two years, indicating an upward trajectory of sustainable finance in these markets.

Given the substantial impact of the revised U.S. methodology on comparability, this analysis will focus on non-U.S. markets to ensure consistency and interpretive clarity. A closer examination of regional data reveals that the upward trend in sustainable assets under management is broadly reflected across most markets. In Europe, sustainable AUM increased from \$12,017 billion in 2020 to \$14,054 billion in 2022, representing a growth of approximately 16.95%. In contrast, the Canadian market remained relatively stable, recording a slight decline of 2.68%, with AUM decreasing from \$2,423 billion to \$2,358 billion. Australia and New Zealand experienced notable growth, with sustainable assets rising from \$906 billion to \$1,220 billion, marking a remarkable increase of 34.66%. However, the most significant expansion occurred in Japan, where sustainable AUM surged by 49.23%, from USD 2,874 billion in 2020 to USD 4,289 billion in 2022 (GSIA, 2023).

Overall, these observations indicate that the sustainable investment market is growing, particularly in the Asia-Pacific region. In contrast, Europe, after suffering from a slight decline between 2018 and 2020, likely due to the COVID-19 crisis, has since rebounded, with AUM returning to levels comparable to those recorded in 2018. This global expansion of sustainable assets signals a broader maturation of the sustainable finance sector. However, such growth also heightens the risk of greenwashing, as asset managers may seek to capitalize on rising demand by marketing financial products as “green” without offering any substantive sustainability benefits. Moreover, the increasing number of actors entering the field has led to a growing diversity of interpretations regarding the definition of sustainable finance. This ambiguity further complicates the identification of genuinely sustainable investments and amplifies the risk of misleading practices.



This chart depicts the distribution of the global sustainable finance market by region in 2022. Europe accounted for the latest share, representing 46% of the global sustainable market. The United States followed with 28%. The methodological change in their computation led to a reversal in rankings compared to 2020 when the US constituted 48% of the market and Europe 34%. Japan completes the podium with 14% of the market. Canada and the combined regions of Australia & New Zealand made up the remainder of the chart, with 8% and 4% respectively.

**Figure 3:** Proportion of sustainable investments by region in 2022

*Source:* GSIA. (2023). *Proportion of global sustainable investing assets by region in 2022.*

Overall, the data highlights Europe’s leadership position in the global sustainable investment landscape, now representing almost half of the sustainable Assets Under Management worldwide.

The following chart delineates the evolution of the sustainable market and compares this growth to that of the global market. It shows an increase in the proportion of sustainable investments relative to the global market, rising from 35.9% in 2020 to 37.9% in 2022. This suggests that the sustainable finance market is growing at a faster rate than the global market overall.

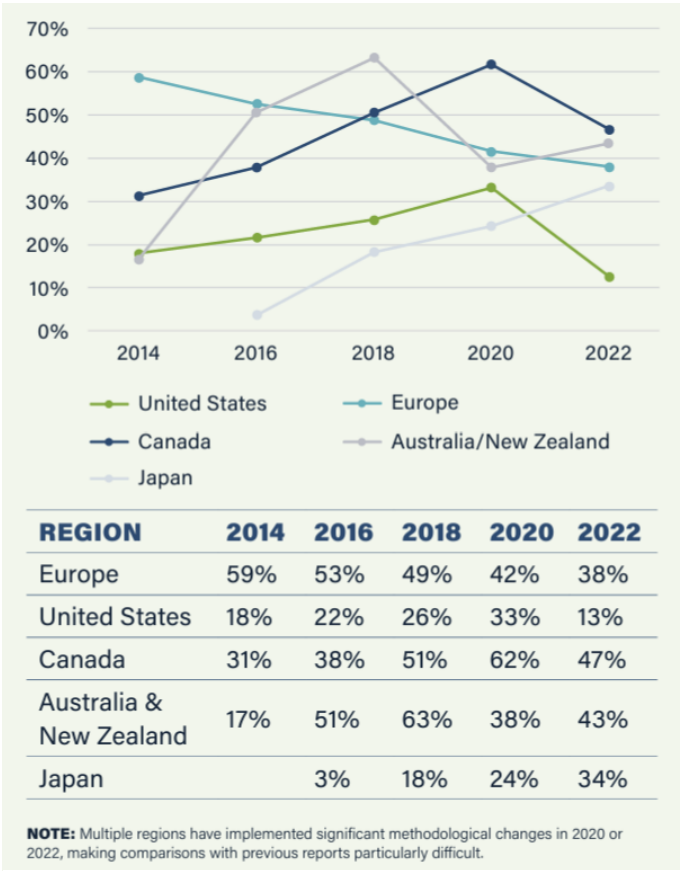
**Table 2:** Proportion of sustainable investments (AUM) to the global financial market

REGIONS	2016	2018	2020	2022*	2022
Total AuM of regions (USD)	81,948	91,828	98,416	57,887	124,487
Total sustainable investments only AuM (USD)	22,872	30,683	35,301	21,921	30,321
% Sustainable investments	27.9%	33.4%	35.9%	37.9%	24.4%
<b>Increase of % sustainable investments</b> (compared to prior period)		34%	15%	20%	n/a

NOTE: 2022\* excludes US data due to the change in methodology and to allow consistent comparison across regions. 2022 change not applicable due to the change in methodology.

Source: GSIA. (2023). *Snapshot of global sustainable investing assets, 2016-2022 (USD billions) including and excluding US data.*

**Table 3:** Evolution of the sustainable market



This final graph illustrates the proportion of sustainable AUM relative to the total AUM by region, offering a more precise perspective to previously analyzed figures. The data reveal that some of the most prominent markets, notably Europe and the United States, are experiencing a relative decline in the share of sustainable investments. In Europe, the proportion of sustainable AUM decreased from 42% in 2020 to 38% in 2022, continuing a steady downward trend observed since 2014, with an approximate decline of 5% every two years. The United States recorded an even more substantial drop, with sustainable AUM falling from 33% in 2020 to 13% in 2022. However, this sharp decline is primarily attributable to methodological changes in how sustainable assets are reported.

Source: GSIA. (2023). *Proportion of sustainable investing assets relative to total managed assets, 2014-2022.*

In Canada, while the absolute volume of sustainable investments remained relatively stable, their proportion relative to total AUM declined markedly from 62% in 2020 to 47% in 2022. These figures suggest that, in these major markets, sustainable investment is not keeping pace with the overall growth of the financial sector.

The GSIA (2023) identifies several factors contributing to this decline. It notices changes in the methodologies and practices of sustainable finance. It also recognizes a strengthening of the regulation towards the transparency of sustainable information. Notably, the implementation of the Sustainable Finance Disclosure Regulation (SFDR) in Europe has led financial actors to adopt a more cautious approach in disclosing sustainability-related claims. These developments in the regulatory framework, practices and methodologies are the reflection of a broader maturation of the sustainable finance sector signaling a shift toward more rigorous standards and accountability.

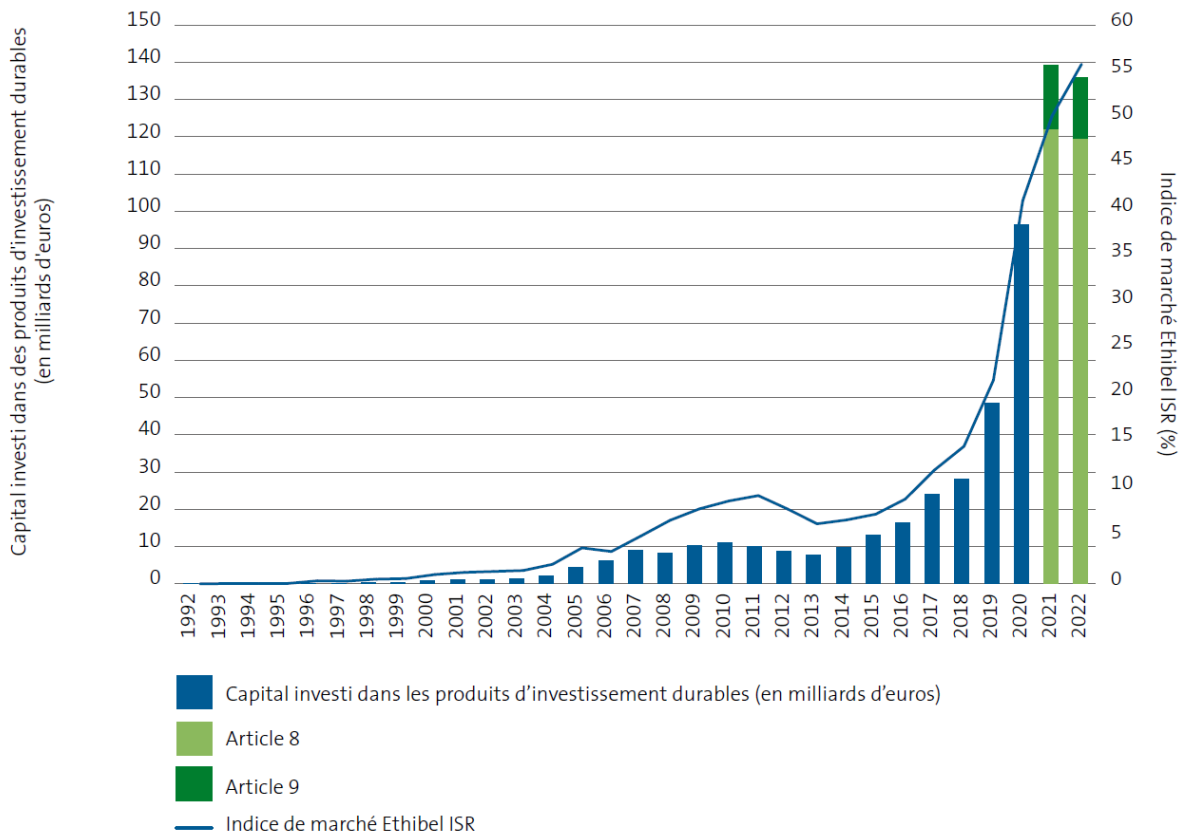
Conversely, the sustainable investment landscape in the Asia-Pacific region appears to be gaining momentum. In Australia and New Zealand, the share of sustainable investments increased from 38% in 2020 to 43% in 2022. Similarly, Japan saw a notable rise from 24% to 34% over the same period. As indicated in previous data, these regions initially lagged in adopting sustainable finance practices, but they are now rapidly closing the gap with their Western counterparts.

This strong regional growth is the reason why the global share of sustainable investments relative to total AUM has continued to rise from 35.9% in 2020 to 37.9% in 2022, despite the stagnation or decline observed in North American and European markets.

### 1.3.2 The Belgian sustainable market

At the national level, sustainable finance in Belgium is closely monitored by Forum Ethibel, a Belgian non-profit organization that publishes the annual *Ethibel Research on Sustainable Investments and Savings* (ERSIS) report. This study is designed to evaluate the evolution of the Belgian sustainable investment market. It is based on a voluntary survey distributed to leading asset managers operating in Belgium and offers an estimate of the country's sustainable finance landscape. In addition to quantifying assets, the report also identifies emerging trends and developments within the market.

The following graph illustrates the evolution of sustainable investment assets in Belgium from 1992 to 2022. Notably, the data reveal a slight decline in assets under management for sustainable products, falling from €139.8 billion in 2021 to €136.3 billion in 2022. This marks the first contraction in the Belgian sustainable investment market since 2013. However, when compared to the broader Belgian market, as reported by the Belgian Asset Managers Association (BEAMA, 2023), this decline appears less severe. During the same period, the total volume of assets under management in Belgium declined by 12.3%, whereas sustainable assets fell by only 2.5%. This suggests that sustainable products remain attractive to investors and might be more resilient than traditional investments during periods of market volatility (Forum Ethibel, 2023).



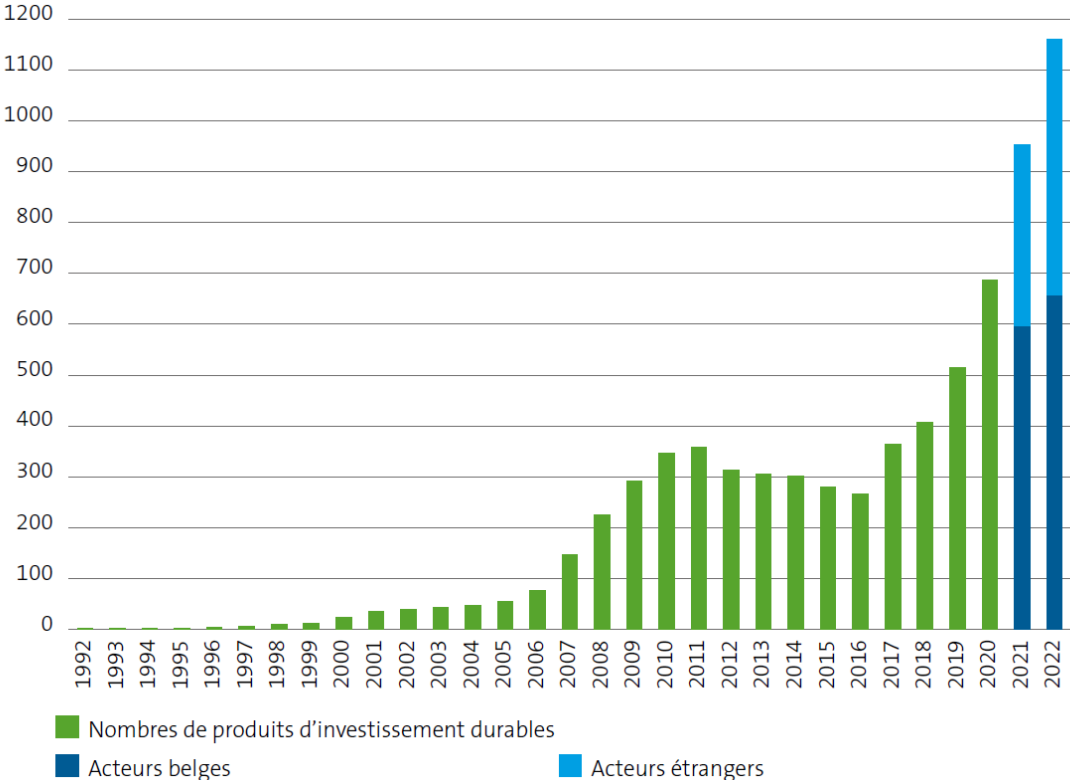
**Figure 4:** Evolution of assets in sustainable investment products in Belgium (1992-2022)

Source: Forum Ethibel. (2023). *Évolution des actifs dans les produits d'investissement durables en Belgique (1992-2022)*.

The *Ethibel SRI Market Indicator* serves as a trend measure, reflecting the share of sustainable assets in relation to total assets. It provides a proxy for market interest in sustainable financial products. According to the latest data, the indicator continued its upward trajectory in 2022, with sustainable products representing almost 55% of the total assets, although the rate of increase has slowed compared to the previous year (Forum Ethibel, 2023).

It is important to highlight that the ERSIS study exclusively focuses on financial products marketed to retail investors. As such, it does not include products targeted at institutional investors, thereby significantly underestimating the overall size of the sustainable investment market in Belgium. Furthermore, for a financial product to be classified as sustainable in this study, it must at a minimum integrate ESG criteria and exclude investments in controversial sectors or activities (Forum Ethibel, 2023).

This second graph illustrates the evolution of the sustainable offer on the Belgian market from 1992 to 2022. Starting in 2021, the study began differentiating products from Belgian entities and foreign entities. Belgian actors are defined as organizations with their headquarters in Belgium or those primarily active within Belgium. Foreign actors are organizations that have progressively established a significant position in the Belgian market (Forum Ethibel, 2023).



**Figure 5:** Evolution of the offer of the number of sustainable investment products, of Belgian and foreign origin in Belgium (1992-2022)

Source: Forum Ethibel. (2023). *Évolution de l’offre du nombre de produits d’investissement durables, d’origine belge et étrangère en Belgique (1992-2022).*

As shown in the graph, the total number of sustainable investment products available in 2022 reached 1,160, reflecting an 8% increase compared to the previous year. Although this growth rate is slightly lower than that recorded in the preceding edition, it remains remarkable, particularly in light of the concurrent trends in sustainable asset volumes. Among these products, 56.55% (656 products) are offered by Belgian organizations, while the remaining 43.45% (504 products) originate from foreign entities.

Overall, since 2016, the number of sustainable investment products available on the Belgian market has continued to grow steadily, highlighting a sustained and increasing interest in sustainable products (Forum Ethibel, 2023).

## 1.4 The role of finance in sustainability

This section examines the critical role of the financial sector can play in addressing societal and environmental challenges, particularly in facilitating the transition toward a more sustainable, low-carbon economy. It begins with a discussion of the fundamental purpose of finance, followed by an analysis of the contribution financial institutions can make in supporting this transition. The chapter concludes with an exploration of how regulatory frameworks can help align financial activities with sustainability objectives. For informational purposes, a discussion of the role of individual citizens is also provided in Appendix 2.

### 1.4.1 The purpose of finance

Unlike other industries, determining the purpose of finance is less straightforward. The consensus in the literature indicates that finance should primarily serve the needs of the broader economy and society and not just itself. However, there has been limited academic research on the question of the measurement of the performance of the financial sector. This is extremely problematic, as it makes it impossible to evaluate whether finance is fulfilling its intended role. This oversight is often attributed to the assumption that market competition will ensure industry efficiency.

Pitt-Watson and Mann (2017) have identified four core functions of finance, which provide a practical and measurable framework for the purpose of finance:

1. **Safeguarding Assets:** Financial institutions are entrusted with protecting people's money and ensuring its availability when needed.
2. **Providing a Payment System:** An effective payment infrastructure is essential to facilitate the exchange of goods and services in the economy.
3. **Risk Sharing:** Through insurance and related products, the financial industry allows individuals and businesses to protect themselves against potential losses from unpredictable events.
4. **Intermediation:** Arguably its most vital and ancient function, intermediation connects those with excess capital to those who need funding, thereby directing capital toward productive uses.

Among these, intermediation is particularly significant in driving economic development and societal progress. However, a study conducted by Philippon (2015) on the U.S. financial system from 1880 to 2010 revealed that despite growth in financial activity, the efficiency of financial intermediation, measured by the cost of channeling funds from savers to borrowers, has not improved over time.

These functions are so embedded in our daily lives that their societal value is often overlooked. However, the financial industry plays a crucial role in society and in the economy. It is therefore imperative that finance remains committed to its original mission: to serve society, especially when history has shown that when the financial sector prioritizes its own interest over purpose, it has inevitably resulted in systematic failures with the most notable example being the 2008 financial crisis (Pitt-Watson and Mann, 2017).

In today's context, sustainable finance emerges as both a solution and a challenge. Scholars such as Chiu, Lin and Rouch (2022) reflect on the fundamental essence of sustainable finance by asking: "*Is sustainable finance a genuine vehicle for solving environmental and social issues, or just another investment opportunity?*". The reality likely lies in between. While sustainable finance can generate returns, it also holds immense potential to support long-term societal transformation if aligned with its original purpose: to serve the world rather than merely generating profit for itself.

## 1.4.2 The role of the financial market

Ahlström and Monciardini (2021) explain that financial institutions stand at the heart of the sustainability transition, not only because of the vast capital they manage but also because of the influence they exert over economic priorities and corporate behavior. Yet historically, the financial sector has often operated under a logic focused on short-term profit maximization, shareholder value, and financial gain. This dominant mindset, commonly referred to as financialization, is responsible for not only financial instability but also the worsening of social and environmental challenges.

They describe that the relationship between finance and sustainability has evolved in three distinct phases from 2009 to 2019. The first phase took place in the aftermath of the global financial crisis (2009-2011). Sustainability and finance appeared in conflict and sustainable finance was then perceived as a cure to the financial excesses of the sector. Then, from 2011 to 2017, a period of complementarity followed, with growing alignment between sustainability advocates and financial actors. Socially Responsible Investing (SRI) gained traction and were embraced by Civil Society Organizations (CSOs) such as WWF and ClientEarth. However, from 2017 to 2019, as sustainable finance grew in popularity, divergent views about its purpose developed and tensions reemerged. Some actors viewed sustainability as an opportunity to generate profits, while others as a means of driving social and environmental change.

Despite this ambivalence, Pitt-Watson and Mann (2017) and Chiu & al. (2022) agree that the key to reconciling finance and sustainability partly lies in the hands of the financial institutions themselves. These institutions must return to their core mission: serving their customers and the broader economy. They have relied too much on regulation to foresee the risks and prevent potential crises. This mentality led to financial crises and damaging public trust in the sector.

Beyond changing their own behavior, financial institutions possess a powerful lever to foster sustainability: their function of intermediation. As highlighted by Ryszawska (2016), current levels of environmental degradation and social inequality threaten long-term economic development. To stay resilient, businesses must revise their models to mitigate ESG risks and embrace more sustainable operational practices. By directing capital flows, the financial market can help financing the sustainable transition of other industries and support greener, more inclusive business practices. With a global financial market worth over \$231 trillion in 2022 (SIFMA, 2024), representing almost nine times the GDP of the United States, these institutions hold the capital needed to fund the global sustainability transition (World Bank Group, 2025).

Despite the vast potential of the financial sector, a significant investment gap persists. The United Nations Conference on Trade and Development (UNCTAD, 2023) reports that the shortfall in sustainable investments required to achieve the Sustainable Development Goals (SDGs) widened from \$2.5 trillion in 2015 to \$4 trillion in 2023. Similarly, the International Monetary Fund (IMF) has also identified a yearly investment shortfall of \$2.6 trillion across critical sectors such as health, education, roads, electricity, water and sanitation (Ziolo, Bak and Cheba, 2020). These figures highlight the urgent need for capital reallocation. However, redirecting just 2% of the global financial market toward SDG-aligned investments could be sufficient to close this gap. This underscores the transformative potential that a relatively modest shift in capital allocation could have in advancing global sustainability objectives.

Therefore, financial markets play a crucial role in addressing sustainability-related challenges. Strategically positioned, they possess both the financial resources and the instruments necessary to drive meaningful change. The transition toward a more equitable and sustainable economy is impossible without adequate financing and its success will largely depend on the capacity of the financial sector to integrate and align with sustainability objectives. However, the current conventional form of the financial system remains largely disconnected from

environmental and social considerations, highlighting a fundamental misalignment with the requirements of a sustainable transition.

To address this detachment, the OECD (2018) and Zorlu (2018) propose several key measures. These include the integration of ESG factors into financial risk assessments, the establishment of comprehensive guidelines for sustainable finance, the enhancement of regional and international cooperation, and the development of clear, standardized classifications for sustainable assets. These recommendations aim to align financial practices more closely with sustainability objectives and to facilitate a more effective transition toward a responsible and resilient financial system.

### 1.4.3 The role of regulation

While financial institutions play a critical part in driving sustainability, regulatory frameworks are equally essential to realign the financial system with long-term social and environmental goals. The scientific literature consistently emphasizes that effective regulation is not only necessary to correct market inefficiencies but also to define and steer the financial sector toward serving the broader public interest.

Interestingly, the issue is not a lack of regulation. As Pitt-Watson & Mann (2017) point out, regulation has expanded considerably alongside the growth of the financial sector. In the UK, for instance, the number of financial regulators per employee increased dramatically between 1980 and 2011. Pension laws alone grew from 3,000 pages to over 100,000 during this period. In order to prevent and resolve market failures, the legislator has always tried to intervene by publishing more and more regulations. The fact that EU regulatory measures regarding sustainable finance only appeared after the financial crisis of 2008 is a revealing element. The real issue lies in the effectiveness of regulation, not its volume.

A possible reason is the ability of financial institutions to stay one step ahead of lawmakers, always finding ways to circumvent new rules. As a result, more regulations have often meant greater complexity, without necessarily improving outcomes. Pitt-Watson & Mann (2017) and Chiu & al. (2022) suggested that regulation should start by clearly defining the purpose of finance. Then, it should measure whether financial institutions are fulfilling their mission. Such an approach could ensure that finance serves the customer interest rather than its own. It would eventually lead to productivity gains, reduced costs of capital and a more secure industry.

Chiu & al. (2022) emphasize that this need for clarity extends to sustainable finance itself. Is its purpose to mitigate financial risk, deliver ethical returns, or address systemic sustainability issues? This ambiguity is reflected in the complexity captured by the "spectrum of capital" (cf. supra p.24), where different investment approaches prioritize financial and impact goals differently. Clear regulatory definitions are therefore critical for building a unified understanding and effective policy framework.

Nonetheless, Europe has clearly recognized the pivotal role finance plays in achieving sustainability goals such as the climate and energy targets set forth in their European Green Deal. Aware of the importance of finance, Europe supports the development of sustainable finance in two different ways. Through their directives and initiatives, Europe can provide prerequisites for the successful development of sustainable finance and promote sustainable financial practices in the market. The most representative example of this is the Action Plan on Financing Sustainable Growth (European Commission, 2020). These directives aim at enhancing the transparency and the standardization of the non-financial information which the market desperately needed (Chiu & al., 2022). These European directives will be further elaborated in this thesis (cf. infra p.52). Then, Europe directly fosters the development of

sustainable finance through substantial investments, notably through the European Green Deal (European Commission, n.d.).

Ahlström & Monciardini (2022) highlight that the financial crisis of 2008 has created two shifts in European regulation. Initially, there were no binding rules on sustainable finance because of the prevalence of financial logic which perceived sustainable considerations as inconsistent with profit maximization. However, after the financial crisis, the EU switched from voluntary policies to legally binding policies. Then around 2015, as the financial sector regained legitimacy, a new shift occurred. EU regulation began focusing on climate finance rather than on sustainable finance because climate issues are more easily converted into financial measures than other social and environmental challenges. This raised concerns that regulation was adapting sustainability to fit finance, rather than adapting finance to address sustainability.

Furthermore, although Ahlström & Monciardini (2022) recognize that regulatory efforts have pushed sustainable finance into the mainstream, they question whether these measures effectively align financial activities with sustainability goals. Similarly, Huang and Kopytov (2024) also raise some concerns regarding the implications of regulatory intervention in sustainable finance. They acknowledge that the global nature of certain sustainable issues like pollution cannot be tackled solely by investors alone and thus require regulatory oversight to mitigate the externalities of human activities.

However, they highlight the dual effects of certain environmental regulations such as pollution taxes and green subsidies. While these instruments aim to reduce emissions, they can also drive away socially motivated investors from polluting firms. This withdrawal could weaken internal shareholder pressure on these firms to adopt green technologies and transition to greener practices. This concern is particularly significant given that shareholder engagement and shareholder action became the most widely adopted sustainable investment strategy in 2022, representing \$8.05 trillion in assets under management (GSIA, 2023). As such, the risk that these policies do not lead to meaningful environmental improvements cannot be dismissed.

Therefore, regulation must be carefully designed. It must account for complex market behaviors and ensure that financial incentives, investor actions and sustainability objectives are aligned. Too much rigidity or misalignment can lead to adverse outcomes, where regulation increases complexity without delivering real-world impact.

In conclusion, because of the financialization of the industry, the financial sector has some responsibilities for current environmental and social issues. However, finance, as an intermediary between buyers and providers of capital, has undeniably the potential and the opportunity to fund the transition towards a greener economy and address these challenges. But for it to do so effectively, regulation also plays a crucial role. First, it must clearly define the purpose of finance and sustainable finance. Then, it must create a regulatory framework that fosters the development of sustainable financial practices without perpetuating the financialization of the industry. Only then can the financial sector be transformed into a reliable driver of sustainable development.

## Chapter 2: Sustainable investment practices and greenwashing

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Having established the broader context of sustainable finance and the role of the financial sector in supporting the transition toward a more sustainable and equitable economy, this chapter will now explore the practical investment approaches used to incorporate sustainability considerations and generate measurable impact.

The chapter begins by examining the various sustainable investment strategies employed by investment funds, with a particular emphasis on impact investing. It then outlines the key methodologies used to measure and manage the impact of these investments. Following this, the discussion will turn to the concept of greenwashing, its definitions, manifestations and implications for the sustainable finance market.

Finally, in response to the risks associated with greenwashing, the chapter concludes with an assessment of the extra-financial performance of Socially Responsible Investment (SRI) funds and impact funds. This final section aims to evaluate the extent to which these funds contribute meaningfully to addressing current societal challenges and to determine whether their sustainability claims are substantiated by actual performance.

### 2.1 Sustainable investment strategies

As outlined in the previous section, a variety of terms are used to describe funds that integrate Environmental, Social, and Governance (ESG) considerations into the investment decision-making process. In this thesis, funds that fall under sustainable investing and pursue sustainability objectives alongside financial returns will be referred to as *Socially Responsible Investment (SRI) funds* or *Sustainable and Responsible Investments*.

Eurosif (2021) defines SRI as:

*“a long-term oriented investment approach that integrates Environmental, Social & Governance (ESG) factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factors in order to better capture long term returns for investors, and to benefit society by influencing the behaviour of companies”* (Eurosif, 2021, p.11).

In this context, the present section will examine the principal sustainable investment strategies employed by SRI funds to incorporate ESG considerations into their investment processes. These strategies are primarily drawn from the classification frameworks established by Eurosif (2024) and the Global Sustainable Investment Alliance (GSIA, 2022).

It is important to note that while the terminology for these strategies may vary across jurisdictions and organizations, their core principles remain largely consistent (Roncalli, 2025).

Broadly, the seven main sustainable investment strategies can be categorized into two groups: pre-investment strategies, which influence decisions prior to capital allocation, and post-investment strategies, which guide investor behavior after the investment has been made.

### 2.1.1 Pre-investment strategies

Pre-investment strategies represent all the practices such as criteria, filters or thresholds that are applied by the investor during the investment decision-making process before the investment decision is made. The objective of these strategies is to assess the sustainability risks and opportunities associated with a potential investment and ensure that the investment is alignment with the sustainability's preferences of the investor.

#### 2.1.1.1 Exclusions or negative screening

Negative screening is an investment strategy that involves the deliberate exclusion of certain sectors, activities, countries, or companies from the investment universe based on ethical, moral, or sustainability-related considerations. This approach reduces the range of eligible investments by filtering out entities that do not meet predefined criteria (Eurosif, 2022).

Typically, negative screening excludes companies or assets associated with products or practices deemed controversial or unethical. Common exclusions include industries such as tobacco, weapons, coal extraction, fossil fuel production, pornography and companies involved in practices such as child labor, animal testing, corruption, or the production of genetically modified organisms. Investors can also exclude companies with poor ESG ratings.

Investors employing this strategy usually maintain an exclusion list, which outlines the specific filters or entities to be omitted from their investment portfolio (Roncalli, 2025).

#### 2.1.1.2 Norm-based screening

Norm-based screening is another form of negative screening that evaluates investee companies based on their adherence to internationally recognized norms and standards for responsible business conduct. This approach excludes companies that are found to be in violation of these principles, particularly with regard to social and environmental issues.

The international standards commonly referenced in norm-based screening include:

- The Universal Declaration of Human Rights (UDHR)
- The United Nations Global Compact Principles (UNGC Principles)
- The OECD Guidelines for Multinational Enterprises (OECD Guidelines)
- The UN Guiding Principles on Business and Human Rights (UNGPs)
- The International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work

Companies that do not comply with these frameworks are excluded from the investment universe (Eurosif, 2022).

#### 2.1.1.3 Best-in-Class or Best-in-Universe or Best-in-Progress

The Best-in-Class, Best-in-Universe and Best-in-Progress approaches represent positive screening strategies in sustainable investing. Unlike exclusionary methods, these approaches actively select companies, issuers, sectors, or projects that demonstrate superior performance on Environmental, Social, and Governance (ESG) criteria.

Under this strategy, investments are directed toward entities that achieve high ESG ratings such as AAA, AA, or A (Roncalli, 2025). The objective is to reward leading or improving ESG performers.

According to Eurosif (2022), these strategies can be further categorized into three distinct types:

- Best-in-Class: Selection of the highest ESG performers within a specific industry or sector.
- Best-in-Universe: Selection of top ESG performers regardless of industry,
- Best-in-Progress: Prioritization of companies that have demonstrated the most significant improvement in their ESG performance.

This approach promotes a performance-based standard for sustainability, encouraging continuous ESG improvement and fostering competition among firms to enhance their ESG profiles, rather than relying solely on exclusionary criteria.

#### 2.1.1.4 ESG integration

ESG integration refers to the systematic consideration of environmental, social, and governance (ESG) factors within the investment analysis and decision-making process, with the aim of improving risk-adjusted returns (GSIA, 2023). This strategy focuses solely on considering the ESG risks and opportunities that can have a material impact on the financial performance of the investment, meaning it does not explicitly account for the broader societal or environmental impacts of a company's activities.

Unlike screening approaches, ESG integration is not necessarily binding. Instead, ESG factors are treated as one element among many in assessing financial performance. Consequently, it is often considered as a non-restrictive strategy and, unless accompanied by binding sustainability strategies, is not enough for a financial product to be classified as a sustainable investment (Eurosif, 2024).

#### 2.1.1.5 Thematic investing or sustainability themed investing

Sustainability-themed investing, also known as thematic investing, is an investment strategy that focuses on allocating capital to assets aligned with specific long-term trends related to sustainability. These themes may include areas such as clean energy, green technology, sustainable agriculture, biodiversity, sustainable infrastructure, health, food security, and gender equality (Eurosif, 2024).

Unlike general ESG integration, thematic investing is proactively aligned with sustainability objectives, targeting sectors and companies that are positively contributing to ecological, social, or governance-related outcomes. It incorporates both financial materiality (investment risk and return) and impact materiality (the effect of investments on people and the planet), making it a strategy that supports both risk management and positive impact generation (Eurosif, 2022).

This approach enables investors to gain exposure to emerging sustainability trends while supporting a broader transition toward sustainable development.

### 2.1.1.6 Impact investing

Impact investing represents a distinct and advanced strategy within the broader framework of sustainable finance. It is defined by the Global Impact Investing Network (GIIN), the reference organization in terms of impact investing, as:

*“Investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return.”* (GIIN, 2025, p.2)

According to the GIIN, four core characteristics define impact investing:

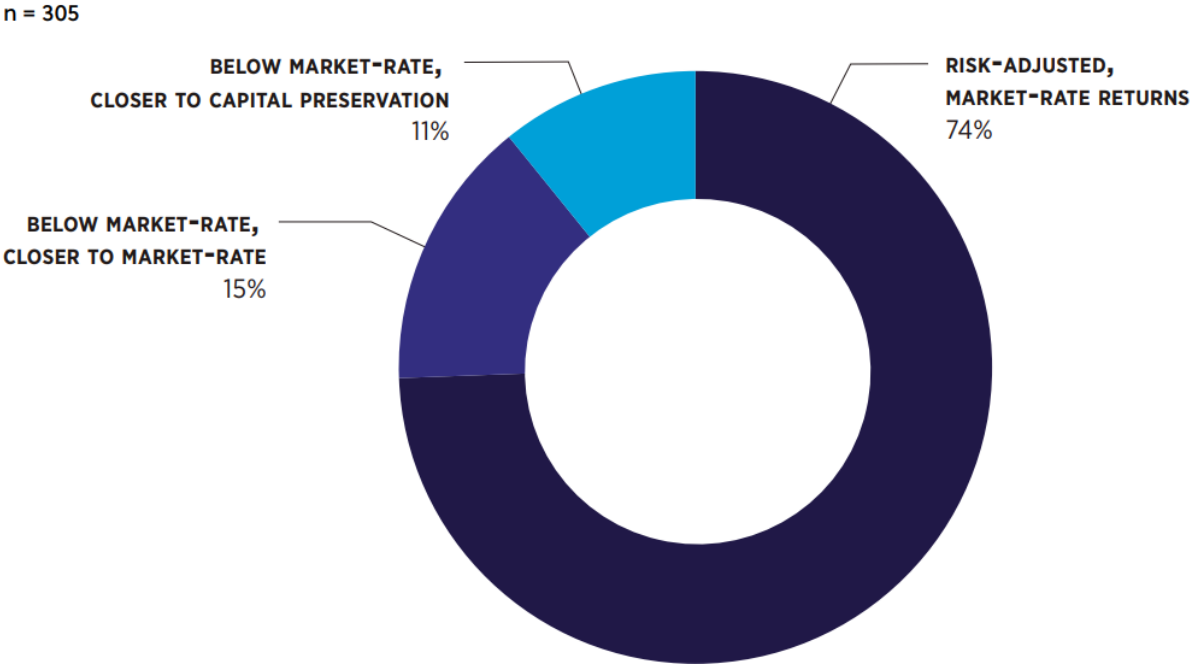
1. **Intentionality:** The investment must be made with a clear and deliberate intention to generate positive social or environmental outcomes.
2. **Return Expectations Across Asset Classes:** Impact investments are expected to generate financial returns that may range from below-market to market-rate, depending on the investor's objectives. These investments can be made across various asset classes, including cash equivalents, fixed income, venture capital and private equity.
3. **Investment with Return Expectations:** Impact investing also involves a commitment to achieving financial returns, thereby excluding philanthropic donations.
4. **Impact Measurement and Management:** A defining feature of impact investing is the requirement to measure and manage the social and environmental outcomes of the investment. Investors must transparently report on the impacts achieved and are encouraged to contribute to the broader development of the field by sharing methodologies, practices and lessons learned.

The intentionality characteristic is what fundamentally sets impact investing apart from the other ESG strategies in terms of priority and purpose. This distinction is often described in terms of “investing *for* impact” versus “investing *with* impact.” Investing *for* impact places impact objectives at the heart of their investment strategy, while investing *with* impact incorporates ESG considerations without making them the primary goal.

Roncalli (2025) captures this difference by referring to “*value before values*”, meaning that impact investors prioritize social and environmental value even before financial outcomes. While strategies such as ESG integration, screening or stewardship may influence corporate behavior and yield societal impact, they do not necessarily fulfill the core requirements of intentionality and measurability that are essential to true impact investing.

Another concept frequently discussed in the field of impact investing, though not included in the GIIN's core framework, is the principle of “*additionality*”. This concept asserts that an impact investment should generate outcomes that would not have occurred in the absence of the investor's contribution. This implies that the investment enables activity in the real economy that otherwise would not have been financed. Therefore, the principle of additionality often implies that investors must be willing to accept non-market conditions or below-market financial returns, as investments with competitive market-rate returns would likely have secured financing. This aligns with the argument presented by Oehmke & Opp (2024), who contend that generating true impact comes at a social cost, therefore going against the fiduciary duty. However, in practice, the principle of additionality is often very challenging to prove. For this reason, Oehmke & Opp (2024) state that greater emphasis should be placed on impact measurement, independently of financial performance considerations.

Financial return expectations represent a key characteristic of impact investments. As illustrated in the figure below, a 2024 survey conducted by the Global Impact Investing Network (GIIN, 2024), which included responses from 305 impact investors, revealed varying financial return expectations across the market. The majority of respondents (74%) reported targeting risk-adjusted, market-rate returns. Additionally, 15% of investors aimed for returns below market-rate but approaching market levels, while 11% pursued returns closer to capital preservation. These findings highlight that although return expectations vary within the impact investing community, the predominant objective remains the achievement of competitive, market-rate financial returns.

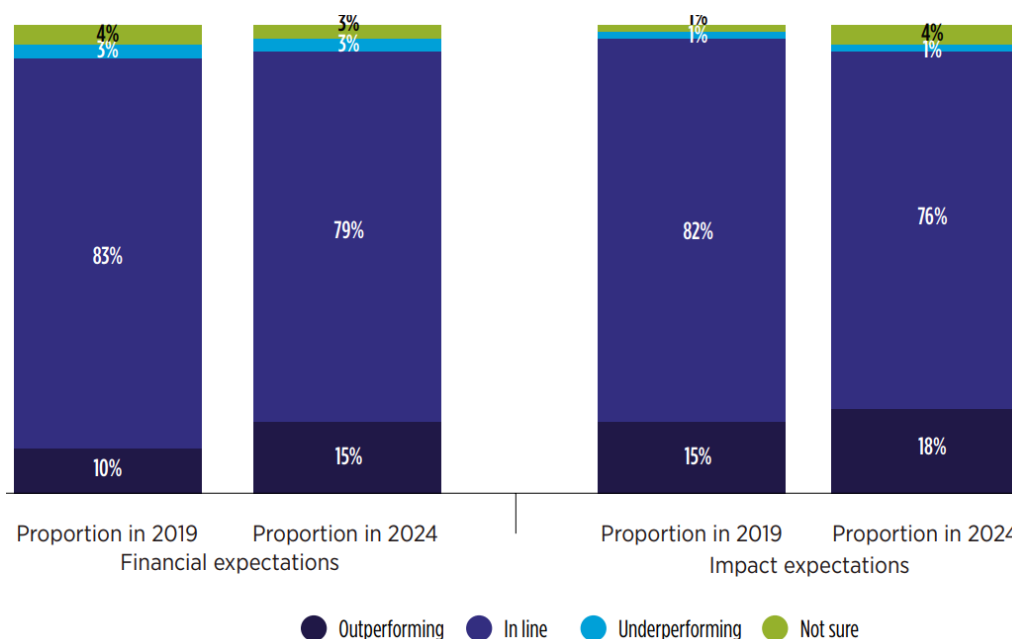


**Figure 6:** Target financial returns

Source: GIIN. (2024). *State of the market 2024*.

The survey also assessed the extent to which impact investments met the initial financial and impact-related expectations of investors. As shown in the next figure, a substantial majority of respondents reported that both the financial (79%) and impact (76%) outcomes of their investments were aligned with their original expectations in 2024. Notably, the proportion of respondents indicating that investments exceeded their expectations increased over time. Specifically, those reporting financial outperformance rose from 10% in 2019 to 15% in 2024, while those noting impact outperformance increased from 15% to 18% over the same period.

These findings underscore the ability of impact funds to deliver measurable social and environmental impact while achieving market-rate financial returns.



**Figure 7:** Performance relative to expectations over time

Source: GIIN. (2024). *State of the market 2024*.

### Impact fidelity

To conclude this section on impact investing, it is important to introduce the concept of “*impact fidelity*”. Although still relatively underexplored in both academic literature and regulatory frameworks, this concept deserves greater attention due to its relevance in preserving the integrity of impact objectives throughout the investment process.

Trelstar (2016) defines impact fidelity as the commitment to ensure the investor’s intended social or environmental impact is maintained consistently across the entire value chain of capital. In essence, it is the counterpart to fiduciary duty: while fiduciary duty obligates financial actors to prioritize the maximization of financial returns, impact fidelity requires a sustained focus on achieving the social or environmental outcomes envisioned by the investor.

This concept is particularly important given that capital typically flows through multitude intermediaries, each of which may interpret or prioritize impact differently. Unlike financial returns, which are easily measured and compared, impact goals are more subjective, diverse and harder to quantify, increasing the risk of misalignment as investments progress through the chain of actors. For this reason, Trelstar (2016) advocates for the development of a common language, standardized reporting mechanisms, and robust measurement tools to clearly articulate and track impact expectations. Strengthening impact fidelity is therefore essential to ensuring the authenticity and effectiveness of impact investing.

## 2.1.2 Post-investment strategy

Post-hoc investment strategies represent the actions that are taken after the investment has been made in order to monitor, influence or improve the sustainability performance of the investee companies.

### 2.1.2.1 Active ownership activism/Stewardship

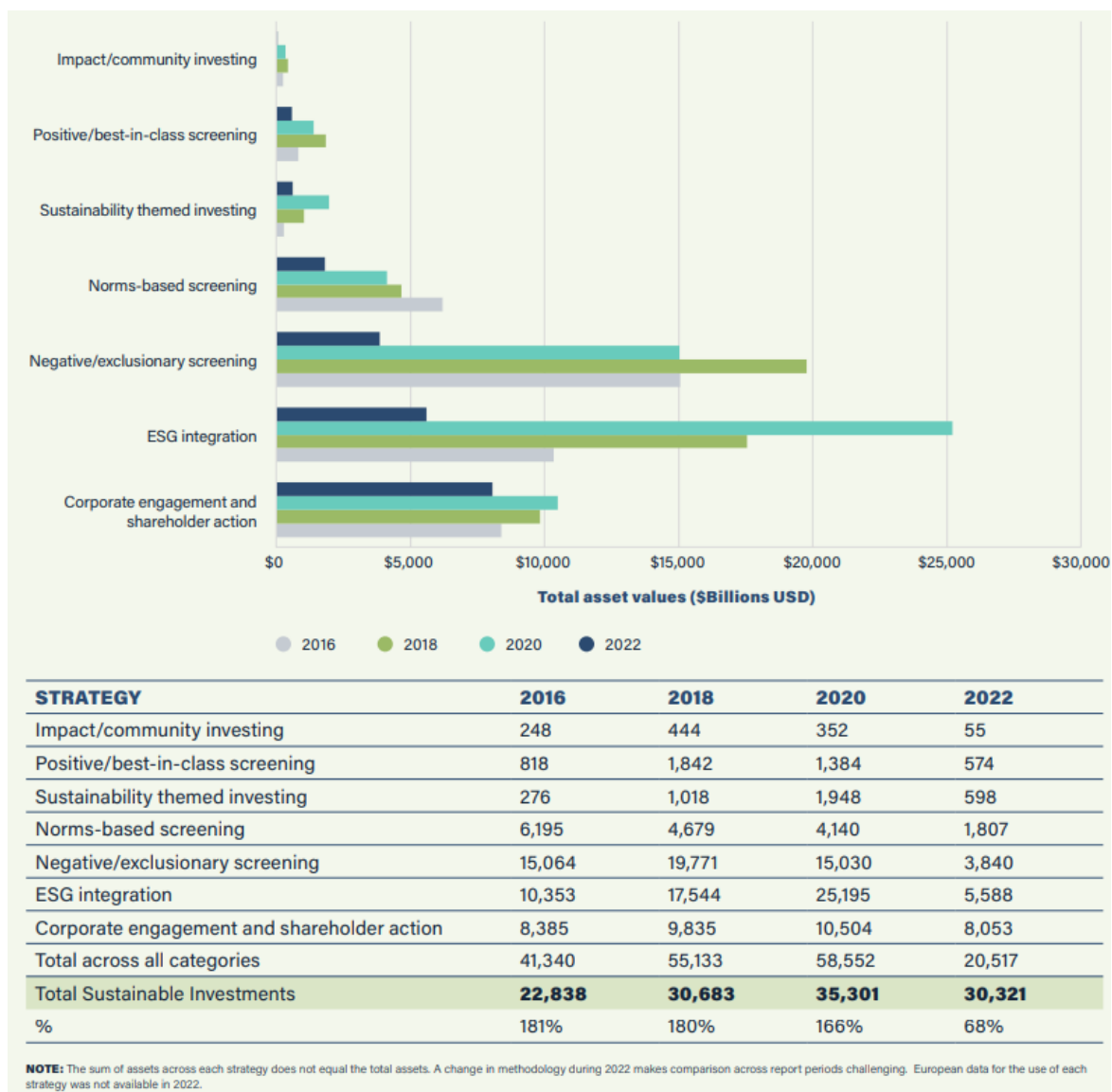
Stewardship, also referred to as active ownership, is a sustainable investment strategy that involves using investor rights and influence to promote positive changes in corporate behavior and enhance long-term value, both financial and societal.

Stewardship serves as a versatile strategy that can support a range of sustainability-related investment objectives, from optimizing ESG risk-adjusted returns to generating positive environmental or social outcomes (Eurosif, 2024).

It is typically implemented through two complementary practices:

- Engagement: This involves direct, ongoing dialogue between investors and investee companies, aimed at improving ESG practices, increasing sustainability-related disclosure, or influencing specific social or environmental outcomes. Engagement is a proactive and collaborative process intended to drive long-term improvements in corporate behavior.
- Voting: As a formal exercise of shareholder rights, voting allows investors to influence company policies and practices through actions such as voting at shareholder meetings, filing proposals, or nominating board members. Voting often serves as an escalation tool when engagement efforts fail to produce the desired outcomes (Eurosif, 2022).

## 2.1.3 Sustainable investment strategies in the global sustainable finance market



**Figure 8:** Sustainable investing assets by strategy, 2016-2022

Source: GSIA. (2023). *Sustainable investing assets by strategy, 2016 – 2022*.

The figure above illustrates the relative adoption of sustainable investment strategies by total AUM in 2022. The most widely employed approach was corporate engagement and shareholder action, accounting for \$8.053 trillion USD, followed by ESG integration with \$5.588 trillion USD and negative/exclusionary screening, which represented \$3.840 trillion USD. In contrast, impact investing constituted a marginal share of the sustainable investment market, with only \$55 billion USD in AUM, equating to approximately 0.26% of the market. This underscores that impact investing remains a relatively niche segment within the broader sustainable finance landscape.

However, data from the GIIN offers a more expansive perspective, estimating the size of the global impact investing market at \$1.164 trillion USD in 2022 (GIIN, 2022). This total kept increasing until the last report of 2024 with market size of approximately \$1.571 trillion USD

distributed across more than 3,900 organizations. The principal actors within this market include investment managers, pension funds, banks and insurance companies.

## 2.2 Greenwashing practices in the financial industry

### 2.2.1 Definition of the concept

The term “*greenwashing*” is derived from the combination of “*green*”, referring to environmental sustainability and “*whitewash*”, which implies covering up undesirable facts. It is defined as the practice of “*the creation or propagation of an unfounded or misleading environmentalist image*” (Oxford English Dictionary, 1987).

In the context of the financial sector, the European Banking Authority (EBA, 2023, p.12) defines greenwashing as:

*"a practice whereby sustainability-related statements, declarations, actions, or communications do not clearly and fairly reflect the underlying sustainability profile of an entity, a financial product, or financial services. This practice may be misleading to consumers, investors, or other market participants".*

Two distinct forms of greenwashing risk can be identified:

- **Explicit and intentional greenwashing:** This refers to the deliberate misrepresentation or exaggeration of the environmental benefit of the institutions’ products, services or activities. This refers to the deliberate misrepresentation of a product’s or institution’s environmental credentials. Financial institutions may engage in this practice to gain a competitive edge, improve brand perception, or attract sustainability-focused capital.
- **Unintentional greenwashing:** This occurs when financial institutions inadvertently misrepresent the environmental characteristics of their products due to inaccurate or incomplete data, ambiguous ESG metrics, or insufficient regulatory guidance. Even with sincere sustainability commitments, firms may unintentionally mislead due to the complexity and variability of ESG definitions.

This section focuses primarily on intentional greenwashing, which can manifest at two levels, as identified by Delmas & Burbano (2011):

- **At the entity-level:** This occurs when financial institutions, such as asset managers or asset owners, exaggerate or falsely promote the environmental impact of their overall operations. Detecting greenwashing at the corporate level is inherently challenging due to the nuanced nature of sustainability claims. For instance, while institutions may highlight their green initiatives, they may downplay or omit information regarding environmentally harmful activities. This does not necessarily constitute greenwashing outright but raises questions of balance and transparency.
- **At the product/service level:** This refers to misleading claims about the sustainability attributes of specific financial products or services, such as funds or advisory agreements. Product-level greenwashing is generally more identifiable, particularly in regulatory contexts where disclosure rules are well-defined and enforceable.

The rise of sustainable investing has transformed ESG into a powerful marketing tool, intensifying the risk of greenwashing. This trend is particularly evident in major sustainable finance markets such as Europe and North America (RepRisk, 2023). According to RepRisk (2023), the banking and financial services sector ranks as the second most exposed to climate-related greenwashing, following the oil and gas industry.

Moreover, given the strategic role of the financial sector in achieving the European Union's climate ambitions, EU policymakers have placed growing emphasis on addressing greenwashing risks. This regulatory focus is aligned with broader climate objectives and seeks to strengthen investor confidence in sustainability-related disclosures (Roncalli, 2025).

Furthermore, with the recognizing of the critical role of the financial sector within the achievement of the Europe ambition towards the mitigation of global warming, the EU regulation increasing concern about global warming, the regulation has attached increasing attention to the resolving to the risk of greenwashing (Roncalli, 2025).

### 2.2.2 Forms of greenwashing

Planet Tracker identifies six primary forms of greenwashing practices:

1. **Greencrowding:** Greencrowding is a greenwashing tactic where companies hide within large sustainability groups or alliances to avoid scrutiny. It relies on the principle of safety in numbers, allowing members to move at the pace of the least ambitious. This strategy creates the illusion of progress through large membership numbers or cumulative investment figures, despite often lacking measurable impact or transparency. Investor caution and due diligence are essential, as greencrowding can mask inaction behind collective claims.
2. **Greenlighting:** Greenlighting is a practice wherein companies publicize minor environmentally positive actions to divert attention from their broader environmentally harmful activities. This misleads stakeholders by overstating the company's commitment to sustainability and concealing significant ongoing negative environmental impacts.
3. **Greenshifting:** Greenshifting involves deflecting environmental responsibility onto consumers by implying that individual behavioral choices are to blame for environmental degradation, rather than corporate practices. This tactic is easily identifiable and increasingly scrutinized, as it diverts attention from corporate accountability to individual behavior.
4. **Greenlabelling:** Greenlabelling refers to the use of vague, ambiguous, or poorly defined sustainability-related terminology on products or services, falsely presenting them as environmentally friendly. This is one of the most prevalent and recognized forms of greenwashing in the market.
5. **Greenrinsing:** Greenrinsing is characterized by companies continually revising, delaying, or failing to meet their sustainability or ESG targets, thereby maintaining a perception of progress without delivering concrete results. This tactic highlights the growing complexity of greenwashing and underscores the need for stronger ESG accountability and verification mechanisms.

6. Greenhushing: Greenhushing involves the intentional underreporting or concealment of sustainability efforts to avoid public scrutiny. While it may appear to reflect modesty, greenhushing can mislead investors by downplaying ESG efforts, potentially inflating valuations or shielding companies from shareholder pressure. It reflects a more covert and sophisticated dimension of greenwashing within financial markets.

In addition to these six forms, two additional greenwashing-related practices are identified within the financial sector:

The primer is the concept of impact washing. Specific to the domain of impact investing, impact washing involves labeling investments as "impactful" for reputational or marketing purposes, without delivering genuine or measurable environmental or social benefits. According to Busch, Bruce-Clark, Derwall & al. (2021), this practice undermines the credibility of impact finance by presenting investments as solutions to societal challenges without substantive evidence or intention. A 2020 survey by the Global Impact Investing Network (GIIN), which included 294 respondents, identified impact washing as the greatest challenge facing the field, with 66% of participants expressing concern over its prevalence (GIIN, 2020).

The second practice is referred to as "greenbleaching". This emerging term describes the deliberate omission or removal of sustainability-related claims from financial products, even when ESG characteristics are present, in order to avoid additional regulatory requirements. While similar to *greenhushing*, the two concepts differ in intent: greenhushing involves underreporting sustainability aspects to avoid public scrutiny, whereas greenbleaching seeks to avoid the additional regulatory burden (Huw, 2023).

This concept is essentially used by the ESMA to describe situations in which asset managers purposely market their Article 9 products as Article 6 or Article 8 in order to avoid additional disclosure requirements, regulatory or legal risks (ESMA, 2023). Although this practice may appear harmless, it undermines the development of sustainable finance by failing to promote transparency and by impeding the financial sector's alignment with sustainability objectives. The development of this practice can be attributed to the tightening of disclosure requirements for sustainability-related information under EU regulations.

### 2.2.3 Consequences for sustainability

In their systematic review, Dempere, Alamash & Mattos (2024) identify several significant consequences of greenwashing within the field of sustainable finance and towards sustainability in general.

One of the most immediate impacts of greenwashing on the development of sustainable finance is the erosion of investor trust. As public awareness of environmental and social issues grows, many investors seek to align their financial choices with their values. However, when greenwashing misleads them into supporting companies that are not genuinely sustainable, it creates a significant breach of trust. This may result in reduced investment in sustainability-oriented products and a broader hesitancy to engage in the sustainable finance market. de Freitas Netto, Sobral, Ribeiro & al. (2020) name this concept "*green skepticism*". Over time, this dynamic can impede capital flows to projects and businesses that are genuinely working toward positive environmental and social outcomes.

On a systemic level, the use of greenwashing has broader implications for the sustainable finance sector as it distorts the allocation of capital by directing funds towards companies that do not contribute to sustainability. Thereby greenwashing favors companies with strong marketing rather than genuine impact. This misallocation compromises the integrity of

sustainable finance markets and weakens the effectiveness of financial instruments designed to facilitate the transition to a more environmentally friendly and socially inclusive economy. In turn, this can undermine the credibility and perceived legitimacy of the sustainable finance industry as a whole (Dempere & al., 2024).

Beyond its effects on the financial sector, greenwashing practices also have broader societal implications. When greenwashing is exposed, it not only damages the reputation of the company involved but also fosters public distrust toward other organizations operating within the same industry or in general. Tirole & Bénabou (2010) argue that this spillover effect can lead to a generalized erosion of consumer trust, even affecting companies that are genuinely committed to sustainability. As a result, firms with authentic environmental and social objectives may also suffer from reduced sales and investment attractiveness. Therefore, the behavior of companies using greenwashing is also detrimental to companies with genuine social and environmental purposes, undermining efforts to shift consumption and production patterns towards more sustainable alternatives.

In summary, greenwashing poses a serious threat to the credibility, functionality and advancement of sustainable finance. By misleading stakeholders and distorting both investor sentiment and capital flows, it impairs progress toward environmental and social goals and damages the reputation of responsible actors within the broader economic system.

#### 2.2.4 Solution to address greenwashing

Furthermore, Dempere & al. (2024) identify three primary categories of actors that play a critical role in mitigating the risk of greenwashing within the sustainable finance ecosystem: regulators, institutions & Non-Governmental Organizations (NGOs) and third-party certifiers.

First of all, regulation serves as a fundamental mechanism for preventing greenwashing by establishing clear, enforceable standards for environmental claims. Through their regulatory frameworks, they can enhance transparency and accountability, making it more challenging for companies to make false or misleading claims about their environmental performance (Delmas & Burbano, 2011). Moreover, regulators bodies can foster harmonization across the financial markets by mandating standardized disclosure of sustainable-related information, thereby enhancing the comparability of financial products. However, despite significant progress, the effectiveness of these measures varies across countries. Dempere and al. (2024) argue that regulation alone is insufficient. To be truly effective, it must be complemented by public scrutiny and market-driven incentives that reinforce ethical corporate behavior.

Then, institutions and NGOs also play a vital role in counteracting greenwashing through various means such as advocacy, education, research and the development of standards and certifications. These actors contribute to the development of more rigorous, verifiable and efficient guidelines for sustainable business practices. NGOs, in particular, are instrumental in raising public awareness, advocating stricter regulatory rules and exposing deceptive practices. Their activism enhances public scrutiny and societal pressure on companies to adhere to genuine sustainability commitments. Academic literature highlights how NGOs and institutional investors, like pension or mutual funds, can leverage their influence by demanding improved environmental performance and divesting from entities suspected of engaging in greenwashing practices.

Finally, third-party independent certifications and sustainability labels serve as another critical tool in addressing greenwashing. By offering credible, third-party verification of a company's or fund's sustainability performance, these labels help mitigate information asymmetry between companies and stakeholders. This enables investors to better distinguish between

authentic sustainability efforts and superficial or misleading claims. Additionally, the verification role of third-party certifiers serves as a deterrent against the exaggeration of sustainability achievements. However, certifications are most effective when they are backed by credible organizations, rigorous verification processes and the transparency of their criteria. When poorly managed, labels themselves can inadvertently contribute to greenwashing.

Effectively combating greenwashing requires a coordinated, multi-stakeholder approach:

- Regulators must enforce stringent, standardized rules that promote transparency and comparability of sustainable information.
- Institutions and NGOs must continue to advocate, educate and monitor sustainability practices across industries.
- Third-party certifiers must provide rigorous, independent verification to ensure the credibility of sustainability claims.

Together, these actors can enhance the integrity, accountability and reliability of the sustainable finance ecosystem, an essential step toward directing capital flows toward genuinely sustainable enterprises and addressing pressing societal and environmental challenges.

## 2.3 Review of the literature about the extra-financial performance of SRI funds

In response to the concerns outlined in the previous section regarding the risk of greenwashing, this section seeks to critically examine and synthesize the academic literature addressing the extra-financial performance of Socially Responsible Investment (SRI) funds. Accordingly, this section aims to assess whether SRI funds adopt distinct investment behaviors compared to conventional funds and to what extent these strategies effectively advance environmental and social goals. Furthermore, the review will identify potential strategies to enhance the capacity of investors to generate measurable and impactful sustainability outcomes.

Given that a substantial body of academic literature has established that Socially Responsible Investment (SRI) funds generally achieve financial returns comparable to those of conventional funds, Benson, Brailsford & Humphrey (2006) investigated whether SRI fund managers exhibit distinct investment behaviors relative to their traditional counterparts. By examining the beta coefficients of SRI portfolios, their study found that despite being inconsistent over time, SRI managers tend to allocate capital differently across industry sectors compared to managers of conventional funds. However, while the findings suggest that SRI fund managers adopt investment approaches that diverge from those of conventional managers, the authors were unable to conclusively attribute these differences to ethical or sustainability-related considerations.

Next, a report of the Eurosif (2021) investigated the effectiveness of shareholder engagement as a sustainable investment strategy. The findings highlight that engagement is one of the most reliable and empirically sustainability approaches for enhancing corporate ESG performance. Through active ownership, investors can influence companies to reduce the impact of their activities on society by reducing their greenhouse gas emissions, implementing cleaner production processes and improving energy efficiency and circularity. The report further stresses that engagement is most effective when the investor holds a significant ownership stake and maintains a trust-based relationship with company management. Furthermore, engagement also yields better outcomes when it is led by large, internationally recognized investors who are aligned in values and operate in coordination with domestic actors. However,

the report also notes that the efficacy of engagement is highly dependent on market conditions and the incentive structures faced by both investors and companies. Firms are unlikely to implement sustainability improvements that would undermine their profitability or expose them to excessive risks. Similarly, investors may be reluctant to push for reforms that could reduce the financial value of their holdings. This issue is particularly relevant in the context of climate-related investments, where decarbonization often entails substantial upfront costs. As a solution, the report recommends that investors also engage with policymakers to create favorable market conditions that align financial and environmental incentives. The report concludes by saying that in the absence of such incentives, engagement alone may fall short of its transformative potential.

In line with these findings, Peng, Zhang, Goodell & Mingsheng (2023) conducted a study assessing whether SRI mutual funds influence the ESG performance of the companies in which they invest. Their research indicated that SRI funds are more likely to invest in firms with strong ESG performance and, more importantly, that such investments have a statistically significant positive effect on the ESG performance of the investee firms. The results indicate that the effects of SRI funds were especially notable in state-owned enterprises (SOEs), which are often driven by broader social objectives. Additionally, their results showed that companies with internationally experienced boards and those under greater media scrutiny were also more responsive to SRI-driven pressure.

In contrast with these studies indicating that engagement is the most efficient sustainable strategy, Berk & Van Binsbergen (2024) examine the efficiency of divestment by Socially Responsible investors. The study finds that the two potential impacts of divestment, namely shifts in control and changes in cost of capital, are ineffective at current participation levels, as divestment merely replaces socially conscious investors with less engaged ones and the resulting price changes are too small to affect investment decisions. On the contrary, to achieve the greatest impact, Berk & Van Binsbergen (2024) advise focusing on the primary market, by investing their capital to social projects, even at lower returns, or instead of divesting, use their share of the company to exercise their voting rights, influence management and drive policy change. In conclusion, the study confirms that engagement or primary market investment are far more feasible ways to achieving measurable social outcomes than large-scale divestment.

The following study led by Popescu, Gibon, Hitaj, Rubin & Benetto (2023) adopted a more quantitative approach by comparing the environmental performance of SRI, conventional and impact funds using two specific metrics: Relative Carbon Footprint (RCF) and Weighted Average Carbon Intensity (WACI). RCF estimates the emissions responsibility associated with a USD 1 million investment, offering a measure of the total environmental impact attributable to an asset manager. On the other hand, the WACI measures the carbon intensity of the companies (total amount of GHG emissions in relation to its turnover), which put the global GHG emissions of the company in relation to its turnover. This gives an indication of the efficiency of the company to generate revenues while managing its environmental impact. Their findings revealed that SRI funds exhibit significantly lower RCF values than conventional funds, meaning that investments made by sustainable funds are responsible to less GHG emissions on average than traditional investments. However, no meaningful differences were observed in WACI scores. The study also compared the funds on these two methods based on their SFDR classifications (Article 6, 8 and 9). The results indicated that Article 9, representing impact funds outperformed all others in terms of RCF. They also found that these funds were less expose to climate-intensive sectors than SRI funds (Article 8). However, the performance of Article 8 and Article 9 were still mediocre in terms of carbon intensity (WACI). Overall, their results are mitigated. Although SRI and impact funds seem to consistently encompass lower RCF than conventional ones, they perform similarly on carbon intensity

(WACI), suggesting they may still hold stakes in highly emitting companies. Furthermore, their study showed that about 38% of SRI funds exhibited life cycle emissions higher than those of the MSCI World Index, and 24% exceeded the emissions of MSCI Europe, raising concerns about the environmental credibility of many SRI funds.

The next article was published by Wagemans (2013). Even though this article is a bit old and the information may be a bit overpassed. It is interesting to have a look in order to see how sustainable practices have evolved and if sustainable investments have gained in efficiency. Wagemans (2013) highlights that while Socially Responsible Investment (SRI) was gaining traction, the academic literature is centered on the financial performance of SRI rather than its effectiveness in improving environmental, social and corporate governance (ESG) performance. The article identifies three core SRI strategies: screening, shareholder rights, and engagement. Their results indicate that the strategy of screening has a small to inexistant impact on corporate ESG performance due to the relatively small size of SRI in relation to the entire financial sector. Only best-in-class screening shows some positive effects by rewarding ESG leaders. However, this can push firms to overly reflect on the sustainability aspect of their activities, thereby encouraging greenwashing. Regarding the strategy of shareholder rights, the study finds that its effectiveness remains also limited, as the vast majority of proposals rarely gain majority support or lead to binding outcomes. However, they note that shareholder proposals can serve as entry points for dialogue, the next sustainable strategy, which can sometimes prompt voluntary corporate actions. But overall, shareholder rights Success is notably higher for influential institutional investors. Finally, regarding the strategy of engagement as such, they find that the research on the impact of engagement is limited and difficult to assess due to its private nature and lack of accessible data. In contrast, shareholder meetings where proposals and voting results are public. Wagemans (2013) explains that measuring the effect of the SRI strategies on ESG performance is very challenging to assess, especially when these strategies are combined. This is because the evolution regarding sustainable issues is often difficult to measure and where there are quantifiable it is difficult to determine that these changes were caused by the SRI strategy. However, they tend to indicate that the impact of SRI on improving corporate ESG performance is limited in comparison to external factors such regulation or consumer pressure.

Wagemans (2013) explains this limited effectiveness of Socially Responsible Investment (SRI) is attributed to five main factors. First, there exists a low level of cooperation between SRI investors. However, the analysis of effectiveness of the different have shown that they would achieve a greater impact if they started to collaborate. This lack of cooperation is mainly because their practice and their vision regarding the purpose of sustainable finance often differ. The second reason is that SRI capital remains a small portion of total investments, limiting its market power. Third, the financial logic remains predominant in the financial sector, focusing on short-term profit maximization which is not compatible with the long-term goals of sustainable finance. Fourth, the fiduciary duty deters institutional investors from adopting unconventional SRI practices for fear of obtaining lower financial returns or facing reputational damage. Finally, the general lack of knowledge sustainable investment practices and the lack of standardized and transparent sustainable information regarding companies and financial products limit the implementation and the impact of SRI.

Finally, Kölbel, Heeb, Paetzold & Busch (2020) also examine how sustainable finance can have an impact on solving sustainable issues. They start by dissociating the investor impact and the company impact. They define investor impact as the change that investor activities achieve in company impact, and company impact as the change that company activities achieve in social and environmental parameters.

They explain that there is a gap in the literature, which primarily investigates how ESG metrics influence investment performance, but not the different ways of investing in order to influence ESG metrics. As a consequence, not much information is available about the investor impact and this concept is only beginning to take root in the SI industry. Currently, most SI funds either exclude firms operating in harmful industries or focus on companies that have in the past performed well on metrics of ESG performance. This is a static approach, which ignores that impact is fundamentally about change. Companies can and do change over time, and investors make an impact by triggering or accelerating such change. Due to a lack of suitable metrics for investor impact, however, very few investors analyze how their activities cause companies to change. As a result, the majority of the US\$ 30 billion that are deployed in SI today (GSIA, 2018) is invested in ways that promise only modest and perhaps even negligible investor impact.

## Chapter 3: State of the non-financial information in the financial market

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This chapter examines the current landscape of non-financial information available within the financial market. It is divided into two main sections. The first section focuses on the European regulatory framework governing the disclosure of non-financial information. It aims to understand how the regulation addresses the risks of greenwashing and impact washing and to identify the specific disclosure requirements imposed on companies and fund managers.

The second section explores the different third-party actors that contribute to the quality and availability of non-financial information in the financial market. These include sustainable data providers, ESG rating agencies, sustainability labels, and benchmarks. Their contributions are essential in assessing the extra-financial performance of companies and financial products, improving data comparability and reinforcing market trust in sustainability claims.

Together, these two sections provide a comprehensive overview of the sustainable information currently available in the market. This overview serves as a necessary foundation for conducting the statistical analyses in the following chapter, which compares the extra-financial performance of traditional, Socially Responsible Investment (SRI) and impact funds.

### 3.1 European regulation on the disclosure of non-financial information

In support of the European Green Deal's objective to make Europe the first climate-neutral continent by 2050, the European Commission revised its *Action Plan on Financing Sustainable Growth*, originally adopted in March 2018, to better align finance with sustainability objectives. The Green Deal targets a reduction in GHG emissions by at least 55% by 2030 and seeks to transform key sectors such as industry, energy, agriculture, construction and mobility. To finance this ambitious transition, the Commission has pledged to invest €1 trillion in sustainable investments over the next decade (European Commission, n.d.). To operationalize this goal, the Action Plan outlines 10 strategic measures, organized in 3 categories (European Commission, 2020):

- I. Reorienting capital flows towards a more sustainable economy
  1. Establishing a clear and detailed EU taxonomy, a classification system for sustainable activities
  2. Creating an EU Green Bond Standard and labels for green financial products
  3. Fostering investment in sustainable projects
  4. Incorporating sustainability in financial advice
  5. Developing sustainability benchmarks
- II. Mainstreaming sustainability into risk management
  6. Better integrating sustainability in ratings and market research
  7. Clarifying asset managers' and institutional investors' duties regarding sustainability
  8. Introducing a 'green supporting factor' in the EU prudential rules for banks and insurance companies
- III. Fostering transparency and long-termism
  9. Strengthening sustainability disclosure and accounting rule-making
  10. Fostering sustainable corporate governance and attenuating short-termism in capital markets

These initiatives reflect the EU’s recognition that transparent, reliable and standardized non-financial information is essential to advancing sustainable investment. Consequently, to address this gap, Europe has developed several major directives to harmonize the practices regarding the disclosure of non-financial information. Currently, the European regulatory landscape regarding non-financial information can be depicted as follows:

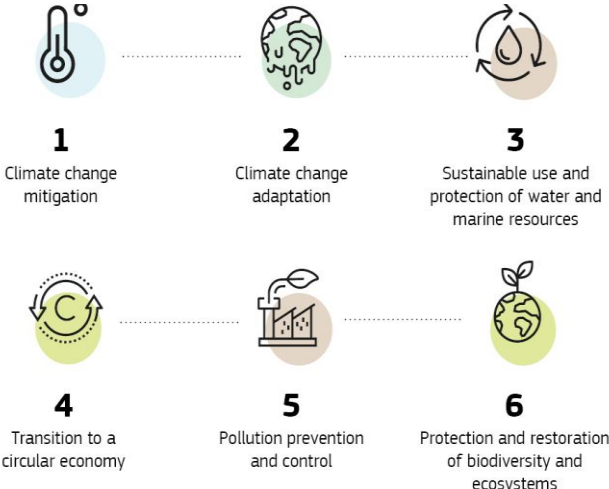
**Table 4:** European Regulation about non-financial information

European Regulation about non-financial information	
European Taxonomy	A standardized classification system defining environmentally sustainable economic activities.
Sustainable Finance Disclosure Regulation (SFDR)	Regulation on the transparency of sustainability information within the financial services sector.
Corporate Sustainability Reporting Directive (CSRD)	Directive on the sustainability reporting of companies.

Source: Table adapted from Forum Ethibel. (2023). *Réglementation européenne*.

3.1.1 The European Taxonomy

The European Taxonomy is instrumental in achieving the objectives of the European Green Deal. Its main function is to establish a standardized classification system for determining which economic activities can be considered as environmentally sustainable. By offering a common framework, the Taxonomy enhances transparency in financial markets and directs investments toward genuinely sustainable activities, thereby addressing concerns related to greenwashing. In this respect, it directly supports the first objective of the EU’s Action Plan on Financing Sustainable Growth, which is to reorient capital flows toward sustainable economic activity. Published in June 2020 and effective as of July 2020, the EU Taxonomy identifies 6 climate and environmental objectives (European Commission, n.d.):

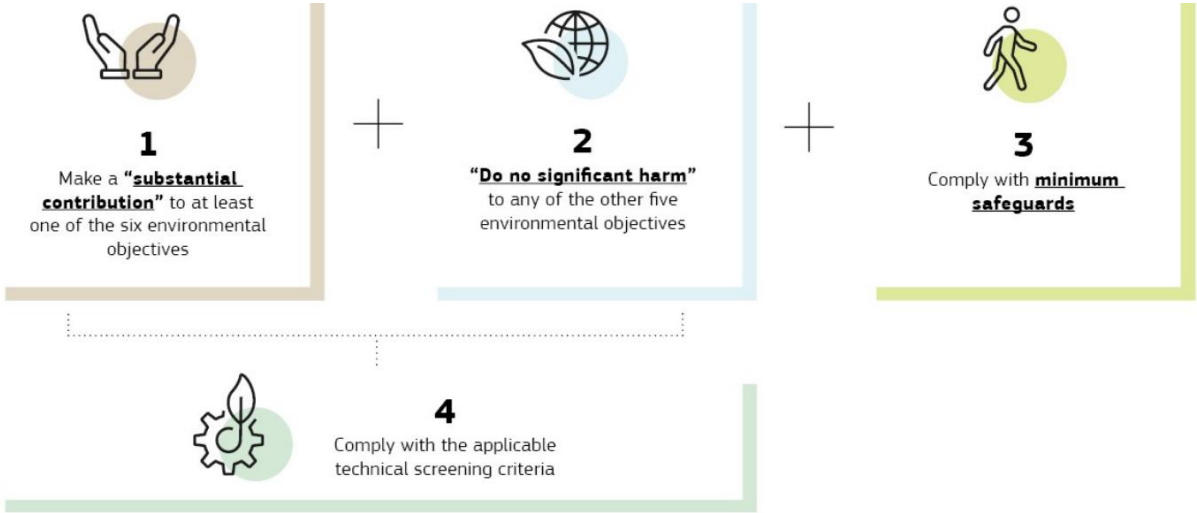


**Figure 9:** The 6 climate and environmental objectives of the EU Taxonomy

Source: European Commission. (n.d.). *EU Taxonomy Navigator*.

For an economic activity to be classified as environmentally sustainable under the Taxonomy, it must first be identified as eligible and then meet the following 4 overarching conditions (European Commission n.d.):

1. It must substantially contribute to at least one of the EU’s six environmental objectives.
2. It must do no significant harm to any of the other objectives.
3. It must comply with minimum social and governance safeguards (e.g. human and labor rights).
4. It must meet technical screening criteria, which include performance-based thresholds defining sustainable practices.



**Figure 10:** Conditions of the EU Taxonomy

Source: European Commission. (n.d.). *EU Taxonomy Navigator*.

In June 2021, the Taxonomy Climate Delegated Act was adopted, specifying technical screening criteria for the first two objectives: climate change mitigation and climate change adaptation. The technical screening criteria for the remaining four objectives are still under development by the European Commission (European Commission, n.d.). Notably, in March 2022, a highly debated amendment was introduced to the Delegated Act, classifying certain economic activities related to nuclear energy and natural gas as environmentally sustainable but under strict conditions (Busch, 2023). This highlights the complexity and political sensitivity of defining "green" activities.

3.1.1.1 Disclosure obligations

The EU Taxonomy also encompasses specific disclosure requirements for companies that are subject to the Corporate Sustainability Reporting Directive (CSRD). These entities are required to disclose, as part of their annual report, both the eligibility of their activities under the Taxonomy and the extent to which those activities are aligned with the criteria set out in the Taxonomy and its delegated acts.

Nonetheless, companies that are not covered by the CSRD may choose to voluntarily report this information to demonstrate the sustainability aspect of their activities or to attract sustainability-focused investors.

To facilitate a smooth transition and allow companies adequate time to adapt, the implementation of the Taxonomy’s disclosure requirements is being phased in progressively from January 2022 to January 2026 (European Commission, n.d.).

### 3.1.1.2 Development of a Social Taxonomy

Although the current EU Taxonomy includes minimum safeguards related to social and governance aspects, its focus remains overwhelmingly environmental. This emphasis reflects the regulatory trend highlighted in Chapter 1, as observed by Ahlström & Monciardini (2022), who noted that environmental issues tend to receive more regulatory attention than social or governance concerns. There are several reasons that can explain this imbalance.

Firstly, environmental issues like climate change have global impacts, making them appear as more urgent and prominent in the eyes of the public and policymakers.

Secondly, according to the Platform on Sustainable Finance (2022), the environmental impact of economic activities is generally easier to distinguish than their social impact. Most economic activities inherently generate social benefits such as employment, tax revenues, or access to essential goods and services, making it more difficult to assess their specific contributions to social objectives. Conversely, economic activities typically entail negative environmental externalities, making their environmental effects more readily identifiable and measurable.

Thirdly, science plays a key role in shaping environmental standards. Decades of scientific research have clearly defined both the causes of environmental degradation and the solutions to address them. In contrast, social challenges are more subjective and context dependent. Their resolution relies on internationally agreed norms or standards like the Universal Declaration of Human Rights, the ILO Declaration on Fundamental Principles and Rights at Work or the OECD guidelines, rather than quantitative data.

Lastly, environmental impacts are typically more measurable, allowing for objective measurement and comparison. Social impacts, by contrast, are often qualitative in nature, encompassing dimensions such as job satisfaction, community well-being, or social inclusion. As such, it is more challenging to develop objective, standardized and measurable criteria to address social issues. Therefore, substantial effort is still needed in order to develop quantitative data about social problematics.

In response to these limitations, the European Commission mandated the Platform on Sustainable Finance (PSF) to develop a Social Taxonomy. While still under development, this framework is designed to mirror the structure of the environmental taxonomy and proposes three core social objectives (PSF, 2022):

1. Decent work (across the entire value chain),
2. Adequate living standards and well-being for end users,
3. Inclusive and sustainable communities and societies.

The Social Taxonomy is intended to support a just transition by ensuring that social considerations are integrated alongside environmental ones. It provides a framework for investors who are increasingly interested in socially oriented investments, enabling them to finance activities that improve working conditions, promote access to essential products and services (such as healthcare, education and housing) and contribute positively to communities (PSF, 2022).

In conclusion, both the Environmental and Social Taxonomies serve as foundational components of a more credible, structured and impactful sustainable finance system in Europe. While the environmental taxonomy is already implemented, the Social Taxonomy remains in development, aiming to balance the current sustainability agenda by addressing social justice alongside climate action.

### 3.1.2 Sustainable Finance Disclosure Regulation

The Sustainable Finance Disclosure Regulation (SFDR) was introduced by the European Union to address the lack of consistent, reliable and comparable information concerning the sustainability characteristics of financial products. Its primary objective is to harmonize disclosure practices and increase the transparency of sustainability-related information within the financial sector, thereby enabling more informed investment decisions and facilitating the redirection of capital towards sustainable economic activities. Adopted on 27 November 2019 and implemented on 10 March 2021, the SFDR constitutes a key component of the EU Action Plan on Financing Sustainable Growth (European Commission, n.d.).

The regulation applies to two principal categories of financial intermediaries:

- i. Financial Market Participants (FMPs), such as asset managers, pension funds or insurance companies and
- ii. Financial Advisers, including entities providing investment or insurance advice.

These intermediaries are required to disclose how they integrate sustainability risks into their decision-making process and how they consider the principal adverse sustainability impacts of their investments, both at the entity (i.e., company-wide strategies and policies) and at the product level (i.e., individual investment funds). This information must be made publicly accessible through various communication channels, including corporate websites, pre-contractual documentation, periodic reports and any marketing materials.

Importantly, the scope and the stringency of the disclosure requirements are correlated with the sustainability claims of the financial product. Products marketed as sustainable or pursuing a specific sustainable objective are subject to more rigorous disclosure obligations than those promoting no ESG characteristics. Additionally, the size and nature of the financial intermediary also influence the extent and depth of its reporting obligations (Busch, 2023).

Overall, the SFDR plays a pivotal role in improving the transparency of sustainability-related disclosures within the financial sector and in mitigating the risk of greenwashing. By mandating robust and standardized reporting obligations, the regulation ensures that sustainability claims of the financial intermediaries are credible and legitimate. The following sections will explore the core concepts associated with the SFDR as well as their implications for FMPs.

#### 3.1.2.1 Definition of sustainable investment

One of the key contributions of the SFDR is the clarification of fundamental terminology within the sustainable finance landscape, thereby fostering a consistent understanding across FMPs. In particular, it introduces standardized definitions for the core concepts such as "sustainable investment" and "sustainability risk".

According to Article 2(17) of the SFDR (European Parliament, 2019) a *sustainable investment* is defined as:

*"An investment in an economic activity that contributes to an environmental objective or an investment in an economic activity that contributes to a social objective provided that such investments do not significantly harm any of those objectives and that the investee companies follow good governance practices".*

This definition introduces a threefold test for an investment to be considered as sustainable:

1. The investment must contribute positively to an environmental or social objective.
2. It must not cause significant harm to any other environmental or social objectives.
3. The underlying company must demonstrate sound governance.

As noted by Busch (2023), this definition is broader in scope than that of the EU Taxonomy, which currently focuses exclusively on environmental objectives when assessing the sustainability of economic activities. While the Taxonomy is expected to extend its scope to include social criteria, it does not currently and is not anticipated to explicitly address governance factors.

### 3.1.2.2 Definition of sustainability risk

Article 2(22) of the SFDR (European Parliament, 2019) defines a *sustainability risk* as:

*“An environmental, social or governance event or condition that, if it occurs, could cause an actual or a potential material negative impact on the value of the investment”*.

In practical terms, sustainability risks refer to non-financial risks, such as environmental incidents, regulatory penalties or reputational harm that can directly or indirectly affect the financial performance of an investment. These risks are associated with the broader concept of financial materiality, which considers the extent to which environmental, social and governance (ESG) factors can influence the economic value of an investment.

### 3.1.2.3 Principal Adverse Impacts (PAIs)

A key concept developed by the SFDR are the *Principal Adverse Impacts* (PAIs). As defined by the regulation, PAIs refer to *“those impacts of investment decisions and advice that result in negative effects on sustainability factors”* (European Parliament, 2019).

In contrast to sustainability risks, which assess how ESG factors may negatively affect the financial performance of investments, PAIs look in the opposite direction, at how investment decisions and advice may adversely affect sustainability-related factors. This approach is known as impact materiality. The PAIs encompasses issues such as environmental degradation, violation of labor and human rights, poor working conditions and corruption or bribery.

To evaluate these impacts, the SFDR establishes a standardized reporting framework consisting of 14 mandatory indicators and 31 additional voluntary indicators. These indicators encompass a broad array of sustainability-related issues. This structured approach ensures consistency in the way financial intermediaries measure and disclose the adverse impacts of their investment decisions and advice. As a result, it significantly enhances the comparability and transparency of sustainability-related information across financial products.

Under the regulation, large FMPs and financial advisors<sup>3</sup> are legally required to disclose how they identify, monitor and address PAIs in their investment activities and advisory services. Smaller entities have the option to voluntarily comply with these disclosure requirements.

By mandating the reporting of PAIs, the SFDR promotes a more holistic and responsible financial system. It encourages financial actors to consider not only sustainability-related risks that may affect the financial performance of their portfolios but also reflect on the broader

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<sup>3</sup> Article 4 of the SFDR defines large FMPs and financial advisers as entities with more than 500 employees on average during the financial year (European Parliament, 2019).

societal and environmental consequences of their activities. This dual focus on both financial and non-financial impacts reflects the principle of *double materiality*, a foundational concept introduced by the Corporate Sustainability Reporting Directive (CSRD), which will be discussed in the following section.

#### 3.1.2.4 SFDR product classification: Article 6, 8 and 9

Articles 6, 8 and 9 of the SFDR (European Parliament, 2019) represent key components of the directive, as their contents have significantly influenced market practices in the field of finance. These articles dictate the mandatory disclosures for financial products based on the degree to which sustainability considerations are integrated into their investment strategies. Consequently, the financial industry commonly categorizes financial products as Article 6, Article 8 or Article 9 funds to denote their sustainability profile.

##### Article 6

Article 6 applies to financial products that do not promote environmental or social characteristics. Nonetheless, FMPs and financial advisors are still subject to:

- Disclose how sustainability risks are integrated into investment decisions (or provide a clear justification for why they are not considered relevant).
- Explain the potential impact of sustainability risks on the financial performance of the product.
- Include a disclaimer in pre-contractual and periodic documentation indicating that the product does not take into account the EU criteria for environmentally sustainable activities. Accordingly, investors are clearly informed about the nature and the potential risks of the financial product (European Parliament, 2020).

Due to their lack of sustainability ambition, financial products falling under this category are often labelled within the industry as “grey products” or referred to as “Article 6 products” (Busch, 2023).

##### Article 8

Article 8 applies to financial products that promote environmental or social characteristics throughout their investments process, provided that the investee companies<sup>4</sup> follow good governance practices. The term “promotion” is broadly interpreted and includes any statements or information conveyed in disclosure documents suggesting that the product incorporates environmental or social characteristics. In addition to the disclosure obligations outlined under Article 6, financial products classified under Article 8 must also:

- Clearly disclose the environmental or social characteristics promoted by the product.
- Explain the investment strategy implemented to support these characteristics.
- Where a benchmark is used, provide a justification demonstrating how the benchmark is aligned with the promoted environmental or social characteristics.

Due to their integration of sustainability considerations to a certain extent, financial products under this category are often referred to in market practice as “light green products” or “Article 8 products” (Busch, 2023).

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<sup>4</sup> Companies where the investments have been made.

## Article 9

Article 9 of the SFDR applies to financial products that have sustainable investment as their primary objective. In addition to the disclosure obligations outlined under Article 6, financial products classified under Article 9 must also:

- Clearly define the specific sustainable objective pursued by the financial product.
- If a reference benchmark is used, explain how this benchmark is aligned with the product's environmental or social objective.
- If no benchmark is employed, provide a detailed description of the investment strategy designed to achieve the sustainable objective.

Importantly, if the financial product pursues an environmental objective but has a negative impact on another social or environmental objective, thereby failing the "Do No Significant Harm" criteria, it is reclassified as an Article 8 product.

In financial market practice, these products are commonly referred to as "Article 9 products." In contrast to Article 8 products, they are sometimes called "dark green products" as they have an environmental or social objective at the center of their strategy, denoting a more profound commitment towards sustainability. However, as noted by Busch (2023), the "light green" and "dark green" terminology is only relevant for investments with an environmental focus, they become irrelevant when referring to financial products targeting social objectives.

### 3.1.2.5 Disclosure obligations under the SFDR

To enhance transparency and combat the risk of greenwashing, the SFDR imposes 4 types of disclosure obligations for financial market participants and financial advisers. These disclosures aim to ensure that sustainability-related information about financial products is readily accessible and comparable across the financial sector.

#### Disclosures at the entity level

At the organizational level, financial intermediaries are required to publish information regarding the policies they have adopted to manage sustainability risks in their investment decision-making processes or advisory activities. This includes providing details on how ESG risks are identified, assessed, and integrated into their operations.

Additionally, large financial entities are mandated to disclose the Principal Adverse Impacts (PAIs) of their investment decisions on sustainability factors, such as environmental degradation or social harm, as well as the measures implemented to mitigate these negative effects. This information must be published on the institution's website and kept up to date.

Should any modifications be made to these sustainability-related policies, the financial intermediary is obliged to provide a clear explanation of the changes and update the corresponding disclosures on their website accordingly (Busch, 2023).

#### Pre-contractual disclosures at the product level

Pre-contractual disclosures are intended to provide prospective investors with all relevant information regarding the sustainability characteristics of the financial products prior to their investment decision.

Specifically, FMPs must disclose the SFDR classification of the product (Article 6, 8, or 9), how sustainability risks are integrated into the investment process, the product's environmental

and/or social characteristics or objectives, the sustainability investment strategy employed, whether a benchmark or index is used as a reference and the consideration of the PAIs.

This information is typically presented in official pre-contractual documentation, including prospectuses, product brochures and Key Investor Information Documents (KIIDs) (Busch, 2023).

#### Website disclosures at the product level

Financial Market Participants are required to publish detailed sustainability-related information for each financial product classified under Article 8 or Article 9 of the SFDR on their official websites. This disclosure obligation aims to ensure greater transparency and accessibility of non-financial information for investors and other stakeholders.

These obligations include: a description of the environmental or social characteristics or the sustainable investment objective, the information used in order to assess, measure and monitor the progression regarding these characteristics or the impact of the sustainable investment, the pre-contractual investment and the sustainability information included in the periodic reports (European Parliament, 2019).

Busch (2023) notes that this requirement exclusively concerns FMPs and not financial advisers, likely because advisers typically depend on the information supplied by FMPs in their own activities.

#### Periodic reports at the product level

Periodic reports constitute the fourth and final type of disclosure mandated by the SFDR. Again, this requirement applies exclusively to FMPs about their financial products classified under Article 8 and Article 9.

FMPs are required to provide an objective assessment of the sustainability performance of these products over the reporting period. Specifically, they must disclose the extent to which the environmental or social characteristics (for Article 8 products) or the sustainable investment objectives (for Article 9 products), were effectively achieved during the period.

Moreover, as illustrated in Appendix 3, FMPs are also obliged to disclose the proportion of the financial product's assets that are invested in environmentally sustainable economic activities (Busch, 2023).

### 3.1.2.6 Delegated Regulation

To complement the SFDR adopted in 2019, the European Commission published on 25 July 2022 a Delegated Regulation, often referred to as the "Level 2" of the SFDR. This regulation, which entered into force in early 2023, provides essential guidance to the financial intermediaries about the practical implementation of the disclosure requirements under the SFDR.

The Delegated Regulation reinforces the core objective of the SFDR by ensuring that sustainability-related information is readily accessible, free of charge, transparent and comparable across the financial sector. Furthermore, it underlines the responsibility of the financial intermediaries to keep the information about the sustainability characteristics of their products up to date on their website.

As a result, the Delegated Regulation introduces Regulatory Technical Standards (RTS), which established a methodological framework for the disclosure of sustainability-related information

across key communication channels, including pre-contractual documents, periodic reports, and websites.

Annex I of the Delegated Regulation outlines the PAIs indicators, including their respective computation formulas. These indicators are divided into an environmental and a social category. FMPs are required to report annually on all 14 mandatory indicators and select at least 2 additional voluntary indicators. Reporting must cover both the current and previous financial year, enabling stakeholders to track the evolution of adverse impacts over time. Additionally, FMPs must comment on the results and describe any corrective actions or future plans linked to each indicator.

Beyond methodology, the Delegated Regulation also introduces standardized disclosure templates for products falling under Article 8 and Article 9 of the SFDR. These templates are intended to visually summarize the sustainability aspect and composition of the financial product. In the first template, the FMP must disclose whether the product has a sustainable objective or promotes environmental or social characteristics. They must also indicate the minimum proportion of investments that qualify as sustainable. The template also requires FMPs to indicate whether these sustainable investments are aligned with the EU Taxonomy or whether they pursue social objectives.

**Does this financial product have a sustainable investment objective?** *[tick and fill in as relevant, the percentage figure represents the minimum commitment to sustainable investments]*

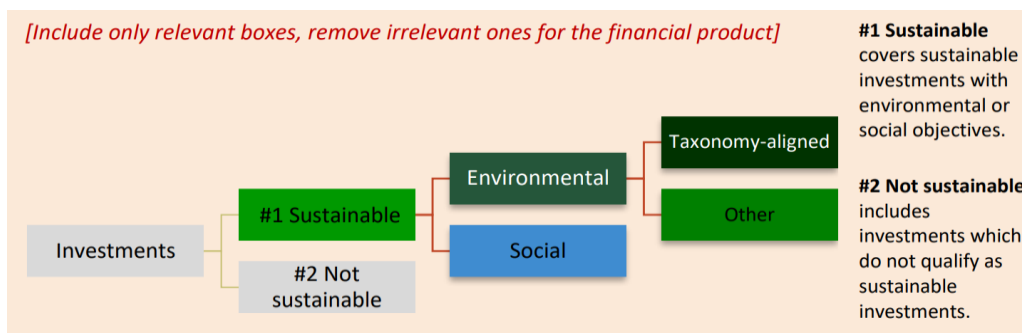
**Yes**                         **No**

<input type="checkbox"/> It will make a minimum of <b>sustainable investments with an environmental objective:</b> ___% <ul style="list-style-type: none"> <li><input type="checkbox"/> in economic activities that qualify as environmentally sustainable under the EU Taxonomy</li> <li><input type="checkbox"/> in economic activities that do not qualify as environmentally sustainable under the EU Taxonomy</li> </ul>	<input type="checkbox"/> It <b>promotes Environmental/Social (E/S) characteristics</b> and while it does not have as its objective a sustainable investment, it will have a minimum proportion of ___% of sustainable investments <ul style="list-style-type: none"> <li><input type="checkbox"/> with an environmental objective in economic activities that qualify as environmentally sustainable under the EU Taxonomy</li> <li><input type="checkbox"/> with an environmental objective in economic activities that do not qualify as environmentally sustainable under the EU Taxonomy</li> <li><input type="checkbox"/> with a social objective</li> </ul>
<input type="checkbox"/> It will make a minimum of <b>sustainable investments with a social objective:</b> ___%	<input type="checkbox"/> It promotes E/S characteristics, but <b>will not make any sustainable investments</b>

**Figure 11:** Template of the sustainability consideration of the financial product

Source: European Commission (2022). *Annexes to the Commission Delegated Regulation (EU).*

The second template depicts the sustainable composition of the financial product by visually representing the information presented in the previous template. First of all, it shows the proportion of sustainable versus non-sustainable investments. Then, it provides a breakdown of sustainable investments into environmental and social objectives. Finally, it further breakdowns environmental investments to specify the proportion that is aligned with the EU Taxonomy.



**Figure 12:** Template of the sustainable investment composition of the financial product

Source: European Commission. (2022). *Annexes to the Commission Delegated Regulation (EU)*.

Together, these templates provide key information to investors about the sustainability consideration of the financial product and its sustainable composition. They significantly enhance transparency and clarity about the sustainability-related information of financial products, ultimately empowering investors to make better-informed decisions.

### 3.1.2.7 Limits of the SFDR

While the Sustainable Finance Disclosure Regulation (SFDR) represents a substantial step forward in enhancing transparency and standardizing sustainability-related disclosure practices within the financial sector, several limitations have been identified in the academic literature that may hinder its overall effectiveness.

One of the primary criticisms concerns the limited scope of the regulation. As noted by Busch, (2023), the SFDR currently applies only to established financial intermediaries, such as asset managers and financial advisers. Emerging actors such as FinTech platforms and novel financial instruments, including crypto assets, remain outside the regulation’s purview. This exclusion creates a separation in the financial sector and may weaken the harmonization objectives of the SFDR. Expanding the regulation’s scope or refining the definitions of “financial market participant”, “financial adviser” and “financial product” would improve inclusivity and make the framework more adaptable to future developments in the financial landscape.

Moreover, the SFDR adopts a “comply or explain” approach, whereby financial intermediaries may opt not to disclose certain information such as the integration of sustainability risks or Principal Adverse Impacts (PAIs) provided they justify the omission. Additionally, the regulation incorporates Member State options, enabling national adaptation of certain provisions. Although these features allow for flexibility, it dilutes the harmonizing intent of the directive by reducing consistency and comparability (Busch, 2023).

Another significant limitation is the absence of a centralized supervisory authority that ensures that the directive is effectively implemented at the national level. Currently, the European Commission delegates this responsibility to national competent authorities rather than being coordinated by a unified body such as the European Securities and Markets Authority (ESMA). This decentralization may lead to inconsistent implementation and interpretation of the regulation across Member States (Busch, 2023).

The SFDR also lacks a harmonized sanctioning regime and does not establish clear civil liability provisions. Consequently, in cases of a breach of sustainability-related disclosure requirements occurred, there are no uniform penalties or compensation mechanisms. This also raises the question of how to compensate for the violation of the investor sustainability’s

preferences. Guided by the general EU principle of effectiveness, which ensures that EU regulation prevail over national law and that civil rights will be respected, the responsibility to sanction the financial intermediary for not properly respecting the disclosure requirements belongs to the national authority.

Furthermore, the literature has raised some concerns about the SFDR's ability to effectively address greenwashing. A study by Cremasco & Boni (2022) found that management fee structures linked to financial and sustainable performance are similar whether a fund is classified as Article 6 or Article 9, meaning that financial incentives for asset managers do not differ regardless of the product's sustainability profile. This suggests that the directive fails to establish clear-cut distinctions about the sustainability commitment of the financial product toward sustainability. This blurs the lines between categories and leads to what they describe as "*category fuzziness*", undermining the SFDR clarification objective.

Next, it is important to note that while Article 8 requires the disclosure of the proportion of investments in sustainable activities, it does not set a minimal threshold to be respected (ESMA, 2021). Additionally, it does not specify the minimal sustainable investment strategies or the methodology to be used for a financial product to be considered as sustainable.

Finally, the last limit of the SFDR is that, as the financial product integrates more sustainability consideration in his decision-making progress, the level of disclosure requirements increases alongside. While these obligations are intended to prevent the risk of greenwashing, they may discourage financial intermediaries from classifying their products as sustainable. This could lead to "greenbleaching" (cf. supra p.46), where the financial manager deliberately classifies his sustainable product as Article 6 in order to avoid more binding disclosure requirements. Consequently, in an effort to address greenwashing in order to improve the redirection of capital flows towards sustainable activities, the directive may paradoxically harm the development of sustainable finance by discouraging financial actors to develop sustainable products or to promote them as such.

In conclusion, the SFDR represents a milestone in the development of sustainable finance in the European Union, particularly through its efforts to harmonize and enhance the disclosure practices about sustainable information. It also contributed to clarifying certain key concepts in sustainable investing such as sustainable investment and sustainability risks. However, the directive still contains several limits that undermine its capacity to achieve its objectives. Accordingly, although the SFDR represents a critical initial step in combating greenwashing and increasing transparency, further revisions and regulatory enhancements are necessary to ensure its long-term effectiveness and impact.

### 3.1.3 Corporate Sustainability Reporting Directive

The expansion of the sustainable investment market and the strengthening of the disclosure obligations introduced by the SFDR have significantly increased the financial intermediaries' demand for reliable non-financial information. In order to meet SFDR requirements and support their sustainability-related claims, these actors require more comprehensive data on the environmental and social performance of the companies in which they invest. Simultaneously, as the consequences of environmental and social issues are becoming more and more alarming, investors become increasingly concerned about the sustainable risks in the financial performance of the company.

Furthermore, companies also realized that they could benefit from high-quality sustainability reporting. Such reporting not only improves their ability to identify and manage those sustainability risks, but it also creates an opportunity to attract sustainable investments and strengthen their communication with stakeholders (European Parliament, 2022).

In this context and as part of the European Green Deal, Europe introduced the Corporate Sustainability Reporting Directive (CSRD) on 16 December 2022<sup>5</sup>. This regulation replaces the Non-Financial Reporting Directive (NFRD) of 2014 and strengthens the regulatory mandates regarding how companies report the non-financial aspect of their activities (European Parliament, 2021).

The main objective of this directive is to harmonize corporate sustainability reporting standards and to ensure that information is relevant, gives a faithful representation, comparable, verifiable and understandable for the stakeholders. This is intended to provide financial intermediaries with the necessary data to comply with SFDR requirements, facilitate informed sustainable investment decisions, and support the development of sustainability-oriented financial products (Busch, 2023).

To this end, companies subject to the CSRD are required to report their sustainability-related information in accordance with the European Sustainability Reporting Standards (ESRS), developed by the European Financial Reporting Advisory Group (EFRAG) (European Parliament, 2021).

One of the most significant developments under the CSRD is the expansion of its scope. While the NFRD applied only to European public-interest entities with more than 500 employees such as listed companies, banks, and insurance firms, the CSRD will gradually increase the scope of the directive to include a broader range of entities, including large companies, listed SMEs and certain non-European companies with substantial operations in the EU.

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<sup>5</sup> More detailed information about the implementation timeline of the EU Taxonomy, the SFDR and the CSRD can be found in Appendix 3.

The directive will be implemented gradually beginning with companies that are already within the scope of the NFRD. These entities will have to publish their report in 2025 about their sustainable information for the fiscal year 2024. The table below depicts the implementation phases of the CSRD (European Commission, n.d.):

**Table 5:** Implementation phases of the CSRD

Companies affected	Fiscal year	Report must be published from
Companies already within the scope of the NFRD  Large European public interest entities with >500 employees	1st January 2024	2025
Large companies that meet at least 2 out of the 3 following criteria: <ul style="list-style-type: none"> <li>- &gt;250 employees</li> <li>- Net turnover &gt;40 million €</li> <li>- Total assets &gt;20 million €</li> </ul>	1st January 2025	2026
Listed SMEs that meet at least 2 out of the 3 following criteria: <ul style="list-style-type: none"> <li>- &gt;10 employees</li> <li>- Net turnover &gt;700,000€</li> <li>- Total assets &gt;350,000€</li> </ul>	1st January 2026  (with an option to postpone to 2028)	2027  (with an option to postpone to 2029)
Non-European companies that meet the 2 following criteria: <ul style="list-style-type: none"> <li>- Turnover &gt;150 million €</li> <li>- At least one subsidiary or branch in the EU</li> </ul>	2028	2029

Source: Table adapted from Principles for Responsible Investment. (2022). *CSRD and ESRS: how EU corporate sustainability reporting is evolving*.

Furthermore, the regulation also aims at remediating several shortcomings of the NFRD identified by stakeholders during the revision period. For example, while the NFRD offered flexibility in how companies reported non-financial information, it lacked standardized frameworks or guidance, resulting in sustainability reports that were often inconsistent, incomparable and of limited utility. Additionally, many organizations complained about the complexity and the burden to establish those reports (European Parliament, 2021).

Lastly, the CSRD further develops the concept of double materiality, initially introduced by the NFRD. According to Chiu & al. (2022), this concept distinguishes European regulation from other global frameworks. Double materiality requires companies to consider both:

- Financial materiality: Risk or opportunity that may significantly impact, either positively or negatively, the company's financial performance.
- Impact materiality: Positive or negative impacts a company's activities may have on people or the environment over the short-, medium- or long-term.

A risk or an opportunity is considered as material when it may have a tangible impact either on the economic value of the company or on society & the environment. The CSRD mandates companies within its scope to disclose information on the double materiality of their activities.

Hence, under the CSRD, companies are obligated to disclose how their activities align with the criteria established by the EU Taxonomy. This includes reporting on the proportion of Capital Expenditures (CapEx) and Operating Expenditures (OpEx) directed towards economic activities classified as environmentally sustainable by the Taxonomy (European Commission, 2023). Despite these advancements, Chiu and al. (2022) emphasize the need for further development of robust standards and metrics to improve corporate disclosures under the double materiality principle.

In conclusion, the CSRD complements the broader European regulatory ecosystem designed to advance the European Green Deal's sustainability objectives. Together, the EU Taxonomy, the SFDR and the CSRD increase the transparency, comparability and reliability of sustainability information in financial markets:

- The EU Taxonomy establishes the general base ground by providing the criteria to determine the economic activities that can be qualified as environmentally sustainable.
- The CSRD standardizes and strengthens how companies report on sustainability risks and how their activities impact society and the environment, using the EU Taxonomy.
- The SFDR harmonizes and increases transparency about the disclosure of sustainable information on financial products. It requires financial intermediaries to disclose how sustainability risks and PAIs are considered and justify the sustainability consideration of their financial products, using the data disclosed by companies.

By mandating transparent, standardized and comprehensive disclosures at both the corporate and financial product levels, this regulatory framework aims to redirect capital flows toward sustainable activities and reduce the risk of greenwashing. Ultimately, it supports the transition to a more sustainable, responsible and resilient financial sector.

## 3.2 Third-party data providers of sustainable information

This second section focuses on the third-party actors that contribute to improving the transparency, accessibility and quality of sustainability-related information in financial markets. Alongside regulatory frameworks, these entities play a critical role in mitigating greenwashing by supplying independent data, metrics and assessments related to the non-financial performance of companies and financial products.

Key third-party contributors include sustainability data providers, ESG rating agencies, sustainability labels and sustainable benchmarks/indexes. Their services support financial market participants such as asset managers, financial advisers and institutional investors in making better-informed investment decisions aligned with sustainable considerations.

### 3.2.1 Sustainable data providers

Sustainability data providers serve as essential intermediaries in the financial market by collecting, aggregating and interpreting material non-financial information from a wide array of sources. Their primary role is to organize and present this data in a coherent and accessible format, enabling investors to make more informed decisions. As investor demand for ESG-related information continues to grow, the function of these data providers becomes increasingly critical (Schaub, 2018).

Furthermore, the implementation of European disclosure regulations about sustainable information such as the SFDR and the CSRD has significantly enhanced the availability and quality of sustainability data. Data providers have leveraged this expanded disclosure of data to offer more relevant and refined insights into the sustainability performance of companies. As a result, investors are better equipped to assess the sustainability profile of financial products and make more informed investment decisions (European Parliament, 2022).

In addition to serving investors, sustainability data providers play a vital role in supporting asset managers during portfolio construction. Their services allow for comparative assessments of peer companies based on non-financial performance, helping in the selection of companies with superior ESG practices. Moreover, asset owners can utilize these insights to engage with investee companies, encouraging stronger sustainability practices or improving risk management (Qayyum, 2022).

Notable sustainability data providers in the current market include:

- MSCI ESG Research
- Sustainalytics
- Refinitiv ESG (formerly Thomson Reuters)
- Bloomberg ESG Data Services
- CDP (Carbon Disclosure Project)
- ISS ESG
- Vigeo Eiris (part of Moody's)
- Trucost (part of S&P Global)
- FTSE Russell

### 3.2.2 ESG rating agencies

ESG rating agencies also represent a major provider of sustainable information about companies to investors. While Credit Rating Agencies (CRA) evaluate the financial performance of the company through its financial statements and financial indicators to establish its credit and default risk, ESG rating agencies focus on the company's extra-financial performance (European Commission, 2022). Like sustainability data providers, ESG rating agencies gather information through corporate reports, publicly available data, questionnaires, interviews and occasionally site visits. Both entities aim at supporting sustainable investments decisions by providing the relevant and material information about the company ESG performance. However, their distinctive value lies in their ability to synthesize this information into standardized ESG ratings or sustainability scores, depicting the company's overall sustainability performance (Dimson, Marsh & Staunton, 2020).

Furthermore, in recent years, Credit Rating Agencies have begun incorporating more Corporate Social Responsibility (CSR) in their assessment of the company's default risk, acknowledging environmental and social performance can affect a firm's capacity to meet its financial obligations. Therefore, in addition to ESG factors, CRAs have started to integrate corporate controversies into their evaluation processes (Scholtens & Witteveen, 2021). Controversy occurs when a company is involved in actions or incidents that can have a negative impact on its stakeholders, the environment or society (Sustainalytics, 2021). These events, ranging from environmental disasters and human rights violations to corruption cases or product safety failures, can have significant reputational and financial damage.

Controversy metrics and ratings such as the Controversy Score developed by Thomson Reuters or the Controversy Rating of Sustainalytics, assess the frequency and the severity of sustainability-related incidents. These measures consist of a new approach to non-financial analysis by evaluating both the occurrence of negative events and the informational value of their absence (Dorfleitner, Kreuzer & Sparrer, 2020).

From the perspective of the Efficient Market Hypothesis (EMH), this information about corporate controversies represents a new source of non-financial information about the company's environmental and social performance and exposure to sustainability risks that should be incorporated into valuations by investors and CRAs. Therefore, if the firm is exposed to severe controversies, its perceived risk will increase (Scholtens & Witteveen, 2021). Real-world examples include the sharing of private information of its users to a third party by Facebook and the Boeing 737 Max safety scandal, both of which significantly damaged corporate reputations and reduced share prices (Li, Haider, Jin, & Yuan, 2018; Nirino, Santoro, Miglietta & Quaglia, 2020).

However, the study of Scholtens and Witteveen (2021) indicated that the integration of controversies into valuations is inconsistent. It was found that investors react more severely to controversies than CRAs, but such reactions are often very inconsistent and short-lived, with share prices recovering once the controversy subsides. Credit rating agencies tend to be less sensitive and slower to respond. The results of their study indicate that financial market players and rating agencies still struggle to integrate sustainability factors into their evaluations.

Another interesting study conducted by Nirino & al. (2020) analyses the effects of ESG practices in mitigating consequences of corporate controversies. Their analysis confirmed that controversies have a significant negative impact on financial performance. However, their findings did not find evidence that ESG practices were significantly efficient to mitigate the consequences caused by controversies. While ESG initiatives can build trust and enhance reputation over time, they can not "undo" the harm once a controversy occurs. They suggest that ESG should be regarded as preventive, helping to avoid controversies rather than remedial.

The European Sustainable Investment Forum (Eurosif, 2021) has emphasized the growing importance of ESG rating agencies and sustainability data providers in supporting informed sustainable investment decisions. Nevertheless, significant concerns have been raised in the academic literature regarding the divergence of ESG scores among different agencies. A widely cited example is the case of Tesla in 2018-2019, when the company simultaneously received a high ESG rating from MSCI, an average score from Sustainalytics and a low score from FTSE. Such discrepancies highlight the challenges investors face when selecting companies that match their sustainability profile.

Dimson & al. (2020) identify four main factors that contribute to the inconsistency of ESG ratings:

The first reason comes from the data used by the ESG rating agencies. Each ESG rating agency can have access to different data, use different metrics and establish different methodologies to compute their ESG score, leading to inconsistencies in the final ratings. If all agencies based their assessments on a standardized dataset, it should lead to a convergence in the rating, making it more relevant to the eyes of the investor due to a phenomenon referred to as “convergent validity”. Lopez & al (2020) develops on this point by explaining how difficult it can be for ESG agencies to compute these scores. They argue that harmonized sustainability disclosure standards are essential to ease the burden on ESG rating agencies and enhance comparability between ratings. That’s where European regulation like the Taxonomy, the SFDR and the CSRD can have a huge impact in fulfilling this gap.

Secondly, agencies may use different reference benchmarks to evaluate the company’s ESG performance. Some assess companies relative to the global market, while others focus on comparisons within industry sectors. As a result, a company operating in a sector with high ESG risks can receive a favorable ESG score when it is assessed relative to its peers but receive a poor ESG rating when it is assessed over the global market.

The third reason comes from the interpretation of missing data. When companies do not report certain metrics, rating agencies may interpret this absence differently. Some assign the value zero, while others estimate a score based on sector averages or comparable companies, further contributing to rating variability.

Lastly, depending on their vision of sustainability, agencies may apply different weightings to the environmental, social, and governance pillars in their overall ESG rating. Therefore, some agencies may emphasize environmental factors or undervalue governance factors in the computation of their global ESG score. For instance, Sustainalytics tends to apply equal weighting across all three pillars, whereas MSCI emphasizes social criteria. Lopez, Contreras, Bendix (2020) affirm that, as long as ESG rating agencies remain transparent regarding the weighting of their ESG score, inconsistencies across ESG rating are not problematic. Every agency is free to have its own sustainable preferences and definitions of ESG performance. Ultimately, investors should select the ESG score that is the most aligned with its own sustainability preferences.

Avramov, Cheng, Lioui & Tarelli (2022) analyze the implications of ESG rating discrepancies on investor behavior. They find that inconsistent ratings can increase perceived risk and diminish investor confidence in a company, even when its sustainability performance is strong. Socially responsible investors, who place greater emphasis on ESG considerations, are especially sensitive to such inconsistencies and will prefer companies with more reliable ESG scores. This loss of confidence may lead to an undervaluation of the company’s stock and a higher expected return to compensate for the perceived risk.

To address these concerns and improve the reliability of ESG ratings, the European Council and the European Parliament reached a provisional agreement on a regulation governing ESG

rating activities. Expected to come into force in early 2026, this regulation will require ESG rating agencies to be accredited and supervised by the European Securities and Markets Authority (ESMA) (Eurosif, 2021).

The forthcoming regulation will also impose greater transparency obligations. Agencies offering a unified ESG score will be required to disclose the weighting of each E/S/G pillar within the final rating. The regulation is also considering the possibility to provide ratings where Environmental, Social and Governance factors are separated to allow for a clearer understanding of a company's performance in each dimension (European Council, 2024).

In addition, the legislative initiative will amend the SFDR to impose equivalent disclosure requirements on Financial Market Participants and financial advisers who develop their own proprietary ESG ratings (European Commission, n.d.). These reforms aim to address concerns raised by scientific literature and enhance the transparency, comparability and credibility of ESG assessments, ultimately supporting the development of a more robust and trustworthy sustainable finance market.

### 3.2.3 Sustainable labels

As developed in Chapter 2 (cf. supra p.46), the risks of greenwashing and impact washing present in the field of sustainable finance make the investor doubt the real impact of sustainable investments and make it difficult for them to identify financial products that actually encompasses sustainable characteristics or pursue a sustainable objective.

Sustainable labels play a key role in addressing greenwashing concerns by certifying that financial products meet a minimum threshold of sustainability. Each label is governed by its own methodology, including specific evaluation criteria and processes designed to assess the ESG aspects of an investment product. Depending on the rigor of its standards, a label may emphasize certain ESG dimensions more than others. Consequently, it is essential for investors to consult the label's methodology and criteria, typically available on the label's official website, to understand the basis on which the sustainability of a financial product is assessed.

To ensure impartiality and objectivity, labels often delegate the verification process to accredited auditors or independent third-party verifiers. Communication between the asset manager and the label or verifier is crucial for accurately interpreting and evaluating the sustainability strategy of the investment product. Based on this evaluation, the label may choose to grant certification, reject the application, or grant the label conditionally, subject to the fulfillment of specific criteria.










For instance, the Belgian label Towards Sustainability (CLA, 2023) applies a comprehensive Quality Standard to assess the eligibility of investment products. Asset managers seeking the label must submit extensive documentation detailing their investment strategy and its alignment with the label's sustainability requirements. The assessment is then carried out by an independent verifier, who evaluates compliance with the criteria. The final decision is made by the Central Labeling Agency, which may adopt or reject the verifier's recommendation.

According to a report by Novethic (2020), nine key sustainable finance labels currently operate within the European market. These can be broadly classified into two categories:

- Green Labels which focus primarily on environmental considerations. Examples include the Greenfin Label and LuxFLAG Environment
- ESG Labels which incorporate a comprehensive evaluation of sustainability, addressing Environmental, Social and Governance (ESG) factors. Examples include the SRI Label, FNG-Siegel, LuxFLAG ESG and Towards Sustainability.

The table below provides a comparative overview of major European sustainable labels:

**Table 6:** Overview of European sustainable finance labels

	Label	Governance	Attribution	Type of label	Annual cost
ESG	 <b>SRI Label</b> (France)	Standalone stakeholder committee, supported by the Ministry of Finance	Accredited auditors	SRI/ESG investment process	Fee including the audit and promotion costs
	 <b>FNG-Siegel</b> (Germany, Austria & Switzerland)	Expert committee under the stewardship of FNG <sup>1</sup>	GNG (FNG's labelling entity) & Uni. Hamburg	SRI/ESG investment process with climate exclusions. Point system	€4200
	 <b>LuxFLAG ESG</b> (Luxembourg)	LuxFLAG <sup>2</sup>	LuxFLAG	SRI/ESG investment process	€3000
	 <b>Towards Sustainability</b> (Belgium)	Central Labelling Agency <sup>3</sup> (CLA)	Verifiers appointed by the CLA	Quality standard combining requirements on the investment process and exclusions	Fee per labelled product collected by CLA
	 <b>Umweltzeichen</b> (Austria)	Austrian Federal Ministry for the Environment	Ministry	SRI/ESG investment process with climate exclusions. Point system	Variable annual fee
«Green» labels	 <b>Nordic Swan Ecolabel</b> (Nordic countries)	Nordic Ecolabelling Board <sup>4</sup> , on a mandate from Nordic governments	Nordic Swan	SRI/ESG investment process with climate exclusions & green reporting. Point system	Based on AuM
	 <b>LuxFLAG Environment</b> (Luxembourg)	LuxFLAG <sup>2</sup>	LuxFLAG	Thematic investments and ESG criteria	3000€
	 <b>LuxFLAG Climate Finance</b> (Luxembourg)	LuxFLAG <sup>2</sup>	LuxFLAG	Thematic investments and ESG criteria. Climate exclusions	3000€
	 <b>Greenfin Label</b> (France)	Standalone stakeholder committee, chaired by the Ministry for the Ecological and Fair Transition	Accredited auditors	Thematic investments and ESG criteria. Climate exclusions	Depending on auditor

Source: Novethic. (2020). *9 labels for European sustainable funds.*

These labels enhance transparency and mitigate the risk of greenwashing within the sustainable finance market. By ensuring that the financial product encompasses minimum sustainability standards, these labels support investors in making more informed and responsible investment decisions.

### 3.2.4 Sustainable benchmarks and indexes

Benchmarks and indexes are closely related financial tools frequently used by investors to evaluate the performance of securities and portfolios. Although the terms are often used interchangeably as they share some common characteristics, they differ in function and purpose.

A benchmark serves as a standard or point of reference against which the performance of an investment is measured. It enables investors to assess how effectively a specific financial product performs relative to a broader market or a specific set of securities. Benchmarks are typically tailored to reflect particular investment goals, sectors or strategies, offering a comparative framework for performance evaluation (Chen, 2024).

An index, by contrast, is a statistical measure designed to represent the composition of a specific group of securities. Indexes are constructed using standardized metrics and methodologies to replicate, as faithfully as possible, the composition of a specific sector, market or geographic region. Although indexes are not inherently designed for comparison purposes, they are frequently used as benchmarks due to their representative nature, which contributes to the conceptual overlap between the two terms (Chen, 2024).

In alignment with the objective of the Action Plan on Financing Sustainable Growth, specifically the goal of reorienting capital flows towards a more sustainable economy, the European Commission introduced a regulatory framework for sustainable benchmarks. Adopted on 27 November 2019 and in effect since 30 April 2020, this regulation amended the original Benchmark Regulation to enhance transparency and standardization in the development and use of sustainability-related benchmarks (European Commission, n.d.).

Under this new framework, actors that develop financial benchmarks are required to disclose how ESG factors are incorporated into their methodologies. These transparency requirements aim to improve the comparability between sustainable benchmarks and reduce the risk of greenwashing (European Commission, 2020).

The regulation also introduced two new categories of climate-focused benchmarks: the EU Climate Transition Benchmarks (CTBs) and the EU Paris-aligned Benchmarks (PABs). To qualify under either category, benchmarks must adhere to minimum standards set by the Technical Expert Group (TEG) on sustainable finance.

- EU Climate Transition Benchmarks (CTBs): CTBs are aligned with climate transition. To be classified as a CTB, the benchmark must demonstrate a weighted average greenhouse gas (GHG) intensity at least 30% lower than its investible universe<sup>6</sup>. These benchmarks offer greater flexibility, allowing for portfolio diversification. They are intended for investors aiming to support the climate transition and reduce their exposure to climate-related financial risks.
- EU Paris-Aligned Benchmarks (PABs): PABs are subject to more stringent criteria. The benchmark must demonstrate a weighted average GHG intensity at least 50% lower than its investible universe and must align with the decarbonization target of the Paris Agreement which aims at mitigating global warming below 1.5°C above pre-industrial levels (Joas, 2024).

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<sup>6</sup> As defined by the EU regulation: “Investible universe means the set of all investible instruments in a given asset class or group of asset classes” European Parliament. (2020). Commission Delegated Regulation (EU) 2020/1818. Chapter 1 Article 1.

Some major financial entities such as MSCI, Solactive, and STOXX have already developed indexes aligned with the CTB and PAB frameworks. For instance, MSCI has introduced the MSCI EU Climate Transition Index and the MSCI EU Paris-Aligned Climate Index.

Beyond the regulatory framework, several sustainability-oriented indexes already exist in the financial market. They are often developed by ESG data providers. Notable examples include:

- FTSE4Good Index Series: Developed by FTSE Russell, this index is commonly used as a benchmark for Socially Responsible Investment funds.
- MSCI ESG Leaders Indexes: Developed by MSCI, this index comprises companies with high ESG ratings relative to their industry peers.

In summary, sustainable benchmarks and indexes foster comparability and accountability in sustainable finance. They provide reference points about sustainable performance, which enable investors to compare the sustainable performance of their investments. Ultimately, these tools support the redirection of capital flows towards companies that demonstrate superior sustainable performances.

## Chapter 4: Statistical analyses

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This section constitutes the final part of the thesis and is dedicated to the statistical analysis of the research question. It begins with a detailed explanation of the research objective, followed by a description of the fund selection process and the identification of key indicators used to assess the extra-financial performance of the selected funds.

Once the methodological framework is clearly established, the statistical analyses will be conducted, beginning with the Morningstar Sustainability Rating™. Given that the analysis involves sixteen different indicators, a comprehensive explanation will be provided for the Morningstar Rating™ to illustrate each step of the statistical procedure. This detailed example will serve as a reference point, allowing subsequent analyses to focus primarily on the interpretation of results while minimizing redundancy.

The chapter will then summarize and explain the findings, before concluding with a discussion of methodological limitations, while providing eventual recommendations and ideas to overcome them or for further research.

### 4.1 Objective of the statistical analysis

The aim of the statistical analysis is to evaluate whether funds with different levels of sustainability integration perform differently on non-financial indicators. Therefore, funds are categorized into three distinct groups according to their stated sustainability consideration: traditional funds, Socially Responsible Investment funds and impact funds. The classification into these three categories is based on the Sustainable Finance Disclosure Regulation (SFDR).

The extra-financial performance of these 3 groups of funds will be examined and compared across a total of 16 indicators. These analyses are structured into two main sections. The first section evaluates the extra-financial performance of the funds based on 10 sustainable indicators. These comparisons are conducted on 3 analytical levels: a general level assessing the fund's overall sustainability performance, an intermediate level analyzing the fund's non-financial performance across the 3 ESG dimensions (environmental, social and governance) individually and a detailed level focusing on 6 specific ESG metrics (total of greenhouse gas emissions, GHG intensity, gender pay gap, proportion of female board members, UNGC Principles/OECD Guidelines Violations and UNGC/OECD Lack of Compliance Mechanisms). The second section adopts a different perspective by evaluating the extra-financial performance of the same 3 groups of funds through the lens of controversy. In this context, controversy refers to incidents, actions or behaviors associated with a company that have been flagged and that raise ethical, legal, environmental or social concerns. Controversies are often indicative of potential issues regarding sustainability. These events may also represent potential reputational or material ESG risks for companies. Sustainalytics classifies these events into 6 controversy ratings: No, Low, Moderate, Significant, High and Severe. Therefore, a total of 6 statistical analyses will be conducted for this section to determine the exposure of each fund sample to these different levels of severity.

Ultimately, the statistical analyses aim to determine whether the professed sustainability efforts of Socially Responsible Investment and impact funds result in superior non-financial performance across various ESG and controversy indicators. It will provide valuable insights into the prevalence of greenwashing within sustainable finance and the genuine impact of sustainable funds towards the resolution of ESG-related challenges. The inclusion of a third group, consisting of traditional funds, serves as a baseline to evaluate the performance that a fund can achieve when it has no explicit commitment towards sustainability. This baseline will

offer a point of comparison to assess the performance of Socially Responsible Investment and impact funds.

Moreover, conducting the analysis across multiple levels will allow for the identification of specific areas where sustainable funds may underperform relative to traditional funds. Identifying these weaknesses will provide useful information for regulators, fund managers, and sustainability-focused investors, highlighting where efforts should be concentrated to enhance sustainability performance.

In addition, by using the SFDR framework to classify the funds, the results of the statistical analysis will also assess the effectiveness of the regulation in addressing greenwashing and impact washing concerns.

Finally, since the statistical analyses focus on measuring the non-financial performance of investment funds from various perspectives, they will offer a broader overview of the current state of data availability of sustainable information and the relevance of the ESG indicators. Particular attention will be paid to the Morningstar Sustainability Rating™, given the questions raised in academic literature regarding the reliability and significance of ESG ratings.

## 4.2 Methodology overview

This section explains the methodology applied for selecting the relevant ESG indicators and funds used in the statistical analyses.

### 4.2.1 Selection of indicators

The identification of appropriate indicators is critical to this study, as they form the foundation for evaluating and comparing the non-financial performance of the funds. However, as highlighted by the scientific literature, interest in the measurement of the non-financial performance of the funds is relatively recent. Consequently, few academic studies have addressed this topic and even fewer have disclosed the precise indicators employed to assess the environmental, social, or governance performance of the funds. This lack of transparency complicates the process of determining which metrics are most relevant to the research question.

To address this challenge, a comprehensive list of sustainability-related indicators was initially extracted from the Morningstar database to identify which indicators were available. From this extensive dataset, 16 indicators were selected to ensure a comprehensive and coherent evaluation of the funds' extra-financial performance.

The following table presents the selected indicator for the first section of the statistical analyses.

**Table 7:** ESG indicators selection

Double materiality	Financial materiality	Level 1	Morningstar Sustainability Rating™				
		Level 2	Portfolio Environmental Risk Score		Portfolio Social Risk Score		Portfolio Governance Risk Score
	Impact materiality	Level 3	PAI Scope 1, 2 & 3 GHG Emissions Tonnes	PAI GHG Intensity Scope 1, 2 & 3 Average Value	PAI Gender Pay Gap Average Value	PAI Percentage of Female Board Members Average Value	PAI Ungc Principles/ OECD Guidelines Violations % of Covered Portfolio Involved

The structure of this indicator selection in three distinct levels allows for a progressive refinement of the analysis, beginning with a broad overview of sustainability performance and gradually moving toward more specific and direct ESG measures. This layered approach ensures that the multidimensional nature of sustainability is properly captured, avoiding a reductionist interpretation based on a single measure.

In addition, the statistical analyses are designed to assess the funds’ performance through the lens of double materiality. The first two levels primarily focus on financial materiality, analyzing how ESG factors may affect the financial value and risk profile of investments. By contrast, the third level emphasizes impact materiality, assessing the broader societal and environmental consequences of the fund’s investments decisions. The second section of statistical analyses based on controversy also assesses the performance of the fund on the double materiality aspect. Sustainability assesses corporate incidents or practices that have consequences on society or the economy. In return, these events can have material or reputational risks for companies. By adopting a double materiality approach, the analysis provides a comprehensive understanding of the funds’ sustainability performance. This approach is particularly relevant in the context of sustainable finance, where stakeholders increasingly expect investments to deliver both financial resilience and meaningful contributions to addressing environmental and social challenges.

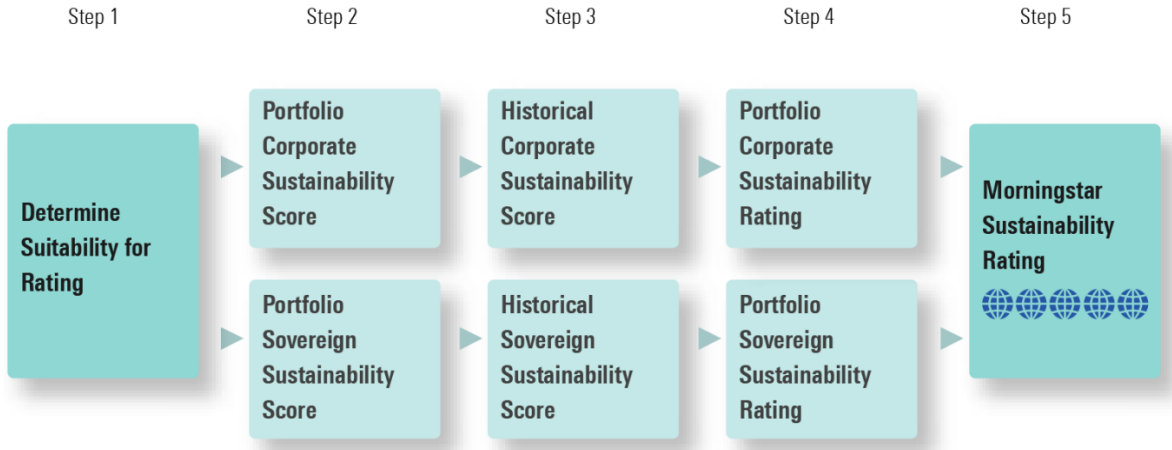
4.2.1.1 Morningstar Sustainability Rating™

The first indicator based on which the different groups of funds will be compared is the Morningstar Sustainability Rating™. Even though the list of indicators extracted from the Morningstar database was quite extensive, the possibilities for the first two levels were quite limited. Indeed, in the context of selecting an indicator to represent the overall sustainable performance of the fund, the only relevant indicator identified was the Morningstar Sustainability Rating™.

This rating was initially introduced by Morningstar in 2016 and has been subsequently updated since then. This rating measures the ESG risks that could affect the financial performance of a fund’s holdings. It provides an evaluation of how effectively a fund’s investments manage environmental, social, and governance risks and opportunities relative to comparable funds. Therefore, it gives an indication about the overall financial materiality of the fund.

According to Morningstar (2021), the computation of the Morningstar Sustainability Rating™ follows a structured 5 steps process. First, the fund’s eligibility is assessed based on the proportion of its holdings that qualify for ESG risk evaluation. Next, the Portfolio Corporate and the Sovereign Sustainability Scores are calculated monthly by asset-weighting the ESG Risk Rating and the Country Risk Rating of eligible holdings. Third, Historical Corporate and

Sovereign Sustainability Scores over the past 12 months are computed by assigning greater importance to more recent scores in order to better reflect the current ESG risk profile of the portfolio. In the fourth step, funds are ranked relative to their peers within the same Morningstar Global Category, with safeguards applied to ensure that differences in ratings correspond to meaningful differences in ESG risk exposure and to prevent high-risk portfolios from receiving favorable scores. Finally, the Morningstar Sustainability Rating™ is derived by combining the corporate and sovereign ratings, weighted according to their respective proportion within the fund. This results in a comprehensive indicator of the fund’s overall exposure to ESG risks. The detailed methodology to compute this rating is outlined in Appendix 8.








**Figure 13:** Morningstar Sustainability Rating calculation steps

Source: Morningstar. (2021). *Morningstar Sustainability Rating Methodology*.

At the conclusion of this process, each fund is assigned a rating ranging from 1 to 5 globes, which reflects the level of sustainability risk of the fund. The more globes a fund possesses, the lower his sustainability risk is. When a fund has a high ESG risk in comparison to its peers, it obtains one globe, suggesting a low sustainability rating. Inversely, when a fund has a low ESG risk, it has a high sustainability rating, which is represented by 5 globes. 2 globes represents an under average sustainability rating. An average sustainability rating is described by 3 globes and 4 globes represents a sustainability rating of above average (Morningstar, 2021).

In the Morningstar database, this rating was originally expressed as a nominal value ("Low," "Below Average," "Average," "Above Average," "High") rather than a direct numerical score. To make this variable usable for the statistical analyses in SPSS, it was necessary to convert these qualitative ratings into numerical values. Table 8 depicts how numerical values were assigned based on the number of globes.

**Table 8:** Morningstar Sustainability Rating™

Morningstar Sustainability Rating™	Number of globe Morningstar	Value attributed
Low		1
Below Average		2
Average		3
Above Average		4
High		5

4.2.1.2 Portfolio Environmental, Social & Governance Risk Score

The second level of the analysis refines the evaluation of the funds' sustainability performance by examining separately the three main pillars of sustainable investment: Environmental (E), Social (S) and Governance (G) aspects. To address these dimensions, three indicators were selected from the Morningstar database: the Portfolio Environmental Risk Score, the Portfolio Social Risk Score and the Portfolio Governance Risk Score. As these indicators share a common methodology, they are presented jointly in this section.

Each of these indicators measures the asset-weighted exposure of the fund's holdings to unmanaged ESG risks specific to its respective dimension. The scores are calculated by Sustainalytics and aggregated at the portfolio level using a continuous scale from 0 to 100, where higher scores indicate greater vulnerability to ESG risks. However, in practice, most scores are comprised between 0 and 25 (Morningstar, 2023). Thus, similarly to the Morningstar Sustainability Rating™, these indicators primarily assess the financial materiality of the fund. Unfortunately, in order to maintain their internal computation methodology proprietary, no detailed information is publicly available about the computation of these scores by Sustainalytics.

- The Portfolio Environmental Risk Score captures the portfolio’s exposure to environmental risks such as climate change, resource scarcity, carbon emissions, waste management, biodiversity loss, and deforestation. These risks can translate into financial consequences such as production disruptions, transition costs, regulatory penalties or simply reputational damage.
- The Portfolio Social Risk Score evaluates the exposure to social risks, including gender inequality, labor rights violations, unsafe working conditions and discrimination. Poor management of these risks can result in regulatory fines, strikes, customer boycotts, reputational harm or decreased employee productivity.
- The Portfolio Governance Risk Score assesses the exposure to governance-related risks such as bribery, corruption, ethical violations and regulatory non-compliance. Weak governance practices can lead to reputational crises, regulatory sanctions or loss of investor trust.

In addition to these three indicators, Morningstar introduced the Portfolio Unallocated Risk Score. This score accounts for ESG risks that could not be distinctly attributed to the environmental, social or governance pillars. This ensures that the aggregation of these scores aligns with the overall Morningstar Sustainability Rating™ (Morningstar, 2021).

Despite a limited choice of indicators at this pillar level, the selected metrics offer notable advantages. First, these indicators all fall under the Sustainability Pillar Scores of Morningstar, which provides a deeper analysis of the portfolio overall sustainability rating. They collectively cover the full spectrum of ESG risks without any overlap or omission, as they were specifically designed to complement one another. Each score represents the contribution of its respective sustainability dimension to the overall risk profile (Morningstar, 2021). Second, because all these scores are produced by the same provider, Morningstar using Sustainalytics data, they are based on a consistent methodology and standardized rating system, enhancing their comparability (Morningstar, 2023).

In conclusion, the Portfolio Environmental, Social and Governance Risk Scores provide a more detailed, robust, coherent, and comparable framework for evaluating the non-financial risks associated with the key dimensions of sustainable investment.

#### 4.2.1.3 Principal Adverse Impacts (PAIs) Indicators

The third level of analysis adopts a more specific approach compared to the previous two. While the earlier indicators were based on Sustainalytics' proprietary methodologies and primarily assessed the financial materiality of ESG factors, this level shifts the focus toward impact materiality. In other words, the selected metrics at this level of comparison evaluate the effects of the funds' investment decisions on environmental, social and governance factors. These measures are less transformed and assess the funds' raw non-financial performance more directly.

At this stage, a wider range of metrics was available, particularly concerning environmental aspects. This imbalance reflects the historically greater attention given to environmental issues, which are generally easier to quantify than social or governance-related concerns. To ensure the robustness of the statistical analysis, a preliminary screening was conducted to prioritize indicators with minimal missing data.

The final selection of metrics was based on the 14 mandatory Principal Adverse Impacts (PAIs) listed in the Annex of the SFDR Delegated Regulation (see Appendix 4). According to the European Regulation, Principal Adverse Impacts are defined as "*those impacts of investment decisions and advice that result in negative effects on sustainability factors*" (European Parliament, 2019). Therefore, they represent the most significant negative impacts that investment decisions may have on environmental, social, and governance factors, helping investors to make more informed and responsible investment decisions. Since January 2023, financial advisers and Financial Market Participants (FMPs) with more than 500 employees are required to report on all 14 mandatory PAIs, along with one additional environmental and one additional social or governance PAI (European Parliament, 2022).

To provide a more balanced evaluation of each sustainability dimension (environmental, social, and governance), two indicators per pillar were selected. This dual approach enables the analysis to capture the funds' performance from two perspectives within each ESG dimension.

The use of mandatory PAI indicators offers several key advantages:

- Regulatory obligation: Large financial institutions are legally required to disclose these indicators, improving data availability and reliability.
- Standardized computation: PAIs must be calculated using standardized formulas, ensuring comparability between funds.
- Transparency: The calculation methods for these metrics are publicly available, enhancing the transparency of the data.
- Relevance: These indicators have been selected by the European Supervisory Authorities (ESAs) following extensive consultation with key stakeholders. As a

result, they reflect the most significant and broadly applicable sustainability risks and are compatible with the existing reporting standards (ESMA, 2023).

In summary, this third level of analysis provides a more direct and tangible assessment of the impact materiality of the funds, complementing the broader, risk-based assessments undertaken in the first two levels.

#### 4.2.1.4 PAI Scope 1, 2 & 3 GHG Emissions Tonnes

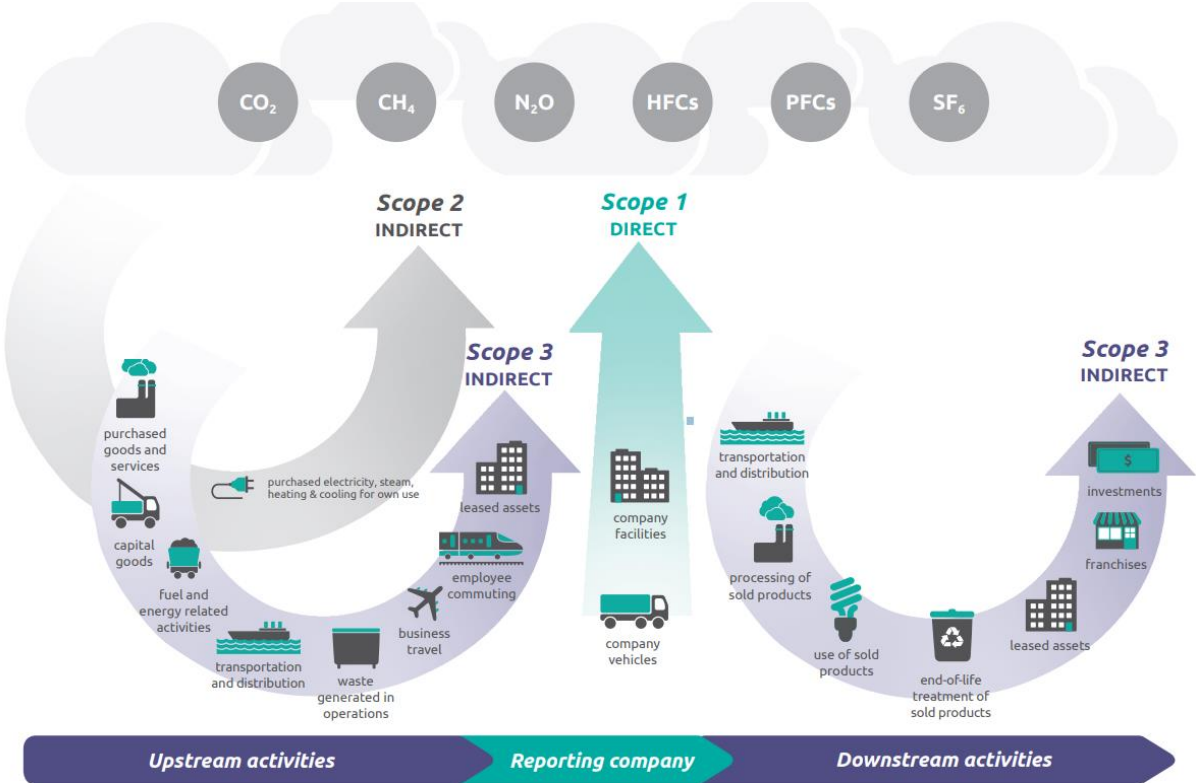
The first environmental metric selected for the analysis is the "PAI Scope 1, 2 & 3 GHG Emissions Tonnes". This indicator measures the total greenhouse gas (GHG) emissions of the investee companies, expressed in tonnes of CO<sub>2</sub> equivalent. It consolidates emissions from all three scopes as defined by the Greenhouse Gas Protocol, the most widely adopted global framework for GHG accounting, developed jointly by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) (GHG Protocol, 2022).

The GHG Protocol distinguishes three types of emissions:

- Scope 1: Direct emissions from owned or controlled sources.
- Scope 2: Indirect emissions from the consumption of purchased energy (e.g., electricity).
- Scope 3: All other indirect emissions across the company's value chain, both upstream and downstream.

Scope 3 emissions, although often representing the largest share of a company's total emissions, are also the most challenging to measure accurately. In certain sectors, these emissions can account for more than 70% of their total GHG emissions (Greenhouse Gas Protocol, 2019). Together, these scopes cover the seven greenhouse gases identified by the Kyoto Protocol, including CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub> (GHG Protocol, n.d.).

The following figure provides an overview of the three scopes of emissions according to the GHG Protocol:



**Figure 14:** Overview of GHG Protocol Scopes 1, 2 & 3 across the value chain

Source: GHG Protocol. (2019). *Overview of GHG Protocol scopes and emissions across the value chain.*

The calculation of this PAI follows the formula set out in the SFDR Delegated Regulation:

(1) ‘GHG emissions’ shall be calculated in accordance with the following formula:

*For x: {1,2,3}*

$$\sum_{i=1}^n \left( \frac{\text{current value of investment}_i}{\text{investee company's enterprise value}_i} \times \text{investee company's Scope}(x) \text{ GHG emissions}_i \text{ (tCO}_2\text{eq)} \right)$$

*where n is the number of investee companies in the investments*

**Figure 15:** Computation formula of the PAI GHG Emissions Scope 1, 2 & 3

Source: ESMA. (2023). *Joint Consultation Paper Review of SFDR Delegated Regulation regarding PAI and financial product disclosures.*

This formula aggregates the GHG emissions for Scope 1, 2 and 3 of all the investee companies present in the portfolio based on the amount invested in each of them. In order to do so, the formula weights each company’s GHG footprint to the value invested in this company compared to the total company’s enterprise value. This allows faithfully attributing the GHG emission of a company to the investor based on his ownership stake in that company.

#### 4.2.1.5 PAI GHG Intensity Scope 1, 2 & 3 Average Value

The second environmental metric selected for analysis is the PAI GHG Intensity Scope 1, 2 & 3 Average Value. Like the previous indicator, it captures the total greenhouse gas (GHG) emissions of investee companies across Scopes 1, 2, and 3, as defined by the GHG Protocol. However, it differs by adjusting these emissions in relation to the size of the companies. Specifically, it measures the GHG efficiency of investee company, expressed in terms of tonnes of CO<sub>2</sub> equivalent per million euros of revenue (tCO<sub>2</sub> equivalent per €M revenue).

This indicator evaluates how effectively a company generates revenue while managing its GHG emissions, thereby offering a size-adjusted and more comparable measure of environmental performance across companies and portfolios. Moreover, the GHG intensity is weighted according to the proportion of the investment in each company relative to the total value of the portfolio. Consequently, companies with larger allocations exert a greater influence on the portfolio's overall GHG intensity.

The calculation methodology follows the SFDR Delegated Regulation and is based on the following formula:

(3) 'GHG intensity of investee companies' shall be calculated in accordance with the following formula:

$$\sum_{i=1}^n \left( \frac{\text{current value of investment}_i}{\text{current value of all investments}} \times \frac{\text{investee company's Scope 1, 2 and 3 GHG emissions}_i \text{ (tCO}_2\text{eq)}}{\text{investee company's €M revenue}_i} \right)$$

*where n is the number of investee companies in the investments*

**Figure 16:** Computation formula of the PAI GHG Intensity Scope 1, 2 & 3

Source: ESMA. (2023). *Joint Consultation Paper Review of SFDR Delegated Regulation regarding PAI and financial product disclosures.*

In summary, while the PAI Scope 1, 2 & 3 GHG Emissions Tonnes metric measures the absolute carbon footprint financed by the portfolio, the PAI GHG Intensity Scope 1, 2 & 3 Average Value provides a relative measure that reflects the carbon efficiency of investee companies. These two metrics are complementary: the former offers insights into the total emissions associated with the fund's investments, while the latter is better suited for comparing the carbon management performance of different funds by adjusting for company size.

#### 4.2.1.6 PAI Gender Pay Gap Average Value

Following the evaluation of the funds' environmental performance, the analysis proceeds to the assessment of their social performance. It is important to note that, while plenty of environmental indicators are widely available in the Morningstar database, the range of social and governance indicators remain comparatively much more limited. This imbalance reflects the structure of the SFDR framework, where 9 out of 14 mandatory Principal Adverse Impacts (PAIs) address environmental issues, once again highlighting the regulation's stronger emphasis on environmental concerns over social and governance aspects (European Commission, 2022).

The first selected indicator for the social dimension is the PAI Gender Pay Gap Average Value. This metric tackles the issue of gender discrimination by measuring the average pay gap between female and male employees across the portfolio's investee companies. The disparity is expressed as a percentage of the average male salary and is calculated in two steps, following the methodology prescribed by the SFDR Delegated Regulation.

(13) 'gender pay gap' shall be calculated in accordance with the following formula:

For each  $i = 1, \dots, n$

$$\text{Gender Pay Gap}_i = \max\left\{0; \frac{\left(\frac{\text{pay of male paid employees in investee company}_i}{\text{pay of female paid employees in investee company}_i} - 1\right)}{\text{pay of male paid employees in investee company}_i}\right\}$$

$$\sum_{i=1}^n \left(\frac{\text{current value of investment}_i}{\text{current value of all investments}} \times \text{Gender Pay Gap}_i\right)$$

where  $n$  is the the number of investee companies in the investments

**Figure 17:** Computation formula of the PAI Gender Pay Gap

Source: ESMA. (2023). *Joint Consultation Paper Review of SFDR Delegated Regulation regarding PAI and financial product disclosures.*

First, the gender pay gap for each investee company is computed by subtracting the average female salary from the average male salary, divided by the average male salary. If the result is negative, indicating that women are paid more than men, the formula assigns a value of zero. This approach ensures that instances of pay equity or reverse gaps do not offset the negative impact of companies with significant gender pay disparities towards women. As a result, the indicator exclusively focuses on capturing the portfolio's gender discrimination against women.

Second, each company's gender pay gap is weighted according to the proportion of the fund's investment in that company relative to the total portfolio value. Consequently, companies representing a larger share of the portfolio have a greater influence on the overall gender pay gap score.

Finally, it is important to highlight that the PAI Gender Pay Gap Average Value is the only selected indicator that includes missing data. Out of the 1009 selected funds in the study, 360 funds (35,68%) lack available data for this metric. As a result, more than a third of the dataset could not be incorporated into the statistical analysis for this specific indicator. Nevertheless, the metric was retained due to the limited availability of other relevant standardized social indicators.

#### 4.2.1.7 PAI Percentage of Female Board Members Average Value

The second social metric selected to evaluate the fund's non-financial performance at the specific level is the PAI Percentage of Female Board Members Average Value. This metric addresses another aspect of gender discrimination, which is the representation of women in corporate leadership roles. Specifically, this PAI measures the average proportion of female board members across the investee companies, expressed as a percentage of total board members (European Commission, 2022). The computation of this metric is based on the following formula adapted to female board members instead of male board members.

(14) 'management and supervisory bodies gender diversity' shall be calculated in accordance with the following formula:

$$\sum_{i=1}^n \left( \frac{\text{current value of investment}_i}{\text{current value of all investments}} \times \frac{\text{number of female board members in investee company}_i}{\text{total number of board members in investee company}_i} \right)$$

**Figure 18:** Computation formula of the PAI Percentage of Female Board Members

Source: ESMA. (2023). *Joint Consultation Paper Review of SFDR Delegated Regulation regarding PAI and financial product disclosures.*

The indicator is calculated in two steps. First, for each investee company, the proportion of female board members relative to the total number of board members is computed and expressed as a percentage. In this context, "board members" encompasses individuals serving in management and supervisory body members.

Second, each company's female board member ratio is weighted according to the size of the investment relative to the total value of the portfolio. Consequently, companies in which the fund has a larger investment exert greater influence on the portfolio's overall gender diversity score.

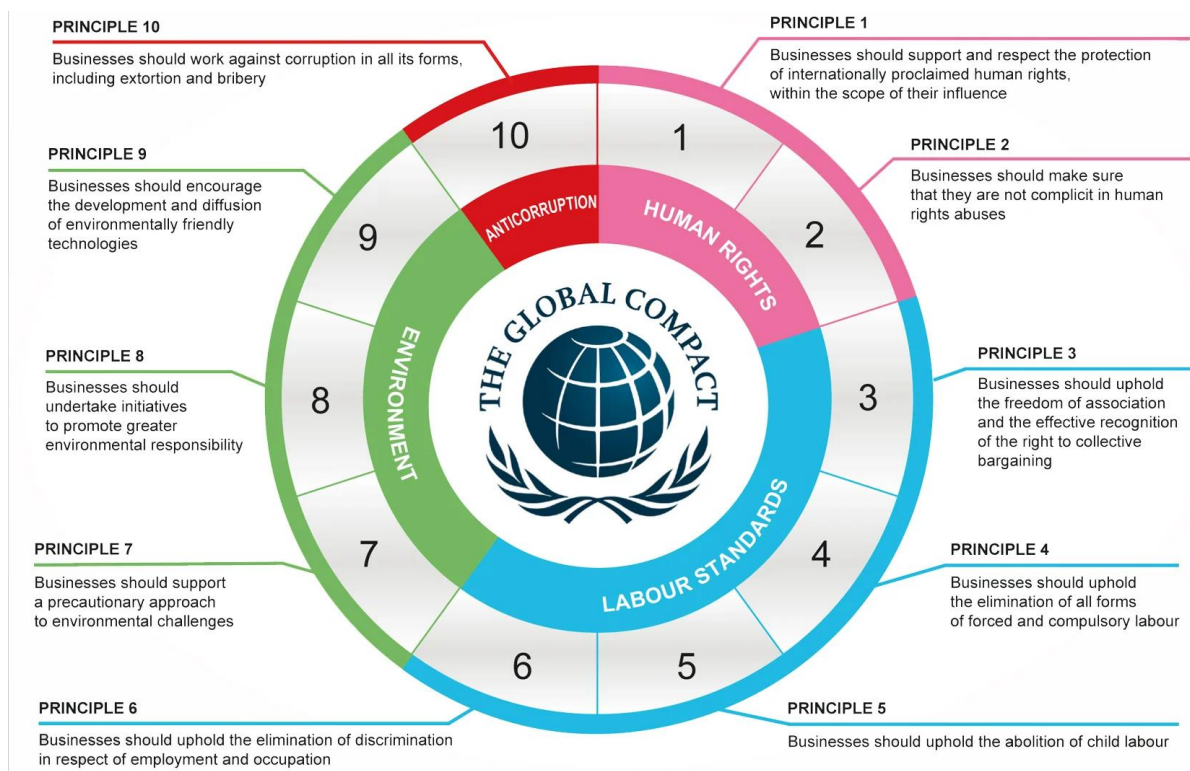
The final result reflects the overall gender diversity within the fund's portfolio at the board level. A score exceeding 50% indicates that women, on average, hold the majority of board seats across the investee companies, while a score below 50% indicates that men remain predominant in leadership roles.

It is also important to note that, although classified under social metrics, this indicator could also be associated with governance factors, given the close interrelation between social and governance issues in sustainability. This overlap underscores the challenge of distinctly categorizing certain indicators as purely social or governance related.

#### 4.2.1.8 PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved

To complete the sustainability analysis of the funds, it is essential to evaluate their performance on governance indicators. As with the social dimension, the availability of governance-related metrics within the Morningstar database was relatively limited. Under the SFDR framework, the two most relevant mandatory PAI indicators related to governance focus on the adherence to the UNGC Principles and the OECD Guidelines.

The United Nations Global Compact (UNGC) Principles consist of ten voluntary principles designed to establish minimum standards for corporate responsibility across key areas, including human rights, labour, environment, and anti-corruption. These principles are derived from the Universal Declaration of Human Rights, the International Labour Organization's Declaration on Fundamental Principles and Rights at Work, the Rio Declaration on Environment and Development and the United Nations Convention Against Corruption (UN Global Compact, n.d.).



**Figure 19:** The Ten Principles of the United Nations Global Compact (UNGC)

Source: HSMC. (2024). *The Ten Principles | UN Global Compact*.

In parallel, the OECD Guidelines for Multinational Enterprises provide government-endorsed recommendations for responsible business conduct. According to the OECD (2023), these guidelines aim to align corporate activities with sustainable development objectives and require companies to conduct due diligence to prevent adverse impacts on people, the planet, and society. They cover a broad range of issues, including human rights, employment and industrial relations, environmental management, anti-bribery, consumer interests, competition, taxation, and disclosure.

Although primarily governance-focused, both the UNGC Principles and OECD Guidelines incorporate significant environmental and social elements, offering a comprehensive view of responsible corporate behavior.

The first selected governance indicator focuses on the violations of these international standards. In the Morningstar database, this is captured by the PAI UNGC Principles/OECD Guidelines Violations % of Covered Portfolio Involved. This metric measures the proportion of the fund’s portfolio invested in companies identified as breaching one or more of the UNGC Principles or OECD Guidelines. Its calculation follows the formula outlined in Figure 21:

- (11) ‘violations of Organisation for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises or the UN Guiding Principles, including the principles and rights set out in the eight fundamental conventions identified in the ILO Declaration’ shall be calculated in accordance with the following formula:

$$\frac{\sum_{i=1}^n (\text{current value of investment}_i \text{ in investee companies in violation of } \text{at least one international guidelines or principles})}{\text{current value of all investments}}$$

*where the international guidelines or principles are either OECD guidelines for multinational enterprises or the UN Guiding Principles, including the principles and rights set out in the eight fundamental conventions identified in the ILO Declaration; and*

*where n is the number of investee companies in the investments*

**Figure 20:** Computation formula of the PAI UNGC Principles/OECD Guidelines Violations

Source: ESMA. (2023). *Joint Consultation Paper Review of SFDR Delegated Regulation regarding PAI and financial product disclosures.*

The computation of this measure is straightforward. The formula sums up the investment values of companies that have breached at least one international standard and divides this amount by the total value of the portfolio. The resulting percentage indicates the portfolio’s exposure to companies associated with violations of globally recognized standards.

Concretely, a lower exposure to companies violating the UNGC Principles or OECD Guidelines suggests more ethical and sustainable governance practices and a lower sustainability risk profile. In contrast, higher exposure indicates greater vulnerability to reputational damage, regulatory sanctions, financial penalties, or longer-term underperformance. Therefore, this PAI gives an indication of the fund’s proportion invested in companies committed to responsible business conduct and sustainable practices.

#### 4.2.1.9 PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved

The second governance indicator selected is the PAI UNGC Lack of Compliance Mechanisms % of Covered Portfolio Involved. This PAI measures the percentage of the fund's total investments allocated to companies that either:

- Do not have policies or processes in place to monitor their compliance with international standards (OECD Guidelines or UNGC Principles), or
- Do not provide grievance or complaint mechanisms to address potential violations of at least one recognized international principle (such as labor rights, human rights, etc.). These mechanisms are essential, as they enable stakeholders to report negative impact resulting from a company's activities.

The calculation of this PAI follows the formula prescribed by the SFDR Delegated Regulation:

(12) 'lack of processes and compliance mechanisms to monitor compliance with the OECD Guidelines for Multinational Enterprises or the UN Guiding principles, including the principles and rights set out in the eight fundamental conventions identified in the ILO Declaration' shall be calculated in accordance with the following formula:

$$\frac{\sum_{i=1}^n \text{(current value of investment}_i \text{ in investee companies with no policies to monitor compliance with or no available grievance and complaints handling mechanisms of at least one international guideline or principle)}}{\text{current value of all investments}}$$

where the international guideline or principle are either OECD guidelines for multinational enterprises or the UN Guiding Principles, including the principles and rights set out in the eight fundamental conventions identified in the ILO Declaration ; and

where n is the number of investee companies in the investments

#### **Figure 21:** Computation formula of the PAI UNGC Lack of Processes and Compliance Mechanisms

Source: ESMA. (2023). *Joint Consultation Paper Review of SFDR Delegated Regulation regarding PAI and financial product disclosures.*

The computation method is similar to that of the previous governance indicator. It aggregates the value of all investments in companies lacking appropriate compliance policies or grievance mechanisms and divides this amount by the total value of the portfolio. The resulting percentage reflects the proportion of the portfolio invested in companies with insufficient compliance and monitoring mechanisms.

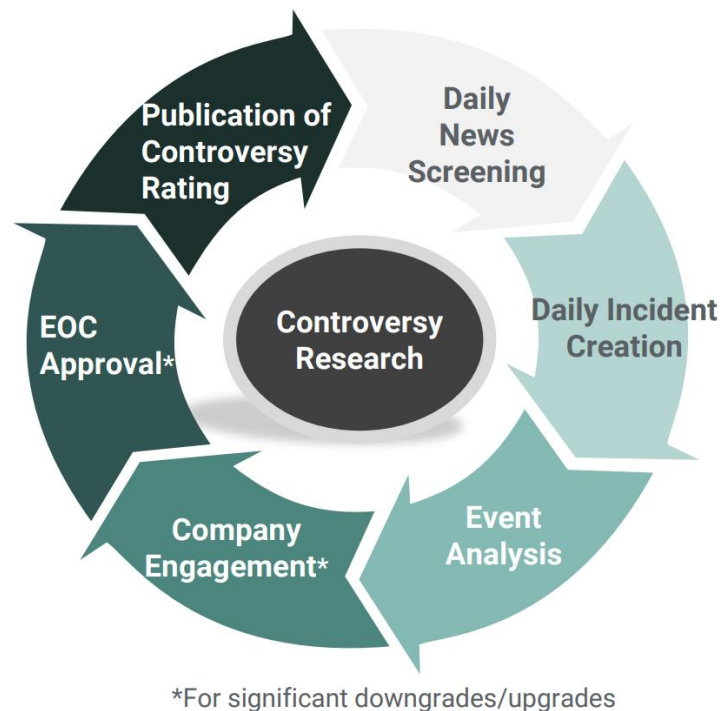
Although both governance PAIs are related to the UNGC Principles and the OECD Guidelines, they follow different approaches. The first PAI evaluates whether companies are breaching at least one of the international standards, thereby providing insight into their current and actual performance regarding the respect of the UNGC/OECD standards. In contrast, the second PAI assesses whether companies have implemented sufficient internal mechanisms to prevent such breaches and to manage them effectively if they occur. Therefore, they offer an indication of the preparedness and the quality of the company's governance policies towards the principles and guidelines.

When analyzed together, these two indicators provide a valuable perspective on the gap between the company's stated commitments towards responsible business responsible conduct and their actual practices (First Sentier, n.d.).

#### 4.2.1.10 Sustainalytics controversy ratings

Among the extracted list of indicators from the Morningstar database, 6 metrics specifically address the issue of controversy. These include the percentage of Assets Under Management (AUM) associated with companies rated as having No, Low, Moderate, Significant, High, or Severe levels of controversy. These indicators form the basis of the second analytical approach in this study. They represent the proportion of the fund that is flagged under various controversy categories by Sustainalytics.

According to Sustainalytics (2021), the controversy research process consists of 6 sequential stages that together constitute a continuous cycle.



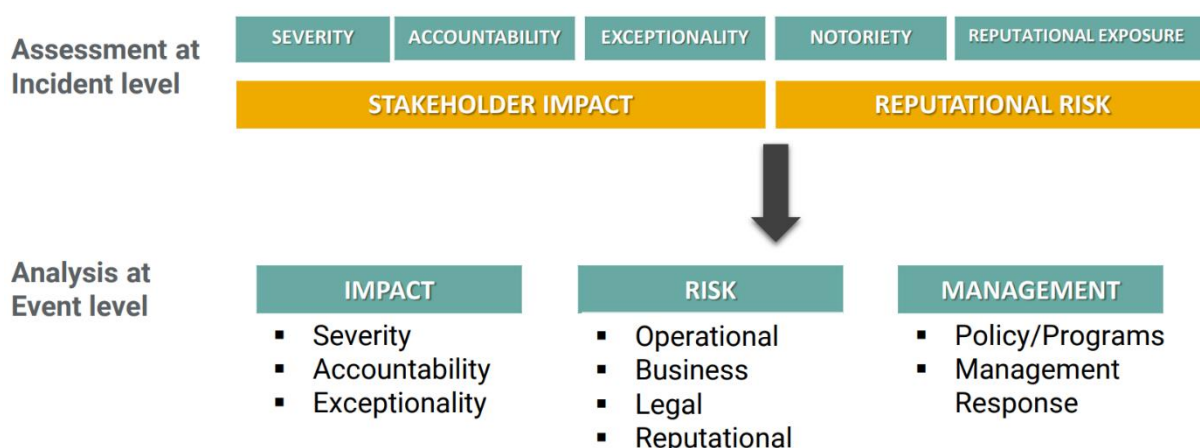
**Figure 22:** Sustainalytics Controversy Research Process

Source: Sustainalytics. (2021). *Introduction - Controversies Research*.

- 1. Daily News Screening:** Sustainalytics begins by screening global news sources daily using data from Moreover Technologies, a subsidiary of LexisNexis. This process monitors over 60,000 sources daily. On this information, Sustainalytics then applies in-built ESG filters to isolate news stories that are relevant for the controversial process. These relevant news are then matched to companies within Sustainalytics' database.
- 2. Daily Incident Creation:** When a relevant news item is associated with a company, it is classified as an incident. The incident is then assessed based on its stakeholder impact and reputational risk. The stakeholder assessment considers the severity of the incident, the accountability of the company and whether the event is isolated or part of a recurring pattern. The reputational risk evaluation considers the potential damage to the company's notoriety and their exposure. These two dimensions are scored from 1 to 10, with 10 indicating the highest level of severity.
- 3. Event Analysis:** In the third step, incidents are aggregated into broader events categories depending on the nature of the incident. These categories are for example,

energy use, GHG emissions, human rights, weapons, animal welfare, bribery or lobbying. Most of the events that are flagged are related to social topics (53%) while governance events account for 30% and environmental concerns for only 18% (Sustainalytics, 2021). Sustainalytics then performs an event-level analysis to assess both the impact materiality (effects on society and the environment) and financial materiality (operational, reputational, legal, and business implications). The company's response, including policy and mitigation efforts, is also taken into account. Based on this evaluation, an Event Rating is assigned to a category ranging from 1 to 5.

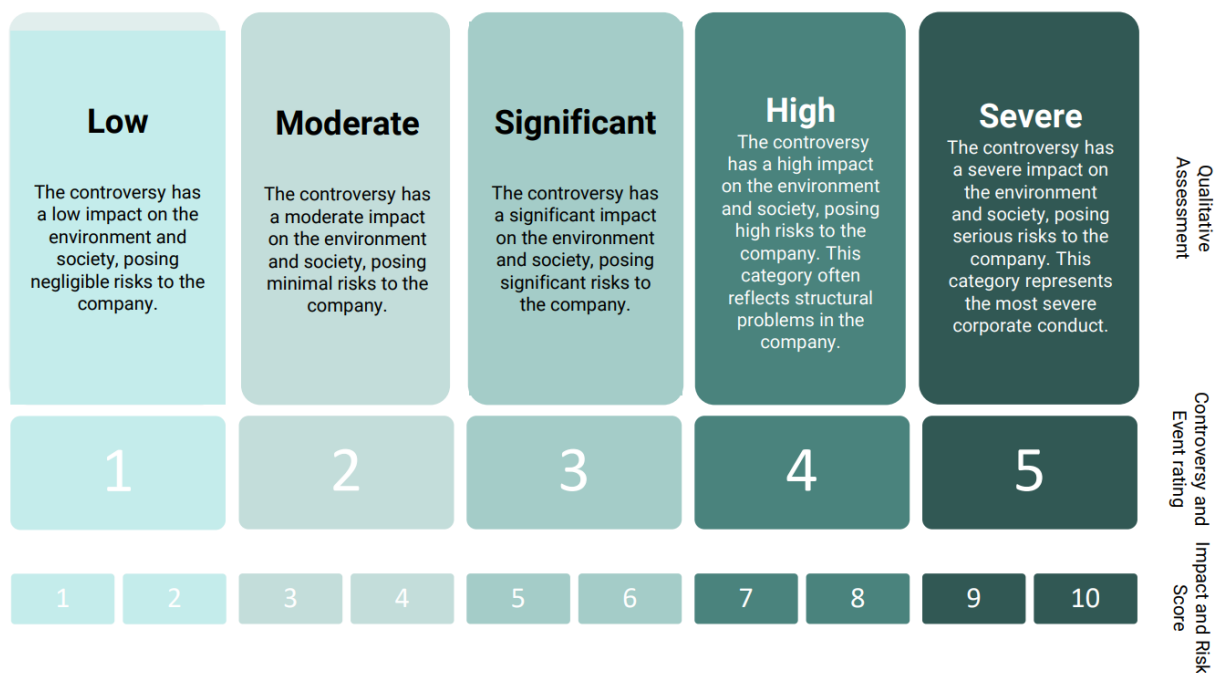
- 4. Company Engagement:** In case of significant downgrades or upgrades to the previous Controversy Rating, Sustainalytics may engage directly with the company to clarify or challenge the assigned severity.



**Figure 23:** Controversy Assessment Framework

*Source:* Sustainalytics. (2021). *Introduction - Controversies Research.*

- 5. EOC Approval:** After assessing all relevant factors, a proposed controversy rating is formulated. If the analysis suggests a change in the company's rating (either an upgrade or a downgrade), the proposal must be submitted to the Event Oversight Committee (EOC) for approval. The EOC includes senior experts such as the Product Manager, Director of Research, Senior Analyst, Senior Client Advisor, and Senior Business Editor. This team of senior experts from various disciplines meet weekly to ensure consistency and rigor in the ratings.
- 6. Publication of Controversy Rating:** Once approved, the final Controversy Rating is published. The ratings range from "Low" to "Severe" and are defined as follows:
  - **Low:** This rating signifies that the controversy has a low impact on the environment and society and constitutes a negligible risk to the company.
  - **Moderate:** A moderate rating means that controversy has a moderate impact and poses minimal risks for the company.
  - **Significant:** This rating indicates that the controversy has a significant impact materiality while encompassing a significant financial materiality.
  - **High:** This rating indicates that the controversy has a high impact on the environment and society and contains high risks for the company. This type of controversy often indicates corporate structural problems.
  - **Severe:** This rating indicates severe consequences on the environment and society while posing critical concerns regarding corporate conduct.



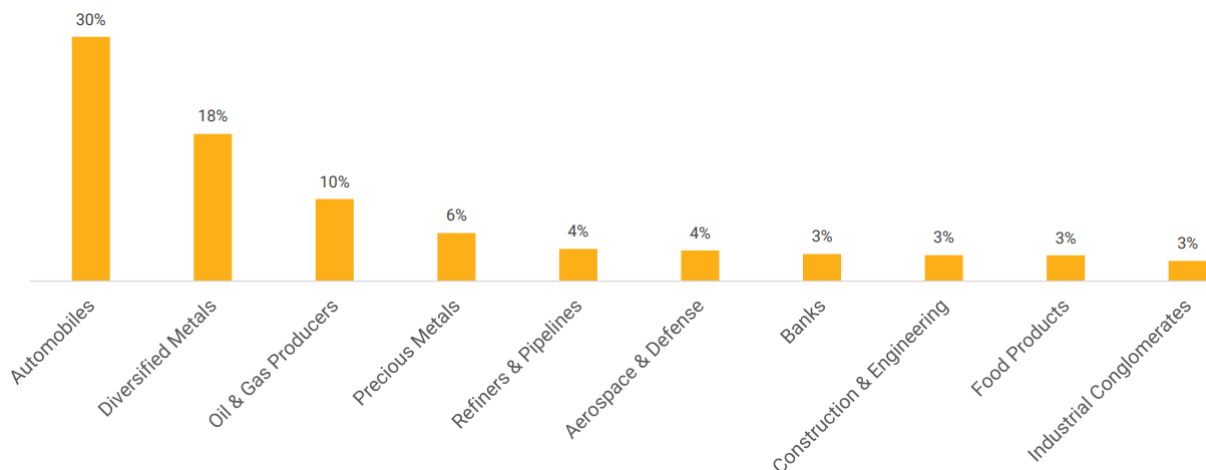
**Figure 24:** Sustainalytics Classification System

Source: Sustainalytics. (2021). *Introduction - Controversies Research*.

In addition to these five controversy ratings, the Morningstar database includes a sixth metric, “*Percent of AUM with No Controversies*”, representing the proportion of a fund’s holdings that have not been flagged by Sustainalytics and therefore do not fall into any of the previously mentioned controversy categories.

In this last step of the Controversy Research Process, the EOC also assigns a Controversy Outlook, forecasting whether the rating is expected to improve, remain stable or deteriorate over the next two years. These outlooks can be positive if the rating is expected to be upgraded, neutral if no changes are foreseen or negative if the rating is expected to suffer a downgrade. As of August 2021, approximately 70% of outlooks were classified as neutral, 20% negative, and 10% positive. This suggests that ratings tend to remain stable over time, but when changes occur, they are more likely to reflect deterioration (Sustainalytics, 2021).

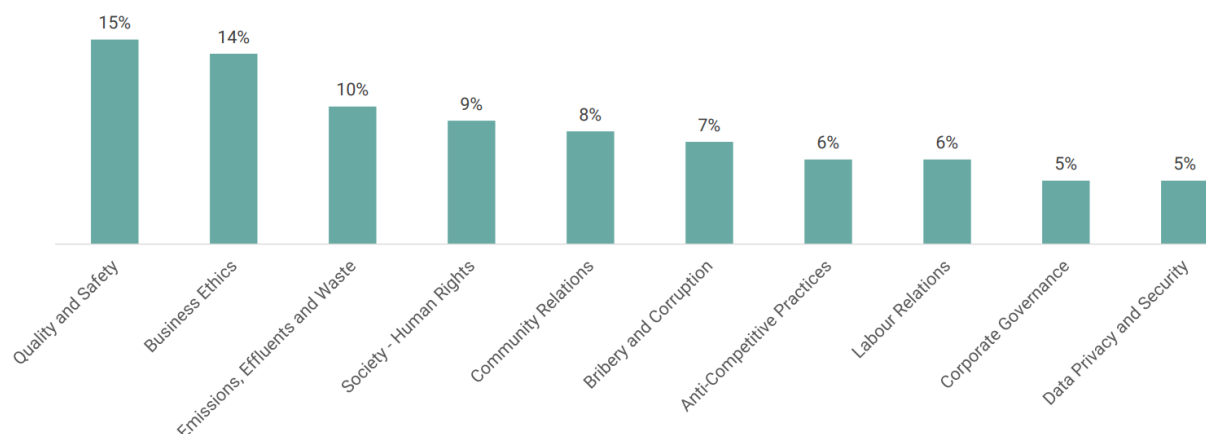
As indicated by the following figure (Sustainalytics, 2021), the sectors most frequently affected by significant controversies include automobiles, diversified metals, oil & gas producers, precious metals, refiners & pipelines, aerospace & defense, banks, construction & engineering, food producers and industrial conglomerates.



**Figure 25:** Top 10 peer groups with Significant Controversies within total Peer Group

Source: Sustainalytics. (2021). *Introduction - Controversies Research*.

Furthermore, the figure below depicts the most frequent ESG controversy themes identified by Sustainalytics (2021). As previously noted, the majority of these controversies are related to social or governance-related issues. The only environmental issue to appear in this top 10 is “Emissions, Effluents and Waste”, which ranks third and accounts for 10% of all cases.



**Figure 26:** Top 10 most common significant Controversies by ESG Topic

Source: Sustainalytics. (2021). *Introduction - Controversies Research*.

Through this rigorous and structured process, Sustainalytics transforms a large volume of information into meaningful Controversy Ratings. These assessments provide a relevant understanding of company’s exposure to sustainability-related risks and their broader societal and environmental impact, reflecting a double materiality perspective.

## 4.2.2 Funds Selection

This section outlines the methodology applied to select the investment funds analyzed in the study. The initial pool of funds was extracted from the Morningstar database, focusing exclusively on open-end funds. Open-end funds are defined as collective investment funds authorized to issue an unlimited number of shares, which investors can buy or redeem daily at the Net Asset Value (NAV), computed daily (Chen, 2024). These funds may invest across a range of asset classes, including equities, bonds, and real estate (Morningstar, 2024).

Several filters and verifications were applied to the Morningstar database to refine the selection process:

### 1. Scope restriction

The scope of this study is limited to equity funds domiciled in Belgium or Luxembourg. Initially restrained to the Belgian market, the analysis was extended to Luxembourg to ensure a more robust and representative sample, as only 204 funds were based solely in Belgium. This restriction drastically reduced the eligible sample from 3804 open-end funds to 1,251 funds<sup>7</sup>.

### 2. Data quality verification

Next, the quality of the data was verified. Control variables such as fund name and ISIN code were reviewed to ensure there were no duplicates. Furthermore, the data associated with the selected indicators was also verified for missing, negative, or extreme values. Extreme values were identified based on the empirical 68-95-99.7 rule, with observations exceeding three standard deviations ( $\mu \pm 3\sigma$ ) considered as outliers (Hayes, 2024). After analysis, no duplicates were found and all extreme values appeared plausible. Consequently, no funds were excluded at this stage.

### 3. Indicator availability verification

After completing the data quality verification, the availability of the relevant indicators was assessed. Funds lacking data for either the Level 1 indicator (Morningstar Sustainability Rating™) or the Level 2 indicators (Portfolio Environmental, Social & Governance Risk Scores) were excluded from the sample. This step reduced the number of eligible funds from 1,251 to 1,069. Additionally, it was noted that nearly all funds missing a Morningstar Sustainability Rating™ also lacked corresponding Level 2 indicator data, underscoring the connection between these indicators.

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<sup>7</sup> The data was extracted on the 5<sup>th</sup> of June 2023. Therefore, the statistical analyses reflect the situation at this temporality.

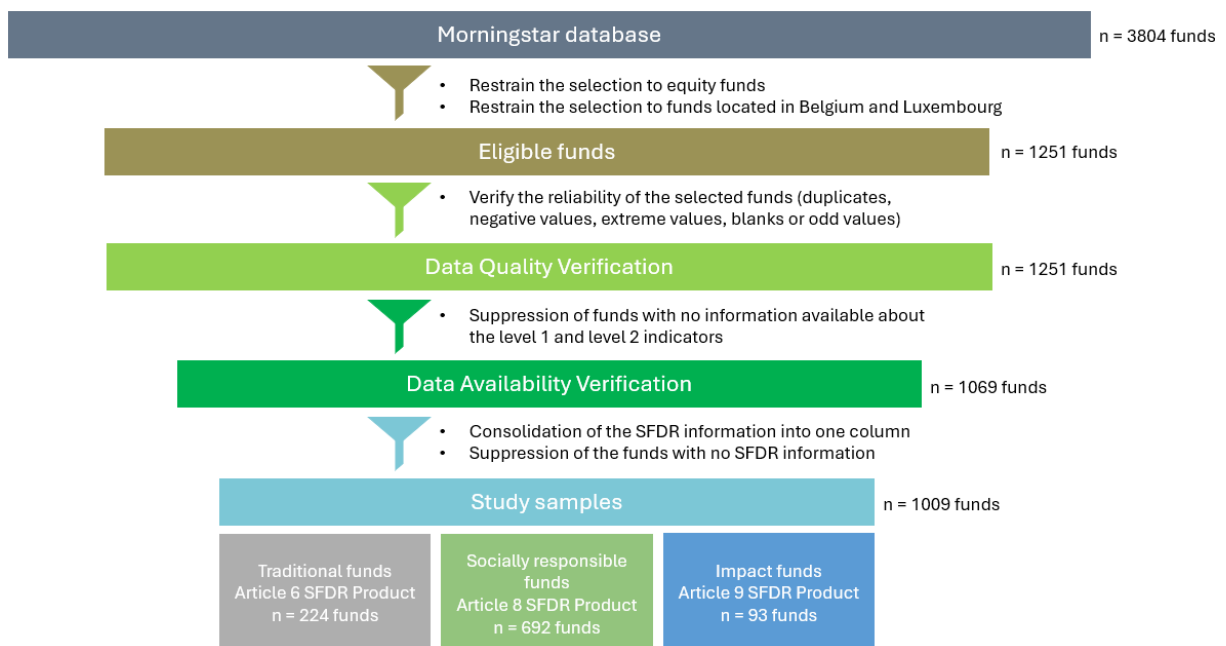
#### 4. SFDR classification verification

The SFDR classification of each fund serves as the independent variable throughout all statistical analyses, enabling the categorization of funds as traditional, Socially Responsible Investment (SRI) or impact funds. Accordingly, verifying the accuracy of the SFDR classification is a critical step in the fund selection process. In the Morningstar database, multiple indicators provided information on each fund's SFDR classification. To ensure consistency and reliability, the various SFDR data points were consolidated into a single centralized column based on the following rules:

- Funds consistently classified under Article 8 or Article 9 across all SFDR-related indicators were retained as such.
- Funds with inconsistent SFDR classifications were excluded to ensure data reliability.
- Funds without Article 8 or 9 designation were categorized as Article 6 products, representing funds with no explicit sustainability focus.

After consolidating the SFDR classifications and eliminating all inconsistencies, a total of 1,009 funds were retained for the study. Of these, 224 were classified as Article 6 funds, 692 as Article 8 funds and 93 as Article 9 funds. As each fund is assigned exclusively to a single SFDR category, the samples are mutually exclusive. The exhaustive list of funds included in the analysis is provided in Appendix 5.

The figure below summarizes the fund selection process:



**Figure 27:** Fund selection process

**Table 9:** Study samples composition

SFDR Classification			
Study sample	Appellation	Frequency	Proportion
Article 6 SFDR Product	Traditional funds	224	22,20%
Article 8 SFDR Product	Socially Responsible Investment (SRI) funds	692	68,58%
Article 9 SFDR Product	Impact funds	93	9,22%

The first group of funds regroups the SFDR Article 6 products. These funds are sometimes referred to as "grey products" (Busch, 2023). In the context of this study, they are classified as traditional funds, as they do not incorporate any explicit sustainability considerations into their investment processes. As previously discussed (cf. supra p.71), this group serves as the baseline for evaluating the performance that a fund can achieve on each indicator when it has no explicit commitment towards sustainability. It also provides a point of comparison to assess the relative performance of Socially Responsible Investment funds and impact funds.

The second group consists of SFDR Article 8 products. According to Busch (2023), these funds are also labelled as "light green products" because they promote certain environmental or social characteristics through various sustainable investment strategies. In the context of this study, these funds will be considered as Socially Responsible Investment (SRI) funds.

The third and final group consists of SFDR Article 9 products. These funds place sustainable investment at the core of their investment objectives. Due to this stronger commitment to sustainability, they are often referred to as "dark green products," in comparison to "light green products" (Busch, 2023). This higher commitment leads to stricter investment constraints and more rigorous legal obligations, which may account for their smaller representation within the sample. For the purposes of this study, these funds are classified as impact funds.

Together, these samples enable a comprehensive evaluation of the non-financial performance of investment funds based on their proclaimed sustainability commitments, in line with the SFDR regulatory framework.

It is important to clarify that the SFDR regulation does not explicitly define Article 6 products as traditional funds, Article 8 products as SRI funds, or Article 9 products as impact funds. This categorization reflects a widely accepted interpretation among financial market participants and will be adopted for the purposes of this study. While the primary objective of the SFDR is to enhance transparency and harmonize disclosure requirements based on the proclaimed degree of sustainability integration of the product, the SFDR remains a pertinent framework for assessing the sustainability profile of investment funds.

### 4.3 General level comparison: Statistical analysis of the Morningstar Sustainability Rating™

The first indicator used to assess the non-financial performance of the selected funds is the Morningstar Sustainability Rating™. This rating is expressed in the form of globes (from 1 to 5), with a higher number of globes indicating a lower level of sustainability risk. In essence, funds with more globes are considered to be better at managing sustainability-related risks.

The analysis of each indicator will follow a systematic and structured approach. First, the descriptive statistics will be examined to provide an initial overview of the central tendencies of the indicator. After which a quick examination of the box plots will be performed in order to further improve the comprehension of the data distribution and potentially already identify where the significant difference(s) might occur. Next, based on the results of the test of normality and homogeneity of variance, the most appropriate statistical test will then be selected and conducted. After that, if this general test reveals the presence of at least one statistically significant difference between the fund categories, a post-hoc analysis will be performed to identify which specific groups differ from one another. Finally, the analysis of the indicator will be concluded with a concise summary of the results.

#### 4.3.1 Descriptive statistics

**Table 10:** Descriptive statistics: Morningstar Sustainability Rating™

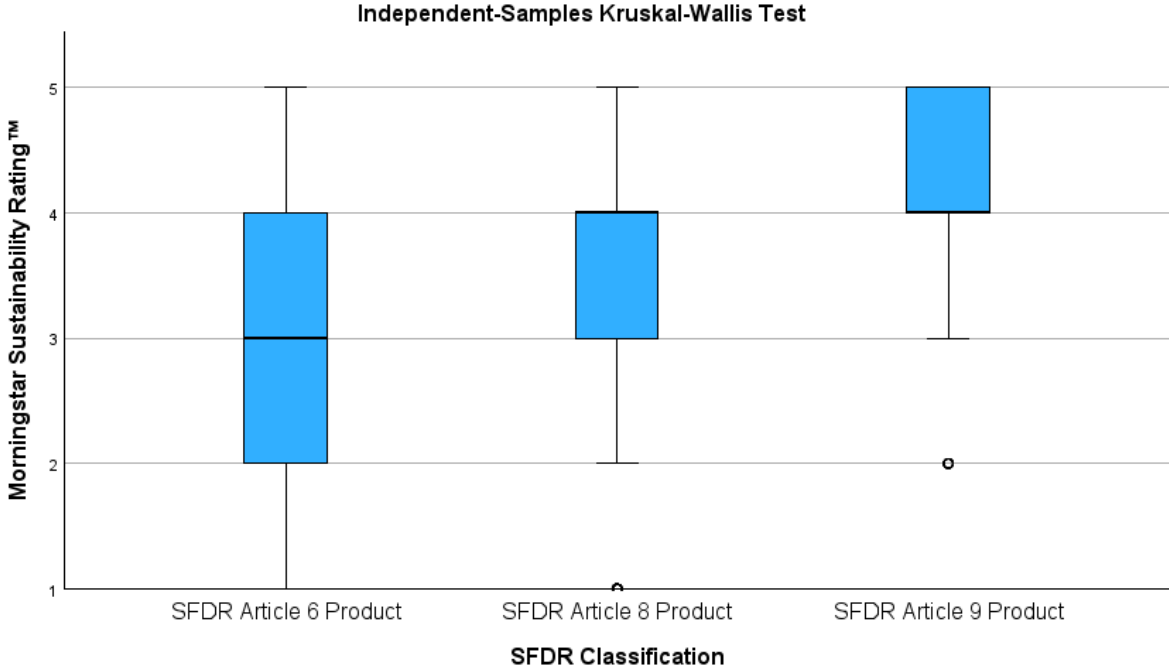
Descriptives		Statistic		
Morningstar Sustainability Rating™		SFDR Classification		
	Article 6 SFDR Product	Mean	2,96	
		95% Confidence Interval for Mean	Lower Bound	2,81
			Upper Bound	3,10
		Median	3,00	
	Std. Deviation	1,120		
	Article 8 SFDR Product	Mean	3,46	
		95% Confidence Interval for Mean	Lower Bound	3,38
			Upper Bound	3,55
		Median	4,00	
	Std. Deviation	1,097		
	Article 9 SFDR Product	Mean	4,10	
		95% Confidence Interval for Mean	Lower Bound	3,90
Upper Bound			4,29	
Median		4,00		
Std. Deviation	,933			

Note: Table produced using the SPSS software

The descriptive statistics for the Morningstar Sustainability Rating™ indicate that traditional funds (Article 6) exhibit the lowest mean rating, at 2,96, which corresponds to an “Average” classification (equivalent to 3 Morningstar globes). The 95% confidence interval for the mean rating of Article 6 ranges from 2,81 and 3,10. Socially Responsible Investment Funds (Article 8) show a higher mean rating of 3,46, placing them just in between the “Average” and “Above Average” ratings. The mean lies between 3,38 to 3,55, indicating a narrower and more concentrated distribution of values. Finally, impact funds (Article 9) achieve the highest mean rating, with an average of 4,10, corresponding to an “Above Average” classification according to Morningstar’s rating scale.

Overall, the descriptive statistics regarding the indicator suggest that the average Morningstar sustainability rating increases in line with the fund's level of sustainability integration, represented by the SFDR classification.

### 4.3.2 Box plots interpretation



**Figure 28:** Box plots: Morningstar Sustainability Rating™

Note: Graph produced using the SPSS software

The figure above presents box plots illustrating the distribution of Morningstar Sustainability Ratings™ across financial products classified under Articles 6, 8, and 9 of the Sustainable Finance Disclosure Regulation (SFDR). Box plots are a standardized graphical representation that summarize key descriptive statistics of a dataset, including the minimum, maximum, lower quartile (Q1), upper quartile (Q3), and median values.

In the diagram, the lower boundary of the blue box denotes the first quartile (Q1), indicating that 25% of the observations fall below this value. Conversely, the upper boundary represents the third quartile (Q3), meaning that 25% of the values lie above it. The interquartile range (IQR), which captures the middle 50% of data points, is visualized within the box. The horizontal line within each box represents the median value of the distribution. The vertical lines extending from the box (whiskers) show the minimum and maximum values within 1.5 times the IQR from the quartiles. Any observations outside this range are plotted individually as outliers (depicted as circles) (Potter<sup>8</sup>, 2006).

While the Morningstar Sustainability Rating™ is an ordinal variable with only five discrete categories, the box plots still offer valuable insights. Notably, the Article 6 (traditional) products display a broader IQR, with 50% of the ratings ranging from 2 to 4 (“Below Average” to “Above Average”). In contrast, Article 8 products are concentrated between ratings of 3 and 4

<sup>8</sup> Expelliarmus

(“Average” to “Above Average”), and Article 9 products between 4 and 5 (“Above Average” to “High”).

Furthermore, both Article 8 and Article 9 product categories share a median rating of 4, indicating an “Above Average” sustainability performance. Interestingly, only the traditional (Article 6) products display no outliers, whereas Article 8 funds exhibit outliers at rating 1 (“Low”) and Article 9 funds at rating 2 (“Below Average”).

In summary, the box plots suggest the presence of differences in sustainability performance among the three product classifications. The distribution for Article 9 products appears skewed toward higher sustainability ratings, while Article 6 products show a broader spread and lower median performance. Article 8 products occupy an intermediate position. However, given the ordinal nature of the data and the visual overlap between distributions, a formal statistical test is required to assess whether the observed differences are statistically significant.

### 4.3.3 Assumption testing

When comparing more than two independent groups ( $k > 2$ ), two primary statistical methods are typically considered: the One-Way ANOVA and the Kruskal-Wallis test. The One-Way ANOVA is a parametric test used to compare the means of groups. This test can only be conducted when the dependent variable is continuous and quantitative. In addition to this, two key assumptions must be met:

1. The data within each group must be normally distributed.
2. The variance within each group must be equal (condition of homogeneity of variance) (Murray, 2017).

If either one of these assumptions is violated, the One-Way ANOVA is no longer appropriate, and the Kruskal-Wallis test should be used instead. This test is the non-parametric equivalent of the One-Way ANOVA (McKight & Najab, 2010). The Kruskal-Wallis test is less restrictive and can be conducted when the dependent variable is ordinal. Unlike the ANOVA, which compares group means, the Kruskal-Wallis test compares the groups based on their medians to determine if there is a significant difference (de Nijs and Levin Klausen, 2012).

Choosing the appropriate statistical test, parametric or non-parametric, is essential to ensure valid and reliable conclusions. Additional explanations regarding the nature and the functioning of these statistical tests are provided in Appendix 9.

In the case of the Morningstar Sustainability Rating™, the variable at stake is ordinal, not continuous. Therefore, the One-Way ANOVA is not suitable. Consequently, the Kruskal-Wallis test is the most appropriate statistical test for assessing the variable in order to determine differences in the distribution of the samples. As the Kruskal-Wallis test is a non-parametric test, it is not necessary to test for normality or variance homogeneity. However, for informative purposes and to provide context for subsequent statistical procedures, the test of normality and homogeneity tests will still be reported.

#### 4.3.4 Test of normality

To assess the normality of the dependent variable, the Morningstar Sustainability Rating™, IBM SPSS Statistics software utilizes both the Kolmogorov–Smirnov test and the Shapiro–Wilk test. According to statistical guidelines (Gerald & Frank Patson, 2021), the Kolmogorov–Smirnov test is more appropriate for samples larger than 50 observations ( $n > 50$ ) whereas the Shapiro–Wilk test is preferred for smaller sample sizes.

In both tests, the null hypothesis ( $H_0$ ) states that the distribution of the dependent variable follows a normal distribution, while the alternative hypothesis ( $H_1$ ) states that the distribution deviates from normality. The significance level applied throughout this study is ( $\alpha = 0,05$ ). If the p-value is less than this threshold ( $p < 0,05$ ), the null hypothesis is rejected, indicating that the variable does not follow a normal distribution. Conversely, if the p-value exceeds 0,05, we fail to reject the null hypothesis and can consider the distribution to be approximately normal. This hypothesis test can be formally expressed as:

$$\begin{cases} H_0: X \sim N(\mu, \sigma^2) \\ H_1: X \not\sim N(\mu, \sigma^2) \end{cases}$$

with:

$X$  = Dependent variable = Morningstar Sustainability Rating™

$\mu$  = mean

$\sigma^2$  = variance ( $\sigma$  = standard deviation)

**Table 11:** Test of normality: Morningstar Sustainability Rating™

Tests of Normality		Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Morningstar Sustainability Rating™	Article 6 SFDR Product	,203	224	<,001	,911	224	<,001
	Article 8 SFDR Product	,198	692	<,001	,903	692	<,001
	Article 9 SFDR Product	,244	93	<,001	,809	93	<,001

a. Lilliefors Significance Correction

Note: Table produced using the SPSS software

The table above presents the results of the Kolmogorov-Smirnov and Shapiro-Wilk normality tests for the three SFDR fund classifications (Article 6, Article 8, and Article 9). The “Statistic” column displays the test statistic, which indicates the deviation of the sample distribution from a theoretical normal distribution. However, this value is not the primary basis for interpretation. The “df” column refers to the degrees of freedom, which correspond to the sample size. The key interpretive measure is the “Sig.” value, representing the p-value of the test.

The results of both the Kolmogorov-Smirnov and the Shapiro-Wilk tests show a p-value <0,001 for all three groups. Given that this value is well below the significance level of 5% ( $p < 0,05$ ), the null hypothesis ( $H_0$ ) is rejected.

Therefore, it can be concluded, with a confidence level exceeding 99% that the Morningstar Sustainability Rating™ does not follow a normal distribution across the 3 study samples. Since none of the groups meets the assumption of normality, the analysis of the ESG rating should be conducted through non-parametric statistical tests.

### 4.3.5 Test of homogeneity of variance

The test of homogeneity of variance is computed in SPSS using Levene's test. SPSS. Similarly to the normality test, this test dresses two hypotheses. The null hypothesis ( $H_0$ ) states that the variance across the groups is equal, meaning that the condition of homogeneity of variance or homoscedasticity is respected. On the contrary, the alternative hypothesis ( $H_1$ ) states that there is at least one significant difference between the variances. The decision on whether the hypothesis is accepted or not is again determined by the significance level, which is set at 5% ( $\alpha = 0,05$ ). If the p-value is less than the significance level ( $p < 0,05$ ), the null hypothesis is rejected and we conclude that the variances are not homogeneous across all groups (heterogeneity of variance). However, if the p-value is greater than the significance level, then we fail to reject the null hypothesis and we consider that the condition of homogeneity is respected. The hypotheses are formulated mathematically by:

$$\begin{cases} H_0: \sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \dots = \sigma_k^2 \\ H_1: \text{there is at least one significant difference between the } \sigma_k^2 \end{cases}$$

with:

$k$  = number of groups = 3

$\sigma_1^2$  = variance of the SFDR Article 6 Product sample

$\sigma_2^2$  = variance of the SFDR Article 8 Product sample and

$\sigma_3^2$  = variance of the SFDR Article 9 Product sample

**Table 12:** Test of homogeneity of variance: Morningstar Sustainability Rating™

Test of Homogeneity of Variance		Levene			
		Statistic	df1	df2	Sig.
Morningstar Sustainability Rating™	Based on Mean	5,911	2	1006	,003
	Based on Median	4,088	2	1006	,017
	Based on Median and with adjusted df	4,088	2	991,021	,017
	Based on trimmed mean	5,235	2	1006	,005

Note: Table produced using the SPSS software

As shown in Table 12, Levene's test can be computed using different tendency measures, such as the mean, median, adjusted median or trimmed mean. The degrees of freedom df1 represent the number of groups minus 1 ( $k - 1$ ) and df2 represents the total number of observations minus the number of groups ( $n - k$ ). Similarly than for the test of normality, the notation "Sig" represents the significance value or the p-value.

The table reveals that the significance value of all the variations of the Levene test are inferior to the significance level of 5% ( $\rho < 0,05$ ). This means that the null hypothesis ( $H_0$ ) is rejected and the condition of homogeneity of variance is not respected.

In conclusion, both the assumption of normality and the assumption of homogeneity of variance are violated. Consequently, the comparison across the different samples for the Morningstar Sustainability Rating™ should be executed through non-parametric tests.



The next step is to determine whether at least one of these mean ranks differs significantly from the others. To assess this, the Kruskal-Wallis H statistic must be calculated. The test statistic is computed using the following formula (Selmouni, 2024):

$$H = \frac{12}{n(n+1)} \left( \sum_{k=1}^K n_k \overline{R_k^2} \right) - 3(n+1)$$

**Table 14:** Kruskal-Wallis test: Morningstar Sustainability Rating™

Test Statistics <sup>a,b</sup>	
	Morningstar Sustainability Rating™
Kruskal-Wallis H	74,175
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 74,175, which is substantially greater than the critical value ( $74,175 > 5,991$ ). Based on these results, the null hypothesis, which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the Morningstar Sustainability Rating™ across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 74,175, p < 0,001$ .

### 4.3.7 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from another. The Dunn's test is the appropriate non-parametric post-hoc test to be conducted after the Kruskal-Wallis (Dinno, 2015). Concretely, this test allows for multiple comparisons between each pair of groups (Pohlert, 2015). In the context of this study, the Dunn's test will perform 3 pairwise comparisons; (i) Article 6 vs. Article 8, (ii) Article 6 vs. Article 9 and (iii) Article 8 vs. Article 9. The results are presented below:

**Table 15:** Dunn's test: Morningstar Sustainability Rating™

Pairwise Comparisons of SFDR Classification					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 6 SFDR Product- Article 8 SFDR Product	-127,104	21,673	-5,865	<,001	,000
Article 6 SFDR Product- Article 9 SFDR Product	-289,553	34,779	-8,326	<,001	,000
Article 8 SFDR Product- Article 9 SFDR Product	-162,449	31,138	-5,217	<,001	,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

As explained in the legend of the table, each row presents the result of a pairwise comparison between two of the study samples. The first column identifies the specific samples being compared.

The second column, labeled Test Statistic, reflects the raw difference in mean ranks between the two groups. This value provides an indication of the magnitude of the difference, while the sign denotes the direction of the difference. A negative sign indicates that the first group has a lower mean rank than the second. The test statistic is calculated using the following formula:

$$\text{Test Statistic} = \bar{R}_i - \bar{R}_j$$

The third column, Standard Error represents the standard deviation. It accounts for the variance in ranks across the entire dataset and takes into consideration the sample sizes of the two groups being compared. This value is used to compute the Standardized Test Statistic in the next column.

The Standardized Test Statistic (or Z-score) is a normalized version of the raw Test Statistic, adjusted for variability. It follows a standard normal distribution, which allows for the calculation of p-values. The standardized value is calculated as follows:

$$\text{Std. Test Statistic} = \frac{\text{Test Statistic}}{\text{Std. Error}}$$

The final two columns present the significance levels of the comparisons. The "Sig." column reports the unadjusted p-values, while the "Adj. Sig." column reflects the Bonferroni-adjusted p-values to correct for the increased risk of Type I error<sup>9</sup> due to multiple comparisons. To address this issue, the Dunn's test can apply the Bonferroni correction to adjust the significance value (Sig) by the number of comparisons (m) as presented in the following formula (Dinno, 2015). The results of the Dunn's test will be interpreted based on the adjusted p-values.

$$p_{adj} = p \times m$$

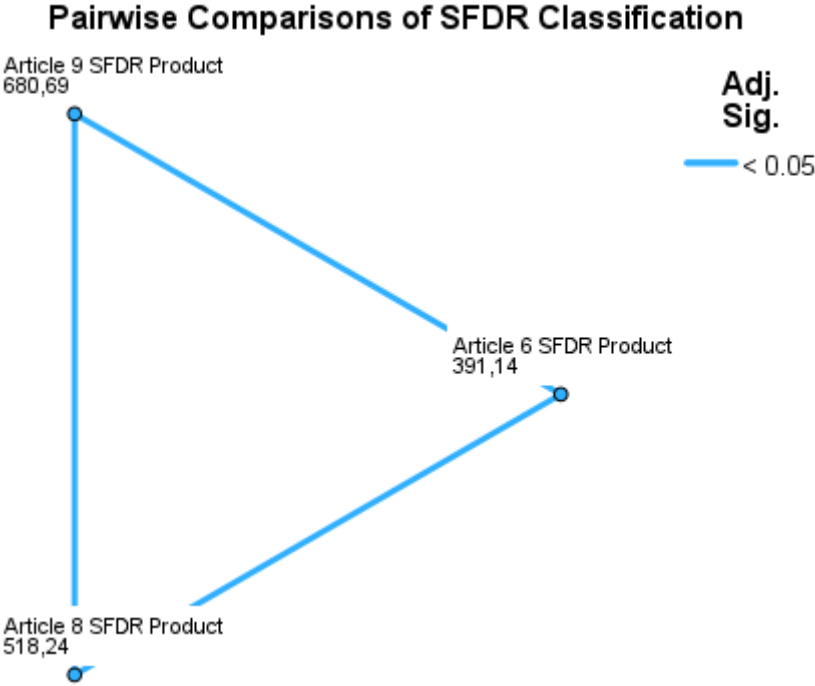
The results of Dunn's test indicate that all three fund classifications differ significantly from one another in terms of sustainable rating ( $p_{adj} < \alpha = 5\%$ ).

- The largest difference is observed between traditional and impact funds, with a Test Statistic of -289,55, suggesting that impact funds tend to be significantly less vulnerable to sustainability risks than conventional funds ( $p_{adj} < 0,001$ ).
- The second-largest difference occurred between Socially Responsible Investment and impact funds, with a Test Statistic of -162,45, also indicating that impact funds tend to be also better at managing sustainable-related risks than Socially Responsible Investment funds ( $p_{adj} < 0,001$ ).
- The smallest difference, yet still significant, is between traditional and SRI funds, with a Test Statistic of -127,10, showing that traditional funds tend to perform worse than the other two groups ( $p_{adj} < 0,001$ ).

---

<sup>9</sup> A Type I error, also called a false positive, occurs when the null hypothesis is rejected while it is actually true. In other words, the study finds a difference when there is actually none (Gerald & Frank Patson, 2021).

These results are visually summarized in the figure below:



**Figure 29:** Pairwise comparisons: Morningstar Sustainability Rating™

Note: Figure produced using the SPSS software

In this figure, each node represents one of the study samples. The mean rank associated with each group, as used in the Dunn’s test, is displayed beneath the corresponding node. Each line connecting two nodes represents a pairwise comparison. A blue line signifies that the difference between the two groups is statistically significant at the 5% level ( $p_{adj} < 5\%$ ). As the figure shows, all three pairwise comparisons resulted in significant differences, confirming that the mean ranks of all fund categories differ meaningfully from one another.

In conclusion, the outcomes of the statistical analyses point to a clear and consistent trend: funds with higher levels of sustainability integration tend to receive higher Morningstar Sustainability Ratings™ and therefore are better at managing sustainability-related risks. Although each fund type is significantly different from the others, the most pronounced distinction is observed between traditional funds (Article 6) and impact funds (Article 9).

However, this pattern is not properly reflected by the analysis of median values. Both traditional funds and Socially Responsible Investment funds share a median rating of “Average”, while impact funds exhibit a higher median rating of “Above Average”.

## 4.4 Pillar level comparisons

### 4.4.1 Environmental pillar: Statistical analysis of the Portfolio Environmental Risk Score

The Portfolio Environmental Risk Score has been selected to assess the non-financial performance of the fund on the environmental factor. This indicator reflects the level of unmanaged environmental risks of the companies in which the fund invests. As such, it serves as a measure of the fund's vulnerability to environmental risks. The exposure is expressed by a score on a scale from 0 to 100, where higher values indicate greater vulnerability to these risks.

#### 4.4.1.1 Kruskal-Wallis test

The test of the condition of normality and homogeneity of variance have determined that the Kruskal-Wallis test is the most appropriate statistical test regarding the analysis of the Portfolio Environmental Risk Score. This test will compare the different samples in order to determine whether there is at least one significant difference in the environmental risk of the fund, in function of its level of sustainability consideration.

**Table 16:** Sample mean rank: Portfolio Environmental Risk Score

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Portfolio Environmental Risk Score	Article 6 SFDR Product	224	617,48
	Article 8 SFDR Product	692	464,36
	Article 9 SFDR Product	93	536,46
	Total	1009	

Note: Table produced using the SPSS software

The examination of the mean ranks reveals that traditional funds (Article 6) exhibit the highest mean rank, at 617,48. This suggests that, on average, these funds tend to have higher environmental risks. Impact funds (Article 9) follow with a mean rank of 536,46, while Socially Responsible Investment funds (Article 8) present the lowest mean rank, at 464,36, indicating comparatively lower environmental risk. This ordering is somewhat divergent from the previous trend observed in the Morningstar Sustainability Rating™, where the ranking followed a consistent increase aligned with SFDR classification. Here, while traditional funds still demonstrate the poorest performance, SRI funds seem to outperform impact funds on average in terms of environmental risk.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 17:** Kruskal-Wallis test: Portfolio Environmental Risk Score

Test Statistics <sup>a,b</sup>	
	Portfolio Environmental Risk Score
Kruskal-Wallis H	47,915
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 47,915, which is substantially greater than the critical value ( $47,915 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the Portfolio Environmental Risk Score across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 47,915, p < 0,001$ .

4.4.1.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 18:** Dunn’s test: Portfolio Environmental Risk Score

Pairwise Comparisons of SFDR Classification					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 8 SFDR Product-Article 9 SFDR Product	-72,096	32,185	-2,240	,025	,075
Article 8 SFDR Product-Article 6 SFDR Product	153,123	22,402	6,835	<,001	,000
Article 9 SFDR Product-Article 6 SFDR Product	81,027	35,948	2,254	,024	,073

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.  
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

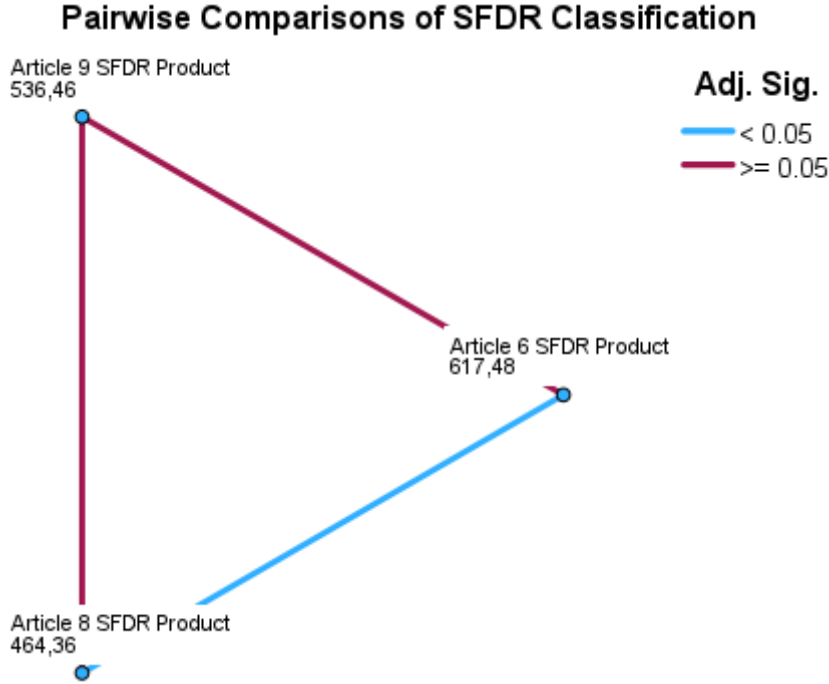
Note: Table produced using the SPSS software

The results of the Dunn’s test revealed that the only statistically significant difference in the average environmental risk score occurs between Socially Responsible Investments funds (Article 8) and traditional funds (Article 6) ( $p_{adj} < \alpha = 5\%$ ).

The Test Statistic for this pairwise comparison is 153,12, indicating that traditional funds tend to exhibit higher environmental risks than funds than SRI funds ( $p_{adj} < 0,001$ ). It should be noted that the Test Statistic must be interpreted with caution, as the sign of this value may not always accurately reflect the true direction of the difference between the labelled groups. This can potentially lead to misinterpretation, suggesting that one group outperforms another when in reality it is the opposite. Nevertheless, this does not affect the interpretation of the magnitude or the statistical significance of the difference between the two samples.

Then, although impact funds stand between conventional and SRI funds in terms of mean environmental risk, the differences between impact funds and the other two categories are not statistically significant at the adjusted 5% level. Therefore, the exposure of impact funds (Article 9) to environmental risks does not differ significantly from that of either traditional or Socially Responsible Investment funds.

These results are visually summarized in the figure below:



**Figure 30:** Pairwise comparisons: Portfolio Environmental Risk Score

Note: Figure produced using the SPSS software

In conclusion, the findings show that Socially Responsible Investment funds (Article 8) tend to be less exposed to environmental risks than traditional funds (Article 6). Specifically, the median environmental risk score for Article 8 funds is 4,09, compared to 5,01 for Article 6 funds. However, it is important to note that both medians fall within the lower segment of the risk scale typically observed, which ranges from 0 to 25 according to Morningstar (2023). This implies that, despite the statistically significant difference, the overall environmental risk exposure of both of these funds remains relatively low.

Moreover, the analysis does not provide sufficient evidence to conclude that there is a significant difference in environmental risk exposure between impact funds (Article 9) and either traditional or SRI funds<sup>10</sup>.

<sup>10</sup> The detailed and comprehensive analysis of the Portfolio Environmental Risk Score is available in the Appendix 12.

#### 4.4.2 Social pillar: Statistical analysis of the Portfolio Social Risk Score

The second pillar focuses on the non-financial performance of the fund regarding social issues. This factor will be represented by the Portfolio Social Risk Score. This indicator reflects the level of unmanaged social risks of the companies in which the fund invests. As such, it serves as a measure of the fund's vulnerability to social risks. The exposure is expressed by a score on a scale from 0 to 100, where higher values indicate greater vulnerability to these risks.

##### 4.4.2.1 Kruskal-Wallis test

The condition of normality has determined that the Kruskal-Wallis test is the most appropriate statistical test to analyze the Portfolio Social Risk Score. The Kruskal-Wallis test will be used to compare the different samples in order to determine whether there is at least one significant difference in the social risk of the fund, in function of its level of sustainability consideration.

**Table 19:** Sample mean rank: Portfolio Social Risk Score

Ranks			
	SFDR Classification	N	Mean Rank
Portfolio Social Risk Score	Article 6 SFDR Product	224	591,57
	Article 8 SFDR Product	692	495,93
	Article 9 SFDR Product	93	363,98
	Total	1009	

Note: Table produced using the SPSS software

The examination of the mean ranks for the Portfolio Social Risk Score reveals that traditional funds (Article 6) exhibit the highest mean rank, at 591,57. This indicates that these funds tend to encompass higher levels of social risk. Socially Responsible Investment funds (Article 8) follow with a mean rank of 495,93, while impact funds (Article 9) show the lowest mean rank, to a great extent at 363,98. These observations tend to indicate that impact funds are the fund which encompasses the least social risks. This ranking order is consistent with the results observed in the descriptive statistics, where the average social risk progressively decreased as the level of sustainability integration of the fund increases.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 20:** Kruskal-Wallis test: Portfolio Social Risk Score

Test Statistics <sup>a,b</sup>	
	Portfolio Social Risk Score
Kruskal-Wallis H	42,214
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 42,214, which is substantially greater than the critical value ( $42,214 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the Portfolio Social Risk Score across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 42,214, p < 0,001$ .

4.4.2.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 21:** Dunn’s test: Portfolio Social Risk Score

**Pairwise Comparisons of SFDR Classification**

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 9 SFDR Product- Article 8 SFDR Product	131,946	32,185	4,100	<,001	,000
Article 9 SFDR Product- Article 6 SFDR Product	227,583	35,948	6,331	<,001	,000
Article 8 SFDR Product- Article 6 SFDR Product	95,637	22,402	4,269	<,001	,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

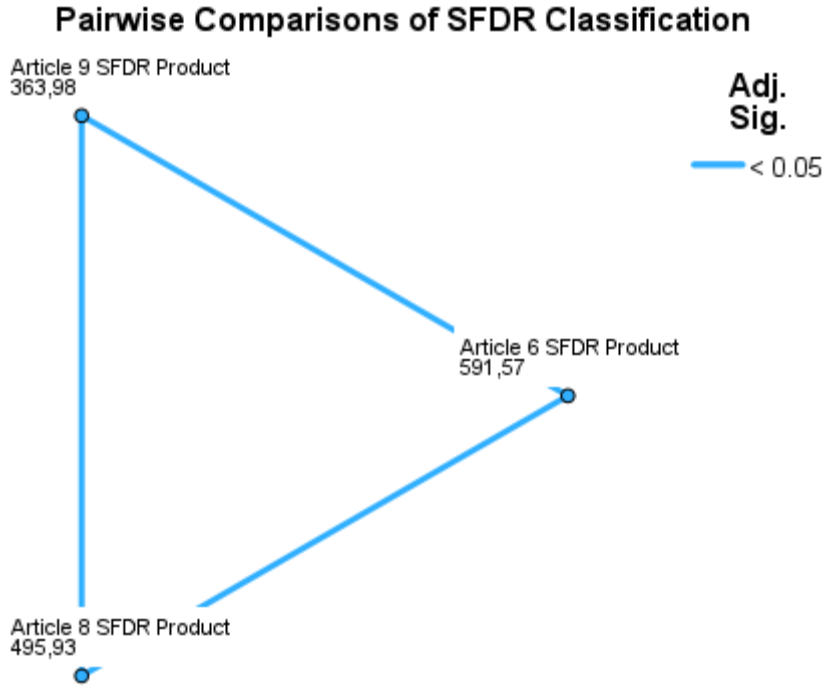
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of the Dunn’s test indicate that all three fund classifications differ significantly from one another in terms of social risk score ( $p_{adj} < \alpha = 5\%$ ).

- The largest difference is observed between traditional (Article 6) and impact funds (Article 9), with a Test Statistic of 227,58, suggesting that traditional funds tend to carry substantially higher social risks compared to impact funds ( $p_{adj} < 0,001$ ).
- The second-largest difference occurs between Socially Responsible Investment funds (Article 8) and impact funds (Article 9), with a Test Statistic of 131,95, indicating that SRI funds also tend to exhibit higher social risks than impact funds ( $p_{adj} < 0,001$ ).
- The smallest difference, yet still statistically significant, is observed between traditional funds (Article 6) and SRI funds (Article 8), with a Test Statistic of 95,64. This shows that traditional funds tend to be again more exposed to social risks than SRI funds ( $p_{adj} < 0,001$ ).

These results are visually summarized in the figure below:



**Figure 31:** Pairwise comparisons: Portfolio Social Risk Score

Note: Figure produced using the SPSS software

In conclusion, the results for the Portfolio Social Risk Score aligns with the findings from the Morningstar Sustainability Ratings™. Indeed, the outcomes of the statistical analysis point to the same trend, which indicates that: greater integration of sustainability considerations tends to lead to lower social risk exposure. While all differences across the three fund categories are statistically significant, the most pronounced distinction is observed between traditional funds (Article 6) and impact funds (Article 9). Specifically, the median social risk score decreases progressively from 8,69 for traditional funds, to 8,19 for Socially Responsible Investment funds and further to 7,49 for impact funds. All three medians fall within the bottom half of the typical risk scale reported by Morningstar (2023), which ranges from 0 to 25. This implies that, despite the statistically significant differences, the overall social risk exposure for all the funds remains relatively low<sup>11</sup>.

<sup>11</sup> The detailed and comprehensive analysis of the Portfolio Social Risk Score is available in the Appendix 13.

#### 4.4.3 Governance pillar: Statistical analysis of the Portfolio Governance Risk Score

The third pillar tackles the non-financial performance of the fund regarding governance issues. This analysis will conclude the comparison of the funds at pillar level. After which, the 3 main aspects of sustainable investment, namely the environmental, the social and the governance (E/S/G) factors will have been addressed.

The performance of the fund on this third component will be assessed based on the Portfolio Governance Risk Score of the fund. This indicator reflects the level of unmanaged governance risks of the companies in which the fund invests. As such, it serves as a measure of the fund's vulnerability to governance risks. The exposure is expressed by a score on a scale from 0 to 100, where higher values indicate greater vulnerability to these risks.

##### 4.4.3.1 Kruskal-Wallis test

The test of normality and homogeneity of variance have determined that the test of Kruskal-Wallis is the most appropriate test to analyze the Portfolio Governance Risk Score. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the governance risk of the fund, in function of its level of sustainability consideration.

**Table 22:** Sample mean rank: Portfolio Governance Risk Score

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Portfolio Governance Risk Score	Article 6 SFDR Product	224	569,92
	Article 8 SFDR Product	692	507,45
	Article 9 SFDR Product	93	330,45
	Total	1009	

Note: Table produced using the SPSS software

The examination of the mean ranks for the Portfolio Governance Risk Score reveals that traditional funds (Article 6) exhibit the highest mean rank, at 569,92, suggesting that they tend to be associated with higher levels of governance risk. Socially Responsible Investment funds (Article 8) follow with a mean rank of 507,45, while impact funds (Article 9) demonstrate the lowest mean rank by a considerable margin at 330,45. These observations would indicate that impact funds are the funds which encompasses the least governance risks.

This ranking order is consistent with the results observed in the descriptive statistics, where the average social risk score decreased progressively as the level of sustainability integration of the fund increases.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 23:** Kruskal-Wallis test: Portfolio Governance Risk Score

Test Statistics <sup>a,b</sup>	
	Portfolio Governance Risk Score
Kruskal-Wallis H	44,531
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
 b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 44,531, which is substantially greater than the critical value ( $44,531 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the Portfolio Governance Risk Score across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 44,531, p < 0,001$ .

4.4.3.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 24:** Dunn’s test: Portfolio Governance Risk Score

Pairwise Comparisons of SFDR Classification					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 9 SFDR Product- Article 8 SFDR Product	177,000	32,185	5,499	<,001	,000
Article 9 SFDR Product- Article 6 SFDR Product	239,469	35,948	6,662	<,001	,000
Article 8 SFDR Product- Article 6 SFDR Product	62,469	22,402	2,789	,005	,016

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

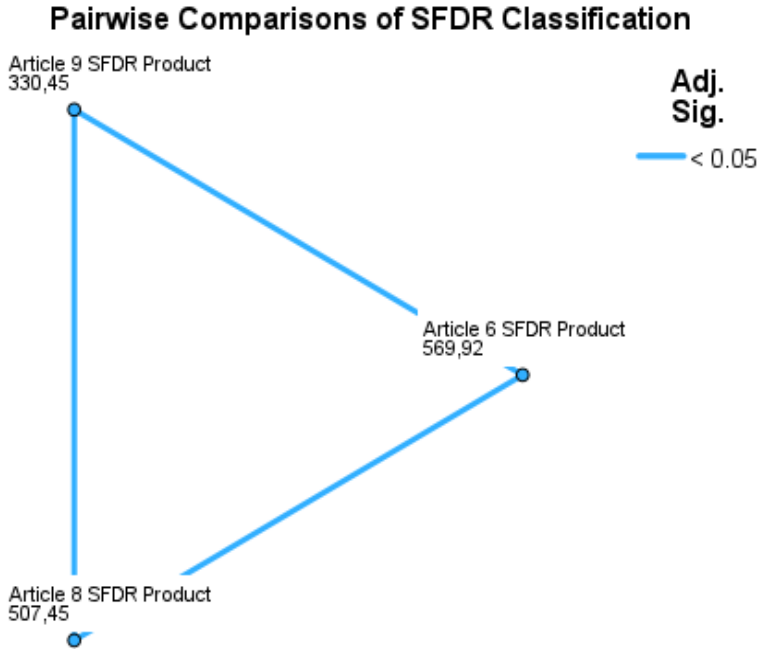
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of the Dunn’s test indicate that all three fund classifications differ significantly from one another in terms of governance risk score ( $p_{adj} < \alpha = 5\%$ ).

- The largest difference is observed between traditional (Article 6) and impact funds (Article 9), with a Test Statistic of 239,47, suggesting that traditional funds tend to be exposed to substantially higher governance risks than impact funds ( $p_{adj} < 0,001$ ).
- The second-largest difference occurs between Socially Responsible Investment funds (Article 8) and impact funds (Article 9), with a Test Statistic of 177,00, indicating that SRI funds tend to also carry significantly greater governance risks than impact funds ( $p_{adj} < 0,001$ ).
- The smallest difference, yet still statistically significant, is observed between traditional funds (Article 6) and SRI funds (Article 8), with a Test Statistic of 62,47. This shows that traditional funds tend to again exhibit higher governance risks compared to SRI funds ( $p_{adj} < 0,05$ ).

These results are visually summarized in the figure below:



**Figure 32:** Pairwise comparisons: Portfolio Governance Risk Score

Note: Figure produced using the SPSS software

In conclusion, the results for the Portfolio Governance Risk Score are aligned with the patterns previously observed, supporting the trend that as the level of sustainability integration increases, progressing from traditional funds to Socially Responsible Investment to impact funds, the exposure of the fund to governance-related risks decreases. While all differences across the three fund categories are statistically significant, the most pronounced distinction is again observed between traditional funds and impact funds. The median governance risk score is highest for traditional funds at 6,96, followed by 6,71 for Article 8 funds and lowest at 6,00 for Article 9 funds. Moreover, all three medians fall within the lower segment of the risk scale typically observed by Morningstar (2023), which ranges from 0 to 25. This implies that, despite the statistically significant differences, the overall governance risk exposure for all the funds remains relatively low<sup>12</sup>.

<sup>12</sup> The detailed and comprehensive analysis of the Portfolio Governance Risk Score is available in the Appendix 14.

## 4.5 Specific level comparisons

### 4.5.1 Statistical analysis of the PAI Scope 1, 2 & 3 GHG Emissions Tonnes

The first metric selected for the level 3 analysis is the PAI Scope 1, 2 & 3 GHG Emissions Tonnes. This indicator measures the total volume of greenhouse gas (GHG) emissions produced by the investee companies, covering all three scopes as defined by the GHG Protocol. The resulting value represents the volume of emissions, expressed in tonnes of CO<sub>2</sub> equivalent, for which the fund is considered responsible for.

#### 4.5.1.1 Kruskal-Wallis test

The test of normality and homogeneity of variance have determined that the Kruskal-Wallis test is the most appropriate test to analyze the PAI Scope 1, 2 & 3 GHG Emissions Tonnes. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the environmental risk of the fund, in function of its level of sustainability consideration.

**Table 25:** Sample mean rank: PAI Scope 1, 2 & 3 GHG Emissions Tonnes

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
PAI Scope 1, 2 & 3 GHG Emissions Tonnes	Article 6 SFDR Product	224	475,58
	Article 8 SFDR Product	692	514,49
	Article 9 SFDR Product	93	505,27
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks indicates that the differences between the fund categories are relatively small. Traditional funds (Article 6) exhibit the lowest mean rank, at 475,58, followed by impact funds (Article 9) with a mean rank of 505,27. Socially Responsible Investment funds (Article 8) hold the highest mean rank by a small margin, at 514,49. These results suggest that, when data variability is removed through rank-based comparison, traditional funds tend to generate fewer GHG emissions, expressed in tonnes of CO<sub>2</sub> equivalent, while impact funds and SRI funds demonstrate comparable performance.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 26:** Kruskal-Wallis test: PAI Scope 1, 2 & 3 GHG Emissions Tonnes

Test Statistics <sup>a,b</sup>	
	PAI Scope 1, 2 & 3 GHG Emissions Tonnes
Kruskal-Wallis H	3,015
df	2
Asymp. Sig.	,221

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 3,015, which is below the critical value ( $3,015 < 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, must be retained.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test indicates, with a confidence level of 95%, that there is no statistically significant difference in the mean ranks of the three groups regarding the PAI Scope 1, 2 & 3 GHG Emissions Tonnes,  $\chi^2(2, N = 1009) = 3,015, p = 0,221$ .

While the median GHG emissions appear to vary slightly across fund types, with 53.791,68 tonnes of CO<sub>2</sub> equivalent for traditional funds (Article 6), 64.545,66 for Socially Responsible Investment funds (Article 8) and 56.960,34 for impact funds (Article 9), the Kruskal-Wallis test determined that the mean ranks of the three groups were not substantial enough to be deemed statistically significant at the 5% significance threshold.

Therefore, it must be concluded that the total of greenhouse gas emissions of the portfolio, expressed in tonnes of CO<sub>2</sub> equivalent, does not differ significantly based on the fund’s level of sustainability integration<sup>13</sup>.

<sup>13</sup> The detailed and comprehensive analysis of the PAI Scope 1, 2 & 3 GHG Emissions Tonnes is available in the Appendix 15.

## 4.5.2 Statistical analysis of the PAI GHG Intensity Scope 1, 2 & 3 Average Value

The second environmental metric that has been selected is the PAI GHG Intensity Scope 1, 2 & 3 Average Value. While this indicator also captures the total GHG emissions of investee companies across the 3 scopes defined by the GHG Protocol, it differs from the previous measure by computing the emissions in relation to the company's size. Specifically, this indicator assesses the carbon efficiency of a company by evaluating how effectively it generates revenue while managing its GHG emissions. The resulting values are expressed as the number of tonnes of CO<sub>2</sub> equivalent emitted per million units of revenue generated, thereby providing a more comparable and size-adjusted measure of environmental performance.

### 4.5.2.1 Kruskal-Wallis test

The test of normality and homogeneity of variance have determined that the Kruskal-Wallis test is the most appropriate test to analyze the PAI GHG Intensity Scope 1, 2 & 3 Average Value. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the carbon intensity of the fund, in function of its level of sustainability consideration.

**Table 27:** Sample mean rank: PAI GHG Intensity Scope 1, 2 & 3 Average Value

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
PAI GHG Intensity Scope 1, 2 & 3 Average Value	Article 6 SFDR Product	224	580,33
	Article 8 SFDR Product	692	475,56
	Article 9 SFDR Product	93	542,60
	Total	1009	

Note: Table produced using the SPSS software

The examination of the mean ranks for the PAI GHG Intensity Scope 1, 2 & 3 Average Value still indicates that traditional funds (Article 6) exhibit the highest mean rank, at 580,33, showing that, on average, these funds are associated with higher GHG intensity. Impact funds (Article 9) follow with a mean rank of 542,60, while Socially Responsible Investment funds (Article 8) show the lowest mean rank, at 475,56, suggesting a slightly lower carbon intensity.

Overall, the ranking order is consistent with the pattern observed in the descriptive statistics, where traditional funds were found to have the highest GHG intensity. Moreover, SRI funds still appear to outperform impact funds, by a modest margin, in terms of carbon efficiency.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 28:** Kruskal-Wallis test: PAI GHG Intensity Scope 1, 2 & 3 Average Value

Test Statistics <sup>a,b</sup>	
	PAI GHG Intensity Scope 1, 2 & 3 Average Value
Kruskal-Wallis H	23,575
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 23,575, which is substantially greater than the critical value ( $23,575 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the GHG intensity of the fund across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 23,575, p < 0,001$ .

4.5.2.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 29:** Dunn’s test: PAI GHG Intensity Scope 1, 2 & 3 Average Value

Pairwise Comparisons of SFDR Classification					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 8 SFDR Product- Article 9 SFDR Product	-67,039	32,185	-2,083	,037	,112
Article 8 SFDR Product- Article 6 SFDR Product	104,762	22,402	4,676	<,001	,000
Article 9 SFDR Product- Article 6 SFDR Product	37,724	35,948	1,049	,294	,882

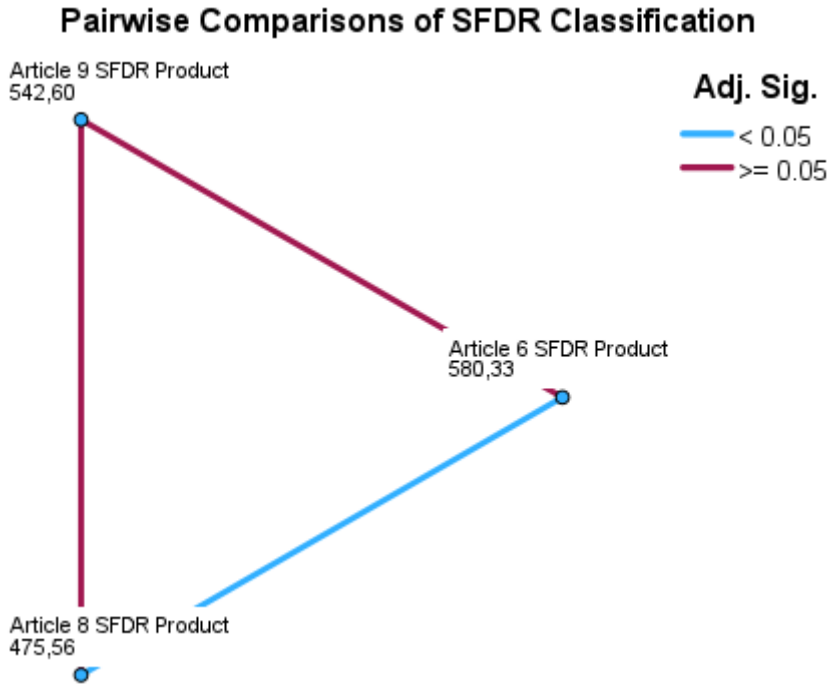
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of the Dunn’s test reveal that the only statistically significant difference in the average GHG intensity occurs between Socially Responsible Investment funds (Article 8) and traditional funds (Article 6) ( $p_{adj} < \alpha = 5\%$ ). The Test Statistic for this pairwise comparison is 104,76, suggesting that traditional funds tend to generate more GHG emissions in tonnes of CO<sub>2</sub> equivalent per million of revenue than SRI funds ( $p_{adj} < 0,001$ ). By contrast, although impact funds (Article 9) are positioned between traditional and SRI funds in terms of average GHG intensity, the differences between impact funds and the other two categories are not statistically significant at the adjusted 5% level. Therefore, the GHG intensity of impact funds (Article 9) does not differ significantly from that of either traditional or Socially Responsible Investment funds. However, the performance of impact funds is more closely aligned with those of traditional funds than that of SRI funds.

These results are visually summarized in the figure below:



**Figure 33:** Pairwise comparisons: PAI GHG Intensity Scope 1, 2 & 3 Average Value

Note: Figure produced using the SPSS software

In conclusion, the analysis indicates that Socially Responsible Investment funds (Article 8) tend to emit fewer tonnes of CO<sub>2</sub> equivalent per million of revenue than traditional funds (Article 6). Specifically, the median GHG intensity for Article 8 funds is 625,01 tCO<sub>2</sub>eq/€m, compared to 865,68 tCO<sub>2</sub>eq/€m for Article 6 funds.

However, the results do not provide sufficient evidence to conclude that impact funds (Article 9), with a median GHG intensity of 778,66 tCO<sub>2</sub>eq/€m, differ significantly in carbon intensity from either traditional or SRI funds. The absence of significant difference between impact funds and Socially Responsible Investment funds may be partly explained by the fact that certain Article 9 products opt to pursue primarily social objectives rather than environmental ones, as presented in the template of the Delegated Regulation regarding the sustainability considerations of the financial product (cf. supra p.61). Consequently, this lack of difference may not necessarily reflect poor environmental performance but rather a different strategy focus, which could lower the overall performance of the sample<sup>14</sup>.

<sup>14</sup> The detailed and comprehensive analysis of the PAI GHG Intensity Scope 1, 2 & 3 Average Value is available in the Appendix 16.

### 4.5.3 Statistical analysis of the PAI Gender Pay Gap Average Value

Following the analysis of environmental factors, the statistical analyses proceed to examine the fund's non-financial performance in relation to two specific social indicators. The first selected metric is the PAI Gender Pay Gap Average Value. This indicator calculates the asset-weighted average pay disparity between female and male employees across the companies held within the fund's portfolio. The gender pay gap is expressed as a percentage of the average male salary.

It is important to clarify that this metric is designed to only reflect instances of inequality where women are paid less than men. Consequently, if a company pays female employees more than their male counterparts, this will not reduce the overall gender pay gap value of the portfolio. This approach ensures that the impact of companies with poor gender pay equity is not diluted by those where women are remunerated better than men. As a result, the indicator especially focuses on capturing the portfolio's gender discrimination against women regarding the pay disparity.

As depicted in the table below, the PAI Gender Pay Gap Average Value is the only indicator in the study which has missing data. Out of the 1009 selected funds that are normally included in the other statistical analyses, 360 funds (35,68%) lack available data for this specific metric. As a result, more than a third of the dataset could not be integrated into the analysis of this indicator.

**Table 30:** Samples composition: PAI Gender Pay Gap Average Value

Case Processing Summary		Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
PAI Gender Pay Gap Average Value	Article 6 SFDR Product	138	61,6%	86	38,4%	224	100,0%
	Article 8 SFDR Product	451	65,2%	241	34,8%	692	100,0%
	Article 9 SFDR Product	60	64,5%	33	35,5%	93	100,0%

Note: Table produced using the SPSS software

It is noteworthy that the proportion of missing data is relatively consistent across all three SFDR classifications: 38,4% for Article 6, 34,8% for Article 8, and 35,5% for Article 9 funds. This observation suggests that a higher level of sustainability integration does not necessarily correlate with greater transparency or improved data availability.

### 4.5.3.1 Kruskal-Wallis test

The test of normality has determined that the Kruskal-Wallis test is the most appropriate test to analyze the PAI Gender Pay Gap Average Value. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the average gender pay gap of the fund, in function of its level of sustainability consideration.

**Table 31:** Sample mean rank: PAI Gender Pay Gap Average Value

Ranks			
	SFDR Classification	N	Mean Rank
PAI Gender Pay Gap Average Value	Article 6 SFDR Product	138	331,04
	Article 8 SFDR Product	451	329,45
	Article 9 SFDR Product	60	277,65
	Total	649	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the PAI Gender Pay Gap Average Value reveals that traditional funds (Article 6) and Socially Responsible Investment funds (Article 8) exhibit nearly identical performance ( $331,04 \approx 329,45$ ). This suggests that the average gender pay gap within companies held by these two fund categories is broadly comparable. In contrast, impact funds (Article 9) display a notably lower mean rank of 277,65, indicating a comparatively smaller average gender pay gap among their investee companies.

Overall, this ranking order is consistent with the pattern observed in the descriptive statistics. While traditional and SRI funds show similar levels of gender pay inequality, impact funds appear to perform more favorably on this metric, though the margin of difference remains modest.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 32:** Kruskal-Wallis test: PAI Gender Pay Gap Average Value

Test Statistics <sup>a,b</sup>	
	PAI Gender Pay Gap Average Value
Kruskal-Wallis H	4,240
df	2
Asymp. Sig.	,120

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 4,240, which is below the critical value ( $4,240 < 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, must be retained.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test indicates, with a confidence level of 95%, that there is no statistically significant difference in the mean ranks of the three groups regarding the PAI Gender Pay Gap Average Value,  $\chi^2(2, N = 649) = 4,240, p = 0,120$ .

While the preliminary analysis of medians potentially suggested that impact funds, with a median gender pay gap of 11,95% may outperform both traditional funds at 17,34% and Socially Responsible Investment funds at 16,70%, the Kruskal-Wallis test determined that the mean ranks of the three groups were not different enough to be deemed statistically significant at the 5% significance threshold.

Therefore, it must be concluded that the gender pay gap among the portfolios does not significantly differ based on the fund’s degree of sustainability. Overall, across all three fund types, women are, on average, paid approximately 15% less than men. These findings highlight the persistent and widespread nature of gender-based pay disparities and underscore the need for continued efforts across all types of funds to achieve gender pay equality<sup>15</sup>.

**4.5.4 Statistical analysis of the PAI Percentage of Female Board Members Average Value**

The second metric that assess the fund’s non-financial performance at the specific level is the PAI Percentage of Female Board Members Average Value. This indicator addresses another aspect of gender discrimination, which is the representation of women in corporate leadership roles. Specifically, it measures the asset-weighted average proportion of female board members across the investee companies, calculated as a percentage of total board members (European Parliament, 2022).

Each percentage is weighted based on the fund’s ownership share in each company, ensuring that firms in which the fund holds a larger stake exert proportionally greater influence on the overall result. In the context of this PAI, board members include members of management or supervisory bodies. A higher value indicates a stronger representation of women in decision-making positions and a value above 50% indicates that, on average, women hold the majority of board seats across the portfolio’s investee companies.

**4.5.4.1 Kruskal-Wallis test**

The test of normality and homogeneity have demonstrated that the Kruskal-Wallis test is the most appropriate test to analyze the PAI Percentage of Female Board Members Average Value. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the mean board diversity of the fund, in function of its level of sustainability consideration.

**Table 33:** Sample mean rank: PAI Percentage of Female Board Members Average Value

<b>Ranks</b>			
	<b>SFDR Classification</b>	<b>N</b>	<b>Mean Rank</b>
PAI Percentage of Female Board Members Average Value	Article 6 SFDR Product	224	408,88
	Article 8 SFDR Product	692	531,29
	Article 9 SFDR Product	93	540,88
	<b>Total</b>	<b>1009</b>	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the PAI Percentage of Female Board Members Average Value confirms that traditional funds exhibit the lowest mean rank, at 408,88. In contrast, Socially Responsible Investment funds and impact funds demonstrate notably higher mean

<sup>15</sup> The detailed and comprehensive analysis of the PAI Gender Pay Gap Average Value is available in Appendix 17.

ranks of respectively 531,29 and 540,88. These results suggest that both SRI and impact funds tend to invest more heavily in companies with greater female representation on their boards.

Overall, while the ranking order is broadly consistent with the descriptive statistics, the rank-based analysis reveals a more pronounced gap between traditional funds and the more sustainability-oriented fund categories, highlighting a higher cleavage in gender diversity performance.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 34:** Kruskal-Wallis test: PAI Percentage of Female Board Members Average Value

<b>Test Statistics<sup>a,b</sup></b>	
	PAI Percentage of Female Board Members Average Value
Kruskal-Wallis H	31,414
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 31,414, which is substantially greater than the critical value ( $31,414 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the PAI Percentage of Female Board Members Average Value across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 31,414, p < 0,001$ .

4.5.4.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 35:** Dunn’s test: PAI Percentage of Female Board Members Average Value  
**Pairwise Comparisons of SFDR Classification**

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 6 SFDR Product- Article 8 SFDR Product	-122,415	22,402	-5,464	<,001	,000
Article 6 SFDR Product- Article 9 SFDR Product	-132,004	35,948	-3,672	<,001	,001
Article 8 SFDR Product- Article 9 SFDR Product	-9,589	32,185	-,298	,766	1,000

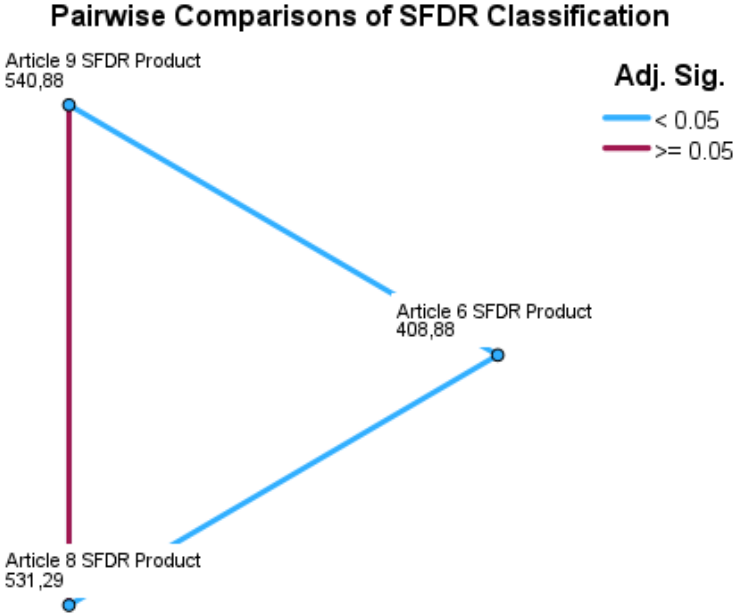
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.  
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of Dunn’s test reveal that both Socially Responsible Investment funds and impact funds differ significantly from traditional funds in terms of the asset-weighted average proportion of female board members ( $p_{adj} < \alpha = 5\%$ ).

- The most statistically significant difference is observed between traditional funds (Article 6) and SRI funds (Article 8). Although this pairwise comparison does not reflect the largest absolute difference in mean ranks (*Test Statistic* = -122,42), the lower variability of the data (*Standard Deviation* = 22,402) results in the most significant outcome. This indicates that SRI funds are significantly more likely to invest in companies with higher female representation on their boards compared to traditional funds ( $p_{adj} < 0,001$ ).
- The second-largest difference occurs between traditional (Article 6) and impact funds (Article 9), with a Test Statistic of -132,00. This indicates that traditional funds consistently allocate more capital to companies with comparatively lower representation of women on their boards ( $p_{adj} < 0,001$ ).

These results are visually summarized in the figure below:



**Figure 34:** Pairwise comparisons: PAI Percentage of Female Board Members Average Value

Note: Figure produced using the SPSS software

In conclusion, while the preliminary analysis revealed similar median values about the proportion of female board members, 32,09% for traditional funds, 34,14% for Socially Responsible Investment and 33,52% for impact funds, the results demonstrate that both SRI and impact funds significantly outperform traditional funds in promoting gender diversity within management and supervisory bodies. However, no statistically significant difference was found between SRI and impact funds, suggesting a possible plateau in gender diversity outcomes at higher levels of sustainability integration. Despite the comparatively better performance of SRI and impact funds, the descriptive statistics highlight that women continue to be substantially underrepresented across all fund types, with an average board representation situated around 30%. This finding underscores the persistent need for further efforts to achieve greater gender balance in corporate leadership<sup>16</sup>.

<sup>16</sup> The detailed and comprehensive analysis of the PAI Percentage of Female Board Members Average Value is available in Appendix 18.

#### 4.5.5 Statistical analysis of the PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved

The statistical analyses conclude with the evaluation of the fund's non-financial performance in relation to two specific governance indicators, the first being the PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved. This indicator measures the proportion of the portfolio that is allocated to companies found to be in violation of at least one of the United Nations Global Compact (UNGC) principles or the Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises. The objective of the analysis is to assess whether the extent of such violations varies according to the level of sustainability integration within the fund.

##### 4.5.5.1 Kruskal-Wallis test

The test of normality and homogeneity of variances have demonstrated that the most appropriate test to analyze the PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved is the Kruskal-Wallis. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the average proportion of violation of at least one UNGC Principle or OECD Guideline, in function of its level of sustainability consideration.

**Table 36:** Sample mean rank: PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved	Article 6 SFDR Product	224	603,15
	Article 8 SFDR Product	692	489,12
	Article 9 SFDR Product	93	386,78
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the PAI UNGC Principles/OECD Guidelines Violations % of Covered Portfolio Involved reveals that traditional funds continue to exhibit the worst performance, with a mean rank at 603,15. Socially Responsible Investment funds follow with a notably lower mean rank of 489,12, while impact funds demonstrate the lowest mean rank of 386,78.

These findings imply that both SRI and impact funds generally encompass lower proportions of investments in companies violating at least one UNGC Principle or OECD Guideline, and that impact funds also have a lower exposure to such breaches than SRI funds.

Overall, the rank order is consistent with the results observed in the descriptive statistics, where the average proportion of violation decreased as the level of sustainability integration of the fund increases.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 37:** Kruskal-Wallis test: PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved

Test Statistics <sup>a,b</sup>	
	PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved
Kruskal-Wallis H	64,624
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
 b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 64,624, which is substantially greater than the critical value ( $64,624 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the proportion of the portfolio involved in the violation of at least one UNGC Principle or OECD Guideline among the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 64,624, p < 0,001$ .

4.5.5.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 38:** Dunn’s test: PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved

Pairwise Comparisons of SFDR Classification						
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>	
Article 9 SFDR Product- Article 8 SFDR Product	102,339	26,183	3,909	<,001	,000	
Article 9 SFDR Product- Article 6 SFDR Product	216,366	29,244	7,399	<,001	,000	
Article 8 SFDR Product- Article 6 SFDR Product	114,027	18,224	6,257	<,001	,000	

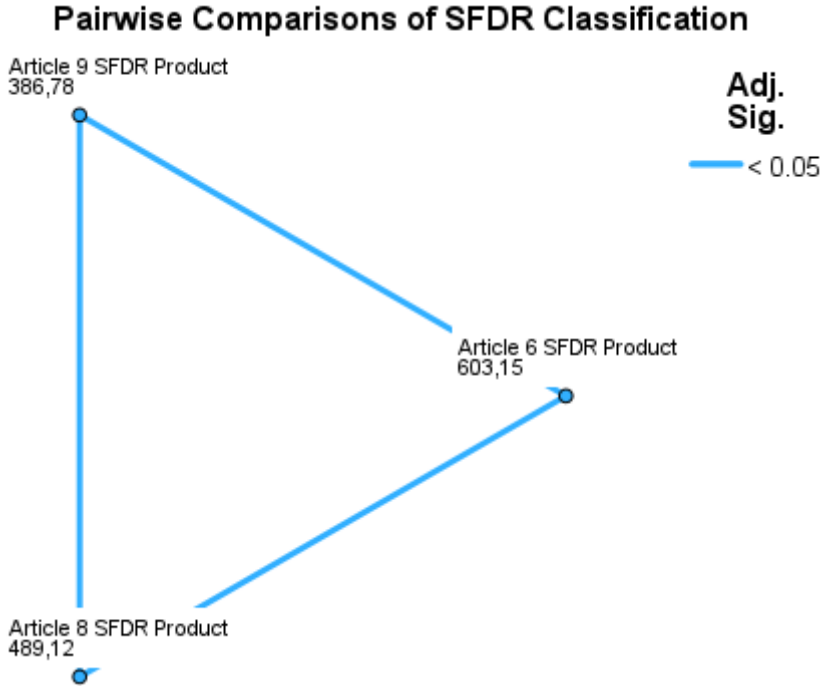
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.  
 a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of the Dunn’s test indicate that all three SFDR fund classifications differ significantly from one another in terms of the proportion of portfolio exposure to companies in violation of at least one UNGC Principle and OECD Guideline ( $p_{adj} < \alpha = 5\%$ ).

- The largest difference is observed between traditional funds (Article 6) and impact funds (Article 9), with a Test Statistic of 216,37, indicating that traditional funds tend to invest significantly more in companies breaching international sustainability principles than impact funds ( $p_{adj} < 0,001$ ).
- The second-largest difference occurred between traditional funds (Article 6) and Socially Responsible Investment funds (Article 8), with a Test Statistic of 114,03, also indicating that traditional funds contain a significantly greater proportion of their portfolio in violation with at least one international principle than SRI funds ( $p_{adj} < 0,001$ ).
- Finally, the smallest difference, yet still statistically significant, is between SRI funds (Article 8) and impact funds (Article 9), with a Test Statistic of 102,34. This suggests that impact funds are, on average, more strongly aligned with international sustainability standards than SRI funds ( $p_{adj} < 0,001$ ).

These results are visually summarized in the figure below:



**Figure 35:** Pairwise comparisons: PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved

Note: Figure produced using the SPSS software

In conclusion, the results of the analysis regarding the portfolio exposure to violations of the UNGC Principles and OECD Guidelines are consistent with the trends observed in the earlier analyses, such as the Morningstar Sustainability Rating™, the Portfolio Social Risk Score and the Portfolio Governance Risk Score. These findings further reinforce the pattern that as the level of sustainability integration increases, progressing from traditional funds to Socially Responsible Investment to impact funds, the non-financial performance of the fund increases, with funds investing significantly less in companies violating at least one international principle. Notably, the most pronounced difference is again observed between traditional and impact funds.

Nevertheless, it is important to highlight that, despite these statistically significant differences, the majority of funds across all fund types reported no exposure to such violations, as reflected by the consistent median value of 0,00%.<sup>17</sup>

**4.5.6 Statistical analysis of the PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved**

The second specific governance metric is the PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved. This metric calculates the proportion of the fund’s portfolio that is invested in companies lacking appropriate processes or mechanisms to ensure compliance with the UN Guiding Principles on Business and Human Rights and the OECD Guidelines for Multinational Enterprises.

The result reflects an asset-weighted average of the fund’s exposure to companies lacking compliance mechanisms in this regard. A higher value indicates a greater portion of the portfolio is allocated to companies that are not sufficiently aligned with at least one internationally recognized governance and human rights standards.

Unlike the previous indicator, which focused on companies that are already violating at least one of these principles, this metric assesses whether investee companies have implemented the necessary due diligence processes to monitor their compliance with the principles and prevent future violations.

**4.5.6.1 Kruskal-Wallis test**

The test of normality and homogeneity of variance have demonstrated that the Kruskal-Wallis test is the most appropriate test to analyze the PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the proportion of the investments lacking compliance mechanisms towards the UNGC principles and OECD guidelines, based on the fund’s level of sustainability consideration.

**Table 39:** Sample mean rank: PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved	Article 6 SFDR Product	224	546,10
	Article 8 SFDR Product	692	500,66
	Article 9 SFDR Product	93	438,31
	Total	1009	

Note: Table produced using the SPSS software

The examination of the mean ranks for the PAI UNGC Lack of Compliance Mechanisms % of Covered Portfolio Involved shows that traditional funds (Article 6) exhibit the highest mean rank, at 546,10, indicating a greater proportion of investments in companies lacking adequate compliance mechanisms. Socially Responsible Investment funds (Article 8) follow with a mean rank of 500,66, while impact funds (Article 9) display the lowest mean rank, at 438,31. This indicates that impact funds tend to invest less in companies with insufficient internal policies to monitor their compliance with the UNGC Principles or the OECD Guidelines.

<sup>17</sup> The detailed and comprehensive analysis of the PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved is available in Appendix 19.

The analysis of mean ranks therefore appears to be more closely aligned with the findings based on the mean rather than the medians, as it highlights moderate differences across the 3 groups, particularly between traditional and impact funds. Overall, the results support the trend that the non-financial performance of the funds improves progressively as the level of sustainability integration increases, moving from traditional to Socially Responsible Investment to impact funds.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 40:** Kruskal-Wallis test: PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved

Test Statistics <sup>a,b</sup>	
	PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved
Kruskal-Wallis H	9,480
df	2
Asymp. Sig.	,009

a. Kruskal Wallis Test  
 b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 9,480, which is greater than the critical value ( $9,480 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level just exceeding 99%, that there is a statistically significant difference in the proportion of investments lacking compliance mechanisms across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 9,480, p = 0,009$ .

4.5.6.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 41:** Dunn’s test: PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved

Pairwise Comparisons of SFDR Classification						
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>	
Article 9 SFDR Product- Article 8 SFDR Product	62,353	32,185	1,937	,053	,158	
Article 9 SFDR Product- Article 6 SFDR Product	107,794	35,948	2,999	,003	,008	
Article 8 SFDR Product- Article 6 SFDR Product	45,441	22,402	2,028	,043	,128	

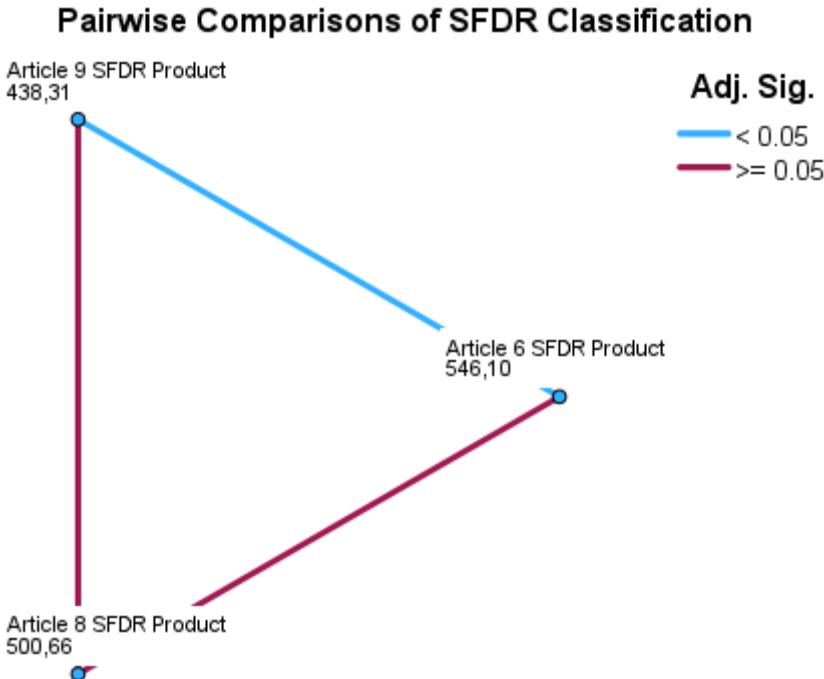
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.  
 a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of Dunn’s test reveal that the only statistically significant difference in the average proportion of companies lacking compliance mechanisms occurs between impact funds (Article 9) and traditional funds (Article 6) ( $p_{adj} < \alpha = 5\%$ ). The Test Statistic for this pairwise comparison is 107,79, suggesting that traditional funds tend to invest more heavily in companies without adequate compliance mechanisms compared to impact funds ( $p_{adj} = 0,008$ ).

By contrast, although impact funds (Article 9) appear to perform better than SRI funds (Article 8) and traditional funds (Article 6), the differences between impact funds and SRI funds ( $p_{adj} = 0,158$ ) and between SRI funds and traditional funds ( $p_{adj} = 0,128$ ) were not statistically significant at the adjusted 5% significance level. Therefore, the average performance does not differ significantly between Socially Responsible Investment and traditional funds, nor between impact and SRI funds.

These results are visually summarized in the figure below:



**Figure 36:** Pairwise comparisons: PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved

Note: Figure produced using the SPSS software

In conclusion, the analysis indicates that impact funds (Article 9) tend to invest significantly less in companies lacking adequate compliance mechanisms compared to traditional funds (Article 6). Specifically, the median proportion of investments in such companies is 53,53% for Article 9 funds, compared to 60,37% for Article 6 funds.

However, the results do not provide sufficient statistical evidence to conclude that Socially Responsible Investment funds (Article 8), which exhibit a median value of 60,27%, differ significantly from either traditional or impact funds in terms of exposure to companies with insufficient compliance mechanisms regarding the UNGC Principles and the OECD Guidelines.

Finally, while impact funds demonstrate a comparatively stronger performance, the descriptive statistics highlight a broader concern: across all fund categories, the majority of the portfolios remain, on average, invested in companies that lack effective mechanisms to demonstrate

their compliance with international standards. These findings underscore the considerable progress that is still required for companies to improve their governance practices, particularly through the development and implementation of internal policies and grievance mechanisms designed to better prevent potential violations of globally recognized principles and address them more effectively<sup>18</sup>.

**4.6.1 Statistical analysis of the Percent of AUM with No Controversies**

The first controversy-related metric used to compare the different samples is the Percent of AUM with No Controversies. This indicator is derived from Sustainalytics’ Controversy Research Process, which identifies companies involved in controversial practices or events. Specifically, this metric represents the proportion of the fund’s holdings that have not been flagged by the Controversy Research Process. Therefore, a higher percentage reflects a larger share of the portfolio that is not exposed to controversy.

The performance of the fund on this dependent variable will be analyzed based on the same unique independent variable as for the ESG approach, namely their SFDR Classification (nominal variable). Based on this factor, funds have been distributed in 3 independent samples: Article 6 products, Article 8 products and Article 9 products.

**4.6.1.1 Kruskal-Wallis test**

The test of normality and homogeneity of variance have demonstrated that the Kruskal-Wallis test is the most appropriate test to analyze the Percent of AUM with No Controversies. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the proportion of the holdings that are not exposed to any controversy, based on the fund’s level of sustainability consideration.

**Table 42:** Sample mean rank: Percent of AUM with No Controversies

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Percent of AUM with No Controversies	Article 6 SFDR Product	224	491,83
	Article 8 SFDR Product	692	497,27
	Article 9 SFDR Product	93	594,26
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks regarding the proportion of AUM with no controversy reveals that traditional funds and Socially Responsible Investment funds both have very similar mean ranks of respectively 491,83 and 497,27. However, impact funds demonstrate the highest performance by a large margin with a mean rank of 594,26.

These findings are consistent with the analysis of the descriptive statistics and the box plots. There does not seem to be any difference in the proportion of AUM with no controversy between Article 6 and Article 8 funds. However, Article 9 funds tend to have higher proportions of AUM with no controversy, resulting in a higher mean rank.

<sup>18</sup> The detailed and comprehensive analysis of the PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved is available in Appendix 20.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 43:** Kruskal-Wallis test: Percent of AUM with No Controversies

<b>Test Statistics<sup>a,b</sup></b>	
	Percent of AUM with No Controversies
Kruskal-Wallis H	9,671
df	2
Asymp. Sig.	,008

a. Kruskal Wallis Test  
 b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 9,671, which is substantially greater than the critical value ( $9,671 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the proportion of the fund with no controversy among the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 9,671, p = 0,008$ .

4.6.1.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 44:** Dunn’s test: Percent of AUM with No Controversies

<b>Pairwise Comparisons of SFDR Classification</b>					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 6 SFDR Product- Article 8 SFDR Product	-5,436	22,402	-,243	,808	1,000
Article 6 SFDR Product- Article 9 SFDR Product	-102,433	35,948	-2,849	,004	,013
Article 8 SFDR Product- Article 9 SFDR Product	-96,997	32,185	-3,014	,003	,008

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

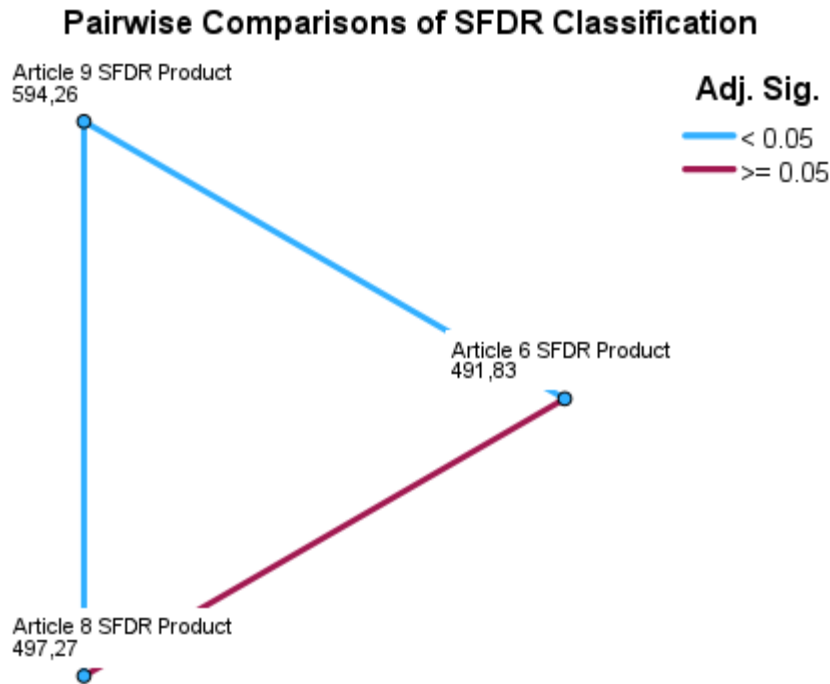
The results of the Dunn’s test reveal that impact funds significantly differ from both traditional and Socially Responsible Investment funds in terms of the average proportion of AUM with no controversy.

- The most statistically significant difference is observed between impact funds (Article 9) and SRI funds (Article 6). Although this pairwise comparison does not reflect the largest absolute difference in mean ranks ( $Test\ Statistic = -96,997$ ), the lower variability of the data ( $Standard\ Deviation = 32,185$ ) results in the most significant

outcome. This indicates that impact funds are significantly more likely to invest in companies with no controversy compared to SRI funds ( $p_{adj} = 0,008$ ).

- The second-largest difference occurs between impact funds (Article 9) and traditional (Article 6), with a Test Statistic of -102,443. This indicates that traditional funds tend to encompass a lower percentage of AUM with no controversy than impact funds ( $p_{adj} = 0,013$ ).

These results are visually summarized in the figure below:



**Figure 37:** Pairwise comparisons: Percent of AUM with No Controversies

Note: Figure produced using the SPSS software

In conclusion, the results of the Dunn's indicate that impact funds (Article 9) tend to invest a significantly higher proportion of their AUM in companies without reported controversies, as compared to both traditional funds (Article 6) and Socially Responsible Investment (SRI) funds (Article 8). The median proportion of AUM with no controversies stands at 13,65% for traditional funds, 15,08% for SRI funds, and 20,21% for impact funds. However, the comparison between traditional and SRI funds does not yield statistically significant differences, as their mean ranks are closely aligned, suggesting comparable performance on this metric.

Furthermore, additional insights were drawn from the analysis of the descriptive statistics and box plots. Firstly, they indicated that impact funds demonstrate a more consistent distribution of controversy-free AUM, whereas traditional and SRI funds show greater variability. Secondly, the analysis of the box plots highlighted a substantial number of outliers within the traditional and SRI samples, funds with exceptionally high proportions of AUM without any controversies. However, these outliers do not offset the broader tendency of these types of fund to be more exposed to controversies compared to impact funds. Thirdly, both analyses also revealed that the distributions of traditional and SRI funds were positively skewed. In contrast, the distribution of impact funds was relatively symmetrical. This skewness suggests that, although a small number of traditional and SRI funds perform well, the majority of their funds have relatively low proportions of AUM with no controversies.

Finally, there is a significant gap observed between the mean and the median values of the 3 samples, particularly for traditional and SRI funds. The mean for traditional, SRI, and impact funds was 19,49%, 20,86%, and 22,25%, respectively, while their medians were lower at 13,65%, 15,08%, and 20,21%. This discrepancy, coupled with the higher variability in traditional and SRI funds, highlights the appropriateness of using a non-parametric test. Unlike parametric tests that are sensitive to skewness and outliers, non-parametric tests are more robust and better suited for such data, although they may lead to different conclusions since they focus on medians rather than means<sup>19</sup>.

**4.6.2 Statistical analysis of the Percent of AUM with Low Controversies**

The second controversy-related metric used to compare the fund samples is the Percent of AUM with Low Controversies. Similarly to the previous analysis, this indicator is derived from Sustainalytics’ Controversy Research Process, which identifies companies involved in controversial practices or events. Specifically, this metric measures the proportion of a fund’s holdings that have received a “Low” Controversy Rating. A company receives this rating when it has a low impact on the environment and society while having a negligible reputational or financial risk (Sustainalytics, 2021).

**4.6.2.1 Kruskal-Wallis test**

The condition of normality has determined that the Kruskal-Wallis test is the most appropriate statistical test to analyze the Percent of AUM with Low Controversies. The Kruskal-Wallis test will be used to compare the different samples in order to determine whether there is at least one significant difference in the average proportion of the fund with low controversy, in function of its level of sustainability consideration.

**Table 45:** Sample mean rank: Percent of AUM with Low Controversies

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Percent of AUM with Low Controversies	Article 6 SFDR Product	224	457,65
	Article 8 SFDR Product	692	497,41
	Article 9 SFDR Product	93	675,55
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the Percent of AUM with Low Controversies reveals traditional investment products exhibit the lowest mean rank at 457,65. Socially Responsible Investment funds perform slightly better with a mean rank of 497,41, indicating a modest improvement in their exposure to low-controversy assets.

However, the most significant difference lies with impact funds. These funds exhibit a substantially higher mean rank of 675,55, far exceeding both Article 6 and Article 8 categories. This result suggests that Article 9 products tend to allocate a larger portion of their assets to companies involved in low controversies.

These findings reinforce the conclusions drawn from the previous descriptive statistics and box plot analysis. While Article 6 and 8 funds show relatively comparable performance in terms of

<sup>19</sup> The detailed and comprehensive analysis of the Percent of AUM with No Controversies is available in Appendix 21.

controversy exposure, impact funds stand out with clearly better outcomes, supporting the idea that deeper integration of sustainability objectives correlates with lower controversy risk.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 46:** Kruskal-Wallis test: Percent of AUM with Low Controversies

<b>Test Statistics<sup>a,b</sup></b>	
	Percent of AUM with Low Controversies
Kruskal-Wallis H	38,237
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 38,237, which is substantially greater than the critical value ( $38,237 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level exceeding 99%, that there is a statistically significant difference in the proportion of the fund with low controversy among the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 38,237, p < 0,001$ .

4.6.2.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 47:** Dunn’s test: Percent of AUM with Low Controversies

<b>Pairwise Comparisons of SFDR Classification</b>					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 6 SFDR Product- Article 8 SFDR Product	-39,760	22,402	-1,775	,076	,228
Article 6 SFDR Product- Article 9 SFDR Product	-217,901	35,948	-6,061	<,001	,000
Article 8 SFDR Product- Article 9 SFDR Product	-178,141	32,185	-5,535	<,001	,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.  
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

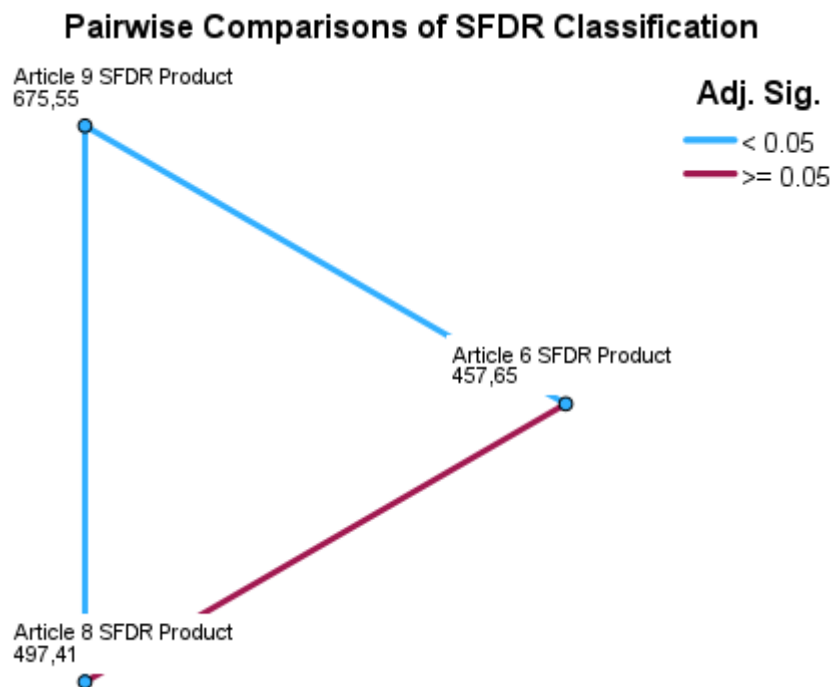
Note: Table produced using the SPSS software

The results of the Dunn’s test reveal that impact funds significantly differ from both traditional and Socially Responsible Investment funds in terms of the average proportion of AUM with low controversy.

- The most statistically significant difference is observed between impact funds (Article 9) and traditional funds (Article 6), with a Test Statistic of -217,901, indicating a highly significant difference. This suggests that traditional funds are significantly less likely to allocate assets to companies with low levels of controversy compared to impact funds ( $p_{adj} < 0,001$ ).
- The second largest statistically significant difference occurs between impact funds (Article 9) and Socially Responsible Investment funds (Article 8). This pairwise comparison yields a Test Statistic of -178,141, confirming that impact funds also hold a higher proportion of low controversy AUM than SRI funds ( $p_{adj} < 0,001$ ).

In contrast, the comparison between Article 6 and Article 8 products does not yield a statistically significant difference after the Bonferroni correction ( $p_{adj} = 0,228$ ). This indicates that, despite a small observed difference in mean ranks, traditional and Socially Responsible Investment funds do not differ significantly in terms of the percentage of their AUM with a low Controversy Rating.

These results are visually summarized in the figure below:



**Figure 38:** Pairwise comparisons: Percent of AUM with Low Controversies

Note: Figure produced using the SPSS software

In conclusion, the results of the Dunn's indicate that impact funds (Article 9) tend to allocate a significantly higher proportion of their AUM to companies with low levels of controversy, as compared to both traditional funds (Article 6) and Socially Responsible Investment funds (Article 8). This suggests that impact funds tend to be less exposed to reputational and financial risks, while also being less associated with adverse societal and environmental impacts.

However, the comparison between traditional and SRI funds does not yield statistically significant differences, as reflected by the similarity in their mean ranks. The median proportion of AUM invested in low controversy companies stands at 16,20% for traditional funds, 17,06% for SRI funds and 22,81% for impact funds, further illustrating the superior performance of Article 9 products for this metric.

These findings are aligned with the results of the descriptive statistics and box plots analyses, which consistently show impact funds outperforming the other two samples. While traditional and SRI funds display broadly comparable distributions, the box plots reveal the presence of a notable number of SRI funds with exceptionally high values, suggesting that a subset of SRI funds may achieve performance levels similar or even higher than those of impact funds<sup>20</sup>.

**4.6.3 Statistical analysis of the Percent of AUM with Moderate Controversies**

The third controversy-related metric used to compare the fund samples is the Percent of AUM with Moderate Controversies. Similarly to the previous analyses, this indicator is derived from Sustainalytics’ Controversy Research Process, which identifies companies involved in controversial practices or events. This metric in particular measures the proportion of a fund’s holdings that have received a “Moderate” Controversy Rating. A company receives this rating when its impact on the environment and society is moderate while posing minimal reputational and financial risks (Sustainalytics, 2021).

**4.6.3.1 Kruskal-Wallis test**

The test of normality and homogeneity of variance have determined that the Kruskal-Wallis test is the most appropriate test to analyze the Percent of AUM with Moderate Controversies. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the average proportion of the fund with moderate controversy, in function of its level of sustainability consideration.

**Table 48:** Sample mean rank: Percent of AUM with Moderate Controversies

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Percent of AUM with Moderate Controversies	Article 6 SFDR Product	224	506,28
	Article 8 SFDR Product	692	498,36
	Article 9 SFDR Product	93	551,30
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the Percent of AUM with Moderate Controversies indicates that traditional funds and Socially Responsible Investment funds exhibit nearly identical values, with mean ranks of respectively 506,28 and 498,36. This suggests that the average proportion of assets allocated to companies with a moderate level of controversy is broadly comparable between these two fund categories.

In contrast, impact funds display a notably higher mean rank of 551,30, indicating a slightly greater average allocation to companies with moderate controversy ratings.

Overall, this ranking aligns with the patterns previously observed in the descriptive statistics and box plot analysis. While traditional and SRI funds exhibit similar exposure to moderately controversial companies, impact funds show a marginally higher tendency to invest in such firms. However, the observed difference, while consistent, remains relatively modest.

<sup>20</sup> The detailed and comprehensive analysis of the Percent of AUM with Low Controversies is available in Appendix 22.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 49:** Kruskal-Wallis test: Percent of AUM with Moderate Controversies

<b>Test Statistics<sup>a,b</sup></b>	
	Percent of AUM with Moderate Controversies
Kruskal-Wallis H	2,711
df	2
Asymp. Sig.	,258

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 2,711, which is below the critical value ( $2,711 < 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, must be retained.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test indicates, with a confidence level of 95%, that there is no statistically significant difference in the mean ranks of the three fund categories in relation to the Percent of AUM with Moderate Controversies,  $\chi^2(2, N = 1009) = 2,711, p = 0,259$ . Although preliminary analysis of the medians suggested that impact funds (Article 9), with a median of 38,06%, might allocate a higher proportion of their assets to companies with moderate controversy ratings compared to traditional funds (Article 6) at 36,44% and Socially Responsible Investment funds (Article 8) at 36,36%, the Kruskal-Wallis test revealed that these differences are not statistically significant at the 5% level.

Thus, it can be concluded that the distribution of the Percent of AUM with Moderate Controversies does not significantly vary based on the fund’s sustainability classification. This finding contrasts with the previous analyses, which both identified that impact funds invested significantly more in companies with either No or Low Controversy ratings than both traditional and SRI funds. In this case, however, the analysis is less conclusive as no meaningful difference was observed between the 3 samples.

Given that the Kruskal-Wallis test did not produce a statistically significant result, no post-hoc analysis is required. Therefore, the Dunn’s test will not be conducted for this metric<sup>21</sup>.

<sup>21</sup> The detailed and comprehensive analysis of the Percent of AUM with Moderate Controversies is available in Appendix 23.

#### 4.6.4 Statistical analysis of the Percent of AUM with Significant Controversies

The next metric used to compare the three fund categories is the Percent of AUM with Significant Controversies. As in the previous analyses, this metric is derived from Sustainalytics' Controversy Research Process, which identifies companies involved in controversial practices or events. Specifically, this indicator represents the proportion of a fund's assets invested in companies that have received a "Significant" Controversy Rating. According to Sustainalytics (2021), this rating is assigned to companies that are associated with controversies having significant adverse impacts on the environment or society and that carry considerable reputational or financial risks for the company.

##### 4.6.4.1 Kruskal-Wallis test

The test of normality and homogeneity of variance have demonstrated that the Kruskal-Wallis test is the most appropriate test to analyze the Percent of AUM with Significant Controversies. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the proportion average proportion of the fund with significant controversy, based on the fund's level of sustainability consideration.

**Table 50:** Sample mean rank: Percent of AUM with Significant Controversies

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Percent of AUM with Significant Controversies	Article 6 SFDR Product	224	500,08
	Article 8 SFDR Product	692	521,92
	Article 9 SFDR Product	93	390,96
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the Percent of AUM with Significant Controversies reveals a clear distinction between the mean ranks among the three SFDR fund classification. Socially Responsible Investment funds (Article 8) exhibit the highest mean rank, at 521,92, followed closely by traditional funds (Article 6) with a mean rank of 500,08. This suggests that, on average, both fund types allocate a relatively similar and higher proportion of their assets to companies involved in significant controversies.

In contrast, impact funds (Article 9) display a substantially lower mean rank of 390,96, indicating a lower allocation to companies with significant controversy exposure than both traditional and SRI funds.

Overall, these findings are consistent with the trends observed in the box plot and descriptive statistics analyses. While traditional and SRI funds exhibit similar exposure to significant controversial companies, impact funds show a marginally more limited tendency to invest in firms with significant controversies.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 51:** Kruskal-Wallis test: Percent of AUM with Significant Controversies

Test Statistics <sup>a,b</sup>	
	Percent of AUM with Significant Controversies
Kruskal-Wallis H	16,640
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
 b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 16,640, which is greater than the critical value ( $16,640 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level just exceeding 99%, that there is a statistically significant difference in the proportion of the fund with significant controversy across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 16,640, p < 0,001$ .

4.6.4.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 52:** Dunn’s test: Percent of AUM with Significant Controversies

Pairwise Comparisons of SFDR Classification						
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>	
Article 9 SFDR Product- Article 6 SFDR Product	109,128	35,946	3,036	,002	,007	
Article 9 SFDR Product- Article 8 SFDR Product	130,961	32,183	4,069	<,001	,000	
Article 6 SFDR Product- Article 8 SFDR Product	-21,833	22,401	-,975	,330	,989	

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.  
 a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

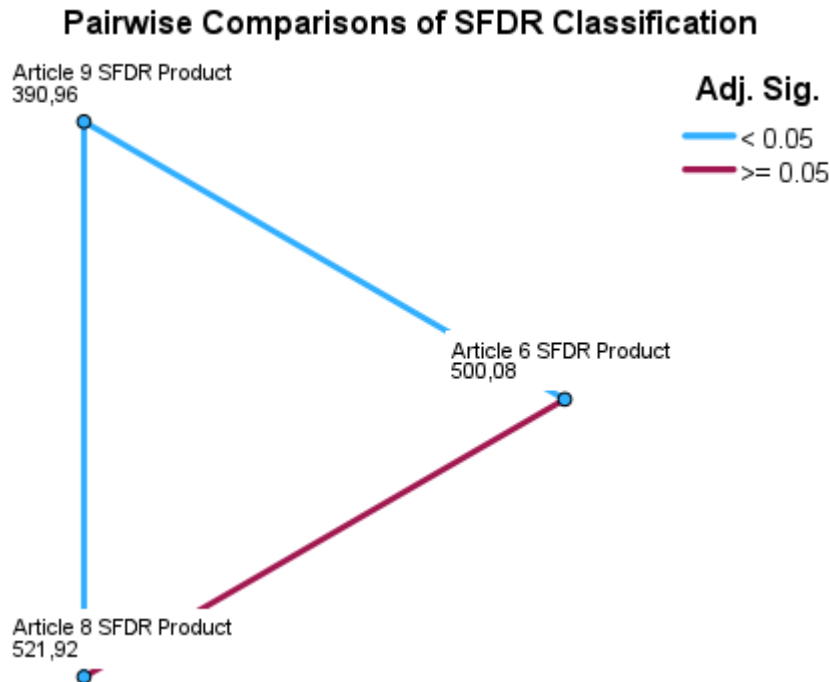
The results of the Dunn’s test reveal that impact funds (Article 9) significantly differ from both traditional (Article 6) and Socially Responsible Investment (Article 8) funds in terms of the average proportion of AUM allocated to companies with significant controversy exposure.

- The most statistically significant difference is observed between impact funds and SRI funds, with a Test Statistic of 130,961. This indicates that SRI funds invest substantially more AUM in companies with significant controversies compared to impact funds ( $p_{adj} < 0,001$ ).
- The second largest statistically significant difference occurs between impact funds and traditional funds. The pairwise comparison yields a Test Statistic of 109,128. This also

indicates that traditional funds tend to allocate significantly more capital to companies with significant controversies than impact funds ( $p_{adj} = 0,007$ ).

In contrast, the comparison between traditional and SRI funds does not produce a statistically significant result after Bonferroni correction ( $p_{adj} = 0,989$ ). This indicates that traditional and SRI funds do not differ significantly in terms of exposure to significant controversies.

These results are visually summarized in the figure below:



**Figure 39:** Pairwise comparisons: Percent of AUM with Significant Controversies

Note: Figure produced using the SPSS software

In conclusion, the results of the Dunn's test indicate that impact funds (Article 9) tend to allocate a significantly smaller proportion of their AUM to companies involved in significant controversies, as compared to both traditional funds (Article 6) and Socially Responsible Investment funds (Article 8). This finding suggests that impact funds tend to be less exposed to reputational and financial risks, as well as to adverse societal and environmental impacts. It is also interesting to note that the difference between impact and SRI funds is slightly more pronounced than that observed between impact and traditional funds.

By contrast, the comparison between traditional and SRI funds does not reveal a statistically significant difference, as reflected by the similarity in their mean ranks. The median proportion of AUM invested in companies with significant controversies is 19,73% for traditional funds, 20,49% for SRI funds and 14,84% for impact funds, further illustrating the lower exposure of Article 9 products on this metric.

These findings are aligned with both the descriptive statistics and box plots analyses, which repeatedly demonstrated that impact funds exhibit not only lower levels of exposure to significant controversies but also a more consistent distribution than the other two samples. In contrast, SRI funds not only show the highest central values, but also the greatest variability, indicating less consistency across the sample.

Lastly, across the series of controversy-related metrics, a notable pattern begins to emerge. For the first two metrics, Percent of AUM with No Controversies and Percent of AUM with Low Controversies, impact funds consistently exhibit higher proportions than both traditional and SRI funds. However, no statistically significant difference was found between traditional and SRI funds for these indicators. When analyzing the Percent of AUM with Moderate Controversies, the results show no significant difference among the three SFDR categories. In contrast, for the Percent of AUM with Significant Controversies, impact funds display a statistically lower proportion, while once again, no meaningful difference is found between traditional and SRI funds.

Therefore, this progression seems to suggest that, as the severity of the controversy increases, the results of the statistical analysis are starting to invert. Specifically, for lower levels of controversy, impact funds tend to have higher proportions of AUM invested in companies with little or no controversy than traditional and SRI funds. Then, for moderate levels of controversy, the exposure is statistically equivalent across all three fund categories. However, when the level of controversy becomes more significant, impact funds tend to allocate a lower proportion of their assets than traditional and SRI funds. Another important finding is that no statistically significant difference has been found yet between traditional and SRI funds, suggesting that these two groups are similarly exposed to controversy risks, despite their different levels of sustainability consideration<sup>22</sup>.

**4.6.5 Statistical analysis of the Percent of AUM with High Controversies**

The next metric used to compare the three fund categories is the Percent of AUM with High Controversies. As in the previous analyses, this metric is derived from Sustainalytics’ Controversy Research Process, which identifies companies involved in controversial practices or events. This indicator measures the proportion of a fund’s assets invested in companies that have received a “High” Controversy Rating. According to Sustainalytics (2021), this rating is assigned to companies that are associated with controversies having high adverse impacts on the environment or society and that carry high reputational or financial risks for the company. This type of controversy is often an indicator of a structural issue within the company.

**4.6.5.1 Kruskal-Wallis test**

The test of normality and homogeneity of variance have demonstrated that the Kruskal-Wallis test is the most appropriate test to analyze the Percent of AUM with High Controversies. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the proportion average proportion of the fund with high controversy, based on the fund’s level of sustainability consideration.

**Table 53:** Sample mean rank: Percent of AUM with High Controversies

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Percent of AUM with High Controversies	Article 6 SFDR Product	224	582,65
	Article 8 SFDR Product	692	504,59
	Article 9 SFDR Product	93	321,03
	Total	1009	

Note: Table produced using the SPSS software

<sup>22</sup> The detailed and comprehensive analysis of the Percent of AUM with Significant Controversies is available in Appendix 24.

The analysis of the mean ranks for the Percent of AUM with High Controversies reveals a distinct hierarchy across the three SFDR classifications. Traditional funds demonstrate the highest mean rank, at 582,65, indicating that, on average, these funds allocate the largest proportion of their assets to companies associated with high levels of controversy.

Socially Responsible Investment funds follow with a mean rank of 504,59, reflecting a moderately lower yet still substantial exposure to highly controversial companies compared to traditional funds.

In contrast, impact funds exhibit a substantially lower mean rank of 321,03, suggesting a reduced exposure to firms with high Controversy Ratings relative to both traditional and SRI funds.

Overall, these results align with the trends observed in the descriptive statistics and the box plots analyses. Article 9 funds continue to distinguish themselves by maintaining a notably lower level of exposure to companies with high controversies. Additionally, unlike earlier analyses, where SRI and traditional funds often displayed similar performance, the current results suggest a modest but noticeable divergence between these two categories regarding this metric.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 54:** Kruskal-Wallis test: Percent of AUM with High Controversies

<b>Test Statistics<sup>a,b</sup></b>	
	Percent of AUM with High Controversies
Kruskal-Wallis H	54,152
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 54,152, which is greater than the critical value ( $54,152 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level just exceeding 99%, that there is a statistically significant difference in the proportion of the fund invested in companies with high controversies across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 54,152, p < 0,001$ .

#### 4.6.5.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 55:** Dunn’s test: Percent of AUM with High Controversies

Pairwise Comparisons of SFDR Classification					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 9 SFDR Product- Article 8 SFDR Product	183,563	31,832	5,767	<,001	,000
Article 9 SFDR Product- Article 6 SFDR Product	261,623	35,554	7,358	<,001	,000
Article 8 SFDR Product- Article 6 SFDR Product	78,060	22,156	3,523	<,001	,001

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

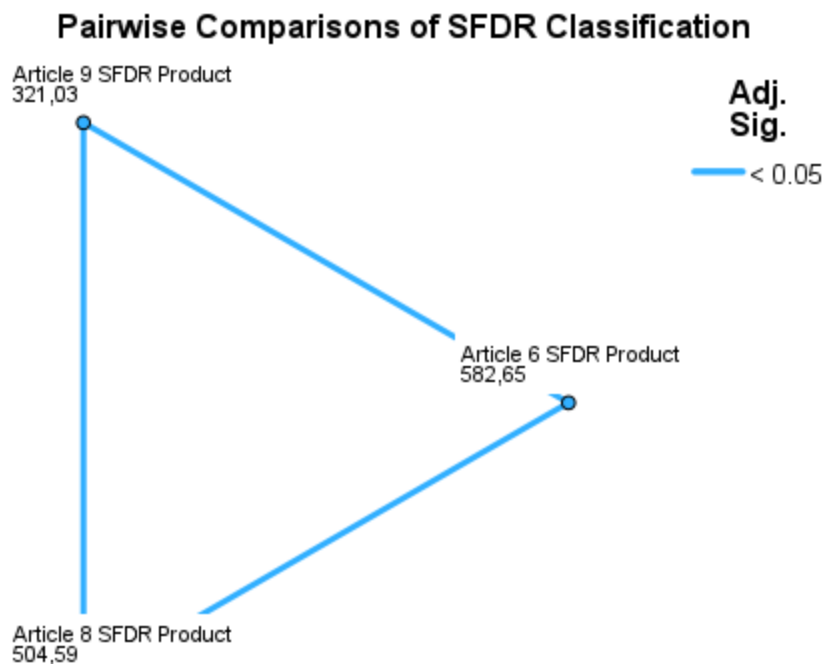
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of the Dunn’s post-hoc test indicate statistically significant differences among the three SFDR fund classifications (Articles 6, 8, and 9) regarding the average proportion of AUM allocated to companies with high controversies.

- The most pronounced difference is observed between impact funds and traditional funds, with a Test Statistic of 261,623 and a standard error of 35,554. This result highlights a substantial divergence in exposure, with traditional funds investing significantly more in companies with high controversy scores compared to impact funds ( $p_{adj} < 0,001$ ).
- The second-largest difference occurs between impact funds and Socially Responsible Investment funds, yielding a Test Statistic of 183,563, which reaches the same level of significance as the previous pairwise comparison ( $p_{adj} < 0,001$ ). This indicates that SRI funds tend to allocate considerably more capital to companies with high controversies than impact funds.
- The smallest statistically significant difference is observed between traditional and SRI funds, with a Test Statistic of 78,060 and a substantially smaller standard error of 22,156. This finding indicates that traditional funds tend to invest significantly more in firms with high controversies than SRI funds. Despite the lower Test Statistic, the difference remains strongly significant ( $p_{adj} = 0,001$ ).

These results are visually summarized in the figure below:



**Figure 40:** Pairwise comparisons: Percent of AUM with High Controversies

Note: Figure produced using the SPSS software

In conclusion, the results of the Dunn's test indicate that impact funds (Article 9) tend to allocate a significantly smaller proportion of their AUM to companies involved in high controversies as compared to both traditional (Article 6) and Socially Responsible Investment (Article 8) funds. Furthermore, the test reveals a third statistically significant difference between SRI and traditional funds, with SRI funds exhibiting a lower exposure to highly controversial companies than traditional funds. These observations seem to indicate that as the degree of sustainability integration increases, the exposure to high controversy decreases. However, an analysis of correlation should be conducted in order to support this pattern.

These findings are consistent with the results of the descriptive statistics and box plots analyses, which already highlighted noticeable differences between the samples, particularly between impact funds and the other two categories. They indicated that impact funds exhibited not only lower exposure to companies with high Controversy Ratings but also exhibited a more consistent distribution.

Key insights emerge from the analysis of their median values: impact funds report a median of only 0,0027%, indicating that nearly half of these funds hold no exposure to highly controversial companies and that 75% allocate no more than 2,5% of their AUM to such firms. By contrast, SRI funds exhibit a median of 3,55% and traditional funds report the highest central tendency, at 5,04%.

Finally, it is important to highlight that this is the first controversy-related metric for which a statistically significant difference is observed between traditional and SRI funds. While earlier analyses of lower levels of controversy indicated relatively similar performance between these two groups, this metric marks the first instance where a meaningful divergence emerges. This discrepancy may be attributed to the specific sustainable investment strategies employed by

SRI funds, which are likely designed to prevent them from investing in companies involved in high controversies<sup>23</sup>.

4.6.6 Statistical analysis of the Percent of AUM with Severe Controversies

The final controversy-related metric used to compare the three fund categories is the Percent of AUM with Severe Controversies. Consistent with the previous analyses, this metric is derived from Sustainalytics’ Controversy Research Process, which identifies companies involved in controversial practices or events. This indicator measures the proportion of a fund’s assets invested in companies that have been assigned a “Severe” Controversy Rating. According to Sustainalytics (2021), this rating is reserved for companies involved in the most critical controversies. These controversies have severe adverse impacts on the environment and society and pose serious reputational and financial risks to the company. It represents the highest level of controversy severity a company can get.

4.6.6.1 Kruskal-Wallis test

The test of normality and homogeneity of variance have demonstrated that the Kruskal-Wallis test is the most appropriate test to analyze the Percent of AUM with Severe Controversies. This test will be used to compare the different samples in order to determine whether there is at least one significant difference in the proportion average proportion of the fund with severe controversy, based on the fund’s level of sustainability consideration.

**Table 56:** Sample mean rank: Percent of AUM with Severe Controversies

<b>Ranks</b>			
	SFDR Classification	N	Mean Rank
Percent of AUM with Severe Controversies	Article 6 SFDR Product	224	621,14
	Article 8 SFDR Product	692	479,71
	Article 9 SFDR Product	93	413,47
	Total	1009	

Note: Table produced using the SPSS software

The analysis of the mean ranks for the Percent of AUM with Severe Controversies reveals again a clear hierarchy among the three SFDR classifications. Traditional funds exhibit the highest mean rank, at 621,14, indicating that these funds tend to allocate the largest proportion of assets to companies involved in severe controversies.

Socially Responsible Investment funds follow with a mean rank of 479,71, suggesting a substantially lower exposure to such companies compared to traditional funds.

Impact funds display the lowest mean rank, at 413,47, suggesting an even smaller exposure to firms with severe Controversy Ratings relative to both traditional and SRI funds.

This ranking is similar as that observed in the previous analysis regarding high controversies, with impact funds exhibiting the lowest exposure, followed by SRI funds and finally traditional funds with the highest exposure. However, in this case, the mean rank of SRI funds is closer to that of impact funds, whereas in the previous analysis it was more aligned with traditional funds. This shift reinforces the trend identified in the previous analysis, suggesting a further divergence in SRI fund performance from that of traditional funds.

<sup>23</sup> The detailed and comprehensive analysis of the Percent of AUM with High Controversies is available in Appendix 25.

Overall, these observations are consistent with the patterns identified in the descriptive statistics and box plot analyses.

The next step in the analysis is to determine whether at least one of these observed differences in mean rank is statistically significant from the others.

**Table 57:** Kruskal-Wallis test: Percent of AUM with Severe Controversies

Test Statistics <sup>a,b</sup>	
	Percent of AUM with Severe Controversies
Kruskal-Wallis H	87,503
df	2
Asymp. Sig.	<,001

a. Kruskal Wallis Test  
 b. Grouping Variable: SFDR Classification

To interpret the Kruskal-Wallis H statistic, it must be compared to the critical value from the Chi-Square distribution. The critical value can be estimated using a Chi-Square distribution table (see Appendix 10). When reporting the p-value of 5% and the degree of freedom ( $df = k - 1 = 2$ ) of the test in the table, it corresponds to a  $\chi^2$  critical value of 5,991. As shown in the table, the observed H statistic is 87,503, which is greater than the critical value ( $87,503 > 5,991$ ). Based on these results, the null hypothesis ( $H_0$ ), which states no difference in the sample distribution across the fund categories, is therefore rejected.

Note: Table produced using the SPSS software

In conclusion, the Kruskal-Wallis test demonstrates, with a confidence level just exceeding 99%, that there is a statistically significant difference in the proportion of the fund invested in companies with severe controversies across the three SFDR classifications (Article 6, 8 or 9),  $\chi^2(2, N = 1009) = 87,503, p < 0,001$ .

4.6.6.2 Post-hoc analysis

Given that the Kruskal-Wallis test was statistically significant, a post-hoc analysis is necessary to determine which specific study sample(s) differ(s) significantly from the others.

**Table 58:** Dunn’s test: Percent of AUM with Severe Controversies

Pairwise Comparisons of SFDR Classification					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
Article 9 SFDR Product- Article 8 SFDR Product	66,234	24,320	2,723	,006	,019
Article 9 SFDR Product- Article 6 SFDR Product	207,663	27,164	7,645	<,001	,000
Article 8 SFDR Product- Article 6 SFDR Product	141,429	16,928	8,355	<,001	,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

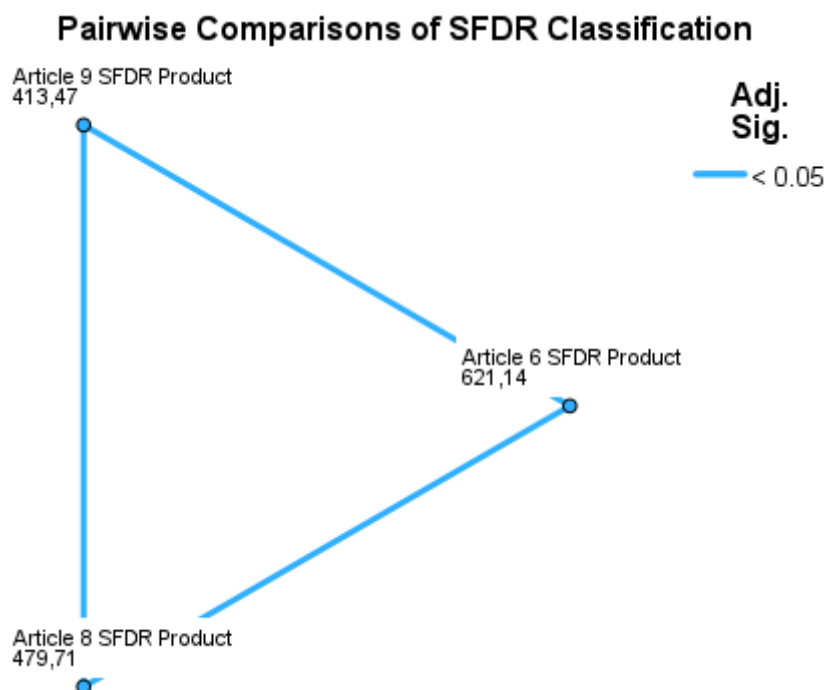
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note: Table produced using the SPSS software

The results of the Dunn’s post-hoc test indicate statistically significant differences among the three SFDR fund classifications (Articles 6, 8, and 9) in terms of the average proportion of AUM allocated to companies with severe controversies.

- The most pronounced difference occurs between traditional funds and Socially Responsible Investment funds. Although this pairwise comparison did not produce the highest absolute Test Statistic, with a value of 141,429, the notably lower standard error of 16,928 resulted in the highest Standardized Test Statistic of 8,355. This value indicates that traditional funds tend to allocate significantly more capital to companies with severe controversies than SRI funds ( $p_{adj} < 0,001$ ).
- The second-largest difference is observed between impact funds and traditional funds, with a Test Statistic of 207,663 and a standard error of 27,164. This result highlights a substantial divergence in exposure, with traditional funds investing significantly more in companies with severe controversy ratings than impact funds ( $p_{adj} < 0,001$ ).
- The smallest, yet still statistically significant, difference occurs between impact funds and SRI funds, with a Test Statistic of 66,234 and a standard error of 24,320. This finding indicates that SRI funds tend to invest significantly more in firms with severe controversies than impact funds. While the magnitude of this difference is smaller than the others, it remains strongly significant ( $p_{adj} = 0,019$ ).

These results are visually summarized in the figure below:



**Figure 41:** Pairwise comparisons: Percent of AUM with Severe Controversies

Note: Figure produced using the SPSS software

In conclusion, the Dunn's identified statistically significant differences between the 3 SFDR fund categories. The results indicate that traditional funds allocate a significantly higher proportion of their AUM to companies involved in severe controversies compared to both Socially Responsible Investment (SRI) funds (Article 8) and impact funds (Article 9). A third statistically significant difference was also observed between SRI and impact funds, with SRI funds exhibiting greater exposure to highly controversial companies than impact funds. This pattern is consistent with the findings from the previous analysis on high controversies, suggesting that a higher degree of sustainability integration is generally associated with lower

exposure to severe controversies. However, a correlation analysis would be required to formally validate this relationship.

These findings are consistent with the results of the descriptive statistics, which already highlighted notable differences between the groups. While the median values did not differ, remaining at 0% for all three categories, the mean and standard deviation provided deeper insights. Impact funds recorded the lowest mean proportion of AUM invested in companies with severe controversies (0,099%), followed by SRI funds (0,274%), while traditional funds showed the highest mean (1,14%). Variability followed a similar pattern: Article 9 funds displayed the lowest standard deviation (0,499%), followed by Article 8 funds (0,933%), with Article 6 funds showing the greatest dispersion (2,22%). Overall, these results highlight that impact funds maintain the lowest and most consistent exposure, followed by SRI funds, and finally traditional funds with both the highest average and the greatest variability.

The box plot analysis further supported these findings. It showed that for Article 8 and Article 9 funds, the distributions were compressed against the x-axis, with no visible upper or lower whiskers or interquartile ranges. The analysis of the data in the Excel sheet indicated that 54,46% of traditional funds, 79,77% of Socially Responsible Investment funds and 93,55% of impact funds had no exposure to severe controversies. However, the SRI sample encompassed a noticeable number of funds with a proportion of investment within companies with severe controversies between 0% and 5%.

Overall, the results for this metric align closely with those observed in the previous analysis regarding high controversies, with impact funds exhibiting the lowest exposure, followed by SRI funds and finally by traditional funds, with the highest exposure. However, in this case, the mean rank of SRI funds is closer to that of impact funds, whereas in the previous analysis it was more aligned with traditional funds. This shift reinforces the trend identified in the previous analysis, indicating a gradual divergence in SRI fund exposure from that of traditional funds for the two highest Controversy Ratings, namely “High” and “Severe”.<sup>24</sup>

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<sup>24</sup> The detailed and comprehensive analysis of the Percent of AUM with Severe Controversies is available in Appendix 26.

## 4.7 Overall interpretation of the results

### 4.7.1 ESG statistical analyses

**Table 59:** Summary of the results of the statistical analyses regarding ESG indicators

	Indicator	Result of the Kruskal Wallis test	Post-hoc analysis*
Financial materiality	Morningstar Sustainability Rating™	Significant difference	Impact > SRI > Traditional**
	Portfolio Environmental Score	Significant difference	SRI > Traditional
	Portfolio Social Score	Significant difference	Impact > SRI > Traditional
	Portfolio Governance Score	Significant difference	Impact > SRI > Traditional
Impact materiality	PAI Scope 1, 2 & 3 GHG Emissions Tonnes	Non-significant difference	
	PAI GHG Intensity Scope 1, 2 & 3 Average Value	Significant difference	SRI > Traditional
	PAI Gender Pay Gap Average Value	Non-significant difference	
	PAI Percentage of Female Board Members	Significant difference	SRI > Traditional Impact > Traditional
	PAI Ungc Principles/OECD Guidelines Violations % of Covered Portfolio Involved	Significant difference	Impact > SRI > Traditional
	PAI Ungc Lack of Compliance Mechanisms % of Covered Portfolio Involved	Significant difference	Impact > Traditional

\* This column indicates which fund type performs significantly better than the other on the ESG indicator. For clarity, the ">" reflects that the fund type has a better performance and not necessarily a higher value.

\*\* "Impact > SRI > Traditional" means that all three groups differ significantly from each other (6 vs 8, 6 vs 9 and 8 vs 9).

At the first level of comparison, evaluating the overall exposure of funds to sustainability risks, the analysis revealed statistically significant differences among all three fund categories: traditional, Socially Responsible Investment (SRI) and impact funds. The most pronounced was observed between traditional and impact funds. The findings even point to a clear and consistent trend: funds with greater integration of sustainability considerations tend to achieve higher overall sustainability ratings. This suggests that stronger sustainability commitments tend to be associated with more effective management of sustainability-related risks

The second level of comparison refines the comparison by assessing the fund's exposure to sustainability risks across the Environmental, Social, and Governance (ESG) pillars individually. For the Social and Governance dimensions, the results of the statistical analyses for the Social and Governance pillars reached the same conclusion as the overall sustainability analysis. Statistically significant differences were identified across all three fund categories, with a clear trend indicating that social and governance risks tend to decrease as the level of sustainability integration increases. Once again, the most pronounced difference was observed between traditional and impact funds. In contrast, the results for the Environmental

pillar showed a more limited distinction. The only statistically significant difference occurred between traditional funds and Socially Responsible Investment funds, suggesting that SRI funds tend to be less exposed to environmental risks. The statistical analyses did not find any significant difference in the overall exposure of the fund to environmental risks between traditional and impact funds or between Socially Responsible Investment and impact funds.

Two hypotheses may explain the smaller observed differences in environmental risks. First, regulatory efforts in Europe have historically prioritized environmental concerns over social and governance issues. As a result, the regulation surrounding sustainability has mainly been developed around the environmental perspective. The reasons for this regulatory focus were already discussed earlier in the thesis (cf. supra p.55). It stems from the global repercussions of environmental challenges, the well-established corporate responsibility in these issues, the greater measurability of the environmental issues and the consensus on how to resolve them.

Second, the increasing urgency of climate change has raised awareness among companies regarding environmental risks. The consequences of global warming are becoming more and more concerning for their activities. Therefore, companies may consider these risks more seriously and may address them more proactively than social or governance issues. Consequently, the more objective and quantitative nature, coupled with their higher financial materiality, may explain why companies are generally more effective and proactive in managing environmental risks. This could account for the smaller performance gap observed between fund categories, whether they are marketed as sustainable or not, on environmental indicators, compared to the differences observed in the social and governance dimensions.

The first two levels of comparison primarily assess financial materiality, that is, the extent to which sustainability risks impact the financial performance of companies. Overall, from this perspective, the results consistently indicate that funds tend to be less exposed to sustainability-related risks as they are more committed towards sustainability. Despite the differences across fund categories, it is important to note that the absolute risk levels for all three pillars generally fall within the lower end of Morningstar's typical risk scale, which ranges from 0 to 25 (Morningstar, 2023). Among the three ESG pillars, environmental risks scores are the lowest, with a global average score ranging from 4,0 to 5,3. Governance risks follow, with a global average score between 5,8 and 7,0. The highest risk exposure is observed in the social dimension, where the global average score ranges from 7,2 to 8,5. These findings suggest that, although the overall risk level remains relatively low, investment funds are globally most exposed to social risks, followed by governance risks, with the lowest exposure observed for environmental risks.

The third level of comparison shifts focus on impact materiality, evaluating the actual impact of funds on environmental, social and governance factors. This level incorporates more specific and direct indicators. The results for this level are more nuanced than the first two levels.

In terms of environmental impact, the first indicator, which measures total GHG emissions (in tonnes), revealed no statistically significant differences between the three fund categories. However, when emissions were analyzed relative to revenue, traditional funds were found to emit more greenhouse gases per unit of revenue than Socially Responsible Funds. This suggests that SRI funds are more carbon-efficient than traditional funds. By contrast, no significant difference was observed between impact funds and SRI funds. This may be partly attributable to the fact that certain impact funds prioritize social objectives over environmental ones, thereby reducing the overall environmental performance of the sample for these metrics.

Regarding the social impact, the findings were also less consistent than those observed at the second level of analysis. For the first social indicator, the gender pay gap, the statistical test was inconclusive, revealing no significant difference between among the three fund categories. Nonetheless, the analysis showed that, on average, women are paid approximately 15% less than men across all fund types.

In contrast, the second indicator, female representation within management and supervisory bodies, demonstrated that both SRI and impact funds tend to invest in companies with a stronger gender diversity than traditional funds. However, unlike the results from the social risk analysis (level 2), no statistically significant difference was found between SRI and impact funds in this regard. This may indicate a possible plateau effect in gender diversity outcomes at higher levels of sustainability integration. Alternatively, as with environmental metrics, this lack of difference may be attributed to the fact that not all impact funds pursue social objectives, with some focusing primarily on environmental ones, thereby diluting the overall social performance of the sample. Despite the better performance of SRI and impact funds, descriptive statistics highlight that women continue to be substantially underrepresented on corporate boards, with an average board representation of approximately 30% across all fund categories. Overall, the findings for both social measures highlight that substantial efforts are still needed to reach gender equality.

For the governance dimension, the first specific measure found significant differences consistent with the trend observed in the general and pillar levels of comparisons. The results demonstrate that as the level of sustainability integration increases, the governance performance of the funds increased as funds invest significantly less in companies violating at least one international principle. In addition, the most pronounced difference was again observed between traditional and impact funds. Nevertheless, it is important to highlight that, despite these statistically significant differences, the majority of funds across all categories reported no exposure to such violations, as reflected by the consistent median value of 0,00%.

The second governance indicator provides more moderate results, as it only showed that impact funds were significantly more likely to invest in companies with adequate compliance mechanisms than traditional funds. Nevertheless, the descriptive statistics indicated that the majority of the portfolios across all fund categories remain, on average, invested in companies lacking adequate governance policies or grievance mechanisms, highlighting the need for continued improvement in governance practices.

Overall, the results of the statistical analyses indicate that impact funds tend to outperform both Socially Responsible Investment funds and traditional funds across a range of ESG indicators, with SRI funds also demonstrating superior performance compared to traditional funds. Indeed, in every instance where a statistically significant difference involved traditional funds, they were systematically the underperforming fund category. Conversely, whenever a significant difference involved impact funds, they were invariably the best-performing group. Therefore, these observations seem to suggest that the more a fund integrates sustainability, the better it performs on ESG indicators. This trend is especially pronounced for indicators such as the Morningstar Sustainability Rating™, the social risk score, the governance risk score and the proportion of portfolio in violation to UNGC and OECD standards. These findings provide strong empirical evidence that the integration of sustainable investment strategies by SRI funds is associated with enhanced ESG performance. Similarly, impact funds, which place environmental and social objectives at the core of their investment strategy, globally demonstrated the highest ESG performance. This suggests that the “impact” designation reflects genuine additional extra-financial performance.

In conclusion, the results align with expectations and reveal no indications of greenwashing or impact washing. Furthermore, the findings suggest that the Sustainable Finance Disclosure Regulation (SFDR) has played a meaningful role in addressing these risks by increasing transparency. Nevertheless, the results also underscore the substantial need for continued progress to address sustainability-related issues across all three dimensions of sustainable investment (E/S/G).

Finally, when viewed through the lens of double materiality, it is noteworthy that the analyses focusing on ESG indicators related to financial materiality yielded more statistically significant results than those examining impact materiality. The more moderate findings associated with impact-oriented indicators, with some instances where no significant differences were observed between fund categories may suggest that fund managers are primarily leveraging sustainability integration as a tool to mitigate financial risk rather than as a genuine desire to generate meaningful environmental or social impact.

4.7.2 Controversy-related statistical analyses

**Table 60:** Summary of the results of statistical analyses regarding controversy metrics

	Indicator	Result of the Kruskal Wallis test	Post-hoc analysis*
Double Materiality	Percent of AUM with No Controversies	Significant difference	Impact > SRI Impact > Traditional
	Percent of AUM with Low Controversies	Significant difference	Impact > Traditional Impact > SRI
	Percent of AUM with Moderate Controversies	Non-significant difference	
	Percent of AUM with Significant Controversies	Significant difference	Impact < SRI Impact < Traditional
	Percent of AUM with High Controversies	Significant difference	Impact < SRI < Traditional**
	Percent of AUM with Severe Controversies	Significant difference	Impact < SRI < Traditional

\* This column indicates which fund type has a significantly lower/higher result than the other on the ESG indicator. Therefore, the interpretation of the cell depends on the nature of the ESG indicator.

\*\* "Impact < SRI < Traditional" means that all three groups differ significantly from each other (6 vs 8, 6 vs 9 and 8 vs 9).

The analysis of six controversy-related metrics, derived from Morningstar database and based on Sustainalytics' Controversy Ratings ranging from "No" to "Severe", provides valuable insights into how sustainability considerations relate to funds' exposure to financial risks and impact on the environment and the society. These findings not only highlight differences in allocation patterns across fund types but also offer evidence regarding the credibility of sustainable investment strategies. Overall, the analyses reveal a clear and progressive pattern in the relationship between the severity of the controversy and the variations in fund exposure across the three SFDR classifications.

For the lowest controversy categories, namely "No Controversies" and "Low Controversies", impact funds consistently allocate a larger share of their AUM to companies with minimal or no

controversy risk than both traditional funds and Socially Responsible Investment funds. This indicates that impact funds tend to invest more heavily in companies with less adverse societal and environmental impact and with lower reputational and financial risks. In both analyses, no statistically significant differences are observed between traditional and SRI funds, indicating similar exposure for lower controversy metrics despite differing degrees of sustainability integration.

In terms of specific figures, for the “No Controversies” metric, traditional funds report the lowest average, ranging from 17,16% to 21,83%, followed by SRI funds at 19,38% to 22,33% and impact funds with the highest mean between 19,59% and 24,91%. For the “Low Controversies” category, 16,33% to 18,21% of the assets in traditional funds are invested in companies with low controversy ratings, compared to 17,88% to 19,08% for SRI funds and 21,50% to 24,67% for impact funds.

When examining the Percent of AUM with Moderate Controversies, the distinctions between samples observed in the previous analyses disappear. The Kruskal-Wallis test indicates no statistically significant differences among the three SFDR fund classifications, marking a turning point in the previously identified pattern between sustainability integration and controversy exposure. The absence of significant variations suggests that, at mid-level severity, where controversies exert a moderate impact on society and the environment, while carrying minimal financial risks, the degree of sustainability integration has limited influence on portfolio composition.

Notably, moderate controversies represent the most prevalent Controversy Rating across all 3 fund categories, with more than one-third of each group’s assets invested in companies falling within this range. Impact funds report the highest mean exposure, between 35,32% and 39,21%, followed by traditional funds at 34,10% to 36,91%, and SRI funds with the lowest mean, ranging from 33,75% to 35,58%.

When controversy severity reaches a significant level, the pattern observed for the lower controversy ratings is reversed, producing entirely opposite results. In this case, impact funds tend to allocate a statistically smaller proportion of their AUM to companies with significant controversies than both traditional and SRI funds. This marks the first instance in which greater sustainability ambition corresponds to reduced controversy exposure.

However, one aspect remains unchanged: no statistically significant difference was found between traditional and SRI funds. This suggests that, despite the sustainable investment strategies promoted by Article 8 products, their exposure to companies with significant controversies is not materially lower than that of traditional funds. The persistent absence of a statistically significant difference between these two groups raises concerns about the depth and credibility of the screening process applied by Article 8 products, thereby heightening the risk of greenwashing.

In terms of average exposure, impact funds report the lowest mean proportion, ranging from 13,57% to 17,71% of their AUM, followed by traditional funds at 18,85% to 22,14% and SRI funds with a slightly higher mean of 20,40% to 22,37%.

For the highest controversies categories, namely “High” and “Severe” controversies, the differences between the 3 fund samples become even more pronounced. In both cases, statistical tests found significant differences across all three groups. Consistently, impact funds exhibit the lowest exposure, followed by SRI funds, while traditional funds allocate the highest share of their AUM to companies involved in highly and severely controversial companies. Compared to the previous metrics, the average proportions of AUM in these levels of severity drop drastically.

For “High” controversies, impact funds allocate between 1,04% and 2,29% of their AUM, with a median value close to zero (0,0027%), indicating that nearly half of these funds hold no exposure at all to high-controversy companies. SRI funds display a notably higher average exposure, ranging from 4,01% to 4,65%, while traditional funds report the highest average, between 5,34% and 6,85%.

The results for Severe controversies show a similar ranking but the mean rank of SRI funds continue to diverge from that of traditional funds and move closer to that of impact funds, suggesting a gradual convergence between these two more sustainability-oriented categories for the most severe controversy levels. In terms of average proportion, impact funds again record the lowest values, ranging from -0,004% to 0,202%. SRI funds follow with averages between 0,204% and 0,343%, while traditional funds remain the highest at 0,848% to 1,432%.

It is also important to note that the 3 samples have a median of 0%, indicating that at least half of the funds in each category hold no exposure to companies flagged for severe controversies. Moreover, data from the Excel sheet indicates that 54,46% of traditional funds, 79,77% of Socially Responsible Investment funds and 93,55% of impact funds have no exposure at all to severe controversies.

The strong alignment between higher sustainability ambition and lower controversy exposure for the most severe categories reinforces the argument that sustainable investment strategies such as ESG integration, negative and positive screening, shareholder engagement or sustainability-themed investing can be effective tools for reducing not only reputational and financial risks but also adverse environmental and social impacts. Importantly, the Percent of AUM with High and Severe Controversies are the first instances where traditional and SRI funds diverge statistically, with SRI funds demonstrating significantly lower exposure than traditional funds.

Overall, the statistical analyses demonstrate that impact funds is the sample which differentiates the most from the others. Across the different analyses, impact funds tend to consistently allocate a larger share of their assets to companies with lower controversies and smaller share to those involved in more severe controversies levels than both traditional and SRI funds.

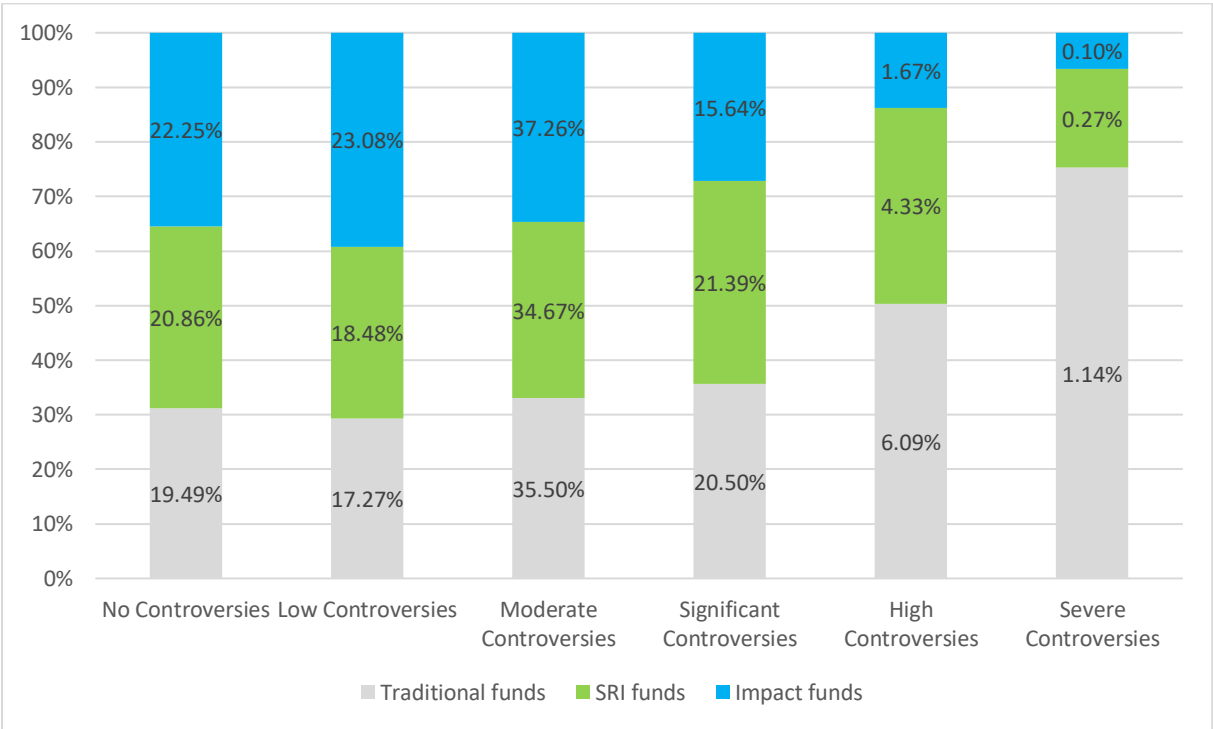
Furthermore, for the lower (“No” and “Low”) and intermediate (“Moderate” and “Significant”) controversy levels, traditional and Socially Responsible Investment funds exhibit similar allocations patterns. This absence of significant differences between the two fund categories raises potential concerns regarding greenwashing, as it suggests that SRI funds may not be applying substantially more rigorous screening at these controversy levels than traditional funds. However, as controversy severity increases (“High” and “Severe”), their exposures diverge, with SRI funds investing significantly less in companies with high and severe controversies.

In conclusion, the findings indicate that the commitment of impact funds to contribute to environmental and social solutions is actually reflected in their allocations patterns for lower and higher controversy levels. Furthermore, the results suggest that the implementation of sustainable investment strategies become particularly more effective where it matters most, for high and severe controversies. The results indicate that higher sustainability integration not only mitigates financially material risks, by avoiding companies facing serious reputational and operational challenges but also reduces adverse environmental and social impacts.

Finally, as with the statistical analyses of ESG indicators, no unexpected or contradictory results were identified (e.g., impact funds exhibiting higher exposure to severe controversies

than other fund categories). In this sense, the outcomes across all metrics were consistent with expectations.

The figure in the next page presents the average allocation of AUM to companies across the six controversy metrics, ranging from No Controversies to Severe Controversies, for the three SFDR Classifications: traditional funds (Article 6), Socially Responsible Investment funds (Article 8) and impact funds (Article 9). The stacked bar chart format facilitates a visual comparison of how each controversy category is distributed across the three fund types, making it easier to identify the allocation patterns highlighted in the preceding statistical analyses.



**Figure 42:** Average proportion of SFDR classification per Controversy Rating

For the two lowest controversy levels, No and Low Controversies, the blue segments, representing impact funds, form the largest portion of each bar. The proportions of traditional and SRI funds remain similar, indicating that, on average, a relatively larger share of AUM in impact funds is allocated to companies with minimal or no controversies compared with the other two categories.

Then, for moderate controversies, the distribution across the three fund types appears more balanced, consistent with earlier statistical findings that revealed no significant differences between them for this category.

Differences re-emerge for significant controversies where impact funds show a visibly smaller share than both SRI and traditional funds. In contrast, SRI and traditional funds hold larger and roughly similar shares, with SRI funds slightly exceeding traditional funds in this category.

The contrast becomes more pronounced for High Controversies. The blue segment for impact funds contracts further, whereas the grey portion for traditional funds expands noticeably, indicating a higher relative concentration in highly controversial companies. SRI funds occupy an intermediate position but begin to diverge from traditional, moving closer to the profile of impact funds.

Finally, in the Severe Controversies category, all fund types allocate only a small share of their portfolios to such companies. Nonetheless, the grey segment for traditional funds continues to grow, while the blue segment of impact funds becomes almost negligible. The share of SRI funds further distances itself from traditional funds, aligning more closely with impact funds.

Overall, the graph visually reinforces the progressive shift in portfolio composition identified in the statistical analyses: as controversy severity increases, the proportion of AUM held by impact funds steadily declines, while the share for traditional funds rises. SRI funds typically remain in an intermediate position but increasingly align with impact funds at the highest controversy levels, underscoring that the effects of stricter sustainability integration are most visible for highly severe controversies.

## 4.8 Methodological Limitations and Recommendations

In order to carry out these statistical analyses, a series of choices were required to develop the most appropriate methodology for analyzing the data and addressing the research question with rigor and precision. Each of these decisions carried implications on the methodology and introduced certain limitations. It is therefore essential to justify these choices and discuss the limitations inherent in this study. These limitations primarily concern three aspects of the methodology: the selection of funds, the choice of the independent variable, and the choice of statistical tests. Finally, when possible, recommendations will be provided to mitigate or address these constraints.

The first set of limitations relates to the fund selection process. As explained in the dedicated section (cf. supra p.93), the funds were exclusively extracted from the Morningstar database. While this ensures consistency in how ESG indicators are being calculated across all funds, it also introduces a selection bias. The conclusions drawn from the statistical analyses may not be fully generalizable to funds not included in the Morningstar universe. A recommendation would be in the first instance to assess the significance of this limitation by calculating Morningstar's coverage of Open-End equity funds compared to the total fund population of such funds in the Belgian and Luxembourg markets. Then, in a second step, replicating the analyses using data from other providers such as MSCI or Bloomberg would be particularly valuable, especially for the specific indicators since level 1 and 2 indicators are more specific to Morningstar. If the results are consistent across different providers, this would enhance the convergent validity of the findings and support broader generalization.

Then, a second limitation within the fund selection process regards the application of data availability filters. Funds missing values for key indicators such as the Morningstar Sustainability Rating™, Environmental Risk Score, Social Risk Score, and Governance Risk Score were excluded, reducing the sample size from 1,251 to 1,009. While this decision was taken to retain only the most relevant and analyzable data, it has introduced another selection bias, as funds with complete ESG data might perform better than those with missing values.

The second type of limitation is related to the selection of the independent variable for the statistical analyses. Currently, there is no universally accepted classification specifically designed to quantify a fund's sustainability level. This study therefore relied on the SFDR classification, which, although mandatory and accessible, was not originally designed to reflect a fund's actual degree of sustainability. The financial industry has, however, taken over three legal articles of the regulation (Article 6, 8 and 9) to distinguish the level of sustainability of the funds because their content reflected certain practices associated with traditional investing, Socially Responsible Investing and impact investing. Given the absence of a more precise and accessible alternative, the SFDR classification was selected to identify the fund's sustainability level. Nevertheless, this choice, while imperfect, also presents an opportunity to assess the effectiveness of the SFDR regulation in tackling the issue of greenwashing.

An additional limitation stems from the dynamic nature of SFDR classifications. Since the regulation is relatively recent, fund managers may still be refining their understanding and application of its criteria. Moreover, fund strategies may evolve over time, allowing managers to reclassify funds to better reflect their updated sustainability goals. This possibility for reclassification might alter the results of the statistical analyses. A recommended solution for this issue would be to repeat the statistical analyses at different time intervals, allowing for the tracking of changes in both classification and ESG performance. Specifically, analyzing funds that have transitioned between classifications (upgrades or downgrades) may reveal whether such changes are correlated with particularly low or high ESG performance, thereby justifying or questioning the reclassification.

Furthermore, the data retrieved from Morningstar directly identified only Article 8 and 9 funds, requiring the classification of all other funds as Article 6 by default. While this introduces some uncertainty about the representativeness of the Article 6 sample as actually not encompassing any sustainable consideration, it does not affect the validity of the comparison between Article 8 and 9. The inclusion of a third sample of Article 6 funds was intended to enrich the comparisons by serving as a control group, which would represent the baseline ESG performance achieved when the fund does not pursue sustainability in its investment strategy. The last set of limitations regards the non-parametric nature of the statistical tests used (Kruskal-Wallis and Dunn's test). Unfortunately, these are inherent to this type of test and cannot be avoided. These methods were chosen due to violations of normality and homogeneity of variance assumptions, which made parametric alternatives unsuitable.

Firstly, since these tests are based on ranked observations rather than the actual values, this results in a loss of information and precision which eliminates variability between observations. While this makes these tests more robust than parametric tests when the assumptions of normality and equality of variances are violated, it comes at the cost of precision. The Kruskal-Wallis test may thus have missed some differences that the One-way ANOVA would have detected if the conditions had been met.

A second consequence that derives from the former is that, since the assumption of equality of variances is not met, some minor differences may be considered as statistically significant effects due to the high variability of the variances rather than true differences in central tendencies.

Thirdly, the presence of outliers for various indicators also posed a challenge. Although these extreme values can distort the results of the tests, they were retained because they appeared plausible and enrich the analyses by enhancing population representativeness.

Lastly, because Dunn's test involves multiple pairwise comparisons, it increases the risk of Type I (false positive). To mitigate this, the Bonferroni correction was applied, which reduces the Type I error rate but in turn increases the risk of Type II errors (false negative). In the context of this study, the Bonferroni correction was applied because the risk of erroneously identifying a significant difference was deemed more problematic than missing a real one (Armstrong, 2014).

This section will be concluded by a notable limitation of the study. The statistical analyses are unable to take into account one of the key sustainability strategies, namely engagement & shareholder action (cf. supra p.43). This strategy involves investing in companies with the intent to influence their practices, often through voting or dialogue at shareholder meetings. According to the ERSIS report (Forum Ethibel, 2023) and the GSIA (2023), engagement ranks among the most widely adopted sustainability strategies in both the Belgian market and global investment markets. Consequently, a sustainable fund (Article 8 or 9) may invest in the same companies as a non-sustainable fund (Article 6) if its aim is to drive change from within. This

fact could artificially lower the average ESG performance of sustainable funds, as there is no possibility of identifying funds that use this strategy. Given the popularity of this strategy in the market, it has a real impact on the results. To address this, data providers should be encouraged to collect and disclose information about the sustainability strategies employed by Articles 8 and 9 funds. This would allow conducting statistical analyses on the non-financial performance of funds based on their sustainability strategies. Specifically for engagement strategies, it would also be possible to assess the actual effectiveness of fund managers in engaging with companies by tracking the changes on the ESG indicators over time to determine whether their engagement with the investee companies has led to any improvements.

## Conclusion

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Sustainable investment has emerged as an indispensable tool for achieving the European Green Deal's ambitious objectives, most notably climate neutrality by 2050 and a 55% reduction in greenhouse gas emissions by 2030. Yet despite Europe's leadership in the sustainable finance market, the United Nations Conference on Trade and Development (2023) estimates that a considerable yearly investment gap persists, widening from \$2.5 trillion in 2015 to \$4 trillion in 2023, highlighting the urgent need to reallocate capital toward sustainability. With a global financial market valued at over \$231 trillion in 2022, even a modest reallocation of 2% of capital could close this gap entirely. Finance, therefore, cannot remain a passive observer; it must actively channel resources toward a more inclusive, low-carbon economy, aligning with its original mission to serve society.

That mission is not a modern invention. The origins of modern finance can be traced to the 16<sup>th</sup> century, when early Italian banks played a community-focused role, lending primarily to diligent and responsible individuals, discouraging loans for luxury consumption, and operating under ethical guidelines that prevented usury. Finance was fundamentally about enabling productive economic activity while upholding societal values. Over the centuries, however, the sector has undergone a profound transformation under the logic of financialization, prioritizing short-term profit maximization and shareholder value. This shift has at times undermined its broader societal role, as starkly demonstrated by the 2008 financial crisis.

In the current era of environmental degradation and growing social inequality, sustainable finance offers both an opportunity and a challenge. The opportunity lies in reorienting capital flows toward activities that mitigate climate change, protect biodiversity, and promote social inclusion. The challenge lies in ensuring that sustainable finance remains aligned with its core mission, rather than becoming another niche investment trend stripped of genuine transformative power. As scholars such as Chiu, Lin, and Rouch (2022) have asked: is sustainable finance truly a vehicle for solving environmental and social issues, or simply another investment opportunity?

Yet sustainable finance also faces a growing threat from greenwashing, where sustainability claims are exaggerated or unsubstantiated. Greenwashing undermines investor trust (green skepticism), misdirects capital away from genuinely sustainable companies, and damages the credibility of the sector. To counteract it, regulation plays a key role, most prominently through the EU's SFDR, CSRD, and EU Taxonomy, which together aim to standardize and harmonize

sustainability disclosures. These frameworks have greatly improved transparency and comparability, but they also reveal an imbalance: environmental objectives receive more regulatory focus than social or governance concerns, partly due to their measurability and strong scientific foundation. The ongoing development of a social taxonomy is a necessary step toward correcting this imbalance and ensuring a just transition.

At the same time, excessive regulatory burdens can trigger greenbleaching, where asset managers deliberately understate sustainability features to avoid additional compliance requirements. In the context of this thesis, greenbleaching could blur distinctions between SFDR fund categories, potentially influencing the observed results, though its effect here is likely moderate. This dual risk of too little regulation (greenwashing) and too much regulation (greenbleaching) underscores the need for a carefully calibrated policy framework.

The core of this thesis lies in its empirical analysis of the extra-financial performance of investment funds, classified under the SFDR as traditional funds (Article 6), Socially Responsible Investment funds (Article 8) and impact funds (Article 9). Using a dual materiality framework, assessing both financially material ESG risks and impact materiality through actual environmental, social and governance outcomes, the study examined ten ESG indicators across three levels of granularity, from aggregate ratings to specific metrics.

At the aggregate level, impact funds consistently outperformed SRI and traditional funds on the Morningstar Sustainability Rating™ and on social and governance risk scores. The statistical differences were strongest between traditional and impact funds, with SRI funds positioned in between. These results support the hypothesis that greater integration of sustainability considerations correlates with stronger ESG performance.

Breaking down the results by ESG pillar revealed a more nuanced picture. Both social and governance pillars mirrored the global ESG pattern, with significant performance gaps between traditional and impact funds, and smaller but still significant gaps between traditional and SRI funds. The environmental pillar, however, showed fewer significant differences. Here, SRI funds performed significantly better than traditional funds in terms of environmental risk exposure, but impact funds did not outperform SRI funds, suggesting that many impact funds prioritize social rather than environmental objectives or that environmental performance has improved broadly across all fund types due to regulatory and market pressures.

Looking at specific environmental metrics, the results diverged from certain prior studies. While Popescu & al. (2023) found no significant differences in Weighted Average Carbon Intensity (WACI) between sustainable and traditional funds, this thesis identified significantly lower GHG intensity (Scope 1, 2 & 3 emissions per unit revenue) in SRI funds compared to traditional funds. However, no difference emerged between SRI and impact funds, nor between impact and traditional funds, suggesting that intensity-based metrics may be less sensitive to differences in fund strategy than absolute emissions measures like Relative Carbon Footprint (RCF).

Social indicators produced mixed results. The gender pay gap remained high across all categories, with no significant differences, with women earning on average 15% less than men across all fund categories. Female representation on boards was significantly higher in both SRI and impact funds compared to traditional funds but differences between SRI and impact funds were negligible, pointing to a possible plateau effect in diversity improvements. Despite the comparatively better performance of SRI and impact funds, the descriptive statistics highlight that women continue to be substantially underrepresented across all fund types, with

an average board representation situated around 30%. This finding underscores the persistent need for further efforts to achieve greater gender balance in corporate leadership.

Governance indicators displayed some of the clearest distinctions: exposure to companies violating UN Global Compact or OECD principles was significantly lower for impact funds than for traditional funds, with SRI funds again in between. While median exposure was zero across all categories, reflecting widespread avoidance of such companies, the relative differences were still meaningful. Governance compliance scores were also significantly higher for impact funds, underscoring the link between higher sustainability ambition and stronger governance oversight.

Overall, the results for financial materiality indicators were more frequently significant than for impact materiality indicators. This suggests that, while sustainability integration is effective in reducing financially material ESG risks, it may be applied more as a risk management strategy than as a means of generating measurable positive environmental or social outcomes.

The analysis of six controversy-related indicators, derived from the Morningstar database provided a different approach to the non-financial performance of the fund. As previous ESG metrics regarding impact materiality, controversy-related metrics revealed fewer significant differences. The findings reveal a clear and progressive pattern: as the severity of controversies increases, the differences in exposure between fund categories become more pronounced, with impact funds consistently exhibiting the lowest exposure.

At the lowest controversy levels (“No Controversies” and “Low Controversies”), impact funds allocate a substantially greater share of their AUM to companies with minimal controversy risk compared to both Socially Responsible Investment (SRI) funds and traditional funds. In contrast, no statistically significant differences were observed between traditional and SRI funds at these levels, indicating similar allocation patterns despite their differing sustainability positioning. This suggests that, at lower controversy severities, SRI funds may not apply significantly stricter exclusion or screening practices than traditional funds.

At the intermediate “Moderate Controversies” level, all differences between fund categories disappear, as confirmed by the Kruskal-Wallis test. This represents a turning point in the trend identified in lower controversy categories. Moderate controversies, which have a limited financial materiality but some societal and environmental implications, account for the largest share of assets in all three fund types, exceeding one-third of their portfolios.

When controversy severity becomes “Significant,” the earlier pattern reverses. Impact funds now allocate a statistically smaller proportion of AUM to such companies than both traditional and SRI funds, marking the first clear instance where higher sustainability ambition results in materially lower exposure. However, traditional and SRI funds still do not differ significantly from each other at this level, raising questions over the robustness and credibility of the screening methodologies applied by Article 8 funds and pointing to potential greenwashing risks.

For the highest severity categories (“High” and “Severe” Controversies), differences between all three fund categories become statistically significant. Impact funds maintain the lowest exposure, followed by SRI funds, with traditional funds holding the largest share of AUM in highly controversial companies. In the “High Controversies” category, nearly half of the impact funds in the sample have zero exposure, compared with much higher proportions in SRI and traditional funds. For “Severe Controversies,” the average exposure across all groups is extremely low, with median values of 0%, but the relative differences remain: 93,55% of impact funds, 79,77% of SRI funds and 54,46% of traditional funds hold no exposure at all. Notably,

for these most severe controversies, SRI funds' allocation patterns move closer to those of impact funds and diverge significantly from traditional funds, suggesting that stricter sustainability integration is most evident where the reputational and societal stakes are highest.

Overall, impact funds are the category that most clearly differentiates itself from the others, consistently allocating more to companies with no or low controversy risk and less to those with high or severe controversy ratings. Traditional and SRI funds, by contrast, show broadly similar exposure patterns at low and moderate controversy levels, diverging only when controversies become severe. This reinforces the finding that sustainability strategies in SRI funds may only achieve their strongest differentiation where controversy risks are most visible and material. These results demonstrate that higher sustainability integration not only reduces exposure to reputational and operational risks but can also mitigate adverse environmental and social impacts.

When considering the results of all 16 statistical analyses collectively, no evidence clearly indicates the presence of greenwashing. In every significant comparison involving traditional funds, these consistently emerged as the weakest performers, whereas in every significant comparison involving impact funds, they ranked as the strongest performers. SRI funds consistently outperformed traditional funds, while impact funds generally outperformed both. No unexpected or anomalous results were observed. Overall, the findings from both the ESG and controversy-related analyses suggest that a higher degree of sustainability integration not only reduces financial materiality but also contributes to mitigating adverse environmental and social impacts.

A key limitation of this study lies in the inability of statistical analyses to account for one of the most prevalent sustainability strategies in the market: engagement and shareholder action. As underscored by Forum Ethibel (2023) and the GSIA (2023), engagement is widely employed by sustainable funds as a means of influencing corporate behavior from inside. Consequently, an Article 8 or Article 9 fund may hold the same companies as an Article 6 fund, yet with the explicit objective of enhancing their ESG practices over time. In the absence of data identifying which funds actively pursue this strategy, the analysis may underestimate the true non-financial performance of sustainable funds, thereby artificially narrowing the observed gap with traditional funds. Given the widespread adoption of engagement as a sustainability approach, this limitation is likely to have a non-negligible impact on the results.

To address this limitation, it would be beneficial for data providers to systematically collect and disclose detailed information on the sustainability strategies employed by investment funds. Such transparency would enable future research to evaluate the effectiveness of engagement by monitoring changes in ESG indicators over time. Additionally, replicating the same statistical analyses on an identical set of funds at regular intervals would allow for the longitudinal tracking of both ESG performance and changes in SFDR classification. Examining funds that have undergone reclassification, whether upgrades or downgrades, could help determine whether such reclassifications are linked to particularly high or low ESG performance, thereby providing evidence to justify or question the reclassification.

This thesis presents five key contributions to the literature. First, it addresses an existing research gap by examining the non-financial performance of sustainable funds, an area that has received considerably less academic attention than their financial returns. Second, it contributes to the limited body of literature exploring the relationship between the integration of sustainability considerations and extra-financial outcomes. Third, by comparing results across multiple levels of ESG analysis and different approaches, it identifies specific areas of

strength and weakness for both Socially Responsible Investment (SRI) and impact funds in comparison to conventional funds. Fourth, through the use of the SFDR classification as an independent variable, it offers insights into the regulation's effectiveness in mitigating risks of greenwashing and greenbleaching. Finally, it provides a comprehensive overview of the data, indicators, and metrics currently available on the market for evaluating fund performance in relation to ESG factors.

The transition to a sustainable economy will not succeed without adequate financing. Financial institutions, by their role of intermediation, control vast resources and have the ability to influence corporate behavior and economic priorities. But to realize their potential, they must realign with their primary purpose of serving the public interest, embrace transparent and credible sustainability practices and commit to measurable impact. Regulation must support this transformation with a careful balance and devote more attention to social and governance-related factors for an inclusive transition.

Sustainable finance, if implemented with authenticity and accountability, can be a powerful leverage in addressing the current environmental and societal challenges. This thesis shows that higher sustainability ambition in investment funds tend to correlate with stronger ESG performance, but also reveals the limitations of current practices, limitations that must be addressed if finance is to play its full role in achieving the European Green Deal and the broader Sustainable Development Goals.

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*I would like to dedicate the final words of this thesis to Joshua Yomedan.*

*You were part of my first work at ICHEC, and you will also be part of my last.*

*May you rest in peace.*