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**Sustainability Risk Disclosure Across the ESRS Framework: An Empirical Analysis of  
Companies in the Dow Jones Sustainability Index Europe**

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## **Abstract**

Sustainability risks have gained prominence in corporate decision-making and disclosure, especially following the introduction of the European Sustainability Reporting Standards (ESRS). Despite this, prior research identifies persistent inconsistencies between sustainability reporting and corporate risk management, prompting questions regarding the identification and disclosure of sustainability-related risks by companies. The present study investigates sustainability risk disclosure using the ESRS framework within the sustainability statements of companies listed in the Dow Jones Sustainability Index (DJSI) Europe.

A quantitative content analysis was conducted on sustainability statements published in 2025 for the 2024 fiscal year. The final sample comprises 46 EU-based DJSI Europe companies that report sustainability information in accordance with the ESRS framework. Sustainability-related risks and negative impacts were manually extracted from Impacts, Risks, and Opportunities (IRO) tables and categorized by ESRS environmental (E1–E5), social (S1–S4), and governance (G1) topics. In total, 538 sustainability-related risks were identified and analyzed using descriptive statistical methods.

The evidence suggests that sustainability risk disclosure is widespread among the companies analyzed, with environmental risks—especially climate-related transition and physical risks—being the most frequently reported. In contrast, risks related to biodiversity, pollution, water resources, and value-chain social issues are disclosed less frequently. Overall, the results suggest that negative impacts and risks directly linked to companies’ operations are reported more consistently than those associated with wider environmental systems or value chains.

The analysis also reveals variations in disclosure patterns across sectors and industries, particularly in the social dimension. By mapping sustainability risk disclosures across ESRS

topics, this study provides an empirical overview of current reporting practices and highlights the sustainability issues that companies identify and disclose as risks within the ESRS framework, offering an initial perspective on sustainability risk management in organizations.

## Abstract

I rischi di sostenibilità hanno acquisito crescente rilevanza nei processi decisionali e nelle pratiche di disclosure delle imprese, soprattutto a seguito dell'introduzione degli European Sustainability Reporting Standards (ESRS). Nonostante ciò, la letteratura precedente evidenzia persistenti incoerenze tra la rendicontazione di sostenibilità e i sistemi di gestione del rischio aziendale, sollevando interrogativi su come le imprese identificano e divulgano i rischi legati alla sostenibilità. Il presente studio analizza la disclosure dei rischi di sostenibilità utilizzando il framework ESRS all'interno delle dichiarazioni di sostenibilità delle imprese incluse nel Dow Jones Sustainability Index (DJSI) Europe.

È stata condotta un'analisi quantitativa di contenuto sulle dichiarazioni di sostenibilità pubblicate nel 2025 relative all'esercizio finanziario 2024. Il campione finale comprende 46 imprese con sede nell'Unione Europea appartenenti al DJSI Europe che rendicontano le informazioni di sostenibilità in conformità con il framework ESRS. I rischi legati alla sostenibilità sono stati estratti manualmente dalle tabelle Impacts, Risks and Opportunities (IRO) e classificati secondo i temi ESRS ambientali (E1–E5), sociali (S1–S4) e di governance (G1). Complessivamente, sono stati identificati 538 rischi di sostenibilità, successivamente analizzati mediante metodi statistici descrittivi.

I risultati suggeriscono che la disclosure dei rischi di sostenibilità è ampiamente diffusa tra le imprese analizzate, con i rischi ambientali—in particolare quelli climatici di transizione e fisici—che risultano i più frequentemente riportati. Al contrario, i rischi relativi alla biodiversità, all'inquinamento, alle risorse idriche e alle questioni sociali lungo la catena del valore sono divulgati con minore frequenza. Nel complesso, i risultati indicano che i rischi direttamente

collegati alle operazioni aziendali sono riportati con maggiore coerenza rispetto a quelli associati a sistemi ambientali più ampi o alla catena del valore. L'analisi evidenzia inoltre variazioni nei modelli di disclosure tra settori e industrie, in particolare nella dimensione sociale.

Mappando la disclosure dei rischi di sostenibilità attraverso i temi ESRS, questo studio fornisce una panoramica empirica delle pratiche di rendicontazione attuali e mette in evidenza le questioni di sostenibilità che le imprese identificano e divulgano come rischi nell'ambito del framework ESRS.

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## **Chapter 1: Introduction**

### **1.1. Background**

As companies face increasing exposure to ESG-related threats, sustainability risks have become more prominent. These risks have the potential to undermine both long-term sustainability and financial performance. High-profile events such as the BP Deepwater Horizon oil spill, the collapse of Rana Plaza, the Wells Fargo account scandal, and the Volkswagen emissions scandal illustrate how ESG-related issues can escalate into significant financial and reputational crises (COSO, 2018). In parallel, global risk assessments highlight the growing relevance of environmental risks. The Global Risks Report 2025 identifies extreme weather events as the most critical risk, while biodiversity loss, ecosystem degradation, and resource depletion are expected to intensify over the coming decade (World Economic Forum, 2025).

Because firms are embedded in and dependent on environmental, social, and economic systems, their activities rely on resources such as ecosystems, institutions, and human capital and can generate both positive and negative impacts (Laine, Tregidga, and Unerman, 2021). The concept of ESG criteria emerged as a framework through which firms address environmental problems, engage with various stakeholders, and develop governance structures geared toward sustainable value creation and accountability (Sekol, 2024; Boothroyd and Thompson, 2024). This growing emphasis on ESG criteria in firms indicates a broader shift toward a concept of sustainability in the business environment in accordance with the World Commission on Environment and Development definition of sustainable development: "the ability to meet present needs without compromising the ability of future generations to meet their own needs" (Boothroyd & Thompson, 2024, p. 324). Sustainable business practices refer to business operations that aim to

protect the environment, society, and the broader community in which a firm operates.

Sustainable business operations integrate social, economic, and environmental factors in business decisions (Harvard Business School, 2018). The concept of the triple bottom line expanded the assessment of business performance beyond financial factors to include social and environmental factors. Elkington first presented the concept of the triple bottom line, highlighting the need to balance economic success with social and environmental factors in three areas: people, planet, and profit (Boothroyd and Thompson, 2024).

Thus, with the growing popularity and adoption of ESG frameworks, there has been a push from investors, regulators, and other relevant stakeholders on companies to report on their environmental and social performance. Hence, sustainability reporting has become an approach towards evaluating, monitoring, and reporting information on the environmental, social, and economic consequences and impacts of an organization's operations, going beyond the traditional financial reporting (Laine, Tregidga, and Unerman, 2021). Global Reporting Initiative (GRI) is one of the prominent sustainability reporting frameworks that guides companies on how they can report on their most significant environmental, social, and economic impacts, referred to as material topics (GRI, 2021).

Sustainability reporting has evolved from reporting on impact materiality to double materiality, which considers not only the implications on society and the environment due to an organization's operations, but the implications on an organization's financial performance due to environmental and societal issues (see figure 1). In this case, sustainability-related financial materiality is defined as environmental, social, or governance factors that could have a negative effect on an organization's finances, performance, cash flows, access to finance, or cost of capital (EFRAG, 2025).

The Non-Financial Reporting Directive (NFRD), adopted in 2014, represented an initial regulatory initiative within the European Union, mandating that large corporations disclose information related to ESG factors. This included details about their business models, policies, due diligence procedures, associated risks, and key performance indicators. However, the flexibility permitted within reporting frameworks complicated the ability to compare and trust disclosures, and it also hindered the application of double materiality (European Parliamentary Research Service, 2021).

Increasing focus has also been directed at sustainability risk management and disclosure. Under this umbrella, the Task Force on Climate-related Financial Disclosures (TCFD) provided recommendations in 2017 aimed at improving the transparency of financial risks and opportunities related to climate change and supporting the integration of climate change considerations in governance, strategy, and risk management processes (TCFD, 2017). On the other hand, the Sustainability Accounting Standards Board (SASB) set industry-specific benchmarks in 2018 aimed at helping organizations communicate material sustainability risks and opportunities. Afterward, the International Sustainability Standards Board (ISSB) proposed new global standards aimed at helping organizations disclose sustainability-related risks and opportunities affecting financial position, performance, and cash flows, including those related to climate change in accordance with the TCFD framework (IFRS, n.d.).

In response to the growing attention to sustainability risks, COSO, a leading institution providing recommendations for the implementation of Enterprise Risk Management (ERM), introduced a framework designed to support the integration of ESG considerations into organizational ERM systems. This framework emphasizes the incorporation of ESG factors into governance structures, corporate strategy, risk assessment, and reporting processes. (COSO, 2018).

The Corporate Sustainability Reporting Directive (CSRD), which became applicable in January 2023, replaces and extends the scope of the previous Non-Financial Reporting Directive by incorporating enhanced, comprehensive, standardized, and auditable reporting requirements for sustainability disclosures (IBM, n.d.). The European Commission adopted the European Sustainability Reporting Standards (ESRS) on 31st July 2023, thereby establishing common disclosure requirements for entities covered by the CSRD. The ESRS are designed to facilitate increased transparency and consistency in sustainability reporting for a wide range of ESG topics while also ensuring global consistency with international reporting initiatives to prevent duplication of sustainability disclosures (European Commission, 2023).

The ESRS framework is the current standard for systematically disclosing sustainability information in ESG areas. The first set of ESRS has 12 standards: two general standards (ESRS 1 and ESRS 2) and ten specific standards. ESRS 1 introduces the foundational principles, including the application of double materiality while ESRS 2 sets out what information needs to be made public about governance, strategy, impact, risk, and opportunity management, as well as metrics and targets (European Commission, 2023; EY, 2023). The topical standards encompass a range of environmental concerns (E1 Climate Change, E2 Pollution, E3 Water and Marine Resources, E4 Biodiversity and Ecosystems, E5 Resource Use and Circular Economy), social considerations (S1 Own Workforce, S2 Workers in the Value Chain, S3 Affected Communities, S4 Consumers and End-Users), and governance matters (G1 Business Conduct) (KPMG, 2024).



Figure 1. Evolution of Sustainability Reporting - From Impact to Risk, developed by the author

## 1.2. Research Gap

Lajili and Zéghal (2005), through a content analysis of Canadian annual reports, find that although companies disclose a substantial amount of risk-related information, these disclosures often lack consistency, clarity, and quantitative detail, limiting their usefulness for stakeholder risk assessment; they also suggest that future research could develop a risk management disclosure index using word and sentence coding to measure the volume of disclosure across different risk categories.

Linsley and Shrives (2006) examine risk disclosures in the annual reports of FTSE 100 non-financial companies. They find that disclosures are largely qualitative, general, and dispersed throughout reports. This provides limited decision-useful information for stakeholders. Their findings also indicate that the volume of risk disclosure is positively associated with firm size, but largely unrelated to most measures of firm risk. More broadly, the authors note that earlier disclosure research paid relatively little attention to risk disclosure specifically. They call

for further studies to better understand how risks are defined, measured, and communicated in corporate reporting.

Leopizzi et al. (2019) analyse nonfinancial risk disclosures among Italian public interest entities following the introduction of the EU Non-Financial Reporting Directive (NFRD) and find that, although the regulation increased the amount of disclosed information, the disclosures remain largely oriented toward past or present events and tend to emphasize neutral or positive aspects, suggesting a predominantly rhetorical rather than substantive approach to risk reporting.

Similarly, Ibrahim and Hussainey (2019) investigate corporate risk disclosure using a keyword-based content analysis approach and develop a refined methodology to measure risk disclosures in annual reports, highlighting the importance of narrative disclosure measurement in understanding corporate risk communication.

A systematic review by Ibrahim et al. (2023) highlights that empirical evidence on the quality, effectiveness, and regulatory compliance of risk disclosure remains fragmented and limited, particularly in the financial sector, and calls for further research examining the determinants, consequences, and regulatory effectiveness of risk disclosure practices.

Ilhan et al. (2023) show that institutional investors actively demand improved climate risk disclosures from firms, suggesting that transparent disclosure of sustainability-related risks is increasingly relevant for capital market participants. Similarly, studies such as Dumay and Hossain (2018) find that while firms may formally comply with governance recommendations related to sustainability risk reporting, the substantive quality of such disclosures often remains limited, raising concerns about the effectiveness of voluntary reporting frameworks such as the Global Reporting Initiative (GRI).

Broniewicz, Jastrzębska, and Lulewicz-Sas (2024) find that banks' environmental disclosures remain limited and fragmented despite the introduction of ESRS guidelines. Similarly, Paoloni, Modaffari, and Piedepalumbo (2025) show that only a small proportion of SMEs currently provide disclosures aligned with ESRS and that climate-related reporting remains incomplete, particularly with respect to the financial impact assessments required by the double materiality principle.

Lindgren et al. (2025) examine how Norwegian companies approach the measurement of environmental indicators under the ESRS framework using a mixed methods design, focusing on materiality, experience, and expected challenges. Their findings show that, although companies are beginning to adapt to CSRD requirements, significant challenges remain in terms of measurement, data quality, and organizational experience, highlighting the need for early preparation, stronger value chain collaboration, and targeted guidance rather than simplification.

Bunzel & Friedemann, 2025 examine how early CSRD adopters address circular economy reporting under ESRS E5, showing that while awareness is increasing, significant challenges remain in achieving clear, measurable, and standardized disclosures, highlighting the need for improved guidance, comparability, and sector-specific support. Similarly, Hadro et al. (2025) aimed to evaluate the alignment of circular economy disclosures in the European automotive sector with CSRD and ESRS E5 requirements, finding that current disclosures partially meet regulatory expectations but reveal significant reporting gaps. The study is limited to the listed European automotive firms and the 2021–2023 reporting period, which constrains generalizability and may exclude recent developments. The authors suggest future research should adopt longitudinal designs and extend the analysis to other high-impact industries.

Schneider et al. (2025) aim to assess the extent to which companies in Germany's mechanical and plant engineering sector align their sustainability reporting with ESRS requirements, particularly regarding environmental disclosures. The study identifies a gap in sector-specific analyses of sustainability reporting and benchmarking of key performance indicators across industrial contexts. It suggests that future research should expand to other sectors, examine how reporting practices relate to firm characteristics, and adopt longitudinal approaches to evaluate how disclosure evolves over time and influences the management of sustainability risks.

Overall, prior research has mostly examined corporate risk disclosure in general, particularly within traditional financial reporting contexts. However, research specifically addressing sustainability-related risk disclosure remains relatively limited. When sustainability risk disclosure is examined, existing studies tend to focus primarily on environmental risks, while other sustainability dimensions receive comparatively less attention. Moreover, empirical research on sustainability risk disclosure under the European Sustainability Reporting Standards (ESRS) framework remains limited, largely because these standards were introduced only recently.

Furthermore, the limited studies that address ESRS-related reporting generally adopt a broad perspective on sustainability disclosures, rather than specifically analysing risk disclosure within the framework. As a result, there is still limited visibility into the extent to which companies identify and disclose sustainability-related risks within the corporate sustainability disclosure requirements established under the CSRD and implemented through the ESRS framework in the European context.

### **1.3. Problem Statement**

Despite the advancement in the field of sustainability reporting, the link to proper risk management is still a concern. COSO (2018) highlights that the most important risk management and disclosure processes within an enterprise generally do not adequately include sustainability risks. Moreover, the World Business Council for Sustainable Development (WBCSD), a global organization representing over 200 companies committed to advancing sustainable business practices, conducted a study in 2017 covering 170 member companies at that time. The study identified a significant gap between sustainability reporting and corporate risk reporting. The findings revealed that only 29% of the sustainability issues disclosed by companies were reflected in their formal risk reporting, while 71% of disclosed sustainability issues were not communicated to investors as risks (WBCSD, 2017).

According to WBCSD (2017), this is because the processes of corporate risk management and sustainability reporting tend to be conducted differently. Corporate risk management tends to focus on the identification of risks that might occur within the next few months or within the next year or two. On the other hand, the focus of sustainability reporting is on the identification of risks that might occur within the next ten or fifteen years, including climate change and the degradation of ecosystems. Additionally, the assessment of sustainability risk is more complex compared to the assessment of financial risk due to the lack of historical data on the subject, and the presence of more uncertainty and the intricate relationships between the variables and lack of tools to properly translate those risks into financial impacts (Laine, Tregidga, & Unerman, 2021; WBCSD, 2017). WBCSD (2017) suggests that there could also be challenges in integrating the risk management and sustainability reporting processes due to the fact that the task of handling sustainability issues is divided among different departments of the company.

Having said that, the ESRS is the newest framework that provides guidance for the disclosure of sustainability risk in different dimensions of ESG. However, due to the lack of empirical data on these new standards, the extent to which companies are disclosing sustainability-related risks across ESG topics is uncertain.

#### **1.4. Research Objective**

The objective of this thesis is to explore how companies listed on the Dow Jones Sustainability Index Europe address sustainability risks in their sustainability reports, with particular emphasis on the various ESRS areas and topics. It aims at shedding light on which risks companies perceive as material across various sustainability aspects covered by the ESRS framework: environmental (E1-E5), social (S1-S4), and governance (G1), and achieve a deeper understanding of the trends and levels of the disclosures.

To reach these goals, this study is built around the following main research question:

- ***What are the main trends in sustainability risk disclosure under ESRS among companies listed in the Dow Jones Sustainability Index Europe?***

The research findings may provide insights for investors by enabling a better understanding of the extent to which sustainability statements cover sustainability-related risk identification. The findings provide insights that could be useful for informing policymakers to improve sustainability risk identification and disclosure practices by means of further guidelines. Finally, this research provides scholars with a practical setting that could be useful for informing further research into methods of risk identification as well as incorporating sustainability-related risks into organizational management practices.

This research is not intended to assess whether disclosed risks are adequate or fully aligned with sustainability-related risks that organizations are expected to face. The research is exploratory and descriptive in nature as it observes the current sustainability-related risk disclosure patterns according to ESRS topics without making any value judgments.

## **1.5. Thesis Structure**

This thesis is structured into six chapters, each designed to progressively develop the research and provide a comprehensive understanding of sustainability risk disclosure within the context of the European Sustainability Reporting Standards (ESRS).

Chapter 1 introduces the research topic by outlining the background, identifying the existing research gap, and presenting the problem statement. It further defines the research objectives and provides an overview of the thesis structure.

Chapter 2 presents the literature review, establishing the theoretical and conceptual foundations of the study. It discusses key frameworks such as shareholder theory, stakeholder theory, and corporate social responsibility, followed by an exploration of ESG and sustainability concepts. The chapter also examines financial and sustainability risks, introduces Sustainability Enterprise Risk Management (SERM), and reviews major sustainability reporting frameworks, including GRI, NFRD, TCFD, IFRS, CSRD, and ESRS. Finally, it analyzes existing empirical literature on corporate risk and ESRS disclosure.

Chapter 3 outlines the research methodology adopted in this study. It describes the research design, sample selection and characteristics, data collection process, and coding procedures. It

also explains the analytical methods used to examine the data and discusses the limitations of the research.

Chapter 4 presents the empirical analysis and results. It investigates risk disclosure across ESG dimensions, explores variations by country and industry, and evaluates the alignment between reported risks and negative impacts under ERSR topics.

Chapter 5 discusses the main findings of the study by interpreting the results in light of the existing literature. It highlights key patterns, including the predominance of environmental risk disclosure, variations across geographical and sectoral contexts, and the level of alignment between risk and impact disclosure.

Chapter 6 concludes the thesis by summarizing the main findings and outlining their theoretical and practical implications. It also addresses the limitations of the study and suggests directions for future research.

## **Chapter 2: Literature Review**

Figure 2 presents the conceptual framework of the study, structured as a layered model that progresses from theoretical foundations to sustainability risk reporting under the ESRS framework.

At the base, the theoretical foundations—comprising shareholder theory, stakeholder theory, and corporate social responsibility—establish that firms have a responsibility to identify and manage risks to ensure long-term value creation and survival.

Building on this foundation, the next layer introduces two interconnected dimensions: company impacts and company risks. Corporate activities generate external impacts, captured through ESG and sustainability concepts, while firms are simultaneously exposed to risks, including both financial and sustainability-related risks. These dimensions are presented in parallel to reflect their interrelated nature.

The following layer represents sustainability risk management, which encompasses governance structures, strategic processes, and practices related to risk identification, management, and reporting within organizations.

This leads to corporate disclosures, where both sustainability reporting and risk reporting are integrated, reflecting the increasing importance of communicating both impacts and risks to stakeholders.

Finally, at the top of the framework, sustainability disclosure is most recently operationalized through the ESRS, which formalizes risk reporting within a standardized regulatory context and constitutes the specific object of analysis of this study.



Figure 2. Conceptual Framework of the Study, developed by the author

## 2.1. Theoretical Foundations Supporting Firm Risk Management

### 2.1.1. Shareholder Theory

One widely held perspective on corporate purpose posits that the primary objective of a corporation is to maximize shareholder value. According to Friedman (1970), the social responsibility of business is to increase its profits while operating within the rules of the market, meaning compliance with laws and ethical norms and participation in open and fair competition.

Friedman said that corporate executives work for the owners of the company and are therefore directly responsible for doing business in a way that is in the best interests of shareholders, which usually means getting the most money for the company (Mansell, 2013). Lougee and

Wallace (2008) mentions that Friedman stated that taking on corporate responsibilities beyond making money could hurt a free market system.

Pfarrer (2010) argues that Friedman's view can be summed up by the famous saying, "the business of business is business" (p. 87). This point of view argues that corporations shouldn't be responsible for social and political issues; instead, governments or voluntary groups should be. Friedman's reasoning is based on the ideas of a free market system that is based on private property and voluntary exchange. In this system, people work together willingly, and social values reflect individual preferences rather than those of groups (Mansell, 2013).

Mansell (2013) asserts that shareholder theory imposes a clear obligation on managers to operate the company in accordance with the desires of the shareholders. Because shareholders own the company, managers should use its resources in ways that are good for them. Utilizing corporate resources to pursue social objectives without obtaining shareholder consent could violate the contractual rights of those shareholders. Unless a company is established with objectives beyond profit generation, managers are typically expected to prioritize financial gain (Mansell, 2013).

Friedman emphasized the necessity of profit maximization; however, he also asserted that businesses are obligated to adhere to legal standards and the principles of fair competition (Mansell, 2013). Consequently, some socially responsible initiatives may be pursued by companies only if they enhance long-term profitability or correspond with market expectations. But from this point of view, these actions are not real social responsibility; they are instead strategic choices to make more money (Freeman et al., 2010; Moura-Leite & Padgett, 2011).

### **2.1.2. Corporate Social Responsibility**

Three ethical principles shed light on the ethical basis of corporate social responsibility (CSR), as described by David Chandler (2022): virtue ethics, deontological ethics, and consequential ethics. The former is based on character traits, whereas deontological ethics is grounded in duty and principles. Consequential ethics focus on outcomes and implications for the common good. Chandler (2022) argued that organizations need not only their own capabilities but also those from society to operate, a situation described as “license to operate” or social contract.

Moura-Leite & Padgett (2011) highlighted that Bowen asserted that corporations possess substantial power and their decisions profoundly impact society. He stated that business leaders ought to formulate decisions and policies that align with the objectives and values of society. Although not portrayed as a panacea for all corporate social challenges, CSR was regarded as a core principle directing ethical business practices. Lee (2008) subsequently emphasized Bowen's perspective, noting that Bowen regarded CSR as a means to address the social issues arising from a laissez-faire economy.

David Packard said that businesses should do more than make money; they should also help society. Companies bring people together to reach common goals and create value that goes beyond making money (Lougee & Wallace, 2008). Moura-Leite & Padgett, 2011 mentioned that Drucker stated that one of the main goals of business is to be responsible to the public. He said that managers should think about whether what their companies do is good for the public and helps keep society stable. Moura-Leite & Padgett, (2011) argued that Frederick supported this viewpoint. He argued that corporate social responsibility (CSR) consists of the social application of economic and human resources for the achievement of common social goals instead of private interests. The discussion on Corporate Social Responsibility (CSR) underwent considerable changes during the 1960s. Moura-Leite & Padgett (2011), argued that CSR goes beyond

economic and legal responsibilities. During the same timeframe, Davis (1967, as referenced in Moura-Leite & Padgett, 2011) underscored the interdependence of business and society, asserting that companies rely on the societies in which they function and cannot prosper in a declining social context.

Chandler (2022) also asserts that corporate social responsibility enables businesses to consider the needs of their stakeholders while simultaneously generating profit. Profitability is important because it is the basis for meeting other obligations. So, CSR supports economic goals by pushing companies to think about what their stakeholders want when making decisions.

Chandler (2022) also argues that CSR is a way for companies to look out for themselves because meeting the needs of stakeholders can build trust and loyalty. In this way, CSR aligns corporate activities with the expectations of stakeholders and, as suggested by Lougee and Wallace (2008), can be viewed as an investment that produces lasting value.

Moura-Leite and Padgett (2011) indicate that Drucker (1984) perceived corporate social responsibility (CSR) as a means of generating profit. PricewaterhouseCoopers survey revealed that 70% of global CEOs deemed CSR crucial to their companies' profitability (Moura-Leite & Padgett, 2011). Lougee and Wallace (2008) highlight that companies can't get the most value by ignoring the needs of stakeholders. Companies ought to consider the societal implications of their actions (Lee, 2008)

Chandler (2022) also argues about the rational side of CSR. He asserts that organizations can circumvent regulatory scrutiny, protect their reputation, and mitigate external constraints by actively engaging with the concerns of their stakeholders. In a world that is becoming more connected, stakeholders have more and more power over how businesses act. Anticipating these concerns represents a prudent and pragmatic approach to risk management. However, a major

challenge still lies in determining which of these concerns should be prioritized. Chandler (2022) argues that the profession has become far more complex with the advent of the digital age. Individuals and organizations can now easily air their concerns and mobilize public support through social media platforms. Organizations may face boycotts or increased regulatory action if they fail to address stakeholder concerns.

Organizations considered good corporate citizens may benefit from their corporate social responsibility activities in terms of brand enhancement, acquisition and retention of high-quality human resources, increased customer loyalty, and ease of regulatory compliance (Lougee & Wallace, 2008). In a broader context, corporate social responsibility acts as a tool through which organizations can understand their relationships with various stakeholders whose needs and expectations change over time (Chandler, 2022). Organizations that ignore stakeholder interests may suffer negative consequences in terms of their performance and reputation, especially if they lose support from key stakeholders such as employees. Corporate Social Responsibility (CSR) illustrates that businesses exist within larger social frameworks and require the support of various stakeholders. So, for an organization to be able to survive in the long term, it needs to find a balance between its economic goals and its social and environmental responsibilities (Chandler, 2022).

### **2.1.3. Stakeholder Theory**

Chandler (2022) stated Freeman stakeholders definition as “any group or individual who can influence or is influenced by the attainment of the organization’s goals” (pag. 65). Chandler (2022) argues that stakeholders are people or groups that are affected by the company, either on purpose or by accident, and have the power and the desire to change it. According to Pfarrer (2010), stakeholders are those who are impacted by, or can impact, the firm. This includes

customers, employees, investors, suppliers, and communities. Pfarrer (2010) further divides stakeholders into three types: capital market stakeholders, who include shareholders and financiers; product market stakeholders, who include customers, suppliers, and communities; and organizational stakeholders, who include employees. He also points out that stakeholders may be more or less important or relevant.

The idea that businesses need to balance the varied interests of stakeholders has existed long before the formal development of stakeholder theory. Frank Pierce of Standard Oil referred to managers as "a balance wheel" for owners, workers, and the public in 1945. Each of these groups has a vested interest in the industry (Chandler, 2022). In the same way, CEO Frank Abrams said in 1951 that companies are "man-made instruments of society" and work best when management balances the needs of stockholders, employees, customers, and the public (Chandler, 2022).

Pfarrer (2010) highlights the stakeholder perspective, mentioning the importance of value creation through effective engagement with a diverse array of stakeholders as opposed to a sole focus on shareholders. Freeman et al. (2010) argue that firms are able to achieve profitability through effective relationship management with key stakeholders. Lougee and Wallace (2008) additionally maintain that stakeholder theory evaluates corporate performance by considering interactions with all major constituencies, rather than concentrating solely on shareholders.

Freeman et al. (2010) argue that stakeholder theory came about as a reaction to traditional economic views by recognizing how complicated it is to create value in today's world, how hard it is to separate ethics from business decisions, and how important it is for managers to think about ethics when making decisions, especially in a global business environment. Lee (2008) argues that the difference between economic and social goals is less important from this point of view because the survival of an organization depends on the support of all stakeholders, not just

shareholders. Freeman et al. (2010) also argue that management needs to get key stakeholders to work together to reach corporate goals.

Chandler (2022) emphasizes that organizations need to continuously foresee and adjust to the evolving expectations of their stakeholders. For-profit organizations are greatly dependent on their employees and consumers because direct support from these two groups is crucial to the continuation of business operations. However, depending on the situation and the type of issues being encountered, other stakeholders such as suppliers, shareholders, government authorities, and local communities may assume critical importance. Thus, the success or continuation of business depends on how well the needs and expectations of these various stakeholder groups are met.

Stakeholder thinking has also had an effect on management tools and strategic frameworks. According to Freeman et al. (2016), MacMillan (1978) created analytical tools to help managers come up with political strategies. He said that businesses should look at more than just markets, products, and customers. They should also look at "symbionts," which are groups of people who work for the company, shareholders, employee groups and unions, competitors, and suppliers. This perspective is consistent with stakeholder theory, which views organizations as systems that depend on a variety of external entities for their survival.

Stakeholder theory is also very important for managing risk. Freeman et al. (2010) point out that it is useful for managing finances and enterprise risk management (ERM), which tries to figure out how different risk events affect each other and keep track of the organization's overall risk portfolio. The objective is to remain within the risk tolerance or appetite of stakeholders. In order to manage risk well, it is necessary to know what stakeholders want and are worried about, since

these things affect how risks are found and what levels of risk exposure are acceptable. (Freeman et al., 2010).

## **2.2. External Impacts of Corporate Activities**

### **2.2.1. ESG**

Sekol (2024) defines ESG as "The material Environmental, Social, and Governance risks that affect a company and opportunities that drive towards long-term value and sustainable growth" (pag. 2). Boothroyd and Thompson (2024) define ESG as a framework for evaluating how organizations impact the environment and society, building on the principles introduced by the Brundtland Commission in the 1980s, while emphasizing governance as the set of mechanisms that ensure accountability and enable positive transformation. Sekol (2024) states that the ESG framework comprises three interconnected components: environmental factors influencing business operations, such as climate change and transition risks; social factors reflecting stakeholder expectations, including diversity, human rights, and talent management; and governance structures that assist corporate leaders in their decision-making processes. These mechanisms are board governance, ethical standards, accountability, and the suppression of corruption. Environmental, Social, and Governance factors have their roots in older forms of values-based investing, which was born in the eighteenth century when religious groups refused to invest in practices that were deemed unethical, such as slavery (Sekol, 2024). This concept later developed into socially responsible investing, which gained prominence in the twentieth century. From the 1960s to the early 1990s, activist investors and groups led divestment campaigns against companies that were linked to the Vietnam War (Sekol, 2024) and the apartheid regime in South Africa (Sekol, 2024).

Sekol (2024) notes that the wider development of ESG is intricately linked to the evolution of corporate social responsibility. CSR was first officially introduced in 1953. In its 1971 report titled "Social Responsibilities of Business Corporations," the U.S. Committee for Economic Development noted a growing expectation among the public for businesses to take greater responsibility for social and environmental concerns. In the 1980s and 1990s, globalization heightened concerns regarding its impact on the environment and society. Consequently, governments began to implement stricter regulations and emphasize corporate social responsibility (CSR) as well as the management of reputational risk (Sekol, 2024).

In the early 2000s, international efforts like the United Nations Global Compact, which encourages businesses to commit to protecting human rights, labor standards, the environment, and fighting corruption, helped make sustainability more a part of business and finance (Sekol, 2024). These efforts made CSR reporting more common and changed the focus of businesses and investors to include environmental, social, and governance factors in their management and investment decisions. The "Who Cares Wins" report mentions this change, highlighting that ESG is the inclusion of these factors in asset management and investment analysis (Pollman, 2024). The United Nations Sustainable Development Goals, which were introduced in 2015, made this change even stronger (Sekol, 2024). The United Nations Environment Programme Finance Initiative (UNEP FI) played a pivotal role in formalizing ESG by engaging banks and various financial institutions in addressing sustainability-related challenges (Sekol, 2024). UNEP FI told investors and companies to focus on material sustainability issues, long-term value creation, and responsible capital allocation instead of just using exclusionary investment screens like avoiding tobacco or weapons makers.

The UNEP Finance Initiative examined over 50 brokerage firms across various industries to assess the significance of sustainability within financial markets. There was a lot of agreement that social and environmental factors can have a big effect on long-term shareholder value (Sekol, 2024). Sekol (2024) argues that ESG considerations are increasingly important in evaluating firms, as they affect capital allocation, reveal significant risks and opportunities that impact long-term value creation, and provide boards and executives with a different perspective for identifying emerging issues and strategically responding to rising stakeholder expectations.

### **2.2.2. Sustainability**

Boothroyd and Thompson (2024) characterize sustainability as the lasting balance and improvement of human welfare, environmental health, and economic prosperity whenever feasible. Similarly, Boothroyd & Thompson (2024) discuss how sustainability integrates natural systems with human behaviors, emphasizing continuity, distinctiveness, and the creation of place. Laine, Tregidga, and Unerman (2021) define sustainability as the ability of the natural environment, society, and economy to last over time. This is in line with this view. They stress that these systems are connected and can last, support themselves, and keep working over time.

The World Commission on Environment and Development defines sustainable development as “the ability to meet present needs without compromising the ability of future generations to meet their own needs” (Boothroyd & Thompson, 2024, p. 324). According to the Commission, there are three pillars that are interconnected in sustainable development: the pursuit of environmental sustainability by protecting biodiversity, air and water quality, and live within ecological limits; Social sustainability is all about fairness, getting people involved, giving them power, and preserving culture; and economic sustainability revolves around the judicious use of resources,

engaging in productive activities, and fulfilling fundamental human needs. The commission emphasized two critical aspects: prioritizing the most pressing needs, particularly for the world's most disadvantaged populations, and recognizing that social and technological constraints hinder the environment's ability to satisfy both present and future demands (Laine, Tregidga & Unerman, 2021).

The United Nations established the Sustainable Development Goals (SDGs) in 2015, further advancing this worldwide initiative for sustainability. By 2030, this global framework has the goal to end poverty, protect the planet, and encourage peace and prosperity (United Nations Development Programme, n.d.). The 17 SDGs are all connected and work together to help each other, as advancements in one area of sustainability can impact outcomes in other dimensions. The United Nations (n.d.) states that these goals contribute to economic growth while simultaneously safeguarding the environment, stressing that ending poverty must go hand in hand with economic growth, social inclusion, and environmental protection, which includes action on climate change.

Sustainability is becoming more important for businesses when they make decisions because they depend on and affect environmental, social, and economic systems. They rely on natural and societal resources and have effects that stakeholders are paying more attention to, and these dependencies and effects vary by industry and situation (Laine, Tregidga, & Unerman, 2021). In business, sustainability usually means corporate strategies that try to lessen negative effects on the environment and society, with ESG metrics often used to measure these strategies (IBM, n.d.). In the same way, sustainable business practices include making decisions that take into account environmental, social, and economic factors so that they don't hurt the environment, communities, or society, ensuring that economic gains in the short term do not lead to long-term

risks (Harvard Business School, 2018). Elkington's idea of the triple bottom line, based on the sustainability concept, is more comprehensive and includes social and environmental factors. Boothroyd and Thompson (2024) argued that the triple bottom line transcends financial factors because it considers the impact on the environment and society as well as financial performance (Boothroyd & Thompson, 2024).

### **2.3. Financial Risks and Implications for Firms**

Aven (2010) presents risk as a multidimensional concept encompassing the likelihood and severity of adverse outcomes, the relationship between event probabilities and their consequences, and the uncertainty surrounding actions and events, particularly in relation to their potential impact on what individuals or society value, further synthesizing these perspectives by framing risk as the effect of uncertainty on the achievement of objectives.

Boothroyd and Thompson (2024, p. 8) present several definitions of risk from different sources: COSO defines risk as the effect of uncertainty on objectives, which may represent positive or negative deviations; the Institute of Risk Management describes risk as the possibility that an event will occur and affect the achievement of objectives, with outcomes that may be either beneficial or adverse; the Institute of Internal Auditors defines risk as the combination of the probability of an event and its consequences; and HM Government (The Orange Book) characterizes risk as the uncertainty of events that may influence the achievement of objectives, typically assessed in terms of likelihood and impact.

These various definitions illustrate that risk is intricately linked to uncertainty when examined from a conceptual perspective. When there are many possible outcomes, it is the chance that an event will happen. This shows the difference between what was expected and what actually

happened, as well as the risk of bad outcomes (Dayal, 2022). Schneiderbauer and Ehrlich (2004) define risk as the probability of adverse effects or expected losses arising from a threat that affects vulnerable components within a given period. Risk usually means the chance of bad effects and the losses they cause in engineering and economics (Schneiderbauer & Ehrlich, 2004). Management literature, conversely, perceives risk as the uncertainty surrounding the achievement of business objectives (Schneiderbauer & Ehrlich, 2004). Earlier research has similarly characterized risk as the potential for harm or loss (Eastman et al., 1997; Burby, 1991; Ehrlich, 2004, as referenced in Schneiderbauer & Ehrlich, 2004). Risk is also defined as the expected losses that arise from hazards affecting vulnerable elements at a specified future point in time (Schneiderbauer & Ehrlich, 2004).

According to Lam (2017), in the past, people have perceived risk as a challenge or an obstacle in achieving business objectives. Nevertheless, risk creates opportunities in the sense that returns are associated with uncertainty. A complete understanding of risk entails understanding whether it results from uncertainty or variability and whether it has positive or negative implications. Hillson (Boothroyd & Thompson, 2024) introduces an additional perspective by asserting that while all risks encompass uncertainty, only those uncertainties that impact an organization's objectives are deemed risks. So, organizations have to deal with a lot of unknowns, but only some of them are threats to their goals.

Business risk is defined by McKinsey & Company (2023) as a situation that is exposed to circumstances that may reduce profitability or endanger the survival of the business. The sources of business risk may come from external sources like political situations, competition, cyber attacks, or reputational damage. The sources from within the organization may be related to management decisions or information breaches. According to McKinsey & Company (2023),

failing to capitalize on opportunities like disruptive innovations may amount to great business risk.

### **2.3.1. Risk types**

Schneiderbauer and Ehrlich (2004) define hazards as physical events, phenomena, or human activities that can lead to loss of life, injuries, damage to property, social and economic disruption, or environmental degradation. These could be caused by natural events or by people. Hazards may be characterized as circumstances or states that have the potential to harm individuals, property, or the environment (Schneiderbauer & Ehrlich, 2004) or as factors that could adversely affect people, communities, the environment, or the economy (Schneiderbauer & Ehrlich, 2004). Hazards represent merely the likelihood of adverse events occurring. The understanding of these consequences depends on how vulnerable the exposed elements are (Schneiderbauer & Ehrlich, 2004). Dayal (2022) identifies three distinct categories of hazards: physical hazards that arise from environmental or material conditions; moral hazards that result from intentional or dishonest actions; and moral hazards that stem from negligence or carelessness.

Likewise, at the organizational level, there is a significant similarity between hazards and operational risks. According to Boothroyd & Thompson (2024), hazards are defined as potential sources of danger within an organization. Moreover, hazard risk is conceptualized as operational risks that are mainly associated with occupational health and safety management. Lam (2014) further explains that operational risk is defined as a potential that external events, such as natural disasters, fires, or other disturbances, may affect the operational efficiency of an organization.

Failures in individuals, processes, or systems that can halt operations are also considered a component of operational risk.

Schneiderbauer and Ehrlich (2004) put hazards into three groups based on their cause: natural, technological, and social (man-made) hazards (see table 1). They highlight the growing importance of environmental risks that arise from the interaction between natural processes and human actions, especially concerning climate change. Garatwa (Schneiderbauer & Ehrlich, 2004) describes these as socio-natural hazards, highlighting the connection between risks posed by natural events and those arising from human activities.

Organizations face a range of risks that can affect their performance, alongside those linked to hazards. Compliance risk refers to the possibility that an organization may violate laws, regulations, or established standards (Lam, 2014). Boothroyd and Thompson (2024) argue that compliance risk is related to following both national laws and rules that are specific to a certain industry. Failure to adhere to regulations may result in legal repercussions, financial liabilities, and increased accountability for managers. In industries with a lot of rules, following them is necessary to keep a business's license to operate. When actions or events damage an organization's public image or erode stakeholder trust, this phenomenon is referred to as reputational risk. For instance, negative media coverage, ethical concerns, or dissatisfied clients. These can significantly impact operations and finances (IBM, n.d.).

According to Boothroyd and Thompson (2024), control risks refer to risks arising from unforeseen or unpredictable events, commonly referred to as uncertainty risks. Individuals might be capable of predicting when certain events will occur; however, they cannot ascertain the exact timing, the associated costs, or the outcomes that will ensue. In a general risk management context, Lam (2014) proposes a range of risk categories that exist in any organization. Strategic

risk refers to the risk of failure of initiatives such as mergers and acquisitions, expansion strategies, and innovative ideas to achieve the desired objectives. Business risk refers to the risk of poor performance in terms of financial and operational outcomes compared to what is expected. Fluctuations in prices, interest rates, or exchange rates can lead to market risk. Customers, counterparties, or suppliers who fail to settle their invoices promptly pose a credit risk. When an organization doesn't have enough cash on hand or at a reasonable cost when it needs it, that's called liquidity risk.

Boothroyd and Thompson (2024) discuss the PESTLE framework, which categorizes external risks faced by businesses into distinct groups. There exist six distinct groups within the framework. (P) Tax policies, trade regulations, and the stability of political systems serve as prime examples of political factors. (E) Economic conditions include things like interest rates, inflation, unemployment, and credit, as well as growth or recession. (S) Demographic shifts, cultural norms, health consciousness, and perspectives on safety or climate change exemplify various sociocultural influences. (T) Changes in technology influence competition, drive innovation, and affect supply chains. (L) Legal factors affect access to resources and rules. (E) Environmental factors pertain to the well-being of the ecosystem and its sustainability over time, frequently intertwining with social and economic concerns.

Hazard group	Hazard sub-group	Hazard type	Examples
Natural		Geological	Earthquake, volcanic eruption, landslides, subsidence
	Potentially socio-natural	Meteorological	Cyclones, lightning and fires, drought, avalanches, hailstorms, cold spells

	Potentially socio-natural	Oceanographic	Tsunami, sea storm
		Hydrological	Flood, flash flood
		Biological	Epidemics, crop blight, and insect infestation
Technological		Explosion	Industrial explosion
		Release of toxic materials	Chemical spills, gas leaks
		Severe contamination	Soil, water, or air contamination
		Structural collapse	Building or infrastructure collapse
		Transportation, construction, or manufacturing accident	Industrial and infrastructure accidents
Social/man-made hazards	Social/man-made hazards	Crowd-related	Riot, crowd crush
		Terrorist activity	Bombing, shooting, hijacking
		Political conflict	International and civil war, revolution, coup d'état

*Table 1. Groups and Types of Hazards, Schneiderbauer & Ehrlich (2004)*

<b>Strategic</b>	<b>Operational</b>	<b>Financial</b>	<b>Compliance</b>
Vision and core values	Research and development	Interest rate volatility	Fraud
Corporate governance	New products	Foreign currency volatility	Bribery
Organizational structure	Marketing	Cash management	Conflicts of interest
Strategic planning	Budgeting and forecasting	Credit risk	Country/state/local regulation
Mergers and acquisitions valuation and pricing	Raw material availability	Accounting policies	Tax regulation
Investor relations	Suppliers	Accounting estimates	Trade regulation
Competition	Production management	Internal control	IP management and protection
Changing customer preferences or lifestyles	Product stewardship	Tax strategy and planning	Greenhouse gas emissions
Growing middle class	Inventory management		Water treatment
Urbanization/growing population	Employee engagement		Health and safety
Emerging markets	Labor relations		
	Human rights		
	IT investment		
	Cybersecurity		
	Business continuity		
	Pandemic		
	Physical impacts of climate change		

*Table 2. Examples of risk inventory, (COSO, 2018)*

Table 2 presents examples of a risk inventory based on the COSO (2018) framework, categorizing risks into strategic, operational, financial, and compliance dimensions. The table

highlights a broad range of potential risks, from high-level strategic issues such as corporate governance and market dynamics, to operational aspects including supply chain and human capital, as well as financial and regulatory risks.

### **2.3.2 Sustainability Risks**

A report from the Institute of Chartered Accountants in England and Wales, published in 2004 and referenced in WBCSD (2017), indicates that the environmental, social, and economic dimensions of sustainable development can create value. However, they also present reputational and financial risks that require careful management. EFRAG (2025) defines sustainability-related risks as the potential negative financial impacts arising from environmental, social, or governance factors, which may affect an organization's financial position, performance, cash flows, access to financing, or cost of capital over the short, medium, or long term. COSO (2018) defines ESG-related risks as environmental, social, and governance factors that may impact an organization's objectives or overall performance.

COSO (2018) states that, though governance risks have been factored in in the past, there has been an increase in the scope and significance of ESG-related risks in recent decades, particularly with respect to environmental and social issues (see table 3). For an organization to effectively manage these risks, there is a need to strengthen oversight, governance, and culture that can support these processes. There have been several incidents that show how ESG-related risks can become significant financial and reputational risks. In the case of JBS S.A., there are issues related to governance and sustainability, including issues like corruption, deforestation, and labor problems, which have impacted financial results, including equity value, as stated in COSO (2018). COSO (2018) has provided further examples that show how sustainability risks can impact firms, such as environmental catastrophes, such as the Deepwater Horizon oil spill,

labor issues exemplified by the Rana Plaza collapse, governance scandals like the fraudulent accounts case at Wells Fargo, and environmental transgressions represented by the Volkswagen emissions scandal.

<b>Period / Year</b>	<b>Event</b>
<b>1980s</b>	Boycott against Nestlé for marketing baby formula in emerging countries
<b>1990s</b>	Nike was accused of employing child workers and paying workers less than minimum wage
<b>2000s</b>	Mattel recalled 967,000 products due to lead paint contamination
<b>2010</b>	BP's oil rig Deepwater Horizon explodes, killing 11 workers, injuring 17, and causing a major environmental disaster
<b>2011</b>	Flooding in Thailand resulted in disruptions to automotive and technology supply chain networks
<b>2013</b>	Building collapse kills more than 1,100 workers in Bangladesh's Rana Plaza factory used by 25+ brands
<b>2014</b>	Drinking water in Flint, Michigan found with dangerous levels of lead
<b>2015</b>	Volkswagen cars revealed after the company admitted falsifying emissions tests
<b>2015</b>	3M suppliers allegedly providing products from endangered species
<b>2016</b>	Samarco (Vale and BHP) dam collapse kills 19 and destroys one of Brazil's worst environmental disasters
<b>2017</b>	After the death of a 20-year-old fraternity pledge, Florida State University suspended fraternities and sororities
<b>2017</b>	Uber faces sexual harassment scandal leading to the #DeleteUber movement
<b>2018</b>	Wells Fargo created millions of accounts in customers' names without their permission
<b>2018</b>	Oxfam faces alleged cover-up of sexual harassment scandal in Haiti

*Table 3. Examples of organizations that have experienced ESG-related impacts, COSO (2018).*

<b>Pillars</b>	<b>Themes</b>	<b>ESG Key Issues</b>
<b>Environmental</b>	<b>Climate change</b>	• Carbon emissions • Product carbon footprint • Financing environmental impact • Climate change vulnerability
	<b>Natural resources</b>	• Water stress • Biodiversity and land use • Raw material sourcing
	<b>Pollution and waste</b>	• Toxic emissions and waste • Packaging material waste • Electronic waste
	<b>Environmental opportunities</b>	• Opportunities in clean tech • Opportunities in green building • Opportunities in renewable energy
<b>Social</b>	<b>Human capital</b>	• Labor management • Health and safety • Human capital development • Supply chain labor standards
	<b>Product liability</b>	• Product safety and quality • Chemical safety • Financial product safety • Privacy and data security • Responsible investment • Health and demographic risk
	<b>Stakeholder opposition</b>	• Controversial sourcing
	<b>Social opportunities</b>	• Access to communications • Access to finance • Access to health care • Opportunities in nutrition and health
<b>Governance</b>	<b>Corporate governance</b>	• Board • Pay • Ownership • Accounting
	<b>Corporate behavior</b>	• Business ethics • Anti-competitive practices • Tax transparency • Corruption and instability • Financial system instability

Table 4. MSCI ESG Issues and Themes, COSO (2018)

<i>Type</i>	<i>ESG-related Risk or Opportunity</i>	<i>Environmental</i>	<i>Social</i>	<i>Governance</i>
<b>Strategic</b>	<i>Shifting customer preferences toward products manufactured with ethical supply chains</i>		✓	
	<i>Growing investor interest in ESG issues, resulting in proxy voting against the company (e.g., diversity, deforestation, human rights)</i>	✓	✓	✓
<b>Operational</b>	<i>Increased cost of raw materials due to sustainable forestry practice requirements</i>	✓		
	<i>Reduction of waste and raw material costs through improved manufacturing processes</i>	✓		
	<i>Changing weather patterns and increased natural disasters disrupting operations and business continuity</i>	✓		
<b>Financial</b>	<i>Reputational impacts and societal concerns due to tax avoidance strategies and lack of tax transparency</i>		✓	✓
	<i>Investment in local content to generate sustained and inclusive growth through economic diversification and employment opportunities</i>		✓	
	<i>Increased taxation from carbon tax regulation</i>	✓		
<b>Compliance</b>	<i>Enhanced reporting requirements for greenhouse gas emissions and energy usage</i>	✓		
	<i>Inaccurate or fraudulent disclosure of emissions resulting in fines, penalties, and loss of consumer trust</i>	✓		✓

Table 5. Example ESG-related risks or opportunities (COSO, 2017)

Tables 4 and 5 provide an overview of sustainability-related risks by presenting key ESG issues and their associated risk and opportunity dimensions. While Table 4 outlines the main ESG

pillars, themes, and specific issues, Table 5 illustrates how these issues translate into strategic, operational, financial, and compliance risks or opportunities for firms

### **2.3.1. Environmental Risks**

Recent global risk evaluations indicate that environmental hazards are intensifying. The Global Risks Report 2025 indicates that extreme weather events rank as the second most significant risk over the upcoming two years. It states that these factors will pose the most significant global risks over the next decade. The decline in biodiversity, the disintegration of ecosystems, significant alterations to Earth's systems, and the depletion of natural resources are all imminent threats. According to EFRAG (2025), companies face physical risks because they rely on stable weather and natural resources. These factors encompass consistent weather patterns and the availability of essential natural resources required for production. Climate-related events such as extreme weather, geological hazards like earthquakes, and larger issues within natural systems, including soil degradation and challenges facing marine ecosystems, can all contribute to these types of risks.

EFRAG (2025) distinguishes between acute and chronic physical risks (see table 6). Acute risks arise from specific events, such as storms, floods, wildfires, and heatwaves. Chronic risks result from long-term environmental changes. These include rising temperatures, sea-level rise, water scarcity, biodiversity loss, and declining soil productivity. Risks often interact. For instance, chronic changes, such as rising temperatures, can increase the likelihood of acute events like droughts or wildfires. Severity and impact vary depending on local conditions. Both living and non-living natural systems are affected. Risks often overlap with broader climate-related risks. Laine, Tregidga, and Unerman (2021) emphasize that physical climate risks are a fundamental

starting point for assessing the impacts of climate change on organizations. The increasing frequency and intensity of extreme weather events can disrupt physical assets, operations, and geographically dispersed supply chains. Such risks are often difficult to fully avoid. They can only be partially mitigated through strategies such as supply chain diversification and improved resilience planning.

While physical risks are considerable, organizations are also exposed to transition risks (see table 7). These arise from societal and economic adjustments to address climate and environmental challenges. According to EFRAG (2025), transition risks occur when companies' strategies or investments do not align with evolving regulations, public policies, technological developments, market trends, or societal expectations about sustainability. Measures designed to address environmental challenges—such as regulatory reforms, technological innovations, changing consumer preferences, or climate-related litigation—can create new risks. Laine, Tregidga, and Unerman (2021) note that climate change increases the need for risk management. Transition risks can appear quickly and unpredictably, reshaping markets and affecting asset values. The authors also stress that liability risks, such as legal claims and higher insurance costs resulting from climate impacts, may influence organizational behaviour and market dynamics.

Type	Temperature-related	Wind-related	Water-related	Solid mass-related
<b>Chronic</b>	<ul style="list-style-type: none"> <li>• Changing temperature (air, freshwater, marine water)</li> <li>• Heat stress</li> <li>• Temperature variability</li> <li>• Permafrost thawing</li> </ul>	<ul style="list-style-type: none"> <li>• Changing wind patterns</li> </ul>	<ul style="list-style-type: none"> <li>• Changing precipitation patterns and types (rain, hail, snow/ice)</li> <li>• Precipitation or hydrological variability</li> <li>• Ocean acidification</li> <li>• Saline intrusion</li> <li>• Sea level rise</li> <li>• Water stress</li> </ul>	<ul style="list-style-type: none"> <li>• Coastal erosion</li> <li>• Soil degradation</li> <li>• Soil erosion</li> <li>• Solifluction</li> </ul>
<b>Acute</b>	<ul style="list-style-type: none"> <li>• Heatwave</li> <li>• Cold wave / frost</li> <li>• Wildfire</li> </ul>	<ul style="list-style-type: none"> <li>• Cyclone, hurricane, typhoon</li> <li>• Storm (including blizzards, dust, and sandstorms)</li> <li>• Tornado</li> </ul>	<ul style="list-style-type: none"> <li>• Drought</li> <li>• Heavy precipitation (rain, hail, snow/ice)</li> <li>• Flood (coastal, fluvial, pluvial, groundwater)</li> <li>• Glacial lake outburst</li> </ul>	<ul style="list-style-type: none"> <li>• Avalanche</li> <li>• Landslide</li> <li>• Subsidence</li> </ul>

Table 6. The 28 climate hazards defined by EU CSRD and EU Taxonomy, Deloitte (2025).

Policy and legal risks	Risks arising from climate-related regulations, government measures, and litigation aimed at limiting emissions or promoting adaptation, with financial impacts dependent on the scope, stringency, and timing of policy changes.
Technology risks	Risks resulting from the development and deployment of low-carbon and energy-efficient technologies that may disrupt existing systems, alter cost structures, and affect organizational competitiveness.
Market risks	Risks driven by shifts in supply and demand for commodities, products, and services as climate-related risks and opportunities become increasingly reflected in market behavior.
Reputational risks	Risks linked to changing stakeholder perceptions regarding an organization’s contribution to, or obstruction of, the transition to a lower-carbon economy.

Table 7. Transition Risks Source, Adapted from TCFD (2017).

### **2.3.2. Social Risks**

Social risks emerge from the ways in which companies interact with individuals affected by their decisions. Rio Tinto's Social Risk Analysis Guidance Note (Graetz & Franks, 2016) indicates that these risks originate from a company's engagement with communities and various stakeholders. They have the ability to stop production, delay projects, increase costs, and reduce the overall value of the company. If a company fails to effectively address social issues, it may face protests or work stoppages that hinder its operations and complicate the approval process.

Graetz and Franks (2016) assert that Bekefi, Jenkins, and Kytle (2006) indicate that social risk poses a significant threat to businesses. Individuals engage in protests against a company's practices when they believe those actions are detrimental to individuals or the environment. This includes situations where employees endure unsafe working conditions, where the company contributes to air pollution, or where public health is jeopardized. This can damage a company's reputation, result in the establishment of new regulations, provoke lawsuits, incite boycotts, and create various other challenges, ultimately diminishing shareholder value.

MSCI (2024) states that social risks arise from the manner in which businesses engage with their employees, customers, suppliers, and the communities they inhabit, along with their responses to societal changes. Some of the most important risks are how employees are treated, such as issues with labor, safety, training, and keeping good workers. Products can be risky if they are unsafe, if they don't protect customer data, or if they don't keep data private. This can lead to recalls, fines, data leaks, or complaints. When businesses have problems with communities or other groups, they may have to deal with protests, lawsuits, or problems with finding supplies, which can hurt their business and reputation.

### **2.3.3. Governance Risks**

KPMG (2024) asserts that merely adhering to regulations is insufficient to address the more significant challenges associated with sustainability and ethical business practices.

Organizational culture, business practices, and ESG factors are all closely related and affect how companies meet regulatory requirements and the needs of their stakeholders. Weaknesses in these areas, along with scattered ESG efforts and companies' unwillingness to change, can put consumers and investors at risk and make the market less stable and less fair.

In this regard, KPMG (2024) describes environmental conduct as the way in which an organization manages its environmental responsibilities, including the use of resources, environmental protection practices, and compliance with relevant environmental laws and regulations. Unsustainable environmental conduct or violation of environmental laws poses a major risk to the environment and to the firm's reputation. Social conduct refers to how an organization relates to its various stakeholders. Unethical relations with stakeholders are a major risk to the firm and its reputation, including risks such as supply chain management risk, stakeholder communication risk, labor relations risk, and discrimination risk.

Governance conduct is the way in which an organization is led and managed. Governance risks arise from factors such as inadequate internal controls, corruption, bribery, conflicts of interest, misconduct, or insufficient transparency. Governance failures can have big legal, financial, and reputational effects, and they can also hurt stakeholder trust and the credibility of the organization (KPMG, 2024).

## **2.4. Sustainability Enterprise Risk Management**

Risk management is a recognized approach for identifying, assessing, and addressing uncertainties that may hinder a business's ability to achieve its objectives. According to Harvard Business School Online (2023), risk management is a structured process that helps businesses find, assess, and deal with risks by looking at how likely they are to happen and how bad they could be, putting in place ways to reduce them, and keeping an eye on how well those ways work over time. The European Commission (2018) also argues that risk management is an ongoing, proactive, and structured process used at all levels of an organization to find, evaluate, and control risks within acceptable limits, giving reasonable assurance that the organization's goals will be met.

ISO describes risk management as coordinated activities through which an organization is directed and controlled in relation to risk; the Institute of Risk Management argues that it is a process that helps businesses understand, assess, and act on their risks to improve their chances of success and lower their chances of failure; The Institute of Internal Auditors defines risk management as the process of selecting which risks to accept, avoid, or mitigate, followed by implementing measures to manage those risks effectively; the UK Government's Orange Book (2023), risk management is also the coordination of activities that are meant to manage risk and put in place effective internal controls in businesses (Boothroyd & Thompson, 2024).

From a management point of view, Lam (2014) argues that risk management is very important for making decisions that take into account the level of risk and for lowering exposure to outside volatility. Organizations can enhance capital allocation, reduce uncertainty, and increase shareholder value by considering risks in their critical decision-making processes. Lam (2014) also argues that corporate management is responsible for managing risk. Managers possess the ability to assess risks and incorporate them into their strategic plans, operational frameworks,

and financial decisions. Conversely, inadequate risk management can lead to significantly detrimental consequences. These include losing money, hurting a firm's reputation, holding executives accountable, and even the failure of the organization. This example, therefore, highlights the significance of stability and sustainability. Generally, the risk management process is a linear sequence of steps.

According to the Institute of Risk Management (n.d.), the initial step is defining the context, which entails defining the objectives of the project or organization and determining the associated risk level. The following step is risk identification, which entails the identification and documentation of significant risks. The third step is risk assessment, which entails the appraisal of risks by considering both the probability of occurrence and the potential severity of the risk's impact, thereby determining the overall level of risk assumed by the organization. After identifying the risks, strategies are developed based on the risk assessment. However, for the strategies developed to be useful and effective, it is imperative that they are continuously monitored and evaluated. Finally, risks are properly documented and communicated.

According to Lam (2017), risk exposure is the highest financial loss that could be incurred as a result of a risk event. Volatility is the level of uncertainty and the outcomes that may be experienced as a result of a risk event. The probability of a risk event happening is known as probability, whereas the level of loss that may be experienced as a result of a risk event is known as severity. The time horizon refers to the duration during which the organization faces potential risk. Correlation shows how different risks are connected, usually because they have things in common.

In addition to these analytical concepts, certain characteristics can enhance our comprehension of risks, particularly hazards. Schneiderbauer and Ehrlich (2004), referencing Gravley (2001),

identify several factors: Magnitude refers to the point at which an event reaches a level of extremity. Duration refers to the period required for an event to progress from its inception to its maximum intensity. The areal extent refers to the magnitude of the area that is influenced. The duration required for an event to achieve its maximum impact is referred to as the speed of onset. Spatial dispersion refers to the extent to which impacts are distributed in relation to one another. Temporal spacing indicates the frequency with which these events occur.

Organizations have various strategies to manage risk. IBM (n.d.) argues that risk avoidance means not doing things that could put the organization at risk, like arguing no to certain investments or projects. Risk reduction recognizes the existence of risk and seeks to lower its likelihood or impact by implementing controls and mitigation strategies. Risk sharing, on the other hand, refers to an event where there are multiple parties involved in managing risks. For example, when there are multiple investors involved in investing in an organization, each investor will only be responsible for a fraction of the losses. Risk transfer, on the other hand, refers to an event where an organization transfers all the burden of managing risks to another organization. Finally, there is also risk acceptance and retention, where an organization acknowledges that there are some risks that cannot be avoided and therefore has to be prepared to manage those risks when they occur.

According to Boothroyd and Thompson (2024), risk management was first developed in the areas of insurance and loss prevention. It has since expanded to include health and safety, finance, project management, and governance. This has been driven by an increase in regulatory requirements, the development and growth of professional practitioners in the field, and the increased complexity of organizations.

According to Lam (2017, p. 10), Enterprise Risk Management (ERM) is defined as “ an integrated and continuous process for managing enterprise-wide risks—including strategic, financial, operational, compliance, and reputational risks—in order to minimize unexpected performance variance and maximize intrinsic firm value. This process empowers the board and management to make more informed risk/return decisions by addressing fundamental requirements with respect to governance and policy (including risk appetite), risk analytics, risk management, and monitoring and reporting.” This approach has helped organizations in making informed decisions on risks and return while at the same time factoring in governance, risk appetite, and risk assessment. Boothroyd and Thompson (2024) emphasize that Enterprise Risk Management (ERM) adopts a comprehensive, organization-wide perspective on risk. It achieves this by acknowledging the interconnections among various risks and transcending isolated approaches to address all uncertainties that may impact strategic objectives.

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) argues that ERM is a process that the board of directors, management, and other employees use to set strategy and across the company to find possible events that could affect the organization and manage risks within its defined risk appetite. This gives reasonable assurance that the organization's goals will be met (Lam, 2014). More recent definitions stress the importance of including risk management in both strategy and performance management. Fraser et al. (2021), drawing on COSO, define Enterprise Risk Management (ERM) as the culture, capabilities, and practices that organizations use to manage risk in the creation, preservation, and realization of value. Fraser et al. (2021) assert that Enterprise Risk Management (ERM) integrates risk management throughout all facets of an organization. This integration occurs by incorporating

risk into the decision-making process, enabling organizations to capitalize on opportunities while simultaneously monitoring potential threats.

Lam (2014) asserts that boards and senior management must establish systems and controls to identify, assess, and manage risks effectively. Some of the key activities include developing a risk appetite, creating an Enterprise Risk Management (ERM) framework, creating a risk-conscious culture, and incorporating risk into strategic decision-making. He further asserts that corporate risk policies must explicitly define the organization's risk appetite, which should then be translated into quantifiable risk tolerances and limits applicable at both the operational and enterprise levels. Aligning risk appetite with strategy facilitates decision-making regarding risk-return trade-offs, establishes protocols for addressing breaches of limits, and ensures that performance is evaluated against predetermined risk thresholds.

Finally, the culture of an organization is very important for managing risk well. ISO 31000 (Boothroyd & Thompson, 2024) argues that people's actions and the culture of an organization affect every part of risk management. The ACCA also argues that risk culture is the set of values, beliefs, attitudes, and behaviors that everyone in an organization has about risk (Boothroyd & Thompson, 2024). The UK Corporate Governance Code (2024, quoted in Boothroyd & Thompson, 2024) argues that boards must set an example by promoting a culture of honesty and risk awareness. This is because the culture of an organization has a big impact on how risks are found, evaluated, and handled.

Investors are more interested in how companies find and deal with ESG-related risks.

Environmental and social proposals have made up about half of all shareholder proposals in the United States in recent years. This makes them the largest group of proposals, ahead of those about board matters, anti-takeover strategies, compensation, or routine issues (COSO, 2018).

Moreover, shareholder proposals on social and environmental issues have dealt with things like political spending, greenhouse gas emissions, sustainability reporting, diversity, and human rights. Governance proposals, on the other hand, have mostly been about board elections and executive pay, with climate-related proposals getting the most support at several large-cap companies (COSO, 2018).

COSO put out some advice in 2018 to go along with its Enterprise Risk Management—Integrating with Strategy and Performance framework. This was in response to the growing need to include ESG risks in ERM processes. The World Business Council for Sustainable Development (WBCSD) played a pivotal role in developing the guidance that assists organizations in leveraging their current Enterprise Risk Management (ERM) frameworks and procedures to comprehend, recognize, evaluate, manage, and report on risks associated with ESG factors. It recognizes that businesses, governments, and non-profits are all confronting an evolving array of ESG-related risks that could significantly affect their profitability, performance, and long-term sustainability. By integrating ESG risks into Enterprise Risk Management (ERM), organizations can reap several significant advantages. For instance, this approach enhances their resilience, establishes a unified framework for assessing how risks influence strategy and objectives, optimizes resource allocation, uncovers opportunities related to ESG, streamlines risk management by consolidating all risks in a single repository, and facilitates greater transparency for stakeholders and regulators, allowing them to comprehend the situation more clearly (COSO, 2018).

The first step in the COSO ERM framework is Governance and Culture. This step is all about setting up oversight, responsibilities, and organizational values to deal with ESG-related risks. Companies begin by figuring out what their ESG obligations are by listing voluntary ESG

commitments, like policies on sustainability, human rights, the environment, and the supply chain, that make people responsible and could hurt their reputation if they aren't followed (COSO, 2018). A strong risk culture is important for making decisions that take ESG into account, as an organization's mission, vision, and core values shape how its employees think about and act on risk (COSO, 2018). Good governance depends on having clear oversight structures with the Board of Directors providing risk direction, monitoring, and consideration of ESG factors in strategic matters at all levels of the organization. COSO (2018) stresses that ERM should not be seen as just a way to meet legal requirements, but should be built into everyday business operations, suggesting that as ESG risks grow increasingly complex, it is essential for risk, sustainability, and operations teams to collaborate more frequently, utilize the same tools, receive uniform training, and exchange their knowledge with one another.

The second step, Strategy and Objective-Setting, examines the influence of internal resources alongside external ESG-related political, economic, social, technological, legal, and environmental factors on the business landscape and its associated risk exposure. This process aids in aligning ESG risks with the organization's overarching strategy and objectives (COSO, 2018). Defining risk appetite is important because it tells the organization what kinds and levels of risks they are willing to take in order to create value, within the limits of risk capacity, or the highest level of risk the organization can handle. This helps organizations prioritize ESG-related risks and figure out the best way to respond to them, such as accepting, mitigating, avoiding, or sharing them, while still being in line with strategy, resources, and organizational goals (COSO, 2018).

The Performance stage focuses on identifying, assessing, prioritizing, and managing risks associated with ESG factors. Risk identification systematically captures potential threats that

could disrupt operations, compromise strategic goals, or impact an organization's ability to function. This process employs various tools, including risk inventories, workshops, interviews, and analytical assessments, to uncover both existing and emerging risks (see table 8). These risks are frequently intricate, long-term, and span multiple boundaries (COSO, 2018). To effectively identify risks, it is necessary to clearly define them in terms of strategic goals and organizational levels and look for root causes to get a better idea of how they are connected to other risks in the overall portfolio. Once risks are identified, they are assessed and prioritized according to their likelihood of occurrence and the severity of their potential impact, employing both qualitative and quantitative approaches. Then, organizations implement appropriate measures to address risks, such as accepting, avoiding, pursuing, reducing, or sharing them. The choice of these measures may hinge on the severity of the risk, the level of risk the organization is prepared to tolerate, the business context, and the expectations of stakeholders. (COSO, 2018).

Data Source	Description
<b>World Economic Forum Global Risks Report</b>	Published annually since 2006, this report gathers insights from global experts and decision-makers to identify and assess major risks, including economic, geopolitical, and environmental challenges.
<b>Global Opportunity Report</b>	Since the adoption of the UN Sustainable Development Goals in 2015, this report has focused on identifying emerging sustainable market opportunities, progressively expanding its scope to reflect evolving global priorities.
<b>Industry Associations</b>	Various industry bodies produce reports analyzing megatrends that affect specific sectors. These reports provide sector-focused insights into emerging risks and opportunities.
<b>Megatrends Reports from Consulting Firms</b>	Consulting firms such as Accenture, Deloitte, EY, KPMG, McKinsey, and PwC publish reports examining global trends and future scenarios. These often include ESG-related insights and may focus on specific industries.
<b>Political Reports</b>	Government and national planning institutions release strategic reports outlining future economic and social development plans, offering insights into policy direction and regulatory trends.
<b>ESG-focused Organizations and Conferences</b>	International organizations, NGOs, and business alliances (e.g., WBCSD, GRI, UN Global Compact) provide research, frameworks, and discussions on ESG trends, best practices, and sustainability initiatives.
<b>Insurance Company Reports</b>	Insurance firms regularly publish risk assessments highlighting key global business risks. These reports are typically based on expert surveys and provide valuable insights into emerging risk patterns.

*Table 8. Resources for Identifying Emerging Risks, COSO (2018)*

**2.5. Sustainability Reporting: From Impact to Risk Disclosure**

Laine, Tregidga, and Unerman (2021) contend that sustainability accounting and accountability utilize evolving tools and methodologies to evaluate, manage, and communicate the environmental, social, and economic effects of organizations. In this regard, sustainability

accounting refers to the application of techniques that take into account supplementary factors beyond conventional ones, while accountability refers to the need for reporting all these factors to a wide array of stakeholders. Conventional accounting practices are usually based on stakeholders with a vested interest, do not take into account externalities, and are based on a small set of performance and profitability indicators. Sustainability accounting helps overcome these problems by making more people responsible for sustainability, helping people make better decisions, and doing things like sustainability reporting. A sustainability report is a corporate document that outlines a company's ESG impacts, risks, and opportunities, as noted by PWC (n.d.). It helps with communication and openness, and it meets the growing demands of investors and stakeholders for sustainability performance to be accountable.

According to Boothroyd and Thompson (2024), ESG started out as a voluntary idea in the 1980s. By the 2020s, formal regulations regarding sustainability had been established. This change was caused by rising needs from governments and businesses in different parts of the world. The International Sustainability Standards Board (ISSB) was established to ensure uniformity in climate-related reporting standards globally. In the European Union, the Green Deal simplified the process of understanding the necessary requirements. This involved a transition from the Non-Financial Reporting Directive to the Corporate Sustainability Reporting Directive, along with the adoption of the ESRS, which is grounded in the standards set by the ISSB and GRI.

### **2.5.1. Global Reporting Initiative (GRI)**

The GRI has played a crucial role in establishing frameworks for sustainability reporting. According to the Global Reporting Initiative (n.d.), the organization initially released its Sustainability Reporting Guidelines (G1) in the year 2000. This established the inaugural global framework for sustainability reporting. As the number of individuals utilizing the guidelines

increased, GRI implemented revisions in G2 (2002), G3 (2006), and G4 (2013). In 2016, GRI stopped giving advice and instead started making formal global standards with the GRI Standards. These standards are routinely revised to address emerging sustainability challenges and evolving reporting techniques. Later, GRI released Topic Standards concerning Waste (2020) and Tax (2019). It modified the Universal Standards (2021) and issued Sector Standards. Oil and gas were the initial sectors to establish standards, subsequently followed by agriculture, aquaculture and fishing, and coal in 2022. The updated Biodiversity Standard and mining were introduced in 2024 (Global Reporting Initiative, n.d.). The primary objective of sustainability reporting within the GRI framework is to enhance transparency (Global Reporting Initiative, 2021). Transparency refers to how organizations contribute to or aim to contribute to sustainable development. This is achieved through disclosing information about the organization's significant economic, environmental, and social impacts, including human rights considerations and how these impacts are addressed.

According to GRI (2021), the framework has provided definitions to help organizations understand various concepts. Impact refers to actual or potential effects, positive or negative, that an organization has on individuals (such as social implications on individuals or groups of individuals, including human rights), the economy (such as implications on markets and societies), and the environment (such as implications on environmental ecosystems). Impacts can be short-term or long-term, planned or unplanned, reversible or not, and happen on a local, national, or global scale. The GRI characterizes these cumulative effects as the organization's total impact on sustainable development.

The Global Reporting Initiative (2021) refers to these significant impacts as material topics. The identification of material topics is an iterative process that requires the identification of the

nature of impacts and their severity. Engagement with stakeholders and experts may be necessary in the process. It should be noted that the GRI framework clearly outlines the need for organizations to report impacts even if they are not currently material in financial terms. It is recognized that these impacts may, in the long term, give rise to concerns related to operations, reputation, or financial stability. When adverse events occur, organizations must address the situation and manage the repercussions that are directly associated with their operations and business partners (Global Reporting Initiative, 2021).

### **2.5.2. Non-Financial Reporting Directive (NFRD)**

According to the European Commission (2021), the NFRD, which was passed in 2014, was a big step toward more openness and accountability. It required large EU public-interest entities, like listed companies, banks, and insurance companies with more than 500 employees, to report on their environmental, social, and governance information, including details on business models, policies (and related due diligence processes), outcomes, risks, and risk management, and key performance indicators. It also required information on social responsibility, employee matters, human rights, anti-corruption and bribery, and board diversity. About 6,000 of the largest EU companies had to follow these reporting rules.

However, the directive allowed significant flexibility in choosing reporting frameworks, resulting in limited comparability and reliability of disclosures, insufficient standardization, challenges in implementing double materiality, and weak assurance practices. As a result, the NFRD was considered inadequate for providing high-quality, decision-useful sustainability information for investors and other stakeholders, prompting a regulatory review. In its communication on the European Green Deal on 11 December 2019, the European Commission announced its intention to review the NFRD as part of its strategy to strengthen the foundations

for sustainable investment. The planned revision aimed to ensure that investors and other stakeholders—including civil society organizations and trade unions—would have access to adequate non-financial information to assess companies’ sustainability-related risks, opportunities, and impacts, while also reducing unnecessary reporting burdens for businesses (European Parliamentary Research Service, 2021).

### **2.5.3. Task Force on Climate-related Financial Disclosures (TCFD)**

The Financial Stability Board established the Task Force on Climate-related Financial Disclosures to develop recommendations on climate-related financial disclosures, assisting investors, lenders, and insurers in understanding how climate change might impact their financial performance (TCFD, 2017). According to TCFD (2017), climate change presents various types of risks that include transition risk (due to changes in policy, technology, market conditions, and company reputation regarding low carbon standards) and physical risk (short and long-term extreme weather changes). There are five main types of opportunities that the task force on climate change has identified as being associated with the transition to a low-carbon economy: the optimization of resource use to minimize costs and emissions, the transition to energy types that have fewer carbon emissions, the development of low-carbon products and services, the exploration of new markets and green finance, and the improvement of organizational resilience (TCFD, 2017).

Climate change has the potential to impact the financial well-being of firms due to the changes it causes in various financial reporting and performance aspects, and may impact revenues, expenses, assets, liabilities, and capital structure due changes in demand due to the transition to a low-carbon economy, the implementation of carbon pricing, changes in cost structures and

capital expenditures, changes in the valuation of long-lived assets that are subject to transition and physical risk or changes in access to capital and borrowing (TCFD, 2017).

The TCFD has categorized its recommendations under four main areas in order to ensure clear and consistent reporting on these impacts. These areas are governance, where the company's climate-related risk and opportunities management is examined; strategy, where the impact of climate-related risk and opportunities is assessed in relation to the company's business model, strategies, and financial planning processes; risk management, where the identification, assessment, and mitigation of climate-related risk is emphasized; and metrics and targets, where the indicators and targets for measuring and managing these factors are established (TCFD, 2017).

Finally, the TCFD (2017) has recommended that companies use scenario analysis in evaluating how well their strategies would perform under different climate-related circumstances, considering different scenarios in a situation where there is uncertainty. Companies may consider: the transition risk, particularly in companies where resource use is high and pollution levels are high; the physical risk, particularly in companies where assets are long-lived, where the company is located in a region with climate-related risk, and where the company uses natural resources such as water.

#### **2.5.4. International Financial Reporting Standards (IFRS)**

According to IFRS (n.d.), the Sustainability Accounting Standards Board (SASB) was founded in 2011 with the aim of advancing sustainability initiatives. It established benchmarks for 77 industries to assist businesses in communicating significant sustainability risks and opportunities. These standards, released in 2018 following six years of research and consultation, illustrate how sustainability concerns can influence financial results such as cash flow, access to financing, and

capital costs. The SASB Standards were developed through a meticulous and transparent process that involved extensive research, contributions from a diverse range of stakeholders, and independent oversight. Companies and investors stand to gain from more transparent sustainability reports and resources such as the SASB Materiality Finder (IFRS, n.d.).

The International Financing Reporting Standards (IFRS) Foundation established the International Sustainability Standards Board (ISSB) in November 2021 with the aim of developing a universal standard for financial disclosures pertaining to sustainability. By assuming responsibility for the SASB Standards in 2023, it unveiled its Sustainability Disclosure Standards, known as IFRS S1 and IFRS S2 (IFRS, n.d.). IFRS S1 establishes fundamental guidelines for how organizations ought to disclose risks and opportunities associated with sustainability that may affect their financial status, operational performance, and cash flow over the short, medium, and long term, while IFRS S2 sets out specific rules for climate-related disclosures that are in line with the TCFD. The main goal is to make sustainability reporting more consistent and comparable, improve governance and strategic alignment, make it easier to get capital, and help investors make better decisions (IFRS, n.d.).

#### **2.5.5. Corporate Sustainability Reporting Directive (CSRD)**

The CSRD, effective from January 2023, supersedes and significantly enhances the previous Non-Financial Reporting Directive by incorporating more comprehensive, standardized, and audited criteria for sustainability disclosures (IBM, n.d.). The directive greatly expands the scope of entities in the European Union that are required to provide sustainability-related reporting. These entities include EU-based firms as well as eligible EU subsidiaries of entities outside the EU. Under the CSRD, a firm must report not only the impact of its activities on social and environmental issues, but also the impact of sustainability-related risks and opportunities on its

financial performance. The directive is based on the idea of double materiality, which argues that businesses must think about both impact materiality and financial materiality. It also requires the use of the European Sustainability Reporting Standards (ESRS) and third-party verification of sustainability disclosures. The goal is to make sustainability information more reliable, comparable, and useful for making decisions, as well as to help the EU reach its broader climate and sustainability goals (IBM, n.d.). The CSRD is likely to impact corporate strategies and decisions apart from ensuring compliance. KPMG (n.d.) asserts that the directive calls on businesses to integrate sustainability into their fundamental strategies, governance arrangements, risk management practices, and business models. Through the identification and communication of sustainability-related risks, impacts, and opportunities, companies are able to enhance their decision-making practices, improve their long-term resilience, discover new opportunities for growth, and enhance their products and services to better promote sustainable development. Moreover, heightened transparency can foster greater stakeholder engagement, improve the company's reputation and trustworthiness, and stimulate innovation, operational enhancements, and more significant strategic transformations.

#### **2.5.6. European Sustainability Reporting Standards (ESRS)**

The Corporate Sustainability Reporting Directive (CSRD) represents a significant component of the European Union's regulatory framework. It compels companies to provide more comprehensive reports. The European Commission officially adopted the European Sustainability Reporting Standards (ESRS) on July 31, 2023. Under the CSRD, these establish uniform disclosure regulations applicable to all companies. The standards enhance the transparency of sustainability reporting and facilitate more straightforward comparisons. The ESRS covers a wide range of ESG issues and is in line with international reporting efforts to

make sustainability disclosures more consistent across Europe and the world and cut down on the number of times companies have to report the same information (European Commission, 2023).

The Corporate Sustainability Reporting Directive (CSR) framework requires the reporting of the critical domains by the enterprises. Article 1 of the directive adds Articles 19a and 29a to the Accounting Directive. This essentially means that the reports are required to include five different areas of discussion: the business model, the policies and due diligence, the outcomes of the policies, the risk and risk management, and the key performance indicators (GRI, 2024). The European Sustainability Reporting Standards (ESRS) provide a standardized framework that emphasizes transparent, uniform, and readily comparable disclosures, rather than prescribing particular methods of operation within the organization (GRI, 2024).

There are twelve standards in the initial set of ESRS, which was approved in 2023. These outline the framework that the CSRD will establish for sustainability reporting. There are three categories of standards: cross-cutting, topical, and sector-specific. The cross-cutting standards, ESRS 1 and ESRS 2, establish overarching rules and disclosure obligations. ESRS 1 discusses concepts and guidelines pertaining to sustainability statements. ESRS 2 outlines the necessary disclosures regarding governance, strategy, impact, risk, opportunity management, metrics, and targets. There are ten topical standards that address governance (ESRS G1), social (ESRS S1–S4), and environmental (ESRS E1–E5) matters (EY, 2023; GRI, 2024; KPMG, 2024), as shown in Figure 3.

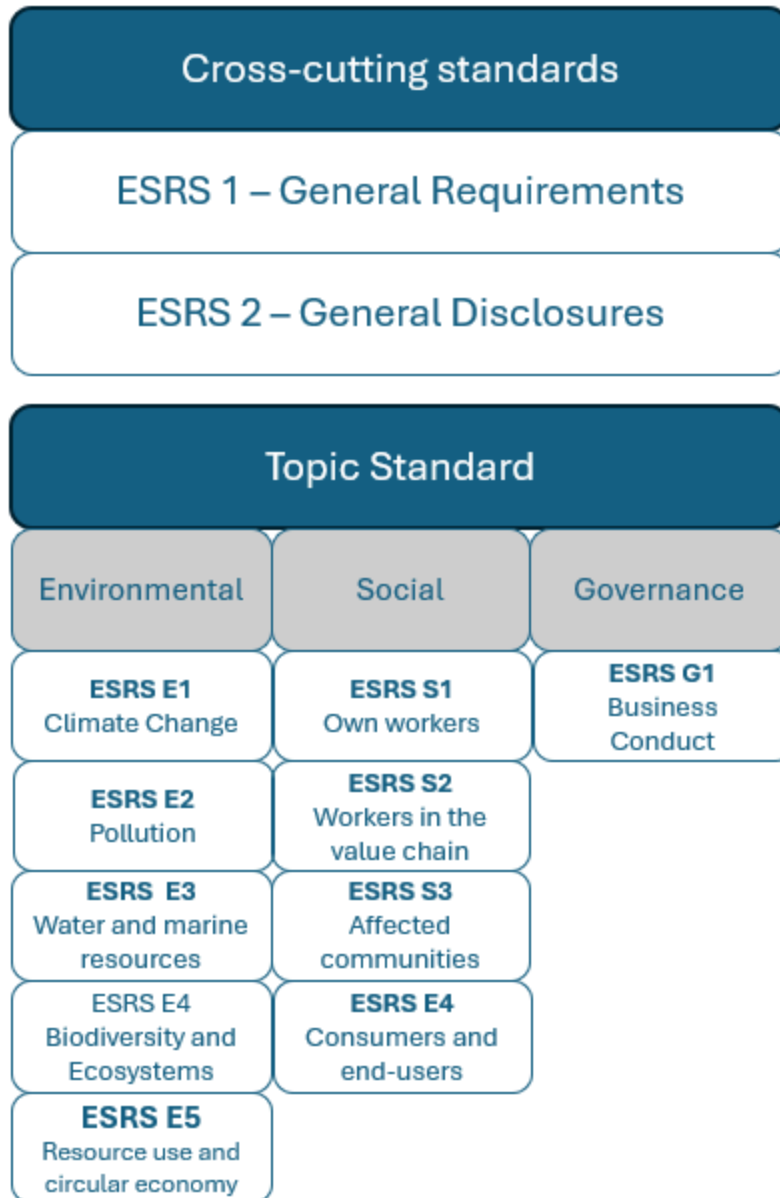


Figure 3. ESRS Framework, EY (2024).

### 2.5.6.1. Fundamental requirements

ESRS 1 establishes the overarching principles and requirements for preparing sustainability statements within the ESRS framework (KPMG, 2024). It defines the scope, key concepts, and general disclosure requirements that guide how companies report sustainability-related information. Notably, ESRS 1 requires that the sustainability statement cover the same reporting

entity as the financial statements, while providing a more detailed and comprehensive view of sustainability-related matters.

A central requirement of ESRS 1 is the disclosure of material impacts, risks, and opportunities (IROs) arising from a company's own operations, its value chain, and, where relevant, the broader external environment. Sustainability issues are defined broadly to include environmental, social, human rights, and governance aspects for which relevant information must be communicated to stakeholders. For each material issue, companies must identify and disclose the associated IROs.

Within this framework, impacts are defined as actual or potential effects of the company's activities on the environment and society. Risks are sustainability-related factors that may negatively affect the firm's financial performance, while opportunities are factors that may enhance it (KPMG, 2024). ESRS 1 also adopts a broad definition of stakeholders, encompassing individuals and groups who can influence or are affected by the entity's activities. These include investors, lenders, business partners, employees, trade unions, civil society organizations, public authorities, and other users of sustainability information. ESRS 1 also requires due diligence—companies must identify, prevent, and manage actual or potential adverse impacts in their operations and value chain. This integrates sustainability into governance and risk management.

Double materiality is a key pillar; companies must assess both impact materiality (effects on environment and society) and financial materiality (effects on financial performance and prospects). Impact materiality requires identifying positive and negative impacts from operations and the value chain. Significant impacts must be disclosed, with severity and likelihood guiding evaluation. Stakeholder views and mitigation measures are included in the analysis. The financial

materiality assessment, in turn, identifies sustainability issues relevant to understanding the company's financial position and performance. A topic is considered financially material if it has, or is likely to have, a significant influence on financial outcomes, such as profitability, cash flows, access to finance, or the cost of capital, across different time horizons (ESRS, 2025). This includes not only internal operations but also exposures arising from the company's value chain and external environment.

Sustainability risks and opportunities come from impacts, resource dependencies, and external factors. Their importance depends on likelihood and financial impact. For instance, dependence on natural resources, such as water, may expose firms to risks related to availability, quality, or price fluctuations. Similarly, negative impacts on local communities may prompt regulatory responses or reputational damage, with subsequent financial implications, such as increased costs or reduced access to talent. Additionally, risks faced by business partners within the value chain may indirectly affect the firm, highlighting the interconnected nature of sustainability risks (EFRAG, 2022).

#### **2.5.6.2. General Information**

The ESRS 2 specifies the fundamental elements of sustainability reporting disclosures, focusing on the following four areas: governance, strategy, IRO management, and metrics and targets.

These reporting disclosures are intended to provide insights into how sustainability is integrated into organizational governance, influences strategic decision-making, and is considered for risk management (KPMG, 2024).

The reporting of sustainability governance is intended to provide insights into how organizations manage sustainability, with a focus on understanding rather than prescribing governance arrangements. Organizations are thus expected to identify the composition of their governing

bodies, identify the specific responsibilities of each member, and explain how they oversee the conduct of the business and sustainability. During the reporting period, organizations are expected to identify how their governing bodies receive and manage information related to sustainability, whether sustainability metrics, such as greenhouse gas emissions reduction targets, are integrated into incentive systems, and how IROs are identified. Finally, organizations are expected to explain how they identify the systems, internal controls, and risk management processes that facilitate sustainability oversight and reporting (KPMG, 2024).

In addition, the ESRS 2 introduces reporting requirements for strategy, where organizations are expected to explain the sustainability impact on their strategic approach, business model, and value chain, as well as explain the link between sustainability factors and significant IROs related to key business activities, resources, markets, and relationships (SBM-1). Organizations are further expected to explain how stakeholder engagement influences strategic decision-making and whether any changes to the business model are considered as a result of stakeholder engagement processes (SBM-2). Finally, organizations are expected to explain how the application of the double materiality test identified significant IROs that will influence strategy, value chain operations, resource allocation, and expected financial impacts in the short, medium, and long term (SBM-3) (KPMG, 2024).

The third domain deals with IRO management. The company must disclose how its sustainability-related impacts, risks, and opportunities are determined to be material using the double materiality principle. The company must disclose how its methods, criteria, thresholds, and assumptions are used to identify, assess, prioritize, and monitor IROs. This includes how actual and potential impacts are being measured. The company must disclose how financial material risks and opportunities are assessed in terms of likelihood and magnitude, and how

these assessments are integrated into its decision-making processes and overall risk management framework. The company must disclose any changes to its assessments from the prior year and identify which ESRS disclosure requirements are being applied and where this information can be located within its sustainability statement. The company must identify any information used from other EU legislation. The company must identify which sustainability topics were assessed as non-material and explain its rationale for reaching such conclusions. The company must describe its measures to prevent, mitigate, or remediate its impacts. If climate change is assessed as non-material, then a clear rationale must be provided along with an explanation of the circumstances under which it could become material in the future (KPMG, 2024).

Lastly, ESRS 2 requires that metrics and targets be disclosed to the public. The disclosures allow users to form an opinion about a company's sustainability-related performance. The disclosures must provide qualitative and quantitative information about sustainability policies and IROs that are deemed to be material by a company under MDR-M. The company is also expected to disclose measurable objectives for sustainability-related IROs under MDR-T. Additionally, it must disclose the purpose, scope, baseline, timeframe, as well as the milestones of objectives. The most significant factors are major social changes and major environmental changes. The disclosures must also provide explicit methodologies, assumptions, as well as a full explanation of any limitations, changes, or need for independent validation of data or metrics (KPMG, 2024).

Moreover, ESRS 2 requires that a company disclose its expectations about sustainability-related risks and opportunities that may affect its financial performance. The disclosures must show users potential impacts on a company's finances, performance, and cash flow over a short-term, medium-term, and long-term period. The financial implications of sustainability-related risks and opportunities must be assessed prior to implementing management strategies. The disclosures

must also provide explicit assumptions as well as levels of uncertainty. Additionally, if quantification is difficult due to cost or effort, qualitative disclosures must be provided. The disclosures must also be consistent with relevant items within a financial statement. In addition, if there are inconsistencies between sustainability-related and financial reporting assumptions, they must be explained. (KPMG, 2024).

### **2.5.6.3. Topic Specific**

The ESRS delineate five thematic areas within the environmental dimension: ESRS E1—Climate Change covers risks and effects on climate change mitigation, climate change adaptation, and energy use including information about greenhouse gas emissions, the risks of transitioning to a low-carbon economy, and the risks of climate-related hazards; ESRS E2 – Pollution looks at the effects of pollution, such as emissions into air, water, and soil, as well as problems with microplastics and other substances that are of concern and specification on companies manage, prevent, and mitigate pollution from their operations; ESRS E3: Water and Marine Resources relates to the management of water resources, including extraction, use, storage, and discharge; ESRS E4: Biodiversity and Ecosystems relates to the causes of biodiversity loss and changes in ecosystems, the state of terrestrial and marine ecosystems, species, and the value of ecosystem services; ESRS E5—Resource Use and Circular Economy—examines the methods by which businesses manage the inflow and outflow of resources within their operations, encompassing their utilization of materials, their management of product-related resource flows, and their approaches to waste generation (EFRAG, 2025).

There are four main groups of people who are affected by the social aspect of the ESRS framework: ESRS S1 – Own Workforce talks about problems that affect workers in the company, such as working conditions, social dialogue and collective bargaining, occupational health and

safety, training and skills development, diversity and equal treatment, and labor-related human rights; ESRS S2—Workers in the Value Chain looks at the same issues for workers in the company's supply chain and other value-chain relationships, including working conditions, labor rights, diversity, and protections for human rights; ESRS S3—Affected Communities looks at how corporate activities affect communities' social and human rights, such as their economic, social, and cultural rights, their civil and political rights, and the rights of indigenous peoples; ESRS S4—Consumers and End-users—looks at how companies' products and services affect people who use them, including issues like privacy and access to information, consumer health and safety, and making sure that everyone can get the products and services they need (EFRAG, 2025).

Finally, ESRS G1—Business Conduct represents the governance dimension, covering ethical and responsible business behaviour, including corporate culture, the management of relationships with suppliers, practices to prevent corruption and bribery, the protection of whistle-blowers, engagement in political influence and lobbying activities, animal welfare considerations, and payment practices, particularly with regard to late payments to small and medium enterprises (SMEs) (EFRAG, 2022).

## **2.6. Empirical Literature on Corporate Disclosure**

### **2.6.1. Risk Disclosure**

Linsley and Shrives (2006) highlight that companies tend to focus on disclosing past and present risks rather than future ones, often avoiding specification of potential impacts and attributing negative outcomes to external factors, reflecting a tendency toward self-justification. The authors also emphasize that forward-looking risk disclosures are particularly valuable for investors and

can enhance market efficiency, yet directors remain reluctant to provide such information due to concerns about commercial sensitivity and the lack of safe harbour protection. Overall, risk disclosures are found to be heterogeneous, largely qualitative, and dispersed across reports, offering limited insight into the actual level, magnitude, and probability of future uncertainties.

Lajili & Zéghal (2005) conducted a study on the annual reports of Canadian companies and found that although firms disclose a substantial amount of risk-related information, the disclosed risk information is often inconsistent, ambiguous, and not sufficiently detailed.

Probohudono et al. (2013) argue that the perception of risk has evolved from a purely negative concept to one encompassing both positive and negative outcomes, increasing the need for more comprehensive risk disclosures to support stakeholders' decision-making and understanding of corporate social responsibility. Their study, focusing on manufacturing firms across Southeast Asia during the 2007–2009 financial crisis, highlights that current risk disclosures are often insufficient and largely voluntary, limiting their usefulness for external users. The authors emphasize that clearer and more effective communication of risk is essential to help investors understand firms' strategies, sustainability, and value creation processes, while also reducing information asymmetry between management and stakeholders, thereby lowering agency costs and improving market efficiency.

Probohudono et al. (2013) find that the extent of risk disclosure is significantly influenced by country context, firm size, and board independence, with cross-country differences reflecting varying economic environments and shareholder expectations. Larger firms tend to disclose more risk information due to greater resources and the need to manage more complex operations, while stronger corporate governance—particularly the presence of independent

directors—enhances transparency and supports more extensive disclosure. In contrast, managerial ownership does not appear to have a significant impact. Overall, the study reveals that risk disclosures remain relatively low, which may increase uncertainty regarding firms' commitment to social responsibility and long-term sustainability.

Companies face a critical decision regarding risk disclosure: they can choose to be transparent about their risks, potentially enhancing the quality of the information provided, or they can opt to restrict or strategically present risk information to safeguard their own interests and maintain a competitive edge (Li, He, & Xiao, 2019).

Dumay and Hossain (2018) argue that sustainability requires companies to address environmental, social, and economic issues without compromising future stakeholders, making sustainability risk disclosure increasingly important for investors and other stakeholders. They highlight that corporate reporting has evolved from focusing mainly on economic risks to also include social and environmental risks, driven by growing societal pressures, regulatory developments, and global awareness. Companies are progressively integrating sustainability risks into their strategies, governance, and reporting practices, particularly following concerns about inadequate disclosures after financial crises; however, there is still limited consensus on how and to what extent these risks should be disclosed.

As investors increasingly seek detailed insights into environmental risks, particularly those associated with climate change, the demand for sustainability risk disclosure has intensified. Ilhan et al. (2023) argue that financial markets necessitate timely and accurate climate risk information to guide investment decisions and pricing strategies. The Task Force on Climate-related Financial Disclosures (TCFD) and the International Sustainability Standards

Board (ISSB) represent two initiatives established to address deficiencies in reporting. The goal of these is to make climate-related information better and easier to compare.

Broniewicz, Jastrzębska, and Lulewicz-Sas (2024) highlight that environmental disclosures among Polish banks remain fragmented and limited, with information spread across multiple documents and often difficult to access, reflecting an ongoing adaptation to the ESRS framework. Their findings show low availability of non-financial data, inconsistent disclosure practices across various reporting formats, a generally limited scope of disclosures (with only one bank approaching most ESRS requirements), a stronger focus on climate-related information (E1) compared to areas such as biodiversity (E4), and significant gaps in detailed disclosures, particularly regarding water resources and biodiversity-related financial impacts.

Lindgren et al. (2025) analyze Norwegian companies' approaches to environmental indicators within the ESRS framework, finding that climate-related risks—especially Scope 3 emissions—are widely regarded as highly material, though measurement is hindered by data limitations and complex value chain dependencies, even as regulatory requirements increase. In contrast, pollution-related issues, such as microplastics, are considered less material but remain highly challenging to assess, primarily due to limited organizational experience and ambiguous definitions; these findings underscore the need for greater standardization and enhanced expertise. Biodiversity, meanwhile, is also gaining prominence under ESRS requirements, yet its assessment remains difficult because of its multidimensional characteristics and interdependencies, requiring more advanced capabilities and integrated methodologies. Similarly, resource use is generally viewed as material and is moderately disclosed, but specific aspects—such as secondary resource use—pose measurement challenges due to limited experience and inconsistent data sources, highlighting the need for improved measurement and

more robust auditing mechanisms. Overall, the study indicates that mandatory reporting frameworks are increasing attention to key sustainability issues, particularly climate change and biodiversity, though significant challenges remain because of limited experience and data availability. Additionally, sustainability reporting practices differ by sector, company size, and regulatory preparedness, with larger and CSRD-prepared firms exhibiting greater disclosure maturity; these patterns align more closely with legitimacy and stakeholder theory than with customer segmentation.

Studies in social and environmental accounting reveal that accounting and reporting systems play a crucial role in identifying and communicating the environmental and social risks linked to corporate activities. Truant, Corazza, and Scagnelli (2017) argue that tools for sustainability reporting and management accounting can help businesses find, evaluate, and deal with these risks. Examples include the ISO 14001 and SA8000 standards, environmental management systems, supply chain risk assessments, and life-cycle assessments, supporting businesses in keeping an eye on risks throughout their operations and value chains.

However, fully integrating sustainability risk into the process of enterprise risk management is still a challenge. PwC (2025) points out that sustainability issues are increasingly critical to the success of any organization. The incorporation of sustainability risk, particularly climate risk, into the process of Enterprise Risk Management (ERM) helps the organization to identify and strategize on the risk, hence facilitating value creation.

COSO (2018) argues that, though ESG disclosures have grown, they don't always correspond with companies' main risk disclosures. This gap could be due to problems with putting ESG risks in financial terms, a lack of knowledge about sustainability risks, and the fact that ESG issues are often handled separately from other business risks.

WBCSD (2017) also notes that significant distinctions exist between risk disclosures and sustainability reports. In a research led by the Council with member companies, it was found that only 29% of the sustainability issues were reported as risks, while the remaining 71% of the sustainability issues were not reported as risks to investors. Moreover, a significant 35% of companies did not show any alignment of risks reported in sustainability statements and risk disclosures, and only 8% of the companies showed full integration between risk disclosures, sustainability statements, and risk reports. The study found that one of the causes of non-alignment is the difference in the time horizon of sustainability and risk management activities. Generally, a company's risk analysis considers a period of two to five years, whereas sustainability assessments, conversely, typically examine time frames ranging from 10 to 30 years (WBCSD, 2017).

Also, it can be hard to measure sustainability risks because there isn't much historical data, science isn't sure about them, and there aren't any tools that have been proven to work to figure out how much they will cost (WBCSD, 2017). New sustainability risks present greater challenges in assessment compared to traditional financial risks, primarily due to the availability of improved measurement techniques and a wealth of experience in their management.

As WBCSD (2017) indicates, various departments within organizations, such as procurement, quality management, and sustainability, are often made responsible for managing sustainability risks. Although this increases individual responsibility, it may limit the ability of managers to identify risks if they are not knowledgeable enough to assess these risks. There are various reporting objectives and target groups for disclosing information. For instance, corporate risk reports are targeted at shareholders and regulators, whereas sustainability reports are targeted at a broader audience. WBCSD (2017) suggests that organizations should enhance the collaboration

between sustainability and risk management to effectively address these challenges. This includes putting sustainability risks into ERM, turning sustainability problems into more common risk terms, making it easier for sustainability and risk teams to communicate with each other, and using tools like scenario analysis and stress testing to better understand new risks.

These issues also alter the way managers perceive sustainability risks. WBCSD (2017) also indicates that 89% of professionals in sustainability believe these risks can significantly impact financial performance. Nevertheless, numerous businesses continue to struggle with incorporating them into Enterprise Risk Management (ERM). Specifically, 70% believe that current risk management practices fail to incorporate sustainability risks, 72% feel that companies do not adequately report these risks to shareholders, and 74% contend that management frequently perceives sustainability risks as less probable or severe compared to traditional risks.

Laine, Tregidga, and Unerman (2021) argue that organizations are increasingly viewing sustainability as an issue of uncertainty, due to the myriad challenges presented by complex and shifting social trends. Boothroyd and Thompson (2024) argue that sustainability risks are very uncertain because there are gaps in scientific knowledge and people have different cultural and social views.

### **2.6.2. ESRS Disclosure**

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maturity; these patterns align more closely with legitimacy and stakeholder theory than with customer segmentation.

Hadro et al. (2025) indicate that circular economy disclosures in the European automotive sector remain largely symbolic and compliance-driven, with limited substantive integration of circular practices, revealing a gap between CSRD/ESRS regulatory expectations and actual corporate implementation. Their findings further suggest that companies tend to emphasize general narratives such as waste management and resource efficiency, while more advanced circular strategies—such as remanufacturing, material recirculation, and lifecycle extension—are only partially and inconsistently disclosed. This reflects a broader lack of systemic integration of circular economy principles into core business models, indicating that firms are still in an early stage of transitioning from linear to circular practices.

Schneider et al. (2025) show that sustainability reporting in Germany's mechanical and plant engineering sector is only partially aligned with ESRS requirements, with most companies disclosing environmental information in a limited and uneven manner—mainly focusing on CO<sub>2</sub> emissions and energy consumption—while other important areas, such as water and material use, are largely neglected, highlighting notable shortcomings in transparency and reporting completeness and the need for improved disclosure practices.

## **Chapter 3. Methodology**

### **3.1 Research Design**

This study employs a quantitative content analysis approach. It utilizes a methodological framework similar to the one employed by Lajili and Zéghal (2005) in their analysis of risk disclosures within Canadian corporations. Lajili and Zéghal (2005) highlight that content analysis is widely utilized in accounting and sustainability research to systematically examine corporate disclosures. According to them, many studies that look at social and environmental reporting have used it (for example, Guthrie & Parker, 1990; Milne & Adler, 1999; Zeghal & Ahmed, 1990). They argue that this approach is particularly suitable for analyzing risk disclosures, as much of the information presented in corporate reports is conveyed qualitatively, particularly regarding non-financial risks.

Using this approach, the present study employs quantitative content analysis to examine how European companies discuss sustainability risks. The analysis focuses on risks related to sustainability disclosed under ESG topics as defined under the European Sustainability Reporting Standards. The aim of the analysis is to identify trends in the disclosure of risks related to ESRS topics based on the quantification of the disclosed risks. The research provides an analysis of how organizations perceive risks related to sustainability through the distribution of risks disclosed. It highlights the ESG risk areas that are frequently reported and identifies potential gaps in disclosure, considering specific patterns by country and industry.

### **3.2 Sample Selection**

The empirical analysis focuses on companies included in the Dow Jones Sustainability Index (DJSI) Europe, identified by S&P Global through the Corporate Sustainability Assessment as

sustainability leaders in Europe (S&P Global, n.d.). This sample was selected to provide a benchmark based on companies recognized for their sustainability performance, allowing the analysis to examine sustainability risk disclosures among firms considered leaders in sustainability practices.

The DJSI Europe index, set to take effect on December 23, 2024, will comprise 147 companies spanning various European nations and sectors. However, not every company within the index was suitable for this study. To make sure that the results were comparable and in line with the research goal, several exclusion criteria were used.

First, companies located in European nations that are not members of the European Union were excluded, as they are not required to adhere to the Corporate Sustainability Reporting Directive and are not obligated to utilize the ESRS framework.

Second, the analysis did not include companies that work in the banking sector. When it comes to sustainability risk disclosures, financial institutions often have to follow different reporting patterns compared to other industries.

Third, companies based in the EU that didn't publish sustainability statements that followed the ESRS framework, or for which a specific sustainability statement couldn't be found at the time of the research, were also left out.

After using these selection criteria, the final sample includes 46 companies from the DJSI Europe index. The study looks at sustainability statements that were published in 2025 and regarding the 2024 fiscal year. This was one of the first reporting periods affected by the ESRS framework under CSRD.

The sustainability data analyzed in this study were obtained from sustainability statements included in companies' integrated reports, which present organized disclosures in alignment with the ESRS framework.

### 3.3 Sample Characteristics

To provide context for the empirical analysis, the sample's composition was examined with respect to geographical distribution and sectoral representation. Descriptive statistics were calculated to illustrate how companies included in the dataset are distributed across countries and industries.

Country	Count of Companies
France (FRA)	12
Italy (ITA)	10
Germany (GER)	8
Spain (SPA)	7
Netherlands (NED)	4
Austria (AUS)	2
Portugal (POR)	2

*Table 9. Companies by country, developed by the Author*

Table 9 presents the country distribution of the sample selected from the Dow Jones Sustainability Index Europe. The sample includes companies from seven European countries, with the highest representation from France (12 firms), followed by Italy (10), Germany (8), and Spain (7). Smaller shares are observed for the Netherlands (4), Austria (2), and Portugal (2).

Sector	Count of Company
Capital Goods	7
Utilities	7
Insurance	4
Materials	4
Telecommunication Services	4
Health Care Equipment & Services	3
Transportation	3
Automobiles & Components	2
Energy	2
Pharmaceuticals, Biotechnology & Life Sciences	2
Real Estate Management & Development	2
Software & Services	2
Commercial & Professional Services	1
Financial Services	1
Food, Beverage & Tobacco	1
Media & Entertainment	1

*Table 10. Companies in the sample by Industry, Developed by the Author*

Table 10 presents the distribution of companies in the sample by industry sector, as classified by the Dow Jones Sustainability Index (DJSI). The highest representation is observed in Capital Goods and Utilities (7 companies each), followed by Insurance, Materials, and Telecommunication Services (4 companies each). Health Care Equipment and Services and Transportation include 3 companies each, while Automobiles and Components, Energy, Pharmaceuticals, Biotechnology and Life Sciences, Real Estate Management and Development,

and Software and Services are represented by 2 companies each. Finally, Commercial and Professional Services, Financial Services, Food, Beverage and Tobacco, and Media and Entertainment include 1 company each, highlighting a diversified but uneven sectoral distribution.

Industry	AUS	FRA	GER	ITA	LUX	NED	POR	SPA
Automobiles & Components				1		1		
Capital Goods		1	3	2				1
Commercial & Professional Services		1						
Energy	1			1			1	
Financial Services				1				
Food, Beverage & Tobacco						1		
Health Care Equipment & Services		2	1					
Insurance		1		2		1		
Materials	1	1	2					
Media & Entertainment		1						
Pharmaceutical		1						1

s, Biotech & Life Science s								
Real Estate Manage ment & Develop ment			1		1			
Softwar e & Services		2						
Telecom municat ion Services			1	1				2
Transpo rtation		1				1		1
Utilities		1		2			1	2

*Table 11. Companies in the sample by Industry and Country, Developed by the Author*

Table 11 presents the distribution of companies in the sample by industry and country. The data show that each industry is represented by firms from different European countries, including Austria, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, and Spain. While some industries are concentrated in a limited number of countries, others include companies from multiple geographical areas. Overall, the table highlights the cross-country presence of industries within the sample.

In addition to the original industry classification, a macro-level sector aggregation was developed for this study. The objective of this aggregation is to group industries with similar business models and economic activities to facilitate the interpretation of sustainability risk disclosure patterns across broader economic activity categories.

Cluster	Industry Areas Included
Production & Manufacturing	Automobiles & Components, Capital Goods, Materials, Food, Beverage & Tobacco
Infrastructure & Network	Energy, Utilities, Transportation, Telecommunication Services
Digital & Financial Platform Services	Financial Services, Software & Services
Asset & Risk-Backed Services	Insurance, Real Estate Management & Development
Knowledge-Based Services	Commercial & Professional Services, Media & Entertainment
Life Sciences & Health	Pharmaceuticals, Biotechnology & Life Sciences, Health Care Equipment & Services

*Table 12. Industry classification by Cluster; Developed by the Author*

In addition to the original industry classification, this study introduces a macro-level aggregation of sectors. The purpose of this classification is to group industries with similar economic activities and business models, thereby facilitating a more coherent analysis of sustainability risk disclosure patterns across broader categories.

As shown in Table 12, industries are organized into six clusters: Production & Manufacturing (including Automobiles & Components, Capital Goods, Materials, and Food, Beverage & Tobacco), Infrastructure & Network (Energy, Utilities, Transportation, and Telecommunication Services), Digital & Financial Platform Services (Financial Services and Software & Services), Asset & Risk-Backed Services (Insurance and Real Estate Management & Development), Knowledge-Based Services (Commercial & Professional Services and Media & Entertainment), and Life Sciences & Health (Pharmaceuticals, Biotechnology & Life Sciences, and Health Care Equipment & Services). This aggregation allows for a more structured interpretation of sectoral differences in ESG-related disclosures.

### 3.4 Data Collection

Data were collected through manual review of the sustainability statements included in the integrated reports of the sampled companies. Focus was given to the Impacts, Risks, and Opportunities (IRO) tables, where companies disclose their material sustainability-related impacts, risks, and opportunities.

Two types of data were extracted from the IRO tables:

1. Sustainability-related risks
2. Negative impacts

Each risk and negative impact was classified according to the relevant ESRS area and topic. The classification used in this study is presented below.

- Environmental Area:
  1. E1 Physical Risks
  2. E1 Transition Risks
  3. E2 Pollution
  4. E3 Water and Marine Resources
  5. E4 Biodiversity and Ecosystems
  6. E5 Resource Use and Circular Economy
- Social Area
  1. S1 Own Workforce
  2. S2 Workers in the Value Chain
  3. S3 Affected Communities

4. S4 Consumers and End-Users
  - Governance Ara
    1. G1 Business Conduct

E1 Climate Change officially encompasses both physical and transition risks as part of the ESRS framework. Nonetheless, this study did not employ E1 Climate Change as a criterion for classification. Instead, the risks were categorized into two distinct groups: E1 Physical Risks and E1 Transition Risks. In the ESRS framework, physical and transitional risk is covered by the E1 Climate Change topic. However, this distinction was developed specifically for this study to enhance the understanding of how companies articulate the primary environmental risks associated with climate change. As the final result, this study considers 6 topics for the Environmental area, 4 topics for the Social area, and 1 topic for the Governance area, totaling 11 topics.

In some instances, companies distinctly categorized negative impacts and risks according to ESRS topics within their reports. If negative impacts or risks were not clearly defined, they were manually categorized according to their descriptions and their alignment with the definitions provided by the ESRS framework.

### **3.5. Coding procedure**

Each sustainability-related risk present in all sustainability statements of the companies in the sample was collected manually. At the conclusion of the extraction process, all risks identified by the companies in the sample were compiled into a single dataset, categorized according to their ESG area and ESRS topic. The analysis identified 538 sustainability-related risks.

The negative impacts, however, were documented through a binary coding approach, being classified for each ESRS topic across all companies:

- If the company reported at least one negative impact for a given topic, it received a score of 1.
- If the company did not report a negative impact for a given topic, the score would be 0.

### **3.6. Data Analysis**

The collected data were organized and analyzed using Microsoft Excel. The dataset included all risks reported by the sampled companies as well as the binary indicators for negative impacts across ESRS topics.

Several descriptive statistical techniques were applied to analyze sustainability risk disclosure patterns:

- Frequency distribution, to identify how often risks are disclosed across ESRS areas and topics;
- The mean and median are used to assess the average number of risks reported by companies.
- Percentages are used to evaluate the proportion of companies disclosing risks within each ESRS topic.
- Cross-topic comparisons, to compare disclosure patterns across environmental, social, and governance categories

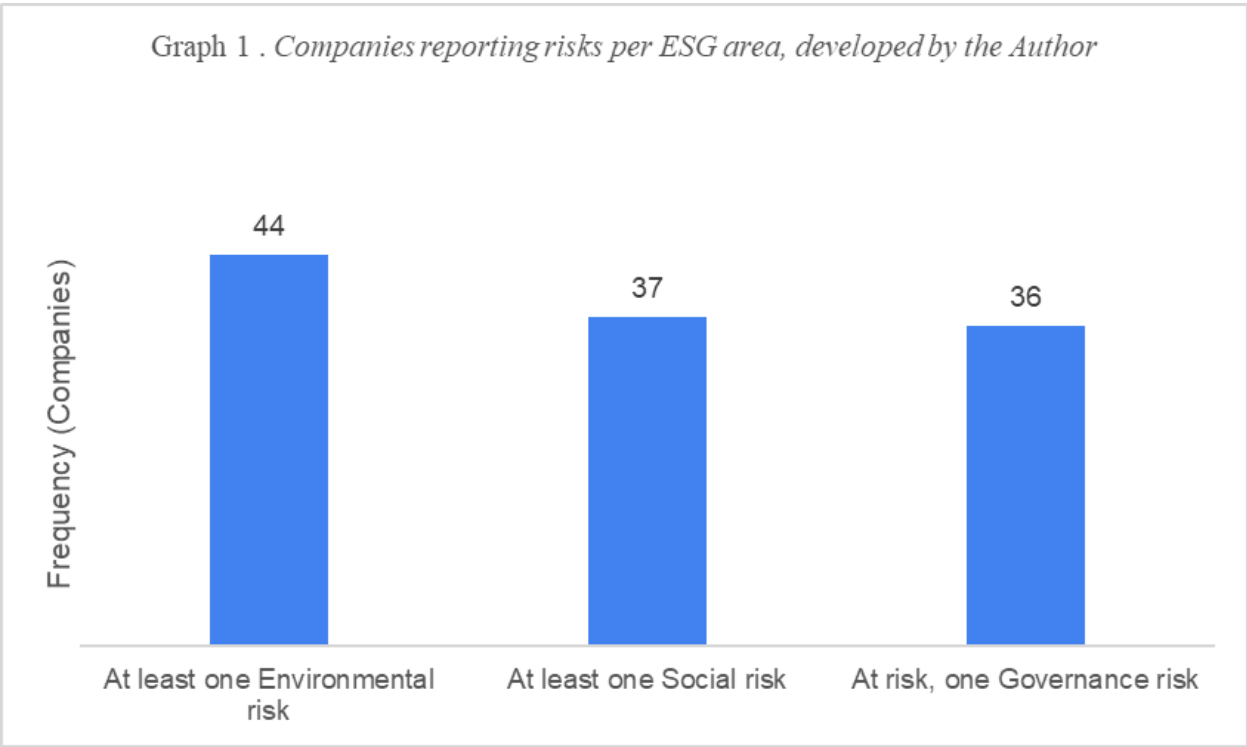
### **3.7. Research Limitations**

This study has some limitations. First, it is based on a single reporting year, and therefore, changes or trends in sustainability risk disclosure over time cannot be observed. Second, the sample includes 46 companies; although these firms are leaders within the Dow Jones Sustainability Index Europe, a larger sample could help strengthen the applicability of the findings. Third, the companies analyzed span various sectors and countries, and the distribution across industries and geographic locations is uneven, which may influence reporting patterns due to differences in industry characteristics, regulatory environments, and disclosure practices. Finally, the European Sustainability Reporting Standards are relatively new, and firms may still be in the early stages of implementation, meaning that disclosure practices may evolve as companies gain more experience with the standards.

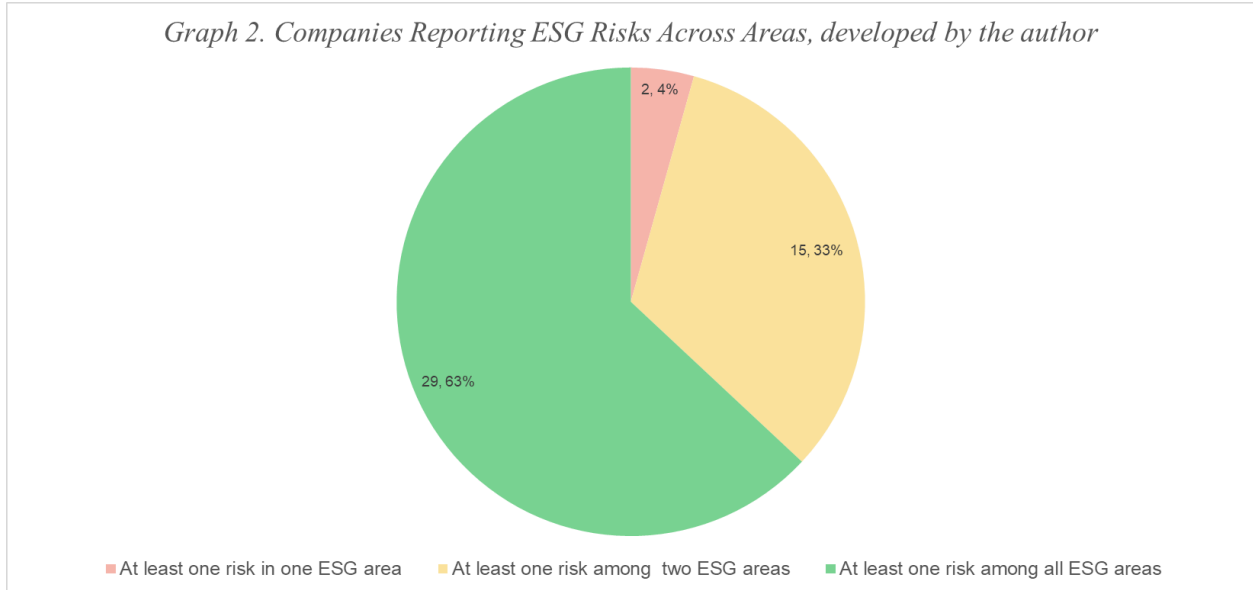
**Chapter 4. Analysis and Results**

**4.1. Risk Disclosure across ESG Areas**

Graph 1 shows the number of companies reporting at least one sustainability risk across ESG dimensions. Of the 46 companies analyzed, 44 (96%) report environmental risks, making this the most widely disclosed category. Social risks are reported by 37 companies (80%), and governance risks by 36 (78%), both at slightly lower yet still substantial levels.



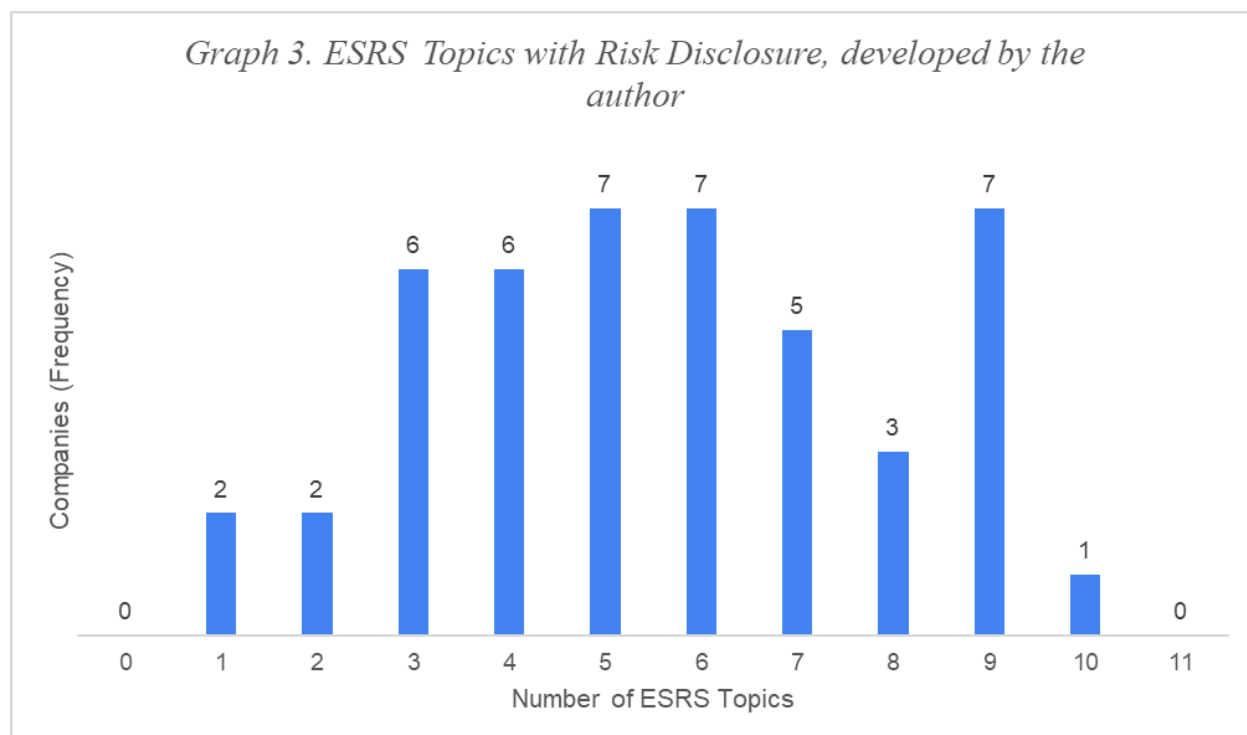
*Graph 2. Companies Reporting ESG Risks Across Areas, developed by the author*



Graph 2 demonstrates the extent of risk disclosure across ESG areas. Most firms (63%) report risks in all three dimensions, suggesting a broad approach to sustainability risk management. Another 33% disclose risks in two areas, and only 4% report on a single dimension.

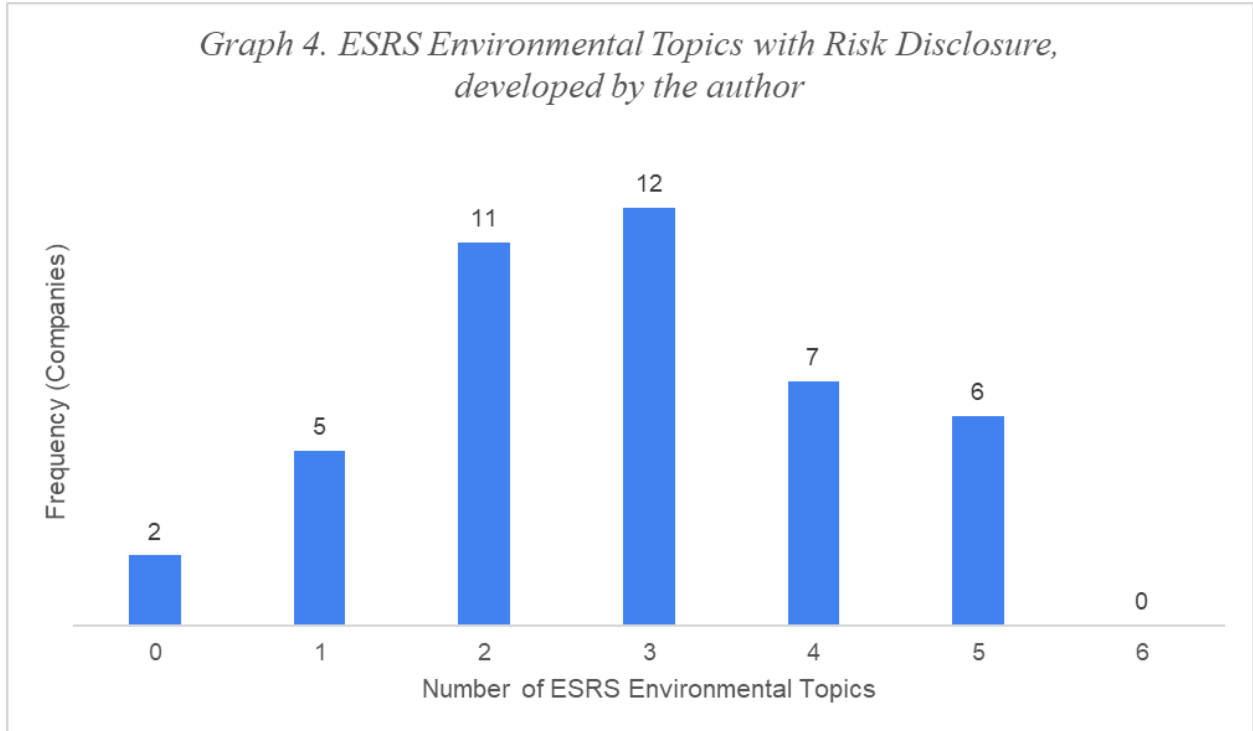
Overall, these findings suggest that companies typically address sustainability risks from multiple angles, with single-dimensional disclosure uncommon. Although rare, some companies do not disclose any ESG risks, showing that complete non-disclosure is minimal but present. Environmental risks stand out as the most prominent, likely reflecting their perceived materiality over social and governance risks.

## 4.2. Risk Disclosure Across ESRS topics



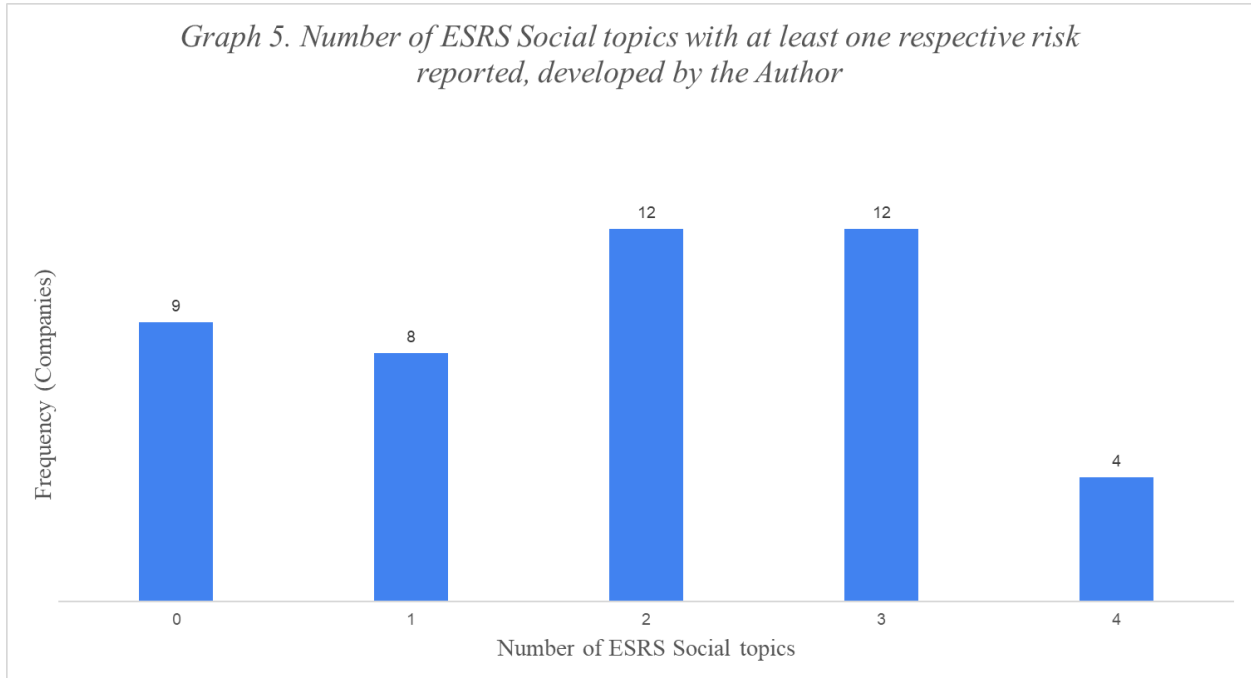
Graph 3 presents the distribution of companies according to the number of ESG topics (out of 11) for which at least one risk is disclosed. The number of topics identified ranges from 1 to 10, with an average of 5.8. The sample is evenly distributed around this average: 50% of companies report risks in 1–5 topics, while the remaining 50% report risks in 6–10 topics.

Most companies are concentrated around intermediate levels of disclosure. The most frequent values are 5, 6, and 9 topics, each reported by 15% of the sample, meaning that nearly half of the companies (46%) fall within these levels. In contrast, extreme cases are limited: only one company (2%) reports risks in 10 topics, and a small number (4%) report risks in only one or two topics. No company reports risks across all 11 topics. Overall, the distribution indicates that companies tend to disclose risks across a moderate range of ESG topics rather than at the extremes.



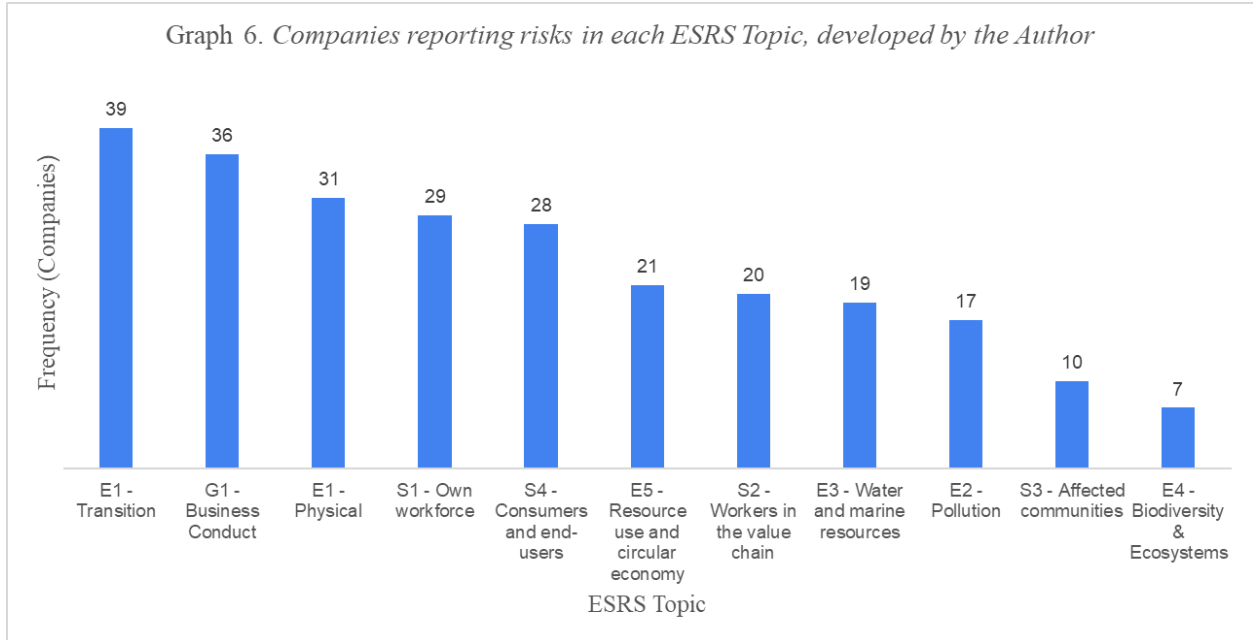
Graph 4 focuses on environmental topics (out of six). The number of environmental topics for which at least one risk is disclosed ranges from 0 to 5, with an average of 2.6. Slightly more than half of the companies (54%) report risks in three or more topics, while 46% disclose risks in two or fewer topics.

When considering the midpoint of the distribution, 61% of companies report risks in at least half of the available environmental topics (3–5), whereas 39% remain below this threshold (0–2). The most common level of disclosure is three topics (26%), followed by two topics (24%). No company reports risks across all six environmental topics, and only a small proportion (4%) reports no environmental risks. The highest observed level is five topics (13%).



Graph 5 illustrates the number of companies categorized by the number of social topics (out of 4) for which at least one risk is disclosed. The number of topics ranges from 0 to 4, with an average of 1.9. A total of 28 out of 46 companies (61%) disclose risks in 2–4 topics, while 18 out of 46 companies (39%) report risks in 0–1 topics.

The most frequent levels of disclosure are 2 and 3 topics, each reported by 12 out of 46 companies (26%). Full disclosure across all 4 social topics is observed in 4 out of 46 companies (9%), while 9 out of 46 companies (20%) report no social risks. This shows that companies most often disclose social risks across multiple topics, although complete coverage remains limited.



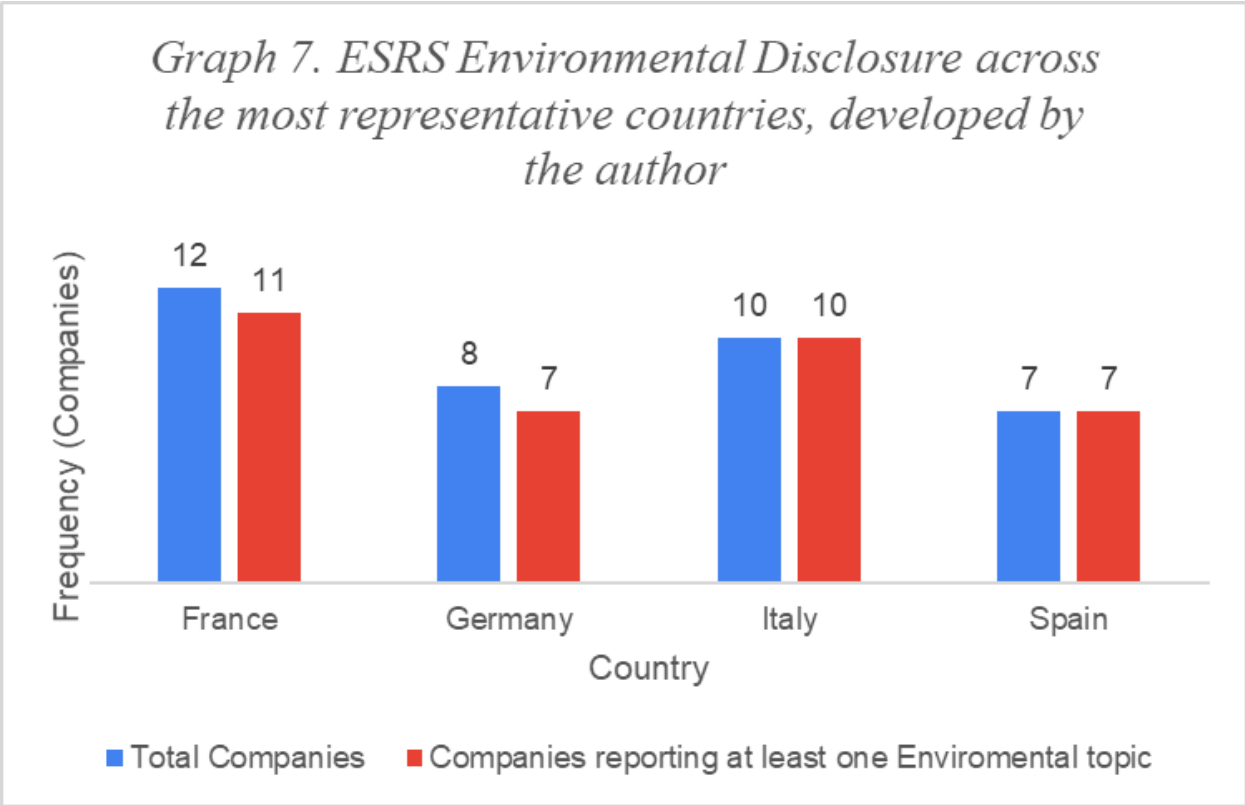
Graph 6 illustrates the number of companies reporting each of the 11 ESG risk topics. Overall, 6 of 11 topics are reported by at least half of the companies, including 2 of 6 environmental topics, 2 of 4 social topics, and the governance topic. The remaining 5 topics are reported by fewer than half of the companies.

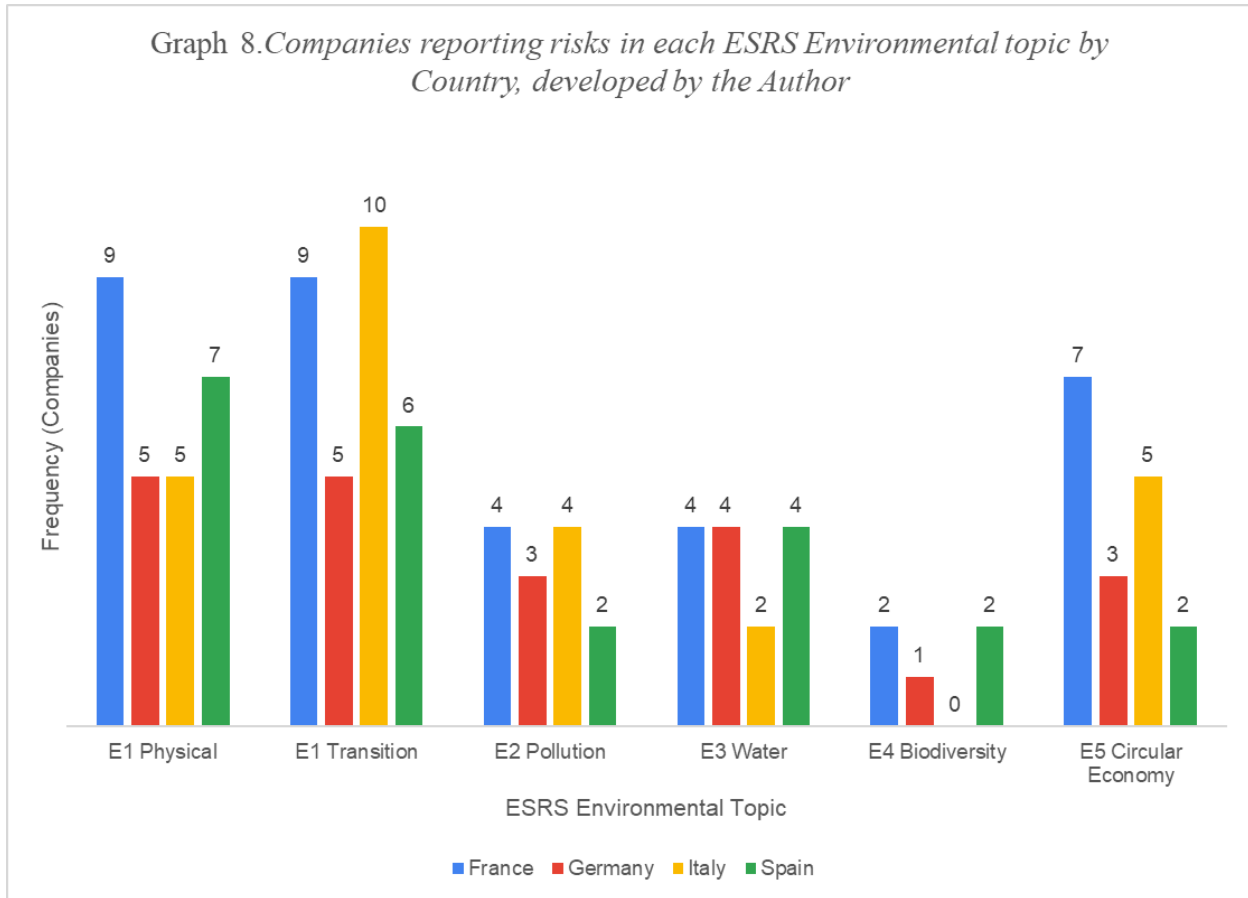
At the upper end, the most frequently reported topic is E1 – Transition, disclosed by 39 of 46 companies (85%), followed by G1 – Business Conduct, disclosed by 36 of 46 companies (78%). E1 – Physical is reported by 31 of 46 companies (67%), followed by S1 – Own Workforce (29 of 46 companies, 63%) and S4 – Consumers and End-Users (28 of 46 companies, 61%).

At the lower end, E4 – Biodiversity and Ecosystems is disclosed by 7 out of 46 companies (15%), and S3 – Affected Communities by 10 out of 46 companies (22%). Other topics include E2 – Pollution (17 out of 46 companies, 37%), E3 – Water and Marine Resources (19 out of 46 companies, 41%), S2 – Workers in the Value Chain (20 out of 46 companies, 43%), and E5 – Resource Use and Circular Economy (21 out of 46 companies, 46%).

These findings show that topics more directly related to companies’ own operations and immediate stakeholders—such as transition risks, business conduct, workforce, and customers—are mostly frequently disclosed by companies. In contrast, topics associated with broader environmental systems and the value chain—such as biodiversity, affected communities, and workers—are less frequently disclosed by companies.

**4.3. Risk Disclosure by ESRS Environmental topics by Country**





Graphs 7 and 8 present the distribution of environmental risk disclosure across the four countries with the largest representation in the sample: France (12 companies), Italy (10 companies), Germany (8 companies), and Spain (7 companies), for a total of 37 companies.

Environmental risk disclosure is widespread across all countries. All 10 Italian companies (100%) and all 7 Spanish companies (100%) disclose at least one environmental risk topic. In France, 11 out of 12 companies (92%) report environmental risks, while in Germany, 7 out of 8 companies (88%) do so.

At the topic level, the highest disclosure levels differ slightly by country but remain concentrated in climate-related risks. In France, both E1 – Physical and E1 – Transition risks are disclosed by 9 out of 12 companies (75%). In Germany, E1 – Transition risks are reported by 5 out of 8

companies (63%). In Italy, all 10 companies (100%) disclose E1 – Transition risks, while in Spain, all 7 companies (100%) report E1 – Physical risks.

At the lower end, E4 – Biodiversity and Ecosystems consistently shows the lowest level of disclosure across all countries. In France, 2 out of 12 companies (17%); in Germany, 1 out of 8 companies (13%); and in Spain, 2 out of 7 companies (29%). None of the 10 companies in Italy reports biodiversity-related risks. In Spain, low levels are also observed for E2 – Pollution, disclosed by 2 out of 7 companies (29%).

Looking at the overall distribution across countries, E1 – Transition risks emerge as the most disclosed topic, reported by 30 out of 37 companies (81%). This includes all 10 companies (100%) in Italy, 9 out of 12 (75%) in France, 6 out of 7 (86%) in Spain, and 5 out of 8 (63%) in Germany.

E1 – Physical risks are reported by 26 out of 37 companies (70%), with all 7 Spanish companies (100%) disclosing them, followed by 9 out of 12 companies (75%) in France, 5 out of 8 companies (63%) in Germany, and 5 out of 10 companies (50%) in Italy.

In contrast, E4 – Biodiversity and Ecosystems represents the least disclosed topic overall, reported by 5 out of 37 companies (14%). This includes 2 out of 12 companies (17%) in France, 2 out of 7 companies (29%) in Spain, and 1 out of 8 companies (13%) in Germany, with no disclosure observed in Italy.

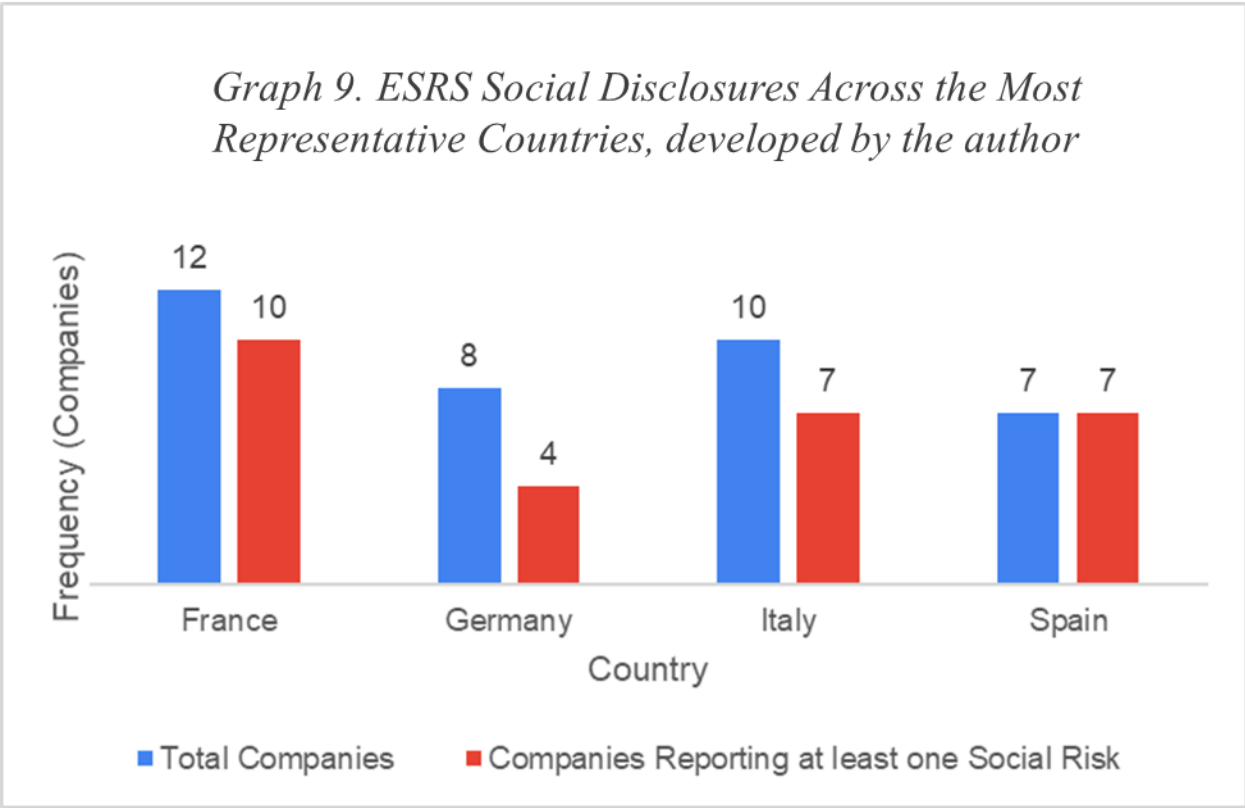
Overall, the cross-country analysis reflects patterns consistent with the broader sample.

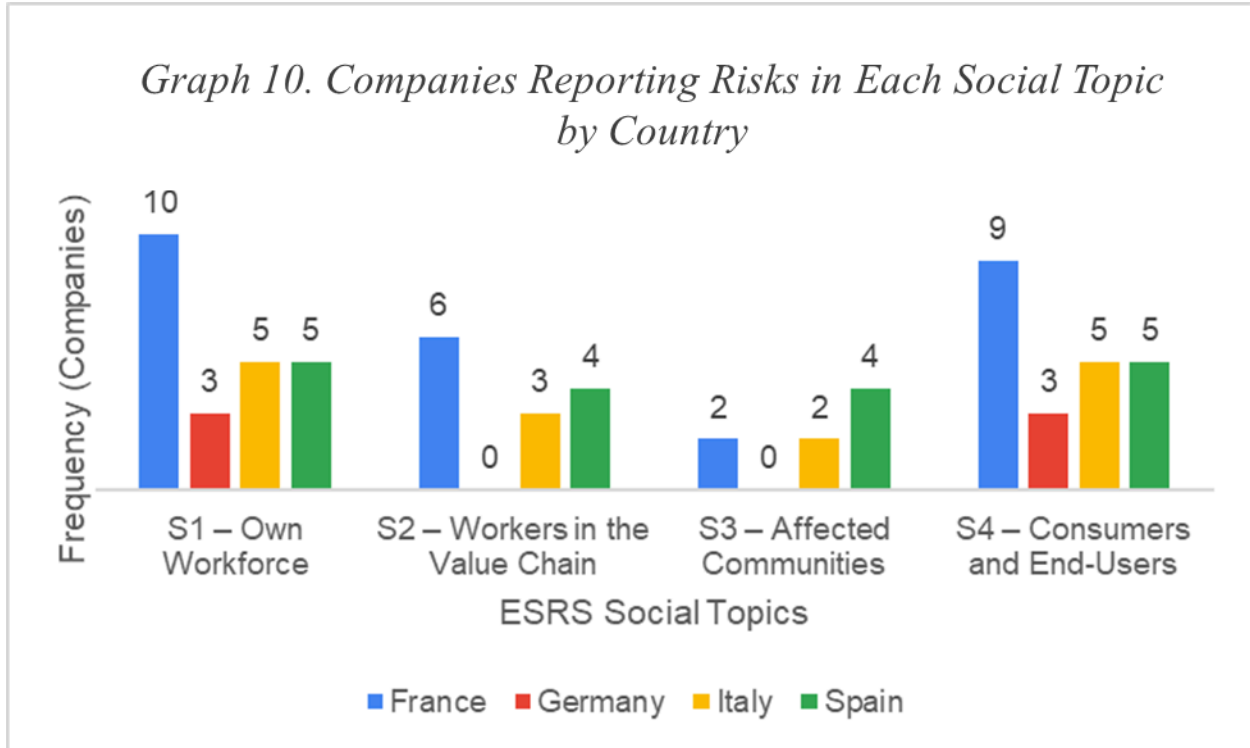
Environmental risk disclosure is present across all countries, with climate-related risks—particularly transition and physical risks—most frequently reported. In comparison, other environmental topics, such as pollution, water and marine resources, and resource use, show

more moderate levels of disclosure, typically reported by a smaller share of companies across countries.

These findings indicate that environmental risk disclosure across countries is not uniform: climate-related risks are consistently reported across all national contexts, while topics related to broader environmental systems—especially biodiversity—are disclosed less frequently and, in some cases, not reported at all within specific countries.

**4.4. Risk Disclosure by ESRS Social topics by Country**





Graphs 9 and 10 illustrate the distribution of social risk disclosure across the four countries with the largest representation in the sample: France (12 companies), Italy (10 companies), Germany (8 companies), and Spain (7 companies), for a total of 37 companies.

Overall, 28 of 37 companies (76%) report risks in at least one social domain. All Spanish companies (100%) disclose social risks, followed by 83% of French companies, 70% of Italian companies, and 50% of German companies.

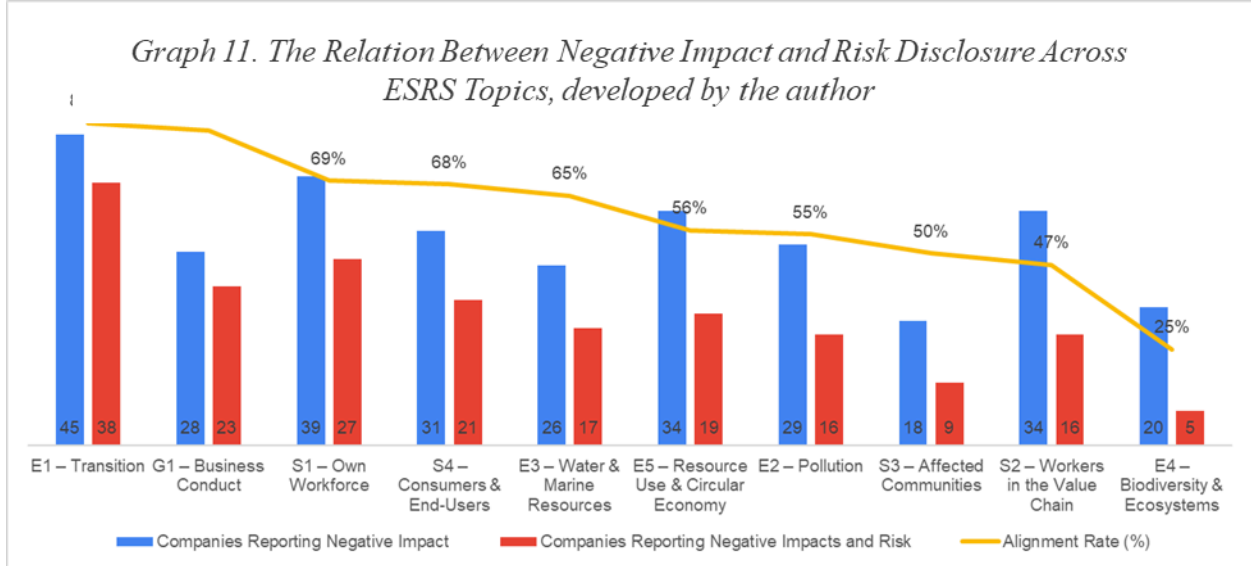
At the topic level, S1 – Own Workforce shows the highest level of disclosure across countries. In France, 10 out of 12 companies (83%) report it. In Spain, 5 out of 7 companies (71%) disclose this topic, while in Italy, 5 out of 10 companies (50%) report it. In Germany, 3 out of 8 companies (38%) disclose risks related to S1. A similar pattern appears for S4 – Consumers and End-Users, with 71% in Spain, 50% in Italy, 38% in Germany, and a majority in France reporting this topic in their disclosures.

At the lower end, S3 – Affected Communities is the least reported: 17% in France, 20% in Italy, limited in Spain, and none in Germany. Similarly, S2 – Workers in the Value Chain is less reported across countries, with no German companies disclosing related risks. S1 – Own Workforce is most frequently reported (62% or 23 companies), followed by S4 – Consumers and End-Users (59% or 22 companies). S3 – Affected Communities is the least disclosed (22% or 8 companies).

These results indicate that social risk disclosure varies across countries and topics. Disclosure is more consistent for topics related to companies’ own workforce and direct stakeholders, such as employees and customers. In contrast, topics with broader social impacts and value-chain implications—such as affected communities and workers—are reported by fewer companies and, in some cases, are not disclosed at all within specific countries.

Overall, compared to environmental risks, social risk disclosure appears less uniform across countries, with greater variation in both the extent of disclosure and the topics addressed.

**4.5. Negative Impacts and Risk Disclosure Alignment across ESRS topics**



Graph 11 illustrates the number of companies that report at least one negative impact per ESRS topic and those that report both a negative impact and the corresponding risk. It also presents the alignment rate between negative impact disclosure and risk disclosure across ESG subtopics.

Alignment refers to cases where a company identifies both a negative impact and the associated risk within the same topic.

At the upper end of the distribution, E1 – Transition shows the highest number of companies reporting negative impacts (45) and the highest alignment rate, with 38 of 45 companies (84%) also disclosing the related risks. Similarly, G1 – Business Conduct demonstrates high alignment, with 23 of 28 companies (82%) reporting both negative impacts and associated risks.

Within the social dimension, S1 – Own Workforce and S4 – Consumers and End-Users show relatively high alignment levels. Specifically, 23 out of 33 companies (69%) disclose both impact and risk for S1, while 22 out of 32 companies (68%) do so for S4.

Moderate alignment is observed in some environmental topics. For E3 – Water and Marine Resources, 26 companies report negative impacts, of which 17 (65%) also disclose related risks. In E5 – Resource Use and Circular Economy, 19 out of 34 companies (56%) report both, while in E2 – Pollution, 16 out of 29 companies (55%) show alignment.

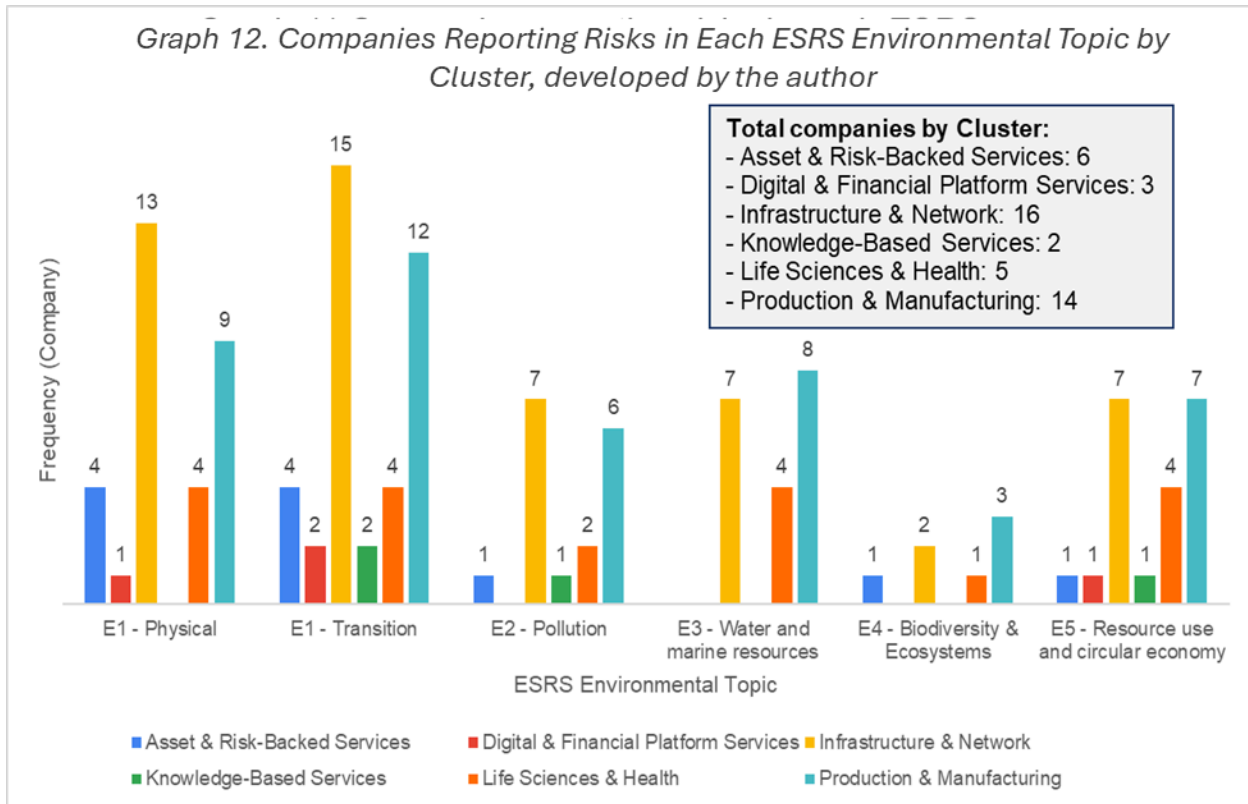
Lower alignment is observed in certain social topics. In S2 – Workers in the Value Chain, 16 out of 34 companies (47%) report both negative impacts and associated risks. Similarly, in S3 – Affected Communities, 9 out of 18 companies (50%) disclose both elements.

At the lower end, E4 – Biodiversity and Ecosystems shows the weakest alignment. Although 20 companies report negative impacts, only 5 (25%) disclose the related risks, resulting in the lowest alignment rate across all ESG subtopics.

Overall, the average alignment rate across ESG topics is approximately 60%, indicating that in many cases, companies that report negative impacts also disclose associated risks. However, alignment varies across topics.

These findings indicate that the relationship between negative impact disclosure and risk disclosure is not uniform across ESG areas. Higher alignment is observed in climate-related and governance topics, as well as in social areas linked to stakeholders closer to companies' direct operations. In contrast, lower alignment is found in topics related to the value chain—particularly biodiversity and certain social dimensions. This reflects an overall pattern in which disclosures are more prevalent and more closely aligned in areas connected to direct operations, while value chain-related topics are less prominently reported and show weaker alignment between impacts and risks.

#### 4.6. Risk Disclosure by ESRS Environmental Topics across industry clusters



Graph 12 illustrates the number of companies reporting risks across environmental topics within different macro-industry clusters.

By comparison, in some clusters, certain environmental topics are not reported at all. For example, in the Digital & Financial Platform Services cluster, neither of the 2 companies reports risks related to E2 – Pollution, E3 – Water and Marine Resources, or E4 – Biodiversity & Ecosystems. Likewise, in the Knowledge-Based Services cluster, none of the 2 companies disclose risks associated with E1 – Physical, E3 – Water and Marine Resources, or E4 – Biodiversity & Ecosystems. Furthermore, in the Asset & Risk-Backed Services cluster, none of the 5 companies reports risks related to E3 – Water and Marine Resources, although other environmental topics are addressed.

In direct contrast, the Infrastructure & Network cluster shows disclosure across all environmental topics. Nevertheless, the distribution remains uneven: E1 – Transition is reported by 15 of 16 companies (94%), followed by E1 – Physical, with 13 of 16 companies (81%). Other topics show lower levels of disclosure, while E4 – Biodiversity & Ecosystems is the least reported, with only 2 out of 16 companies (13%).

A similar pattern is observed in the Production & Manufacturing cluster. E1 – Transition is disclosed by 12 out of 14 companies (86%), followed by E1 – Physical with 9 out of 14 companies (64%). Other topics show moderate levels of disclosure, including E3 – Water and Marine Resources (8 out of 14, 57%), E5 – Resource Use and Circular Economy (7 out of 14, 50%), and E2 – Pollution (6 out of 14, 43%). As in other clusters, E4 – Biodiversity & Ecosystems remains the least reported topic, with only 3 of 14 companies (21%) disclosing it.

Overall, environmental risk disclosure varies by cluster. Infrastructure & Network and Production & Manufacturing report risks across a broader range of environmental topics, whereas Digital & Financial Platform Services, Knowledge-Based Services, and Asset & Risk-Backed Services disclose risks across fewer topics, with instances where no disclosure is observed for a specific topic.

Taken together, across all clusters, a consistent pattern emerges: topics related to climate risks (E1 – Transition and E1 – Physical) are disclosed more frequently, while biodiversity (E4 – Biodiversity & Ecosystems) shows the lowest levels of disclosure in every cluster. This reflects an overall distribution in which certain environmental topics are consistently reported across industries, whereas others appear less frequently or are absent in specific clusters.

#### 4.7. Risk Disclosure by ESRS Social topics across industry clusters

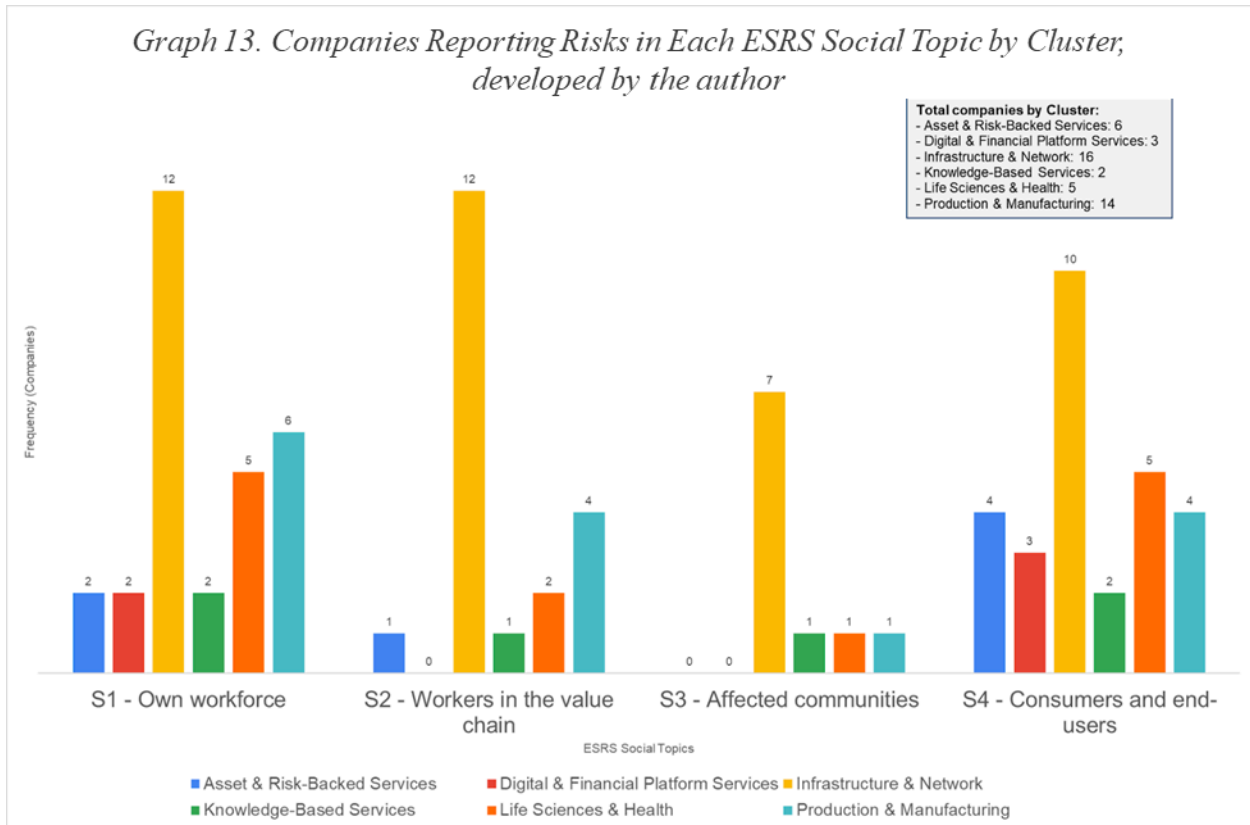


Table 13 illustrates the number of companies reporting risks across social topics by industry cluster.

In some clusters, certain social topics are not disclosed. In the Digital & Financial Platform Services cluster, none of the 3 companies reports risks related to S2 – Workers in the Value Chain or S3 – Affected Communities. Similarly, in the Asset & Risk-Backed Services cluster, none of the 4 companies discloses risks associated with S3 – Affected Communities.

In contrast, the Infrastructure & Network cluster reports risks across all social topics.

Specifically, 12 out of 14 companies (86%) disclose risks related to S1 – Own Workforce and S2

– Workers in the Value Chain. Additionally, 10 out of 14 companies (71%) report risks related to S4 – Consumers and End-Users, while 7 out of 14 companies (50%) disclose risks associated with S3 – Affected Communities.

A similar, though smaller-scale pattern is observed in the Life Sciences & Health cluster. All 5 companies (100%) report risks related to S1 – Own Workforce and S4 – Consumers and End-Users, while 2 out of 5 companies (40%) disclose risks related to S2 – Workers in the Value Chain, and 1 out of 5 companies (20%) reports risks associated with S3 – Affected Communities.

In the Production & Manufacturing cluster, disclosure is more concentrated. A total of 6 out of 9 companies (67%) report risks related to S1 – Own Workforce, while 4 out of 9 companies (44%) disclose risks related to S2 – Workers in the Value Chain and S4 – Consumers and End-Users. Only 1 out of 9 companies (11%) reports risks associated with S3 – Affected Communities.

Overall, the results show that social risk disclosure varies across industry clusters. Clusters such as Infrastructure & Network and Life Sciences & Health report risks across a broader range of social topics, covering all or most ESRS categories. In contrast, Digital & Financial Platform Services and Asset & Risk-Backed Services disclose risks across fewer topics, with instances where no disclosure is observed for specific social topics within the cluster.

Across all clusters, disclosure is more frequently concentrated in S1 – Own Workforce and S4 – Consumers and End-Users, while S3 – Affected Communities consistently shows the lowest level of disclosure.

## **Chapter 5. Discussion**

### **5.1 Predominance of Environmental Risk Disclosure**

The findings of this study reveal a clear prominence on environmental risk disclosures. Specifically, 96% of firms disclose environmental risks, compared to 80% for social risks and 78% for governance risks. Furthermore, a majority of companies (63%) report risks across all three ESG dimensions, indicating a broadly multidimensional approach to sustainability risk disclosure. However, environmental risks remain the most consistently reported category.

This result aligns with broader global trends, where environmental risks—particularly climate-related risks—are increasingly recognized as among the most significant threats. Global risk assessments consistently rank environmental issues among the top risks in the coming years. The prominence of environmental disclosure is also consistent with the growing regulatory and institutional focus on climate-related reporting frameworks, such as TCFD and ISSB. As argued by Ilhan et al. (2023), financial markets require timely, decision-useful climate risk information to support pricing and investment decisions, underscoring the centrality of environmental disclosures.

### **5.2 Moderate Coverage of ESRS Topics**

The results indicate only moderate coverage across ESRS topics. On average, companies disclose risks across 5 to 6 of 11 topics, with most firms clustered at intermediate levels of topic representation. This suggests that while companies engage with multiple ESG topics, comprehensive coverage across all ESRS categories remains limited.

This pattern reflects findings from earlier studies on risk disclosure. Linsley and Shrives (2006) note that risk disclosures tend to focus on past or present risks rather than forward-looking uncertainties. Moreover, firms face a trade-off between transparency and competitive considerations, as highlighted by Li et al. (2019), who argue that companies may selectively disclose risk information to balance stakeholder expectations with the protection of proprietary information. This is further supported by Dumay and Hossain (2018), who note that although sustainability risks are increasingly integrated into corporate reporting, there remains limited consensus on the extent and format of disclosure.

Additionally, the complexity and uncertainty surrounding sustainability risks contribute to this partial coverage. According to WBCSD (2017), sustainability risks are inherently difficult to measure due to limited historical data, scientific uncertainty, and the absence of standardized assessment tools. This reinforces the argument by Laine et al. (2021) and Boothroyd and Thompson (2024), who emphasize that sustainability is increasingly framed as a domain of uncertainty shaped by evolving social, environmental, and cultural dynamics.

### **5.3. Prominence of Risk Disclosure in Direct Operational Topics**

A more granular analysis of ESRS topics reveals differences in the prominence of risk disclosure across specific areas suggesting a prominence in topics related to companies direct operations compared to the ones across the value chain.

Climate-related risks (E1—both transition and physical), as well as governance-related risks (G1—Business Conduct) and social risks directly associated with internal stakeholders (S1—Own Workforce and S4—Consumers and End-Users), are more frequently disclosed across

companies. In contrast, risk disclosure related to topics such as biodiversity (E4), affected communities (S3), and workers in the value chain (S2) appears less prominently.

In the environmental side, these findings are consistent with Broniewicz et al. (2024), who, in a study focused on overall ESRS disclosure among Polish banks, also found stronger disclosure in climate-related areas and lower coverage of biodiversity topics. While their study examines overall ESRS disclosure and this study focuses specifically on risk disclosure across multiple sectors at the European level, both show the same pattern: climate-related risks are more prominently disclosed, whereas biodiversity-related risks remain less represented, suggesting that this may reflect a broader disclosure pattern.

#### **5.4 Geographical and Sectoral Variations in Disclosure Practices**

The analysis also reveals both geographical and sectoral variations in sustainability risk disclosure.

Across countries, environmental risk disclosure—particularly climate-related risks—is consistently high, indicating convergence in environmental reporting practices. However, social risk disclosure shows greater variability, both in the proportion of companies reporting and in the range of topics covered. Moreover, some companies in countries such as Italy and Germany, which constitute the most represented countries in the sample, did not report risks for certain topics.

At the industry level, sectors such as Infrastructure & Network and Production & Manufacturing report risks across a broader set of ESG topics, while sectors such as Digital & Financial Platform Services and Knowledge-Based Services disclose risks across a more limited set of

topics. Across all clusters, climate-related risks are consistently reported, whereas biodiversity-related topics appear less prominently.

These findings align with Probohudono et al. (2013), who demonstrate that risk disclosure practices are influenced by country-specific factors, firm characteristics, and governance structures. Differences across countries and industries may therefore reflect variations in institutional environments, exposure to specific risks, and stakeholder expectations.

### **5.5 Moderate Alignment Between Risk and Impact Disclosure**

Finally, the analysis of the relationship between negative impact disclosure and risk disclosure reveals only partial alignment, with an average alignment rate of approximately 60%. While higher alignment is observed in areas such as climate-related risks and governance, other topics—particularly biodiversity and value chain-related social risks—show lower consistency.

This suggests that the identification of sustainability impacts does not always correspond to the disclosure of associated risks. In other words, the relationship between impact and risk disclosure appears to vary across topics.

According to EFRAG (2022), sustainability-related risks may arise from a company's impacts and dependencies. For instance, negative impacts on local communities may expose firms to stricter regulatory interventions or reputational consequences, which can, in turn, translate into financial effects such as increased costs or difficulties attracting and retaining talent.

In this context, the observed misalignment may indicate challenges in systematically translating identified impacts into corresponding risk disclosures. The complexity of linking impacts, risks, and financial implications, particularly in areas characterized by high uncertainty, limited data availability, and complex value chain dynamics, may hinder full integration.

These findings could be interpreted through prior literature, which highlights the evolving nature of sustainability risks and the lack of standardized methodologies as key obstacles to coherent and decision-useful disclosure practices. As a result, despite the conceptual integration promoted by ESRS, the empirical alignment between impact and risk disclosure remains uneven across topics.

## **Chapter 6: Conclusions**

### **6.1. Implications**

The findings of this study generate relevant implications for policymakers, practitioners, companies, investors, and the academic community, particularly in the context of the early-stage implementation of the ESRS framework.

From a policy perspective, the results provide empirical insights into how sustainability risk disclosure is distributed across ESRS topics. The moderate level of topic coverage and the uneven prominence of certain areas—such as the lower representation of value chain–related risks—highlight areas where additional clarification or guidance may be beneficial. Furthermore, the partial alignment between impact and risk disclosure points to practical challenges in applying the double materiality principle. These findings may inform the ongoing refinement of ESRS guidance, supporting improvements in the consistency, comparability, and completeness of sustainability reporting.

From a managerial and professional perspective, the results offer relevant insights for consultants, advisory firms, and risk management professionals involved in sustainability and enterprise risk management. The observed variation in disclosure patterns across ESG topics may support practitioners in assessing whether less frequently disclosed risks reflect lower materiality or limitations in current identification and assessment processes. This may contribute to the development of more structured approaches and tools aimed at strengthening the integration of sustainability risks into enterprise risk management, particularly in relation to complex environmental issues and value chain exposures.

For companies, the findings underline the importance of strengthening internal processes for linking sustainability impacts to risk disclosures. The observed partial alignment between these elements suggests that their integration may not yet be fully operationalized. This may encourage greater coordination between sustainability, risk management, and reporting functions, with the aim of enhancing the coherence and completeness of disclosures. In addition, the uneven distribution of risk disclosure across ESRS topics may support increased attention to less represented areas, particularly those that are more difficult to assess or quantify.

From an investor perspective, the findings provide a structured view of how sustainability risks are currently disclosed under ESRS. The variability in topic coverage and the incomplete alignment between impacts and risks suggest that disclosures may not always offer a fully integrated representation of companies' risk exposure. As a result, investors may need to interpret available information with caution, especially in areas where disclosures appear limited. At the same time, these findings may support more informed engagement with companies, encouraging greater transparency in how sustainability risks are identified, assessed, and communicated.

From an academic perspective, prior studies have mainly focused on traditional risk disclosure, while sustainability-related risk disclosure remains underexplored. Existing research tends to adopt narrow approaches, often limited to specific countries, sectors, or individual topics, with little evidence at a broader European level. This gap is particularly relevant in the context of the recently introduced ESRS framework, where empirical research remains limited.

## 6.2. Limitations and Future Research

This study adopts a broad, cross-sectional perspective on sustainability risk disclosure, focusing on observed disclosure patterns rather than evaluating whether companies report risks in line with expected material risk exposures. As a result, the analysis does not assess whether disclosed risks correspond to what firms *should* report based on emerging global trends and material risk factors.

For instance, global evidence such as the Global Risks Report highlights the increasing relevance of environmental risks, including extreme weather events, biodiversity loss, ecosystem collapse, and resource depletion over the coming decade. However, while climate-related risks appear among the most frequently disclosed in corporate reports, other environmental risks—such as biodiversity, pollution, and water-related risks—are less prominently reported. This divergence suggests a potential gap between disclosed risks and broader sustainability risk trends. Future research could explore this discrepancy in greater depth by examining whether it reflects differences in financial materiality assessments, limitations in risk identification and measurement, or challenges in translating emerging risks into reportable information. In particular, further studies could investigate how companies assess materiality in relation to macro-level sustainability trends and compare corporate disclosures with scientific and expert-based evaluations of risk relevance.

Similarly, the findings indicate that social risks related to the value chain—such as risks affecting workers in the value chain and affected communities—are less consistently disclosed than those related to companies' own workforce. Future research could examine whether these patterns reflect differences in perceived materiality, data availability constraints, or the complexity of

assessing risks beyond the firm's direct operational boundaries. Comparative analyses between corporate disclosures and external assessments of value chain risks could help identify potential gaps in risk identification.

In addition, future research could adopt more granular approaches by analysing specific material topics across countries and sectors. Different industries and national contexts are exposed to distinct environmental and social risks, and sector- or country-level analyses could provide deeper insights into whether disclosed risks align with expected material risk profiles. Such studies could compare company disclosures with sector-specific risk exposures and broader macro trends to assess the consistency and completeness of sustainability risk reporting.

Finally, this study relies on content analysis, which limits the ability to capture the internal processes underlying risk identification and disclosure. Future research could complement these findings with qualitative methods, such as interviews with sustainability and risk management professionals. This would provide deeper insights into how companies interpret materiality, how sustainability risks are assessed internally, and why certain risks—despite their potential relevance—may not be reflected in sustainability disclosures.

### **6.3. Conclusion**

This study set out to examine the main trends in sustainability risk disclosure under the ESRS framework among companies listed in the Dow Jones Sustainability Index Europe.

Overall, the findings indicate that sustainability risk disclosure is not evenly distributed across ESG dimensions and topics. Environmental risks, particularly climate-related risks, are the most prominently disclosed, followed by social and governance risks. In addition, risks related to

internal operations, such as climate, governance, and workforce-related aspects, are more frequently reported than those associated with broader value chain dynamics or more complex environmental issues.

The analysis also reveals a moderate level of coverage across ESRS topics, suggesting that while companies engage with multiple sustainability areas, comprehensive disclosure remains limited. This reflects variability in how sustainability risks are identified and reported, potentially influenced by data availability, measurement challenges, and differing interpretations of ESRS requirements. Furthermore, geographical and sectoral differences indicate that contextual factors continue to shape disclosure practices.

Importantly, the study identifies only partial alignment between negative impact disclosure and risk disclosure. While certain areas, such as climate-related risks, show higher consistency, other topics exhibit weaker alignment. This finding highlights challenges in operationalizing the double materiality principle, particularly in linking identified impacts to their corresponding financial risks.

From a broader perspective, this study provides a European-wide overview of ESRS application across ESG topics, with a specific focus on sustainability risk disclosure—an area that remains underexplored in the literature. The findings offer relevant insights for policymakers, practitioners, companies, and investors, particularly in the context of the early implementation of ESRS, and contribute to supporting further research and development of the framework to enhance sustainability risk reporting practices.

However, this study is subject to certain limitations. It focuses on observed disclosure patterns rather than assessing whether reported risks align with expected material exposures. Future

research should address this gap by examining sustainability risks in relation to global trends, conducting more granular sector- and country-specific analyses, and incorporating qualitative approaches to better understand how companies identify, assess, and disclose sustainability risks.

In conclusion, while the ESRS framework represents a significant step toward more structured and comprehensive sustainability reporting, the integration of sustainability risks into corporate disclosure remains an evolving process, requiring further refinement, guidance, and empirical investigation.

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