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SUSTAINABILITY REPORTING PRACTICES AND ASSURANCE CHALLENGES IN THE EUROPEAN UNION: THE IMPACT OF CSRD ENFORCEMENT

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Sustainability reporting practices and assurance challenges in the European Union: The impact of CSRD enforcement

Ph.D. Dissertation

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List of abbreviations

Abbreviation	Full term/Meaning
AA1000AS	*AA1000 Assurance Standard*
BY	*Base-year framework (comparisons relative to the assurance year)*
CI	*Confidence interval*
CSRD	*Corporate Sustainability Reporting Directive*
D/E	*Debt-to-equity ratio*
EBIT	*Earnings before interest and taxes*
EFRAG	*European Financial Reporting Advisory Group*
EPS	*Earnings per share*
ESG	*Environmental, social and governance*
ESRS	*European Sustainability Reporting Standards*
FY	*Fiscal year*
IAASB	*International Auditing and Assurance Standards Board*
IASP	*Independent assurance services provider*
ISAE 3000	*International Standard on Assurance Engagements 3000*
LSEG	*London Stock Exchange Group*
NFI	*Non-financial information*
NFR	*Non-financial report*
NFRD	*Non-Financial Reporting Directive*
PY	*Previous-year framework (year-on-year comparison)*
ROA	*Return on assets*
ROE	*Return on equity*
SME	*Small and medium-sized enterprise*
Big Four (Big4)	*the four largest global professional services networks*
CSR	*corporate social responsibility*
GRI	*Global Reporting Initiative*
CSDDD	*Corporate Sustainability Due Diligence Directive*
ESEF	*European Single Electronic Format*

MNB	*Magyar Nemzeti Bank / Hungarian National Bank*
NVivo	*Qualitative data analysis software*
PIEs	*Public Interest Entities*
R&D	*Research and Development*
SFDR	*Sustainable Finance Disclosure Regulation*
SMEs	*Small and Medium-sized Enterprises*
BRSR	*Business Responsibility and Sustainability Reporting*
CEE	*Central and Eastern Europe*
CSDDD	*Corporate Sustainability Due Diligence Directive*
FSB	*Financial Stability Board*
IFRS	*International Financial Reporting Standards*
ISSB	*International Sustainability Standards Board*
KPI	*Key Performance Indicator*
PPP	*People, Planet and Profit*
RQ	*Research Question*
SASB	*Sustainability Accounting Standards Board*
SDGs	*Sustainable Development Goals*
SEC	*U.S. Securities and Exchange Commission*
SGX	*Singapore Exchange*
SLR	*Systematic Literature Review*
SSBJ	*Sustainability Standards Board of Japan*
TCFD	*Task Force on Climate-related Financial Disclosures*
UN	*United Nations*
UNEP	*United Nations Environment Programme*
UNFCCC	*United Nations Framework Convention on Climate Change*

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I. Research context and framework

I.1. Introduction and structure of the dissertation

Based on the growing international and European relevance of sustainability reporting and assurance, my doctoral research focuses on the evolution, practices, and challenges of sustainability reporting and its independent third-party assurance within Europe. In the dissertation layered samples were utilized, with a special emphasis on the effects of the Corporate Sustainability Reporting Directive (hereinafter referred to as CSRD). Over the past few decades, sustainability reporting has emerged as one of the most crucial corporate communication tools. It connects financial and non-financial information and enhances stakeholder trust, accountability, and transparency. However, ensuring the reliability of such reports remains a relatively new and underexplored area, necessitating more thorough theoretical and empirical research.

In the following section, I present the dissertation's structure, outlining the main objectives and research questions that guide it. Then, I present the main findings of the articles and discuss how they contribute to the understanding of the role of sustainability reporting and assurance. My dissertation is structured as an article-based PhD, relying on four empirical research papers:

- The first article, *"The Diversity of Environmental, Social, and Governance Aspects in Sustainability: A Systematic Literature Review"* (Jámbor & **Zanócz**, 2023, *Sustainability*), provides a comprehensive overview of the academic literature on ESG/sustainability reporting, scoring, and rating, as well as the lack of reporting assurance. This study identifies the main conceptual and methodological inconsistencies within the sustainability reporting and rating landscape. It also highlights how the absence of harmonized standards and limited assurance mechanisms has led to transparency and comparability challenges. The article establishes the theoretical foundation of the dissertation by highlighting the fragmented and inconsistent nature of ESG evaluation and the need for more reliable assurance frameworks.
- The second paper, *"Review of Preparations for CSRD: An Examination of the Hidden Complexity of Sustainability Reports at Hungarian Public Interest Entities Based on Interviews"* (Jámbor & **Zanócz**, 2025, accepted for publication in

Budapest Management Review), presents a qualitative, interview-based study. It examines the organisational preparedness of Hungarian Public Interest Entities (hereinafter referred to as PIEs) for implementing the CSRD. Through eleven semi-structured interviews, the study finds that while regulatory compliance has increased transparency in sustainability disclosures, the introduction of mandatory assurance poses a new and significant challenge. The findings reveal the internal and external difficulties companies face (such as fragmented data systems, human resource constraints, and barriers to strategic adaptation), while emphasizing that external assurance is perceived as the next major milestone for sustainability reports.

- The third article, *"Non-Financial Reporting and Assurance Trends in Selected Central European Countries"* (**Zanócz**, 2025, *Public Finance Quarterly*), extends the empirical analysis to an international level. Using quantitative data from the LSEG/Refinitiv database, this paper examines how selected Central European companies develop their sustainability reporting maturity over time. The results indicate that, on average, companies achieve sufficient data quality and complexity suitable for assurance after approximately 3 reporting cycles (median). However, the study also reveals that assurance practices remain inconsistent across the region due to the lack of a unified regulatory or methodological standard, further emphasizing the need for convergence in assurance approaches and the professionalization of sustainability assurance.
- The fourth article, *"Expected Impact of Assurance of the Sustainability Disclosure of Large Companies in the European Union"* (**Zanócz** & Bodó, 2026, currently in the publication process), explores the relationship between sustainability assurance and corporate financial and non-financial performance. This quantitative research aims to discover how the assurance of sustainability reports affects corporate transparency, data quality, and information reliability, and how these changes relate to investor and creditor decision-making. Focusing on the early stages of CSRD implementation, the quantitative analysis tracks the evolution of assurance practices and their alignment with ESG ratings and EU sustainability requirements. Empirically, the study connects the introduction of external assurance with changes in ESG ratings and key financial indicators.

Since this doctoral dissertation is built upon four individual studies, the traditional structure of theoretical background, methodology, results, and discussion is distributed among the included articles. Each paper is presented in its full, published, or ready-for-publication form to ensure academic integrity and completeness. Therefore, theoretical overlaps may occur, as certain conceptual foundations (basic sustainability reporting concepts, regulatory changes over the past few years, and the role of assurance in companies) recur in more than one article to provide continuity and coherence across the dissertation. In some instances, wording has been slightly adapted from the published versions to ensure linguistic and structural consistency, without altering the meaning of the original texts.

All references cited within the included publications are consolidated and listed at the end of the dissertation. The following chapters provide a comprehensive overview of my research process, findings, and academic contributions.

In **Chapter I**, I introduce the dissertation's focus, rationale, and research objectives. This includes defining key concepts such as sustainability reporting, assurance, and CSRD compliance, and framing their relevance in both the European and Hungarian contexts. I also present the theoretical perspectives underpinning the research, including stakeholder theory, legitimacy theory, and institutional theory, as they help explain the drivers and implications of sustainability reporting assurance.

Chapter II is a literature review on sustainability and ESG concepts, which highlights the importance of how these factors can be measured and the global risks involved in measuring them. It then shows how ESG metrics, reporting frameworks, and assurance methods have evolved over the years and how this topic has relevant research gaps in terms of conceptual frameworks and regulation.

In **Chapter III**, the first study will present a systematic literature review on sustainability in companies, providing a theoretical and conceptual overview of ESG ratings, scoring, reporting, and CSR practices. This chapter establishes the foundation of the dissertation, summarizing the state of academic knowledge and identifying key research gaps that motivated the subsequent empirical investigations.

Chapter IV introduces the qualitative findings from eleven semi-structured interviews with Hungarian Public Interest Entities. This section explores the organisational and

operational challenges of implementing CSRD requirements and identifies assurance as a critical milestone in enhancing the credibility of sustainability disclosures.

Chapter V continues with a quantitative regional analysis of selected Central and Eastern European companies, examining the quality and maturity of sustainability/ESG disclosures and the evolving assurance trends across multiple jurisdictions. It provides statistical evidence on how reporting practices and assurance evolve in post-transition economies within the EU.

Chapter VI presents the final study, which investigates the relationship between sustainability assurance and corporate performance. Although this research is currently in publication, it represents a natural continuation of previous findings and provides empirical evidence of assurance's broader impact on corporate sustainability practices and performance.

Finally, **Chapter VII** synthesizes the results of all four studies, providing an integrated framework of sustainability reporting and assurance under the CSRD. It summarizes the theoretical and practical implications of the findings and discusses their relevance to academic researchers, policymakers, and companies. It also proposes directions for future research.

The four studies were completed at different points of a rapidly changing regulatory cycle, and each published chapter reflects the legal position prevailing at the time of its submission. Chapter V describes national transposition as of January 2025, and Chapter VI the CSRD assurance framework as it stood before Directive (EU) 2026/470. These sections of the text have been deliberately left unchanged in order to preserve the integrity of the published texts. Section II.6 sets out the framework as it stands in 2026, and the introduction to each chapter indicates where subsequent reforms have superseded the position described in the article.

I.2. Research objectives and questions

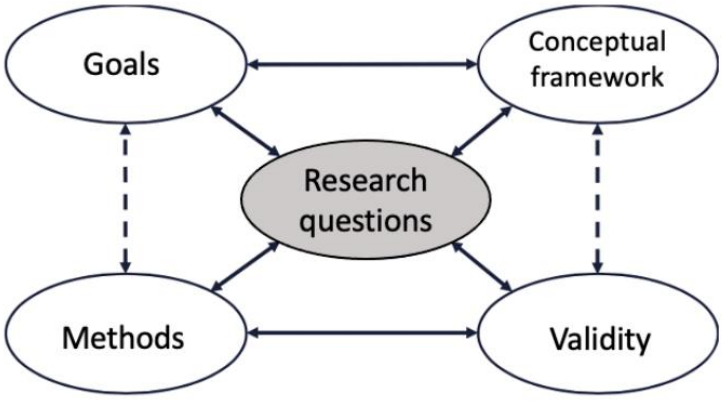
My choice of topic was inspired by the fact that sustainability and responsible corporate behaviour are increasingly becoming part of everyday social and economic discourse, raising fundamental questions about how we measure, report, and assure their impact. During my studies, sustainability became tightly linked to my own life, shaping both my

personal and professional values. My interest in ESG and sustainability accounting originally arose during a master's degree in management accounting, when an assignment on sustainability performance measurement first drew my attention to the complexity and relevance of non-financial information.

This initial academic experience motivated me to continue working on ESG issues in my professional life, where I soon encountered the practical challenges of sustainability reporting and assurance. Later, my postgraduate studies specializing in ESG further deepened this focus, allowing me to systematically build on my previous studies and work experience. In addition, my agricultural background has long made environmental and resource-related issues particularly important for me, which naturally directed my interest toward green accounting issues and the credibility of sustainability disclosures. These practical, personal, and academic influences combined to motivate me to explore how sustainability assurance can strengthen the reliability of non-financial information and thereby contribute to broader sustainability initiatives.

To ensure methodological rigor and transparency in my doctoral research, I have adopted the research design model proposed by Maxwell and Loomis (2002) (*Figure 1*), further developed by Maxwell (2012). This model is widely recognized for its flexibility and focus on the integration of quantitative and qualitative approaches within coherent research planning. It helps clarify how methods, research questions, goals, conceptual framework, and validity considerations interrelate throughout the study, fostering systematic coherence in mixed-methods research.

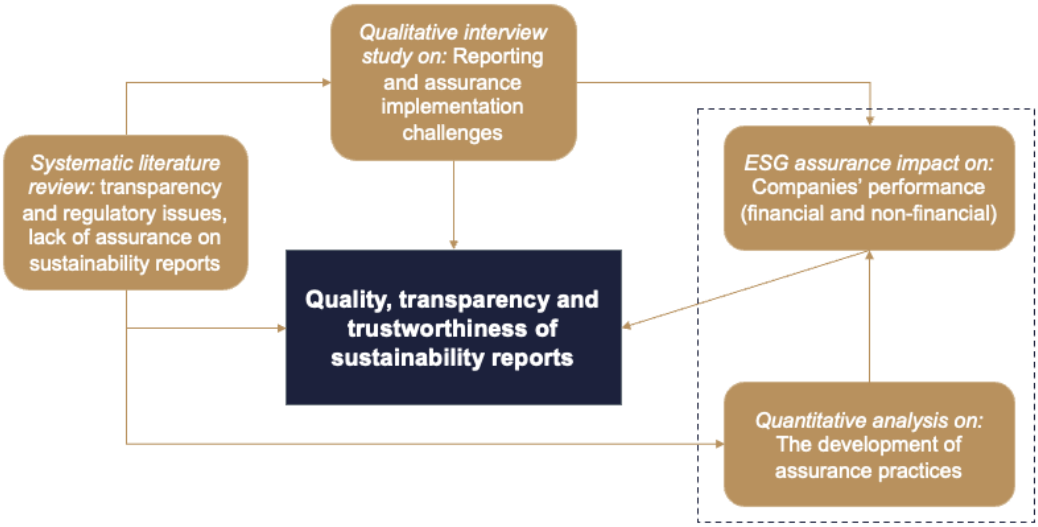
Figure 1: Model of the research design



Source: Maxwell & Loomis, 2002; Maxwell, 2012

The empirical approach follows the structure visualized in my methodology (*Figure 2),* which is modelled after Maxwell & Loomis (2002). This figure illustrates the interconnected empirical phases and substantiates the logical flow of inquiry.

Figure 2: Connection between dissertation articles and central research topic



Source: Own composition based on Maxwell & Loomis, 2002; Maxwell, 2012

The methodological steps encompass four interdependent streams:

I. Systematic Literature Review (hereinafter referred to as SLR): The study begins with a systematic literature review of transparency and regulatory issues in sustainability reporting. Two academic databases and practitioner reports were screened for relevance, theoretical coverage, and methodological reliability (Page et al., 2021). Inclusion criteria, coding schemes, and review protocols are documented to ensure replicability.

II. Qualitative Interviews: Semi-structured interviews were conducted with ESG experts and sustainability professionals to identify challenges in implementing regulations and sector-specific issues in Hungary. Participants were selected through targeted sampling to reflect the diversity of sectors and organisational roles, while remaining relevant, as only Public Interest Entities were mandated to report their sustainability statements at that time. Interview transcripts were subjected to thematic analysis, and coding was validated through expert review to increase reliability and reduce bias (Braun & Clarke, 2006).

III. Quantitative Analysis of Assurance Practice: Data on ESG assurance practices are collected from public databases, LSEG (formerly Refinitiv), and company disclosures. Statistical analyses (survival and trend analyses) are applied to examine the evolution of assurance engagements over time and across sectors in selected Central European countries.

IV. Quantitative analysis on the expected impact of assurance of companies' financial and non-financial performance: The study employs a panel design involving 1,070 EU-headquartered companies, centred on the first year in which each company's sustainability report is externally assured, and uses LSEG ESG scores and a 20-year financial time series to analyse how assurance relates to ROE, ROA, EBIT, D/E and EPS. Preceding year (hereinafter referred to as PY) and assurance-year-based (hereinafter referred to as BY) reference frames are applied to the first differences of these indicators, and paired significance tests on means and medians are summarised in a matrix to distinguish short-term level effects from more persistent trends in financial performance associated with sustainability assurance.

Research quality is addressed through method-specific procedures across the dissertation. In the qualitative study, credibility is supported through transcript validation by interviewees, transparent thematic coding, expert review and reflexive checks. In the quantitative studies, reproducibility is supported through documented data-selection rules, variable definitions, statistical procedures and explicit treatment of missing or censored observations. Triangulation is applied at the dissertation level by comparing evidence from the literature review, interviews, company disclosures, ESG databases and assurance data, rather than by treating qualitative and quantitative validity as interchangeable. Limitations relating to access, data availability, measurement and generalisability are reported separately for each study. Together, these procedures strengthen the transparency and trustworthiness of the overall research design (Mathison, 1988; Maxwell, 2012).

The overall aim of this doctoral dissertation is to explore how sustainability reporting and assurance practices evolve in the European Union and to understand the main challenges and future impacts arising from the transition to mandatory sustainability assurance under the Corporate Sustainability Reporting Directive. My goal with this research is to

contribute to the academic and practical discourse on sustainability assurance by examining how companies develop their reporting system maturity, and how assurance affects companies' financial and non-financial performance. My goal, therefore, is to explore what consequences these have for the transparency and comparability of the reports, as well as for stakeholder trust.

The dissertation seeks to fill the current research gap where sustainability assurance is often treated as a technical compliance issue rather than as an integral part of corporate accountability and performance management. The dissertation addresses this gap through a multi-method design in which each component has a distinct analytical role. The systematic literature review establishes the conceptual foundation; the qualitative interviews examine organisational experiences and implementation challenges; and the two quantitative studies analyse regional assurance-adoption patterns and firm-level ESG and financial-performance changes. The findings are integrated at the interpretation stage to develop a coherent understanding of how sustainability assurance may enhance the credibility of non-financial information and support the broader objectives of the European sustainability agenda. Therefore, I formulated the following comprehensive research question for my dissertation, to which I seek answers using four articles. The purpose and research questions of these articles are shown in *Table 1.*

Main Research Question:

- *How is sustainability assurance associated with enhancing the reliability of corporate sustainability reports, and what theoretical and empirical mechanisms explain this effect in the evolving European regulatory context?*

Accordingly, the specific objectives of the research are as follows:

Table 1: The objective and key questions of my four main research articles

Articles	Research objectives	Research questions
Article 1 (Chapter III.)	**To systematically review and synthesise existing academic literature** on ESG reporting, rating, scoring, and CSR activities, identifying conceptual inconsistencies and highlighting the need for harmonised approaches in reporting and assurance practices.	**RQ1:** What ESG concepts and trends have emerged in the corporate world over the past few decades?
Article 2 (Chapter IV.)	**To explore the organisational preparedness and challenges** companies face in implementing the CSRD, with a focus on Hungarian Public Interest Entities (PIEs) subject to the new regulatory framework.	**RQ2:** What are the key organisational, strategic, and operational challenges Hungarian Public Interest Entities face in preparing for CSRD-compliant sustainability reporting?
Article 3 (Chapter V.)	**To empirically analyse regional reporting maturity and assurance trends** in Central and Eastern Europe, demonstrating the development path companies typically follow before achieving assured sustainability reports.	**RQ3a:** When do large firms begin obtaining external assurance on their sustainability reports? Was there a typical time-to-adoption? **RQ3b:** Does the time-to-adoption differ across industries and country groups? **RQ3c:** How has the assurance provider mix evolved over time?
Article 4 (Chapter VI.)	**To examine whether the introduction of sustainability assurance is associated with changes in ESG ratings** and selected financial performance indicators, and to assess the timing and direction of these observed associations without attributing causal effects to assurance.	**RQ4a:** Is the introduction of external sustainability assurance associated with changes in ESG ratings that may reflect differences in the quality and reliability of ESG information?

Articles	Research objectives	Research questions
		RQ4b: What changes in key financial performance indicators (ROE, ROA, EBIT, D/E and EPS) are observed around the introduction of sustainability assurance, and are the observed patterns consistent with implementation costs, signalling benefits, or both?

Source: Own composition based on the earlier written articles

The dissertation adopts a multi-method design in which the four studies remain methodologically distinct but contribute complementary evidence. The qualitative study explains organisational experiences and implementation challenges, whereas the quantitative studies identify longitudinal and comparative patterns in assurance adoption, ESG scores, and financial indicators. Their findings are integrated at the dissertation level to advance the theoretical understanding of sustainability reporting and assurance and to inform practitioners navigating the evolving CSRD landscape.

I.3. Research problem and relevance of the topic

Due to growing global awareness of environmental degradation and social inequality, sustainability has become a priority issue in corporate discourse and strategic planning (Gulluscio et al., 2020). This urgency stems from the recognition that anthropogenic activities, particularly industrial activities, contribute significantly to climate change, which has serious environmental and socio-economic consequences. Climate change, caused primarily by human activities, is evidenced by increased frequency of extreme weather events, rising sea levels, and the vulnerability of essential resources, including food and water (Tsagas & de Villiers, 2020).

The World Economic Forum underscored this in 2023 by forecasting that the coming few decades will be characterized by environmental challenges, including extreme weather events, biodiversity loss, and resource scarcity. As a result, corporate responsibility, particularly in accounting and financial reporting, must go beyond traditional financial indicators and integrate comprehensive sustainability measures, among which climate change is of paramount importance (Gulluscio et al., 2020). This requires transforming

corporate reporting paradigms towards integrated frameworks that effectively capture and communicate the environmental impacts, resource use, and social contributions of organisations (Uwuigbe et al., 2018).

This expanded reporting scope is crucial for providing stakeholders with transparency into an organisation's economic impact and future resilience (Lakatos, 2013; Pinto & Bandeira, 2013). The ever-changing landscape highlights the fact that sustainability accounting, reporting, and auditing play a fundamental role in promoting corporate responsibility and in enabling investors, regulators, and other stakeholders to make informed decisions (Brunelli et al., 2021). This integration is key to assessing the complex interactions among sustainability issues, corporate reporting, and overall company performance (Christensen et al., 2024).

The dissertation commences with a broad overview of the significance of sustainability and climate change, progressively narrowing its focus to the specific challenges and opportunities presented by sustainability reporting solutions (Tsagas & de Villiers, 2020). Climate change, recognized as a significant and urgent global challenge, has become a prominent subject in public and political discourse, necessitating solid frameworks for its assessment and mitigation (Alsheikh & Alsheikh, 2023). This growing need for non-financial disclosures, driven by global ecological awareness and the pursuit of sustainable economic growth, compels organisations to integrate environmentally sensitive, sustainable practices into their daily operations (Uwuigbe et al., 2018). This integration not only aims to ensure long-term financial viability but also contributes positively to environmental protection and social equity.

I.4. Research methods and data

This section summarises the main research design features of the dissertation’s four empirical studies, and *Table 2* presents, for each article, the research title, applied methods, and underlying data sources in a comparable format.

Table 2: Research methods applied and data used

Research	Research methods	Research data
Article 1 (Chapter III.)	Systematic literature review using a structured search, screening and qualitative thematic-synthesis protocol. Web of Science and Scopus were searched for the keyword 'ESG' in titles, abstracts or keywords. The search was restricted to English-language academic journal and review articles in business, management and accounting, economics and finance. After duplicate removal and multi-stage relevance screening, the included studies were coded and synthesised by thematic category, geographic focus and methodological approach. The review does not constitute a primary quantitative empirical study, even though numerical counts are reported to document the selection process.	Data source: bibliographic records from Web of Science and Scopus. Initial search result: 1,944 records; after removing 561 duplicates, 1,383 records remained. After title/abstract screening, 76 articles were retained; after full-text assessment, 40 articles were selected for the final review. Time coverage of selected empirical articles: 2013–2023. Geographic focus: mainly global samples.
Article 2 (Chapter IV.)	Qualitative study based on semi-structured interviews with ESG/sustainability leaders. Two-phase design: (1) document analysis of companies past sustainability/NFRD reports and assurance practices; (2) in-depth, semi-structured interviews following a chronological (past–present–	Location: Hungary; focus on large Public Interest Entities (PIEs) within the first wave of CSRD (banks and manufacturing/service firms; insurance firms mostly absent). Data: eleven semi-structured interviews with sustainability/ESG leaders, usually 2–3 experts per company, each

Research	Research methods	Research data
	future) and thematic structure (reporting history, current practices, CSRD and assurance challenges, future plans). Interviews transcribed, validated by interviewees, and analysed in NVivo with iterative thematic coding, triangulation, and reflexive checks.	about one hour. Time of data collection: July–September 2024. Sampling: targeted sampling of entities pre-identified by Opten Ltd. and verified as PIEs in scope of CSRD (and previously subject to NFRD), complemented with background document analysis of sustainability or integrated reports.
Article 3 (Chapter V.)	Quantitative longitudinal event-history study based on company-level secondary data, supplemented by structured document review to verify reporting and assurance events. The study identifies each company's first non-financial or sustainability report and first externally assured report, measures time to assurance adoption, and analyses adoption patterns by country, industry and provider type. Companies without external assurance by the end of the observation period are treated as right-censored. Descriptive comparisons are reported for the available sample and are not presented as statistically generalisable estimates for all companies in the region.	Location: selected Central and Eastern European countries, with Germany and Luxembourg included as comparators. The sample comprised 83 large listed companies across ten industries, of which 67 had published at least one non-financial or sustainability report. The observation period covered 2002–2022. Data were obtained from LSEG/Refinitiv ESG and supplemented by publicly available non-financial, integrated and sustainability reports. The event was defined as the publication of a company's first externally assured sustainability report. The time variable measured the number of years between the first non-financial or sustainability report and the first externally assured report.

Research	Research methods	Research data
Article 4 (Chapter VI.)	Quantitative panel analysis of ESG scores using two reference frames: (i) PY – year-on-year absolute changes in ESG scores; (ii) BY – cumulative absolute changes relative to the assurance year. Independent two-sample tests (Welch t-tests) comparing mean ESG scores of assured vs. non-assured firms; one-sample tests on ESG-score changes vs. zero. Parallel quantitative panel analysis of financial indicators using PY (year-on-year changes) and BY (changes relative to the assurance year) frames. Tests on first-differences of ROE, ROA, EBIT, D/E and EPS; joint assessment of mean and median changes via paired significance tests, summarised in PY/BY effect matrices.	Location: EU countries. Firm-level ESG data from LSEG/Refinitiv for 1,070 publicly listed companies headquartered in EU Member States. ESG scores available for at least five consecutive years per firm up to FY2024; ESG time series used for up to 10 years pre- and post-assurance where available. Firm-level financial data (ROE, ROA, EBIT, D/E, EPS) from LSEG/Refinitiv for the same 1,070 EU-headquartered listed firms. Annual financial statements covering up to 20 years around the first assurance year; missing values retained (no interpolation). Assurance year identified for each firm based on the first externally assured sustainability report.

Source: Own composition based on the earlier written articles

Throughout the dissertation, the use of layered samples and distinct qualitative and quantitative methods across the individual studies was crucial to developing a differentiated contribution. The research journey began with a global systematic literature review (Article 1), which mapped the main trends in sustainability and ESG reporting research and identified persistent gaps in sustainability assurance. Article 2 then used qualitative, interview-based research to examine how Hungarian Public Interest Entities interpret and address CSRD-related organisational and operational challenges. Articles 3 and 4 employed quantitative designs for different purposes: Article 3 analysed reporting and assurance adoption patterns in a regional company sample, whereas Article 4

investigated ESG-score and financial-performance changes around the first year of external assurance in a larger EU panel. The qualitative study provides contextual insight into organisational processes and stakeholder perspectives, while the quantitative studies document empirical patterns and associations. Taken together, these complementary but analytically separate approaches strengthen the triangulation, credibility and practical relevance of the dissertation's findings.

II. Literature Review

II.1. The concept of sustainability and ESG

The intellectual origins of sustainability can be traced to eighteenth-century German forestry, where the notion of '*Nachhaltigkeit'* emerged as a principle of harvesting no more timber than forests could naturally regenerate, most prominently articulated by Hans Carl von Carlowitz in '*Sylvicultura Oeconomica'* (1713). The modern environmental movement gathered momentum in the second half of the 20th century, catalysed in particular by Rachel Carson's '*Silent Spring'* (1962), which exposed the ecological and health impacts of synthetic pesticides and helped bring environmental concerns into mainstream public debate. A decade later, the Club of Rome's report '*The Limits to Growth'* (Meadows et al., 1972) highlighted the limited availability of natural resources and the risks of uncontrolled economic growth, further emphasising the need to align economic development with the planet's limits.

The currently widely accepted definition of sustainable development was formulated in the 1987 Brundtland Report, '*Our Common Future'*, prepared by the World Commission on Environment and Development (United Nations, 1987). The report defined sustainable development as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* and determined that environmental protection and economic development are mutually reinforcing goals, rather than conflicting priorities. Building on this conceptual foundation, the acronym ESG (environmental, social, and governance) entered the financial vocabulary in the early 2000s. A key milestone was the 2004 UN Global Compact/UNEP Finance Initiative report '*Who Cares Wins'*, which explicitly recommended the systematic integration of ESG factors into investment analysis and capital-allocation decisions, arguing that this would enhance long-term risk management, returns, and market stability.

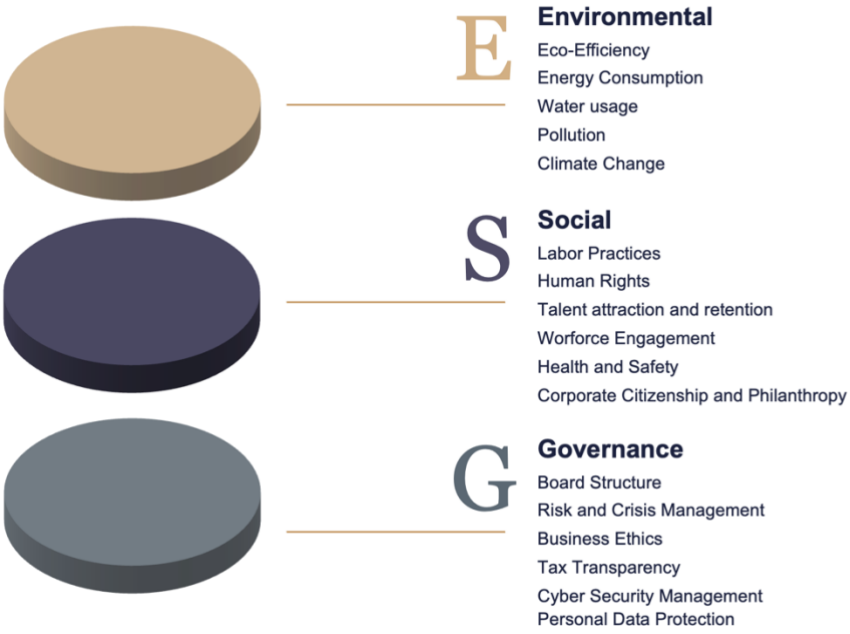
Several further milestones have shaped the evolution of ESG thinking. John Elkington's *Cannibals with Forks: The Triple Bottom Line of 21st Century Business* (1997) popularised the idea that corporate success should be assessed across three dimensions (PPP: profit, people and planet), rather than financial performance alone. At the global policy level, the adoption of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (hereinafter referred to as SDGs) by the UN General Assembly in September 2015 provided an integrated framework for economic, social and environmental objectives, while the same year's Paris Agreement under the United Nations Framework Convention on Climate Change (hereinafter referred to as UNFCCC) established a legally binding climate treaty aimed at limiting global warming to well below 2°C compared with pre-industrialization levels. In the European Union, the 2019 European Green Deal set out a comprehensive roadmap for a climate-neutral, resource-efficient economy, and subsequent legislative initiatives; most notably the Corporate Sustainability Reporting Directive and the Corporate Sustainability Due Diligence Directive (hereinafter referred to as CSDDD), have progressively transformed previously voluntary sustainability and ESG frameworks into mandatory, enforceable reporting and due diligence obligations for large companies.

These frameworks do not adopt a single, universally agreed definition of ESG; rather, they operationalise related sustainability concepts for different audiences and materiality perspectives. The Global Reporting Initiative (hereinafter referred to as GRI) focuses on an organisation's impacts on the economy, environment and people, whereas the International Sustainability Standards Board (hereinafter referred to as ISSB), established under the IFRS Foundation, focuses on *sustainability*-related risks and opportunities that could reasonably be expected to affect an entity's prospects. Under *the* ISSB framework, sustainability is connected to an *entity's ability to* maintain access to the *resources and relationships* on which its business model depends over *the short, medium and long term* (IFRS Foundation, 2023). This distinction shows that sustainability encompasses both corporate impacts and the dependencies, risks and opportunities relevant to enterprise value.

ESG serves as a framework for quantifying and benchmarking sustainability performance, particularly in investor decision-making (Khan, 2019). The three pillars, as shown in *Figure 3,* are typically associated with indicators such as energy efficiency and emissions

for E; human capital, diversity, and labour practices for S; and shareholder rights, board independence, and internal control systems for G (Ducsai & Hajdu, 2024).

Figure 3: Main topics related to the ESG pillars



Source: Own composition based on Gold & Taib, 2020

Traditional financial reports focus predominantly on historical, monetary information. Consequently, many ESG risks and opportunities that are critical in the long term remain hidden from users (Nwangele, 2025). As a result, companies increasingly prepare separate sustainability reports or integrated reports that present environmental, social, and governance performance (Gold & Taib, 2020; Jucá et al., 2024). The literature distinguishes two main forms of corporate disclosure: legally mandated, compulsory disclosures and voluntary disclosures; both may be issued annually or at other intervals (Hassan & Marston, 2010; Shehata, 2014). This dissertation focuses on the shift to mandatory, regulated reports because, with the CSRD, ESG information is increasingly being elevated to the level of *financial reporting.*

Table 3: Voluntary reporting standards in 2026 and their specialities

Framework	Owner	Focus	Used by	Purpose	2026 importance
ISSB – IFRS S1	IFRS Foundation	ESG (financial)	Investors, regulators	Sustainability-related financial risks	Global baseline
ISSB – IFRS S2	IFRS Foundation	Climate	Investors, boards	Climate governance, risks, metrics	Core climate standard
GRI Standards	GRI	Impact-based ESG	Corporates	Stakeholder & impact reporting	Widely used
SASB Standards	IFRS Foundation	Industry ESG	Investors	Financial materiality	Complements ISSB
TCFD	FSB	Climate	Corporates, banks	Governance & risk structure	Embedded into ISSB

Source: Own composition based on ICRS (2025)

Table 3 summarises major international sustainability-reporting standards and legacy recommendations that may be applied voluntarily or incorporated into jurisdictional requirements. *Table 4* presents selected jurisdiction-specific mandatory reporting regimes. The classification is therefore indicative rather than absolute, because the legal status of IFRS Sustainability Disclosure Standards depends on adoption or incorporation by individual jurisdictions.

Table 4: Mandatory reporting standards in 2026 and their specialties

Framework	Region	Mandatory for	ESG focus	Key disclosures	2026 status / relevance
SEC Climate Rule	USA	Public companies	E	Climate risks, emissions	Litigation uncertainty (not enforced yet)
California SB-261	USA (CA)	Large companies doing business in CA	E	Climate financial risk	First reports due 2026
California SB-253	USA (CA)	Large companies	E	Scope 1–3 emissions	Scope 1–2 from 2026
BRSR	India	Top listed companies	E, S, G	ESG performance & policies	Mandatory
BRSR Core	India	Top 1000 listed	E, S, G	Assured KPIs + value chain	Fully phased by FY 26–27
SGX Climate Reporting	Singapore	Listed companies	E	Scope 1–2 (Scope 3 phased)	Mandatory climate reporting
Australia Climate Disclosure	Australia	Large entities	E	Climate financial disclosure	First reports from FY25–26
Japan SSBJ Standards	Japan	Listed companies (phased)	E, S, G	ISSB-aligned disclosures	Gradual mandatory adoption

Source: Own composition based on ICRS (2025)

II.2. Critical perspectives on ESG, measurement and regulation

Alongside the rapid institutionalisation of ESG, critical and anti-ESG perspectives have become more visible in academic, political and business debates; however, this dissertation considers them only as a contextual development rather than as a separate object of empirical investigation (Edmans, 2023; Nchako & Benjamin, 2025). For the purposes of this research, the most relevant criticism concerns the conceptual and measurement validity of ESG metrics: ratings may differ because of inconsistent methodologies, selective disclosure and limited comparability, while high scores may partly reflect firms' reporting capabilities and disclosure resources rather than their underlying environmental or social performance (Berg et al., 2022; Christensen et al., 2022; Drempetic et al., 2020).

Differences between ESG ratings represent one of the main methodological limitations of ESG-based assessment. Ratings assigned to the same company may vary significantly between different providers, as institutions use different indicators, data sources, sector classifications and weighting systems (Hajdu et al., 2023). Furthermore, they differ in how they address contentious issues and interpret materiality. Consequently, ESG ratings should not be treated as direct, universally comparable measures of a company's fundamental sustainability impact. Instead, they should be interpreted as the providers' specific assessments, which relate to the company's policies, publicly disclosed information, governance systems and selected performance outcomes (Dimson & Staunton, 2020). Tabur's (2023) panel-data analysis found that, on the same firm sample, Bloomberg ESG scores were positively related to return on assets, whereas LSEG/Refinitiv scores showed a negative correlation, highlighting the significance of methodological differences between indicators. Therefore, it is important that investors and regulatory authorities are aware of the limitations of ESG ratings. ESG ratings should not be used as the exclusive basis for decision-making. Rather, they should be considered in conjunction with other factors, such as financial performance and management quality.

Recent empirical research suggests that differences between ESG ratings may weaken the expected positive relationship between ESG performance and productivity by increasing information asymmetry, financial constraints and short-term thinking by management. The same research suggests that more comprehensive reporting practices and the use of established reporting frameworks may mitigate these effects (Lei & Ma, 2025).

‘Greenwashing’ represents one of the main credibility risks in ESG communication, as it can arise not only through explicitly false claims, but also through selective, strategically worded or insufficiently auditable disclosures. This risk is even greater if ESG information is based on differing rating methodologies, incomplete supply chain data or unclear commitments relating to the future. These limitations do not call into question the relevance of sustainability reports; rather they suggest that the usefulness of ESG information for decision-making depends on transparent methodologies, appropriate materiality assessments and credible auditing mechanisms (Berg et al., 2022; Sneideriene, 2026).

The following sections therefore examine the risk context, measurement frameworks and assurance mechanisms through which ESG information can become more comparable and reliable.

II.3. Global risk and ESG information

One of the latest assessments of the global risk situation (World Economic Forum, 2024) highlights why ESG information has become so important for both regulators and market participants. Over a two-year horizon, the assessment ranks misinformation and disinformation, extreme weather events, and state-based armed conflicts as the most severe risks, while social polarization, cyberwarfare, and environmental pollution also feature prominently (*Table 5*). In this sense, the global risk agenda provides an important backdrop to the regulatory developments discussed in the next chapter, where EU and international standard setters are seeking to translate these systemic concerns into concrete reporting and assurance requirements (World Economic Forum, 2024; EY, 2024).

Table 5: Global risks ranked by severity over the short and long term

Risk	2-year risk outlook	10-year risk outlook
1.	Misinformation and disinformation	Extreme weather events
2.	Extreme weather events	Biodiversity loss and ecosystem collapse
3.	State-based armed conflict	Critical change to Earth systems
4.	Societal polarization	Natural resource shortages
5.	Cyber espionage and warfare	Misinformation and disinformation
6.	Pollution	Adverse outcomes of AI technologies
7.	Inequality	Inequality
8.	Involuntary migration or displacement	Societal polarization
9.	Geoeconomic confrontation	Cyber espionage and warfare
10.	Erosion of human rights and/or civic freedoms	Pollution

Source: Own composition based on World Economic Forum (2024)

The institutional response to this changing risk environment is reflected in the evolving structure of global standard-setting. The IFRS Foundation now operates with two complementary standard-setting boards: the International Accounting Standards Board (IASB), which develops IFRS Accounting Standards, and the International Sustainability Standards Board (ISSB), which develops IFRS Sustainability Disclosure Standards. Both boards are overseen by the IFRS Foundation Trustees, while the Monitoring Board provides a formal link between the Trustees and public authorities and enhances public accountability (EY, 2024).

These interconnected global risks have increased the demand for more consistent, comparable and reliable sustainability-related information, thereby accelerating the development of reporting and assurance frameworks discussed in the following section.

II.4. ESG measures, reporting frameworks and assurance

The dual-board structure is significant because it strengthens the connectivity between financial statements and sustainability-related financial disclosures within general-purpose financial reporting. It does not, however, make all sustainability disclosures mandatory or place the two bodies in a legal hierarchy; mandatory application depends on jurisdictional adoption. For banks and other capital-market participants, interoperability between IASB and ISSB requirements can increasingly shape how climate-related and other sustainability-related risks are measured and disclosed. In the European Union, these disclosures are governed by the CSRD and European Sustainability Reporting Standards

(hereinafter referred to as ESRS) framework and are subject to the applicable assurance requirements (EY, 2024).

Corporate ESG measurement and reporting are supported by various standards and initiatives, such as the GRI, the Sustainability Accounting Standards Board (hereinafter referred to as SASB), the TCFD, and IFRS Sustainability Disclosure Standards S1 and S2, as well as the ESRS (Kimbrough et al., 2022; IFRS Foundation, 2023, Nagy et al., 2025). These frameworks place different emphases on industry-specific metrics, risk-oriented disclosure, and the double materiality approach, which creates significant implementation challenges for companies (Deloitte, 2024; EFRAG, 2023).

The vast majority of meta-analyses examining the relationship between ESG and financial performance (hereinafter referred to as FP) report a positive or neutral association; however, the magnitude of the effect depends on the metrics used, industry, and geographic context (Clark et al., 2015). Some studies identify a non-linear, U-shaped relationship, suggesting that initial ESG investments may temporarily reduce profitability, while at higher ESG scores, a positive return premium emerges (Bruna et al., 2022). Other authors (especially those using Central European data) find only weak or statistically insignificant relationships, raising questions about data quality and measurement models (Delova-Jolevska et al., 2024; Vezeteu & Stănciulescu, 2024).

Interpretation of the ESG–FP relationship is further complicated because many studies do not distinguish between assured and unassured ESG data; consequently, they may not adequately control for differences in data reliability, greenwashing risk or information asymmetry (Escrig-Olmedo et al., 2010; La Torre et al., 2020). ESG assurance may therefore strengthen the reliability of the evidence used to test this relationship, although its moderating effect remains underexplored in the empirical literature.

Sustainability assurance has become increasingly important, as the usefulness of ESG information depends not only on the volume of data disclosed, but also on its credibility, accountability and consistency. In theory, independent assurance can reduce the information asymmetry between the preparers and users of sustainability reports by assessing whether the disclosed information has been prepared in accordance with the applicable criteria and is free from material misstatements. Furthermore, it can encourage companies to formalise their data collection procedures, document their assumptions,

establish internal controls and clarify management responsibilities (IAASB, 2024; KPMG, 2026a).

The literature on ‘greenwashing’, however, points out that the benefits of assurance also depend on the scope and quality of the engagement. Assurance is more likely to address measurable, historical indicators than qualitative statements, assumptions, scenario analyses, transition plans or value chain estimates. Thus, a statement of assurance can reinforce confidence in the selected, disclosed information without necessarily providing comprehensive verification of the company’s entire sustainability narrative. This distinction is particularly important where companies use ESG reporting as a reputation-building exercise, or where the information is based on forward-looking targets and complex value chain data (Peng et al., 2026; Sneideriene, 2026).

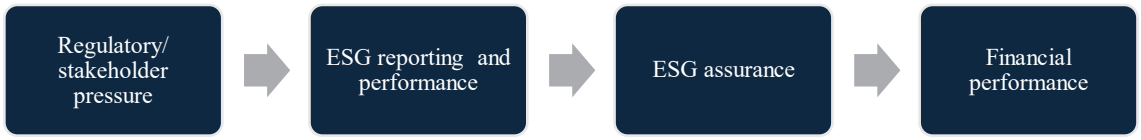
In the Hungarian context, assurance of sustainability statements under the CSRD and certification of ESG reports under the national ESG Act constitute distinct verification mechanisms; the scope, requirements and role of the Hungarian ESG Act and its mandatory certification regime are therefore discussed separately in Section II.7.

II.5. Research gaps and conceptual framework

The preceding review identifies several interconnected research gaps. First, although stakeholder, legitimacy and institutional theories explain motivations for ESG reporting, assurance is less often modelled as a distinct explanatory or moderating factor, particularly in studies combining double materiality with banking-sector risk (Simnett et al., 2009; Deloitte, 2024). Second, methodological fragmentation persists because studies rely on different ESG databases, rating methodologies and financial-performance measures, while relatively few analyse the content of underlying reports and assurance statements, especially for Central and Eastern European banks (Diófási-Kovács & Nagy, 2023; Tabur, 2023). Third, evidence on the implementation and effects of mandatory regional reporting and verification remains limited and requires updating in light of the amended CSRD scope and timetable. Against this background, the dissertation primarily addresses the limited empirical evidence on how ESG assurance affects the reliability of sustainability information and the observed relationship between ESG and financial performance.

Building on these gaps, my dissertation's conceptual model distinguishes four main constructs: ESG reporting quality (content, transparency, comparability), ESG performance (with external ratings), financial performance (primarily accounting-based measures), and ESG assurance (existence, type, standard, and the nature of the assurance provider) (*Figure 4*). The model assumes that higher ESG performance and better ESG communication are associated with more favorable financial outcomes. However, the strength and reliability of this relationship are moderated by assurance, which may reduce information asymmetry and the risk of greenwashing (Simnett et al., 2009).

Figure 4: Conceptual model of ESG reporting, performance, financial performance and assurance



Source: Own composition

II.6. Regulatory research gaps

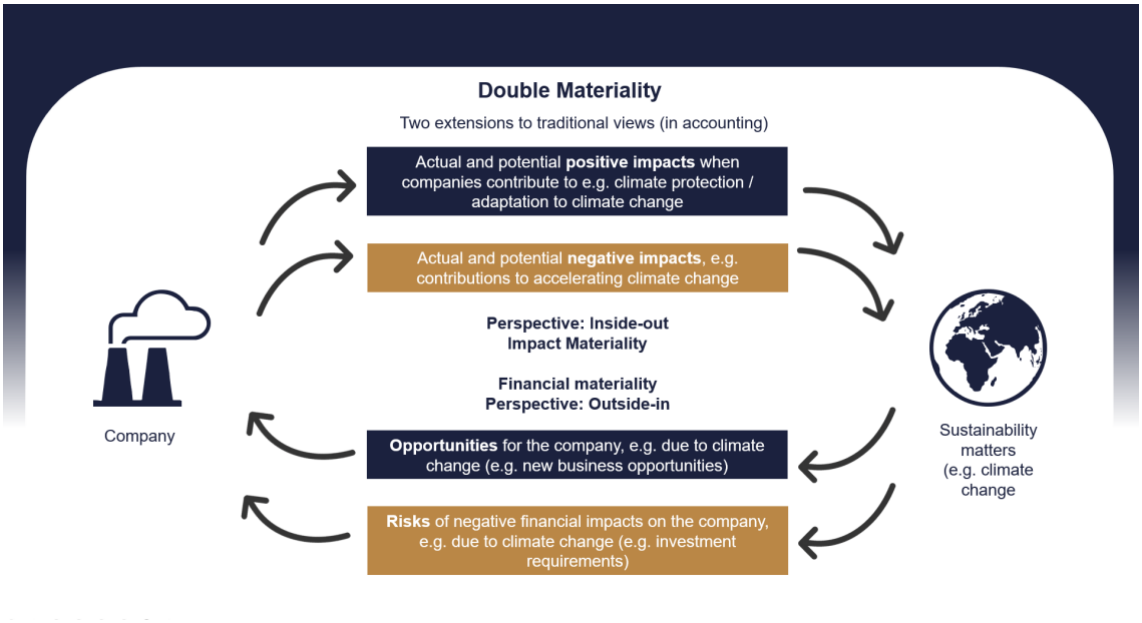
Over the past decade, the European Union has progressively strengthened the regulation of sustainability-related disclosure. Directive 2014/95/EU (the Non-Financial Reporting Directive, hereinafter referred to as NFRD) marked the first major step by requiring certain large public-interest entities with more than 500 employees to disclose, for financial years beginning in 2017, information on their business model, policies, outcomes, principal risks and key performance indicators relating to environmental, social and employee matters, respect for human rights, and anti-corruption and bribery matters (European Union, 2014). Although the NFRD increased the volume of non-financial information and improved transparency in some dimensions, its minimum-harmonisation approach, flexible reporting frameworks and 'comply or explain' mechanism left undertakings considerable discretion. This contributed to heterogeneous disclosure practices and persistent limitations in comparability, reliability and capital-market usefulness (Biondi et al., 2020; Masiero et al., 2019; Velte, 2017).

In Hungary, the NFRD was transposed through Section 95/C of Act C of 2000 on Accounting, under which affected undertakings included a non-financial statement in their business report covering environmental, social and employment matters, respect for human rights, and anti-corruption and bribery. The NFRD did not introduce a harmonised mandatory assurance requirement for the disclosed sustainability information. Domestic practice therefore remained uneven: many companies initially limited reporting to minimum legal compliance, whereas some large undertakings, particularly in the financial sector, also used GRI or integrated-reporting frameworks (Fredi-Fülöp & Várkonyi, 2022). These limitations provided an important regulatory rationale for the subsequent transition from the NFRD to the more prescriptive CSRD–ESRS framework.

In response to the limitations of the NFRD, the Corporate Sustainability Reporting Directive (CSRD), adopted in 2022, established a more prescriptive EU sustainability-reporting framework by expanding the range of undertakings covered, requiring in-scope companies to prepare sustainability statements in accordance with the European Sustainability Reporting Standards (ESRS), introducing digital tagging and making external assurance mandatory (European Parliament and Council, 2022; European Commission, 2023a). A central feature of this framework is double materiality (Figure 5), under which undertakings assess both how sustainability matters affect their development, financial performance and position (financial materiality, or outside-in) and how their activities affect people and the environment (impact materiality, or inside-out). ESRS 1 establishes double materiality as the basis for sustainability disclosures and requires material impacts, risks and opportunities to determine the information reported (EFRAG, 2023).

The ESRS system consists of two general standards (ESRS 1-2) and ten thematic standards covering the key areas of E, S, and G, including climate change, biodiversity, employee rights, value chain risks, and corporate governance (European Commission, 2023a; EFRAG, 2023). This double materiality-based architecture is particularly important for banks, as their lending portfolios expose them to both physical and transitional climate risks, as well as financed emissions and broader societal impacts (European Banking Authority, 2020).

Figure 5: The double-materiality approach: inside-out and outside-in perspectives under ESRS 1



Source: Author's own elaboration based on European Commission: Guidelines on non-financial reporting: Supplement on reporting climate-related information, 2019/C 209/01

The current CSRD framework must be interpreted in light of the 2026 Omnibus I amendments. Directive (EU) 2026/470 narrowed the general scope to undertakings exceeding both 1,000 employees and €450 million in net annual turnover and introduced transitional relief for certain first-wave undertakings that fall outside the revised scope. The amendment also adjusted aspects of the timetable and reduced reporting burdens for undertakings excluded from the new scope (European Parliament and Council, 2026).

The Omnibus I amendments should be understood as a recalibration rather than a reversal of the EU sustainability-reporting framework. They preserve ESRS-based reporting and limited assurance for undertakings remaining within the revised CSRD scope, while seeking to address concerns about proportionality, implementation costs and value-chain reporting burdens. These concerns are particularly relevant to smaller undertakings and other companies outside the mandatory scope that may nevertheless receive extensive sustainability-information requests from in-scope business partners (European Commission, 2025). For such undertakings, sustainability reporting may remain relevant on a voluntary basis or in response to financing conditions, investor expectations, contractual information requests and sector-specific requirements.

A central innovation of the CSRD is the mandatory external assurance of sustainability reporting. Following the 2026 amendments, the EU framework retains limited assurance as the required level rather than providing for a later automatic transition to reasonable assurance. The purpose of assurance is to obtain an independent conclusion on whether the sustainability information has been prepared in accordance with the applicable criteria and is free from material misstatement, thereby reducing information asymmetry and supporting stakeholder confidence (Simnett et al., 2009; Lippai-Makra et al., 2022). Voluntary sustainability-related assurance and verification engagements also exist, including engagements performed under ISAE 3000 (Revised) and other recognised frameworks; however, second-party opinions on sustainable finance instruments should be distinguished from assurance over an entity's sustainability statement.

At the international level, ISAE 3000 (Revised) has long served as the general standard for assurance engagements other than audits or reviews of historical financial information, while AA1000AS provides a stakeholder- and accountability-oriented assurance framework (AccountAbility, 2018; IAASB, 2013). The IAASB issued the final International Standard on Sustainability Assurance (ISSA) 5000 in November 2024. ISSA 5000 is a comprehensive, standalone and framework-neutral standard for sustainability assurance engagements, designed for use by both professional accountants and other assurance practitioners. It applies to limited and reasonable assurance engagements and addresses sustainability-specific matters such as value-chain information, estimates and data quality. The standard is effective for periods beginning on or after 15 December 2026, with early adoption permitted (IAASB, 2024). *Table 6* summarises the principal standard.

Table 6: Summary of assurance standards for non-financial reports

Standard	Standard setter	Applies to
ISSA 5000	IAASB	ESG assurance
ISAE 3000	IAASB	Non-financial reporting
AA1000AS	AccountAbility	ESG assurance

Source: Own composition

In the domestic market, the voluntary ESG assurance practices of major banks have become more evident in recent years, typically built on ISAE 3000 or AA1000, while smaller institutions rely more on internal controls and partial external reviews (Lippai-Makra et al., 2022). With the CSRD, however, these practices are formalised and expanded, raising

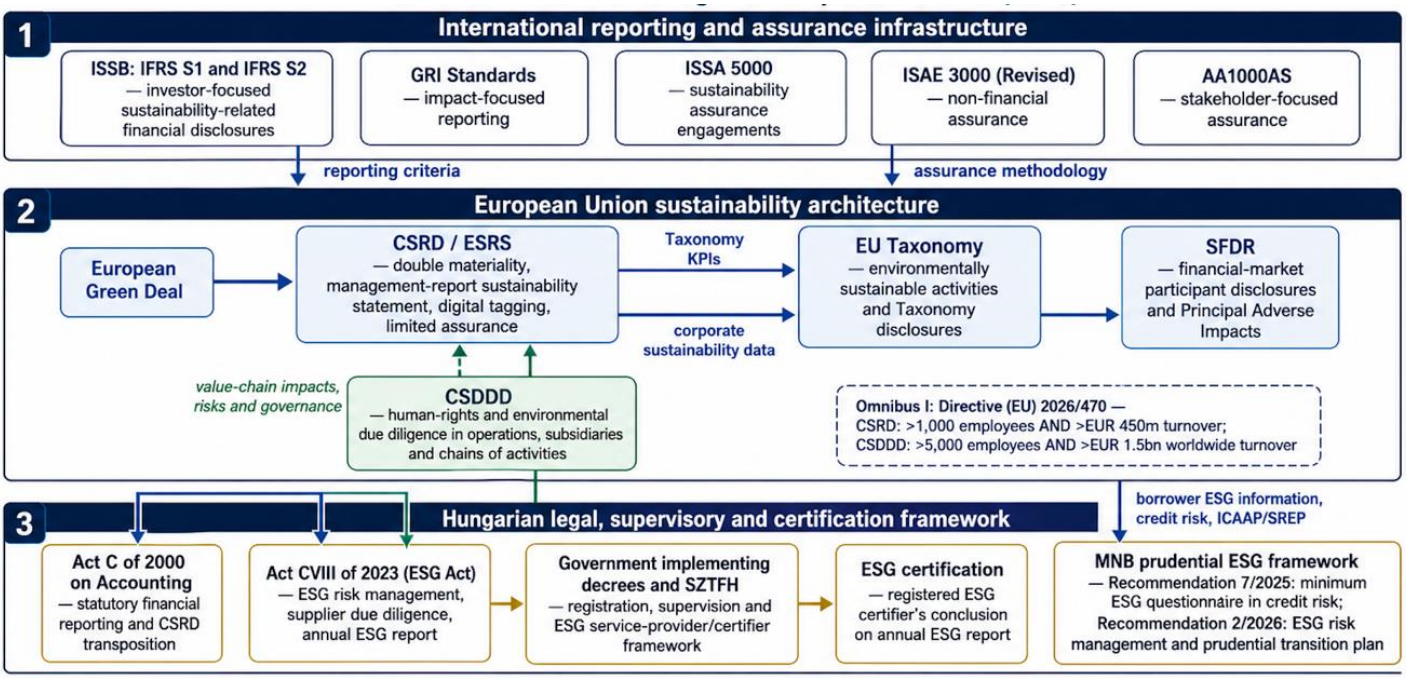
questions about audit market capacity, professional scepticism, and the consistency of standard application.

In the Hungarian regulatory environment, the prudential treatment of sustainability risks has developed substantially since the earlier climate-risk and green-finance recommendations. Amendments to Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises and the revised supervisory framework of the Hungarian National Bank (hereinafter referred to as Magyar Nemzeti Bank or MNB) have integrated ESG risks into credit institutions' governance, risk-management systems, Internal Capital Adequacy Assessment Process (ICAAP), strategic planning, and supervisory review. Accordingly, ESG risks are no longer treated primarily as reputational or voluntary sustainability considerations, but as prudentially relevant risk factors (European Banking Authority, 2025; KPMG, 2026b).

In particular, MNB Recommendation No. 2/2026 (III.6.) requires covered institutions to identify, measure, manage and monitor environmental, social and governance risks, incorporate them into their risk appetite frameworks and prepare ESG risk-management plans with milestones, target values and a long-term perspective. The recommendation applies from 1 July 2026 to large and complex institutions and from 1 January 2027 to the remaining institutions within its scope. MNB Recommendation No. 7/2025 (VI.23.) further supports the integration of ESG factors into credit-risk management through a minimum ESG questionnaire for relevant loan applicants. These developments make the quality, traceability and external assurance of corporate ESG information increasingly relevant for borrower assessment, portfolio management, capital planning and financial-stability considerations (MNB, 2025; MNB, 2026).

The preceding discussion has presented the principal elements of the evolving sustainability-reporting and assurance environment. *Figure 6* does not introduce additional reporting requirements; rather, it synthesises the regulatory, professional and national elements already discussed into one analytical framework. Its purpose is to show how international standards, EU legislation, Hungarian implementation and corporate practice interact in shaping the quality and assurance-readiness of sustainability information.

Figure 6: Multi-level sustainability reporting, due-diligence and assurance architecture: EU framework and Hungarian implementation (2026)



Source: Own composition based on Directive (EU) 2022/2464; Regulation (EU) 2020/852; Regulation (EU) 2019/2088; Directive (EU) 2024/1760; Act CVIII of 2023 on Corporate Social Responsibility and Environmental, Social and Governance Considerations; IAASB (2024).

Figure 6 should be read from top to bottom. The first level represents the international professional infrastructure. The ISSB and GRI standards provide alternative but complementary reporting perspectives, while ISSA 5000, ISAE 3000 (Revised) and AA1000AS shape the methodological environment for sustainability assurance. These standards influence the criteria against which sustainability information may be prepared, evaluated and externally assured, even where they do not themselves establish legal reporting obligations (AccountAbility, 2018; GRI, 2021; IAASB, 2024; IFRS Foundation, 2023).

The second level presents the EU regulatory architecture. The CSRD and ESRS form the central corporate reporting mechanism, while the EU Taxonomy, SFDR and CSDDD extend the use of sustainability information to environmental classification, financial-market disclosure and value-chain due diligence. The arrows in the figure indicate functional rather than strictly hierarchical relationships: CSRD/ESRS disclosures provide relevant information for Taxonomy and SFDR reporting, while due-diligence requirements under the CSDDD are connected to companies' assessments of sustainability-related impacts, risks and governance arrangements. The Omnibus I amendments modify the

future scope and timetable of these requirements but do not alter this basic regulatory logic (European Parliament & Council, 2026).

The third level presents the Hungarian implementation and supervisory layer, including the national accounting framework, the separate ESG Act regime and the MNB's prudential integration of ESG information; the detailed reporting, due-diligence and certification requirements of the Hungarian ESG Act are discussed in Section II.7 (Act C of 2000 on Accounting, 2016; Act CVIII of 2023; MNB, 2025; MNB, 2026).

Within this multi-level framework, the dissertation's empirical research focuses on the CSRD transition and ESG assurance practices of European entities, with particular attention to how regulatory changes are reflected in the extent of assurance and the evolution of companies' business performance.

II.7. Hungarian ESG Act, certification requirements and the national implementation context

Hungary provides a particularly relevant national context because EU sustainability-reporting requirements operate alongside a separate domestic ESG due-diligence and certification regime. Act CVIII of 2023 on Corporate Social Responsibility and Environmental, Social and Governance Considerations (hereinafter referred to as the ESG Act) requires in-scope undertakings to establish ESG risk-management processes, assess sustainability risks within their own operations and supply chains, and prepare annual ESG reports. Although the two frameworks address overlapping sustainability information, their regulatory purposes and verification mechanisms differ: the CSRD requires ESRS-based sustainability statements prepared under the double-materiality principle and subject to external assurance, whereas the Hungarian ESG Act focuses on ESG risk management, supplier due diligence, annual ESG reporting and statutory ESG certification (Act CVIII of 2023; European Parliament and Council, 2022).

Under the Hungarian ESG Act, large entities of public interest are subject to its requirements if, in each of the two financial years preceding the relevant financial year, they exceed at least two of the following thresholds: total assets of 10 billion forints, annual net turnover of 20 billion forints and an average workforce of 500 employees. The regulations also apply to other large companies operating in the sectors specified in Annex 1 to the ESG Act, provided that their annual net revenue exceeds 90 billion forints and their

average workforce exceeds 500 employees. The first reporting cycle covers activities carried out in the 2025 financial year, which must be reported on in 2026 (KPMG, 2026a).

The Act requires in-scope companies to develop an ESG strategy and an internal responsibility system, assess ESG-related risks, conduct sustainability due diligence and report annually on the fulfilment of their ESG-related obligations. The due-diligence expectation extends beyond the reporting entity itself, as it can include subsidiaries and suppliers. This feature makes the Hungarian framework especially relevant to the value-chain perspective of European sustainability regulation, even though the legal basis and detailed obligations differ from those of the CSDDD and CSRD (Act CVIII of 2023; KPMG, 2026a).

A key element of the national regulatory framework is the mandatory certification of ESG reports prepared in accordance with the ESG Act. The certification process involves preparation and planning, an assessment of compliance with the applicable requirements, a substantive review of the ESG report, the formulation of conclusions, and the issuance of the ESG certification report. Consequently, ESG certification is not merely a voluntary mark of credibility, but an official verification mechanism within the framework of the Hungarian regulatory system (KPMG, 2026a).

The Hungarian reporting and certification system is highly relevant to this thesis, as it concretises the broader research question at a national level. However, it should be noted that this thesis does not deal with certification under the ESG Act, as the assurance of sustainability reports under the ESRS is not the same as the certification of ESG reports.

A recent Hungarian study confirms that compliance with regulatory requirements must be considered separately from the substantive quality of reports. Lippai-Makra and Tóth (2025) analyse the compliance of sustainability reports with regulatory requirements in Hungary and point out that the existence of statutory reporting requirements does not automatically guarantee uniform, comparable or useful disclosures for decision-making. Their research highlights the importance of implementation practices, reporting expertise and organisational capacities. Similarly, Bodó and Lippai-Makra (2026) conclude that, as a result of regulatory changes, Hungarian banks' sustainability disclosures may become increasingly similar in terms of both form and content, whilst changes in the intensity of disclosure are likely to remain more formal than substantive in nature. These findings

underscore the need to examine not only whether companies produce reports, but also how their reporting processes, data systems and external assurance practices are evolving.

In this context, the interaction between the Hungarian ESG Act and the CSRD creates a particularly valuable research environment. The CSRD strengthens harmonised corporate sustainability reporting and legal clarity at EU level, whilst the Hungarian ESG Act supplements domestic requirements relating to supplier due diligence and ESG certification. Together, these frameworks enhance the significance of the concept developed in this thesis: regulation shapes organisational implementation; implementation determines the quality and auditability of sustainability information; and assurance or certification can contribute to credibility, stakeholder trust and improved decision-making efficiency.

III. The Diversity of Environmental, Social, and Governance Aspects in Sustainability: A Systematic Literature Review

This first article, published in 2023, lays the conceptual foundations of the thesis. It provides an overview of the fragmented terminology, measurement methods and research trends relating to ESG reports, ratings, scores and corporate social responsibility. Its main contribution is to highlight the conceptual and methodological inconsistencies that limit the comparability and credibility of sustainability information. The following empirical chapters build on this foundation and examine how this information is applied, regulated and independently audited at the Hungarian, Central European and EU levels.

Abstract: Significant emphasis has recently been placed on measuring companies from a sustainability perspective by environmental, social, and governance (ESG) scores, resulting in a considerable amount of financial, accounting, business, and management research on the subject. We provide a concise and harmonized systematic literature review of the current trends within this area for a broader range of academic researchers and practitioners. This work comprehensively explains ESG ratings, scores, and reports and aims to summarize how CSR activities are accounted for as non-financial information. The review aims to provide information and a better understanding of the complexity of corporate ESG aspects for those interested in this area. The results suggest that diverse methodologies, subjective elements, and some complexity of ESG measurement exist, leading to companies unconsciously using ESG ratings based on incorrect measures. Scoring methodologies are controversial, highlighting the need for more certainty about the validity of the ratings. ESG ratings need more reliability, and ESG reports do not help increase credibility, transparency, or accountability. Greenwashing emerges from loose regulation, measurement complexity, and the absence of transparency, emphasizing the need for more auditing and regulations in sustainability reporting and rating. Our results also demonstrate that ESG reporting is an ever-growing issue in sustainability and finances, and regulators must focus on it. Inconsistencies and uncertainties exist in ESG ratings and reporting; therefore, education is needed for decision-makers to understand better how this emerging topic works in practice.

Keywords: CSR; ESG rating; ESG reporting; ESG scores; sustainability; transparency; greenwashing; assurance

III.1. Introduction

Due to rising pollution and the threat of climate change, the attention paid by corporations to sustainability concerns has extensively risen. With the growth of responsible investing, one question has become relevant: how to measure and disclose a company's environmental, social, and governance (ESG) performance as the three classified categories of sustainable corporate initiatives. ESG performance is not a fundamentally new concept; it has received significant attention in recent decades, driven by the ethical and sustainability-oriented principles of investor decision-making (Jain & Tripathi, 2023). The literature shows that environmental, social, and governance aspects have become undeniably important and form integral parts of the largest business organisations. ESG scores, ratings, and reports can provide insights into companies' sustainability engagement (Schiemann & Tietmeyer, 2022).

Tarquinio and Posadas (2020) conducted a bibliometrics analysis to demonstrate that there still needs to be a consensus on the meaning of NFI. A generally accepted or single definition of the term still does not exist. ESG, corporate social responsibility (hereinafter referred to as CSR), and non-financial information (hereinafter referred to as NFI) are usually used as substitutes for each other in the academic literature, and that clearly shows how unconscious the expression is. Academics prefer to define NFI in residual terms after explaining the meaning of the financial information of a company as supplementary financial information (Tarquinio & Posadas, 2020). According to Kotsantonis and Serafeim (2019), non-financial information is thought to capture how companies use different forms of capital - natural, social, human, intellectual, and financial - to supply their goods and services. Other academics define and understand NFI in terms of CSR issues, intellectual capital information, and information external to financial statements (Singhania & Saini, 2022).

Non-financial reporting is responsible for providing high-quality information that commands public confidence. In some industries, companies can effectively manage their reputation and promote responsible practices through transparent and comprehensive ESG reporting (Sethi et al., 2016). Companies provide a higher level of ESG reporting to legitimize and justify the continued existence of the firms, in line with the legitimacy theory (Rahman & Alsayegh, 2021). Generally, ESG reports provide extensive information on sustainability issues. Still, they may undermine public confidence in the accuracy of these

reports and devalue one of the most important public communication tools for companies (Sethi et al., 2016).

ESG scoring and ratings also significantly affect economic decisions, although diversity exists in this area. Rating agencies use different scales to determine companies' ESG scores, and there is also uncertainty about the conversion of companies' scores according to their scoring systems, which can lead to significant differences in measurement scales. In addition, how the individual indicators are combined and, hence, how the final scores per pillar and the aggregated scores are calculated is often surrounded by uncertainty (Widyawati, 2021). Transparency in ESG assessment methodologies and investor education must be improved for investors to understand the underlying assumptions better and make better investment decisions (Şahin et al., 2022).

The number of publications on NFI started peaking in 2015 and still has yet to end since a new regulatory regime, the Corporate Sustainability Reporting Directive, appeared in 2021 (Alamillos & de Mariz, 2022). Given the increased trend in the number of publications, the findings reveal that ESG reporting is a developing area in the study of sustainable finance. In addition, most of the articles highlighted that companies, investors, and consumers have evidently shifted their attention to corporate sustainability issues (Jain & Tripathi, 2023).

The aim of this paper is to give a systematic review of the academic literature on ESG reporting, given the growing importance of the topic. ESG reporting has become widespread in almost all areas of economic policy and decision-making, but no coherent summary structuring the ideas behind ESG reporting has been available (Sethi & Martell, 2016). However, further studies on embedding ESG scores in corporate life are needed (Şahin et al., 2022). Therefore, we established our main research question: What ESG concepts and trends have emerged in the corporate world over the past few decades? The paper is structured as follows. Section 2 explains how our sample selection was made, supported by basic descriptive statistics. Section 3, which is divided into four subsections, presents the results of our literature review, followed by our main conclusions.

III.2. Materials and Methods

To obtain a comprehensive overview of the environmental, social, and governance rating systems, we conducted an online search using two main electronic databases: the Web of Science and Scopus. Only the ESG keyword was used in the search, and the keyword had to be included either in the title, abstract, or keywords. We only selected materials written in English and focused only on academic journal articles or review articles – book chapters, books, or conference papers were omitted from the dataset. Our analysis did not restrict the publication year for finding empirical articles. However, the relevance and novelty of the topic can be proven by the fact that the total number of articles was published between 2013 and 2023, meaning that the research results are selected from the last decade.

Table 7 shows the top 10 high-quality published article sources, shown according to the journal names we analysed. Since the research subject is very popular, we selected our main research areas, which were business, management and accounting, economics, and finance. After the initial research, we obtained 1944 entries, out of which 561 were duplicates, and we concluded that an especially high number of articles were written on the selected topic. To ensure that only relevant articles were included in the final analysis, the authors met twice to discuss the 'conflicting' articles. Firstly, to ensure that only relevant articles were included in the final analysis, we undertook a higher level of screening process. Secondly, we looked deeply into the articles to select those that could meet our research objective.

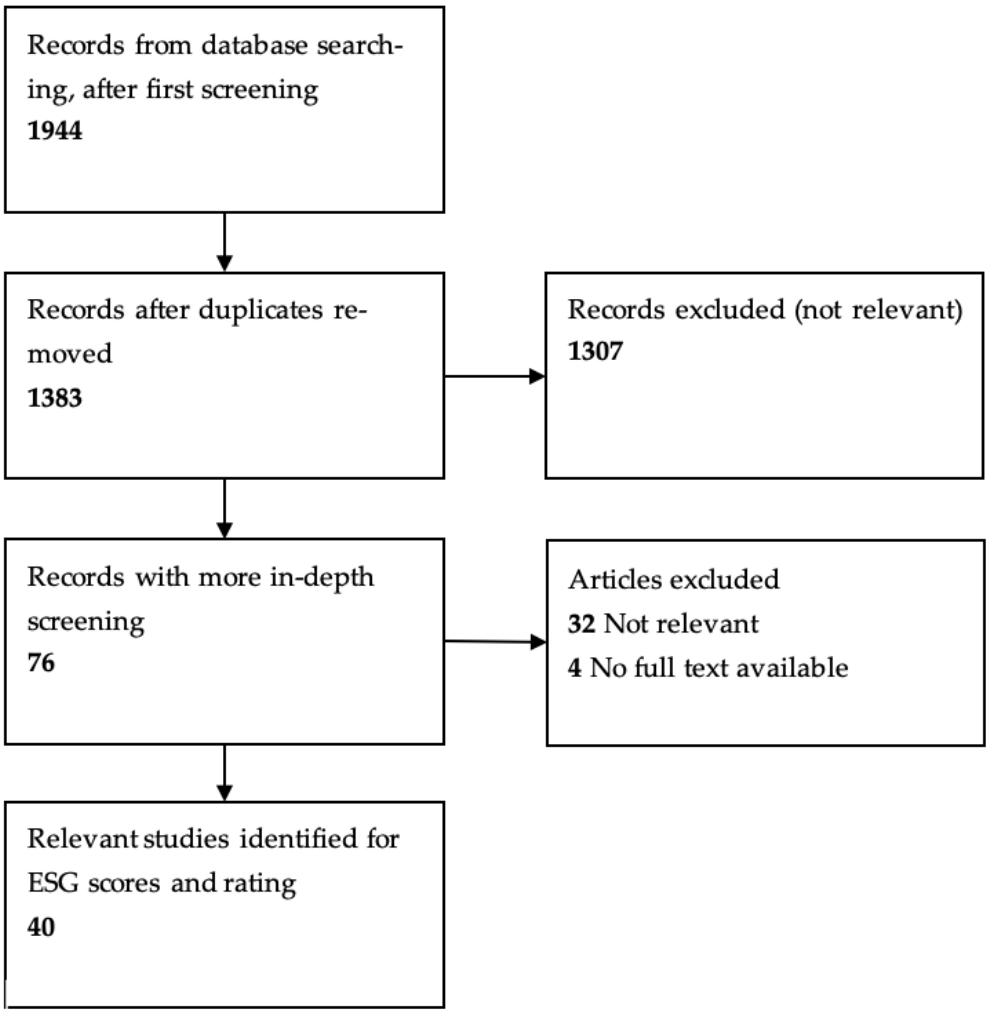
Table 7: Most productive journals, according to the Web of Science and Scopus

Rank	Journal Name	No. of Articles and Percentage (N = 909)	Journal Name	No. of Articles and Percentage (N = 1035)
	Web of Science		**Scopus**	
1	*Financial Research Letters*	56 (6.16)	*Journal of Sustainable Finance and Investment*	82 (7.92)
2	*Journal of Portfolio Management*	39 (4.29)	*Finance Research Letters*	64 (6.18)
3	*Journal of Applied Corporate Finance*	33 (3.63)	*Journal of Portfolio Management*	41 (3.96)
4	*International Review of Financial Analysis*	25 (2.75)	*International Review of Financial Analysis*	26 (2.51)
5	*Journal of Asset Management*	22 (2.42)	*Borsa Istanbul Review*	19 (1.84)
6	*Journal of Risk and Financial Management*	21 (2.31)	*Global Finance Journal*	17 (1.64)
7	*Journal of Investing*	18 (1.98)	*Journal of Business Research*	17 (1.64)
8	*Journal of Investment Management*	18 (1.98)	*Research in International Business and Finance*	17 (1.64)
9	*Research in International Business and Finance*	16 (1.76)	*Corporate Governance*	15 (1.45)
10	*Journal of Business Research*	14 (1.54)	*Journal of Investing*	15 (1.45)

Source: own composition.

The initial screening led to 76 articles, as we excluded a further 1307 non-relevant articles. After a comprehensive screening process, we concluded that 4 articles were unavailable, and another 32 articles did not address our research objectives. Both authors also screened the remaining articles, resulting in 40 publications that were relevant to our systematic literature review. *Figure 7* provides an overview of the whole selection process.

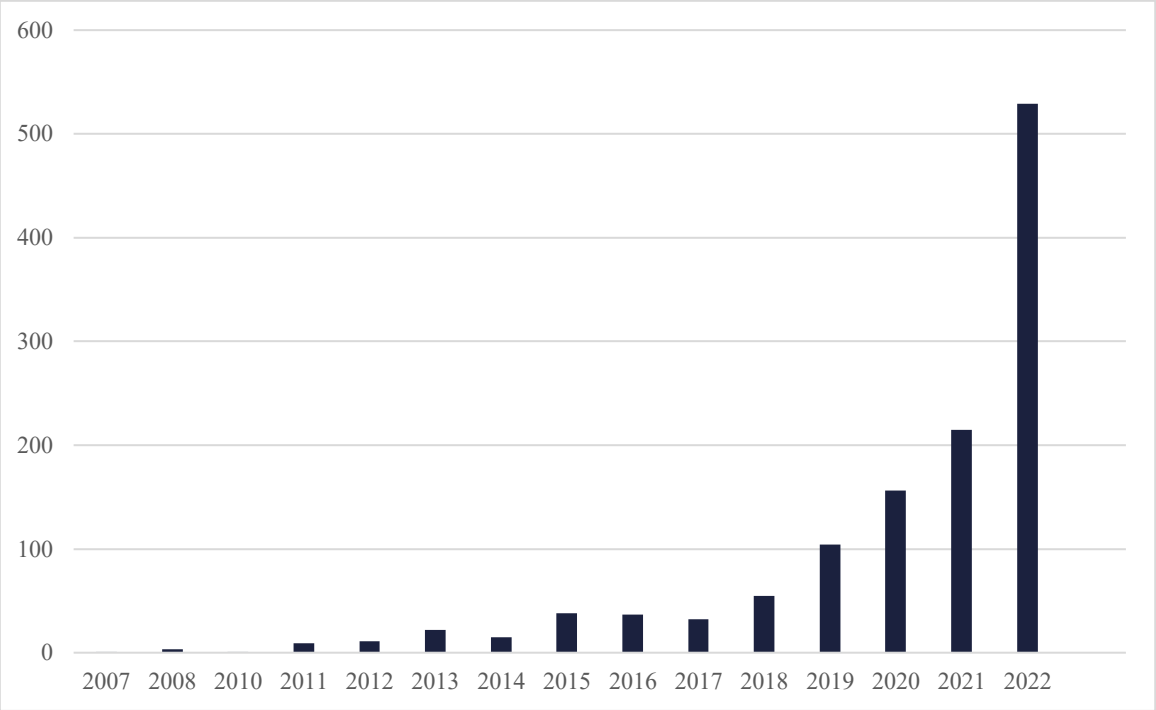
Figure 7: Overview of the literature selection process



Source: Own composition

It seems evident that ESG reporting is an ever-growing research topic, and since 2017, there has been an increasing number of publications on the subject, peaking in 2022 (*Figure 8*). The results for 2023 are not yet complete, but it is already evident that this year will also be productive in terms of publications.

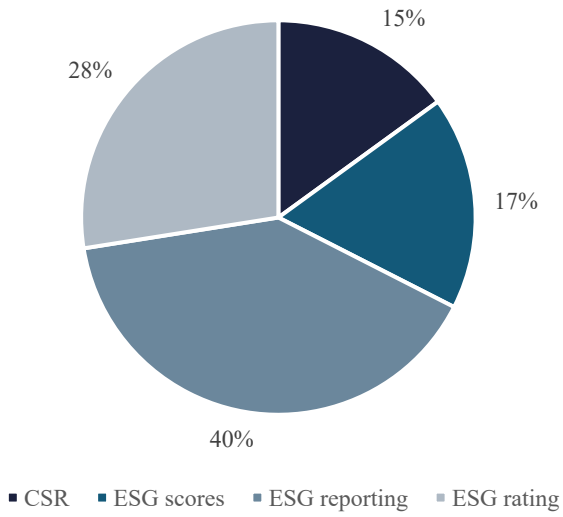
Figure 8: The number of publications on ESG matters



Source: Own composition

After reviewing the relevant publications, we identified 4 main ESG-related categories. Most of the research articles focused on ESG reporting (16) and ESG rating (11). In addition, the 2 other categories we created were ESG scores – on which topic we found 7 relevant articles – and CSR, with a further 6 papers. *Figure 9* shows the main topics of the articles analysed.

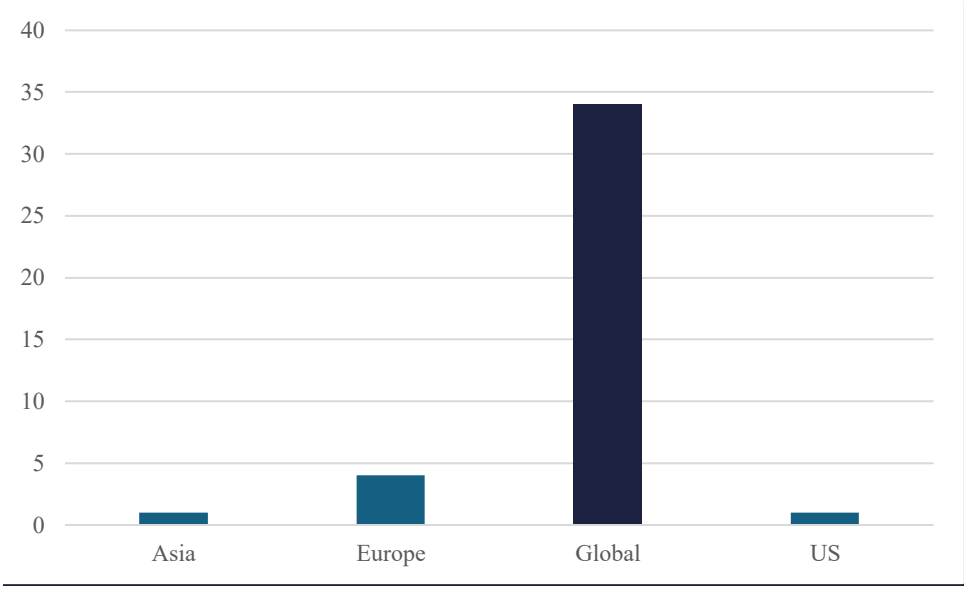
Figure 9: Overview of topics of the analysed articles



Source: Own composition

In the selected empirical literature, we also analysed geographical diversity. Most studies were written on global issues (34), while only a few of them focused on specific regions, such as Europe (4), Asia (1), and the US (1). *Figure 10* shows the main regions studied in the analysed articles.

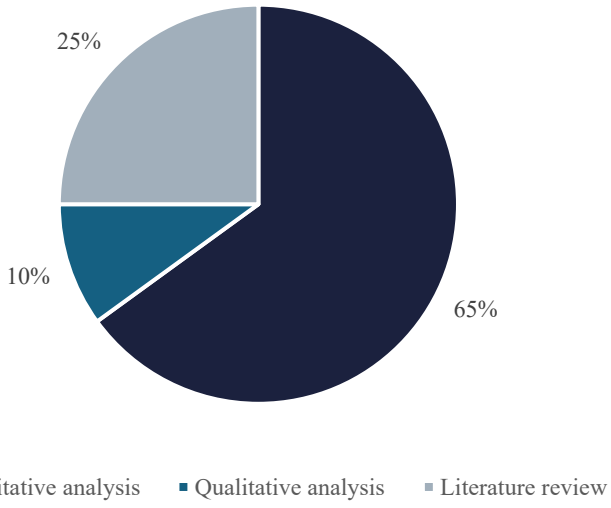
Figure 10: Frequency of regions analysed in the ESG-related articles



Source: Own composition

In terms of the methodologies used in the selected articles, quantitative analysis was the most popular (65%), followed by literature reviews (25%) – only 10% of the studies applied qualitative analysis (*Figure 11).*

Figure 11: Research methods used in the ESG-related articles



Source: Own composition.

III.3. Results

Although the notion of environmental, social, and governance (ESG) reporting has been known for many years in the field of sustainability studies, the last twenty years have seen a significant improvement in this concept. While reading the articles, we were able to identify the following four themes, as evident from *Table 8.*

Table 8: Summary of articles on the various aspects of ESG reporting and its effects on corporations.

ESG Reporting	ESG Rating	ESG Scores	CSR
Adams and Abhayawansa (2022)	Capizzi et al. (2021)	Clément et al. (2023)	Aksoy et al. (2022)
Alamillos and de Mariz (2022)	De la Cuesta and Valor (2013)	Jain et al. (2019)	Bofinger et al. (2022)
Christensen et al. (2024)	Dorfleitner et al. (2015)	Kiriu and Nozaki (2020)	Capelle-Blancard and Petit (2017)
Dinh et al. (2023)	Dumrose et al. (2022)	Lee and Hess (2022)	Chung and Cho (2018)
Jain and Tripathi (2023)	Dupuy and Garibal (2022)	Mercereau et al. (2022)	Dicuonzo et al. (2022)
Kotsantonis and Serafeim (2019)	Fiaschi et al. (2020)	Mikolajek-Gocejna (2018)	Waas (2021)
Linnenluecke (2022)	Gyönyörová et al. (2021)	Singhania and Saini (2022)	
Rahman and Alsayegh (2021)	Tsang et al. (2023)		
Rezaee et al. (2023)	Utz (2019)		
Şahin et al. (2022)	Widyawati (2021)		
Schiemann and Tietmeyer (2022)	Louche et al. (2023)		
Sethi et al. (2016)			
Singhania and Saini (2023)			
Tamimi and Sebastianelli (2017)			
Tarquinio and Posadas (2020)			
Yu et al. (2020)			

Source: Own composition

III.3.1. ESG Reporting

ESG reporting aimed to meet stakeholders' demand for companies' non-financial information, but recently it became a popular greenwashing tactic without any standardized regulation system. This trend needs to be changed, as ESG reporting is one of the most valuable sources of information for stakeholders' decision-making (Sethi et al., 2016).

There has been growing interest among stakeholders in non-financial information, a demand that the advent of the Non-Financial Reporting Directive (2014/95/EU) sought to address (Alamillos & de Mariz, 2022). Non-financial reporting trends gave rise to the need for information about activities that impact more significant public concerns, such as sustainability concepts, supply chains, bribery or product safety issues, and the treatment of employees (Sethi et al., 2016). Company stakeholders pressure firms to disclose more information on environmental, social, and governance matters and push policymakers to design a legal and measurable ESG framework (Rahman & Alsayegh, 2021). Since the EU Directive does not provide consistent reporting guidelines for ESG disclosure, several voluntary reporting frameworks have appeared (Alamillos & de Mariz, 2022).

In response to the emerging situation, Rezaee et al. (2023) found that the adoption of the 2014/95/EU directive in Europe improved companies' disclosure rates for non-financial reporting. Furthermore, they conducted research among US and EU firms and argued that the EU's mandatory regulatory regime is more efficient and, therefore, outperforms US firms with their voluntary disclosure regimes (Rezaee et al., 2023). The academic literature also shows that developed countries generally have a more comprehensive and rigorous regime for ESG disclosures, with well-established reporting frameworks and enforcement mechanisms. By contrast, developing countries face challenges in terms of regulatory deficiencies, weak implementation, and limited resources for ESG compliance (Singhania & Saini, 2023).

Other European Union regulatory initiatives significantly shape ESG practices worldwide by enhancing transparency and giving clearer guidelines, such as the sustainability finance disclosure regulation (SFRD) and the EU taxonomy regulation guidelines (Alamillos & de Mariz, 2022). While the EU has taken the lead in ESG regulations, other countries must adopt these policies into local legislation, which is usually called the 'ESG Brussels Effect'. Alignment between global and EU ESG regulations is vital to ensure consistency and avoid

regulatory fragmentation (Alamillos & de Mariz, 2022). Uniformity is also needed in the definitions, and non-financial information paves the way for conceptualizing the expression and its different understandings (Tarquinio & Posadas, 2020). Furthermore, uniformity contributes to the development of ESG ratings, metrics, and a comprehensively structured corporate reporting system (Kotsantonis & Serafeim, 2019).

Businesses can eliminate information deficiencies through regulated financial reporting and voluntary communication, such as management assumptions, announcements, and analyst presentations (Schiemann & Tietmeyer, 2022). Hence, the main purpose of non-financial information disclosures is to resolve the information asymmetry problem with disclosure policies that are convenient, credible, comparable, and finally flexible enough to encompass black swan events (Singhania & Saini, 2023).

The existing challenges of ESG reporting are manifold as there is neither a main governance body nor a specific and clear regulatory guideline to ensure the accuracy of ESG reports, and there is no obligatory audit activity to make the information reliable. ESG metrics vary in ESG ratings and scores are in line with the disclosure requirements (Yu et al., 2020). Linnenluecke (2022) discussed the challenges of analysing ESG performance at the firm level in developing economies and found several situations when ESG ratings could have been more effective in accurately determining a business's ESG performance.

Due to growing concerns about sustainability and ethical business practices, ESG criteria are now more crucial than ever for managers and investors. However, there is broad disagreement regarding the significance of ESG performance (Linnenluecke, 2022). Investors mainly aim to use ESG information for risk-screening purposes (Schiemann & Tietmeyer, 2022). Therefore, we need to differentiate between ethical and responsible investment approaches. The ethical investors' main characteristic is rejecting companies that do not comply with their sustainability approaches. If responsible investors consider the risk posed by ESG factors, they can still opt for maximization of return (Yu et al., 2020). Linnenluecke (2022) highlights that there is still a lack of understanding of how ESG reporting affects company performance and long-term economic value generation.

Yu and colleagues' (2020) research shows that companies with better ESG performance tend to have higher ESG ratings, indicating that stakeholders perceive ESG efforts as value enhancers. The study also shows that a positive relationship between ESG performance and

firm value is more prominent in sectors that stakeholders, such as the financial and services sectors, more intensively monitor. Moreover, the publication of ESG reports positively affects corporate reputation (Sethi et al., 2016). Companies with higher ESG disclosure ratings tend to have better financial performance, indicating a positive relationship between transparency and general business success.

Conversely, Christensen et al. (2024) found that in the early stages of institutional innovation around ESG disclosures, greater ESG disclosure leads to more significant ESG disagreement among ESG rating agencies and does not seem to help resolve ESG scoring disagreements. Moreover, the method of ESG ratings calculated in a particular industry group might change after the initial disclosure of information. This can significantly impact the results of ESG research. Furthermore, even if nothing has changed in the operations of a business, their first disclosure of ESG data and an update to the release of ESG data may make the company seem more sustainable (Şahin et al., 2022).

When discussing ESG reporting, concerns about greenwashing and misleading disclosures can arise in several aspects. Previous research results show that greenwashing in ESG reports can be prevented by (1) more independent directors, (2) more institutional investors, and (3) more influential public interest through a less flawed national system (Yu et al., 2020). On the one hand, investors and regulatory organisations increasingly demand that sustainability information be presented in a standardized way. However, managers have considerable reservations about the framework that is followed, the quality of the information reported, and the assurances that are given (Dinh et al., 2023). On the other hand, several aspects could be improved, underlying the push for harmonization and the standardization of NFI reports. A respectful engagement between existing framework-setters is important to enhance the quality of the reports. Furthermore, there is a need for critical accounting scholars to contribute to the debate and research corporate accountability for sustainable development (Adams & Abhayawansa, 2022).

There has been vast progress in ESG reporting among companies, but there is still room for improvement, especially regarding transparency (Tamimi & Sebastianelli, 2017). ESG reports lack standardization and may not fully reflect a company's sustainability performance, may require contextual interpretation, may be subjective, and must be supplemented with additional information to enable informed decision-making (Kotsantonis & Serafeim, 2019). A consistent and standardized non-financial reporting

framework is needed to enhance disclosures (Tamimi & Sebastianelli, 2017). The research results of Rezaee et al. (2023) encourage regulators to initiate more homogeneous and structured non-financial reporting guidelines. Therefore, policymakers and governments need to take urgent action to ensure sustainable growth and development and raise sustainability awareness among businesses and stakeholders (Jain & Tripathi, 2023).

Table 9 shows the four most common concerns regarding the current ESG reporting system.

Table 9: The most commonly researched topics within ESG reporting

Considerations in ESG Reporting	Details of the Consideration	Article
Reporting framework	A harmonized reporting framework can describe a set of factors used to measure the non-financial impact of investments and companies.	Tamimi and Sebastianelli (2017) Tarquinio and Posadas (2020) Adams and Abhayawansa (2022) Singhania and Saini (2023) Alamillos and de Mariz (2022)
Reporting assurance	ESG reporting with external assurance or audits can improve the quality of information provided.	Sethi et al. (2016) Yu et al. (2020) Dinh et al. (2023) Rezaee et al. (2023)
ESG and financial performance (FP)	ESG performance can affect the financial performance of companies in many ways.	Linnenluecke (2022) Şahin et al. (2022) Schiemann and Tietmeyer (2022)
ESG measures	ESG measures are used to benchmark the sustainability performance of companies from environmental, social, and governance aspects, which is influenced by reporting.	Kotsantonis and Serafeim (2019) Rahman and Alsayegh (2021) Christensen et al. (2024) Jain and Tripathi (2023)

Source: Own composition

III.3.2. ESG Rating

ESG ratings vary from agency to agency, in terms of their purpose, target, geographic parameters, and many other reasons. Agencies, as non-financial data providers, have recently become central actors in evaluating the sustainability performance of companies (Tsang et al., 2023).

Gyönyörová et al. (2021) explored the consistency and convergent validity of the most widely recognized ESG rating providers, and their exploratory factor analysis demonstrates considerable uncertainty across latent factors. The authors also showed that consistency and convergent validity across ESG data significantly depend on the industries and countries under consideration. Therefore, the authors highlight that a naïve use of ESG ratings may provide misleading information. This argument is supported by Dorfleitner et al. (2015), empirically comparing the ESG scores of three different data providers, including more than 8500 companies. They found an evident lack in the convergence of ESG measurement concepts in both distribution and risk; therefore, they call for a critical evaluation of the respective results. Similarly, Widyawati (2021) was in search of the measurement quality of four ESG ratings and also found significant differences in measurement methods and the whole construct. However, the results also suggest that while the agreement between ESG scores is low, there is evidence of a low to moderate agreement regarding ESG rankings.

Dupuy and Garibal (2022) investigated the impact of aggregation rules when combining information on firms across all E, S, and G categories into single ESG ratings. They found that the usual aggregation rules may bias scores toward the most dispersed category; therefore, they suggested a correction for managing this bias. Dumrose et al. (2022) also found differences in ESG firm-level ratings and argued that the EU taxonomy could support reducing this divergence. They especially highlighted that environmental ratings are significantly related to the EU taxonomy, although the authors also showed that the issue of measurement divergence cannot be fully resolved.

De la Cuesta and Valor (2013) evaluated the quality of ESG reporting by Spanish companies listed in the IBEX-35 stock index and also analysed the main drivers of differences among the reporters. The authors concluded that despite the standardization advantages of GRI indices, their approach to indicators cannot provide high-quality, comparable, and complete information on a firm's sustainability performance. Regulation and reputation were found to be the main drivers for improving the quality of ESG reporting. Similarly, Capizzi et al. (2021) investigated the divergence of ESG ratings in a sample of Italian companies. They found that weight divergence and social and governance indicators are the main drivers of rating divergence. The authors elaborated a new tool for

analysing these divergences and provided a number of recommendations for researchers, practitioners, and policymakers interested in ESG ratings.

Louche et al. (2023) assessed companies' decent work practices by comparing six rating agencies' respective rating methodologies and found that the concept of decent work itself remains diffuse and abstract for many ESG professionals. It seems that the more one goes into the details of rating methods, the greater diversity one finds. The results were different because of the scope of assessment, in terms of its breadth and depth, and the differences in methodologies regarding score aggregation, weighting, the activation of indicators, and the assessment of controversies. Moreover, the authors also found that some degree of subjectivity is unavoidable, despite the desire to be as objective as possible during the rating process (Louche et al., 2023).

Utz (2019) analysed corporate scandals, proxied by press releases, and the reliability of ESG ratings on an international sample, and also found high diversity among ratings. His results suggest a significant decline in retrospective controversy indicators during the period in which details of the scandals were publicly released, while, following the scandals, he found a rebound of these indicators. His findings also suggest that aggregated ESG ratings are useless when it comes to predicting corporate scandals; therefore, managerial education regarding a comprehensive vision of CSR is greatly needed (Utz, 2019).

Fiaschi et al. (2020) sought to measure the corporate 'wrongdoing' of companies by elaborating an index that is understood as firms' involvement in controversies over universal human rights. The index identifies those companies that do harm, irrespective of how much good they do through their CSR activities and aims to shift the CEO's mindset to doing no harm instead of doing many good and bad things in parallel – avoidance and mitigation were found to be key elements in this regard (Fiaschi et al., 2020). *Table 10* shows four of the main misconceptions about ESG ratings.

Table 10: Four misconceptions about ESG ratings

Misconception about ESG Rating	Details of the Misconceptions	Article
The ESG ratings authorized by agencies are standardized and consistent.	There is no generally accepted approach, criteria, or methodology for setting up an ESG rating; therefore, comparing companies using ratings can lead to misunderstandings.	Gyönyörová et al. (2021) Widyawati (2021) Louche et al. (2023)
The higher the ESG rating, the better the financial performance.	ESG ratings primarily focus on a company's non-financial performance with several company-, industry-, and country-specific factors. Meanwhile, although evidence suggests correlations between a company's financial and non-financial performance, a high ESG rating does not guarantee better financial performance.	Dorfleitner et al. (2015)
ESG rating only focuses on events in the past.	ESG ratings are not only based on a company's past performance. Still, ratings can also change over the years, as agencies constantly update their information on the company in addition to their rating methodology. Therefore, ESG performance can affect the financial performance of companies in many ways.	Utz (2019) Fiaschi et al. (2020)
Comprehensive assessment of ESG performance without subjectivity.	ESG rating can only capture publicly available, intentionally, and voluntarily provided information, as there is no universally accepted method of disclosure and assessment.	Dupuy and Garibal (2022) Dumrose et al. (2022) De la Cuesta and Valor (2013) Capizzi et al. (2021)

Source: Own composition

III.3.3. ESG Scores

ESG scores are becoming increasingly relevant in the academic literature, although little consensus is made about the definition of ESG scores and their measurement methods. This is mainly due to the fact that different rating agencies use different variables, databases, weights, and measurement methods to calculate their own indexes (Kiriu & Nozaki, 2020).

Clément et al. (2023) conducted a systematic review of the academic literature on ESG scores and found five thematic definitions emerging in terms of how scholars have used

ESG scores in their research: sustainability, corporate social responsibility, disclosure, finance, and the analysis of ESG scores.

In terms of sustainability, most articles aim to capture the sustainability of companies in general, although they face serious problems when trying to compare the different results, as even the definition used to measure sustainability is still difficult to capture (Mercereau et al., 2022). It seems evident from the literature analysed herein that environmental and governance issues have a greater impact on ESG scores than social issues. However, even environmental issues are biased as a direct measurement of global warming or climate change is not possible at the company level (Clément et al., 2023).

Several authors suggested new approaches to improve the comparability of ESG scores. Mikolajek-Gocejna (2018), for instance, aimed to set an index reflecting the degree to which European companies are represented in major social responsibility indices and proposed introducing the GDP of each country into the calculation formula. Singhania and Saini (2022) took another approach and suggested classifying countries into well-developed, rapidly improving, developing, and early-stage ESG frameworks so that their scores can be better compared. Lee and Hess (2022) developed a new index based on companies' contributions to SDGs to compare their respective results. Focusing on Fortune 500 companies in 2017, their new index provides methodological clarity and data granularity. Jain et al. (2019) compared various Thomson Reuters and MSCI indices to check for potential inter-linkages and comparability and found no significant differences between sustainability-based and conventional indices in terms of measuring a company's overall performance in the eyes of investment managers.

Table 11 summarizes the main deficiencies related to ESG reporting, rating, and scoring mechanisms, as identified from the literature analysed.

Table 11: The main shortcomings of ESG rating, scores, and reporting

ESG Reporting	ESG Rating	ESG Scores
▪ Inconsistent legislation ▪ Non-standardised and harmonised framework ▪ Lack of accountability ▪ Lack of assurance ▪ "greenwashing" and "cherry picking" problems	▪ Lack of regulation systems ▪ Different rating agencies with different perspectives ▪ Incomparability ▪ Lack of transparency	▪ Weighting problems ▪ Aggregation issues ▪ Purpose, target, sector, geographic differences ▪ Complexity of measuring ESG impacts

Source: Own composition

III.3.4. Corporate Social Responsibility in Investments

Measuring corporate social responsibility is challenging and causes controversy between authorities, companies, and other economic stakeholders. Non-financial information is hard to capture, and determining its impact on a company's performance is even more complex (Tarquinio & Posadas, 2020).

Chung and Cho (2018) conducted a literature review within the social and environmental accounting research area. They found controversial arguments about the negative relationship between corporate social performance and financial performance, while environmental investment and return on investments are positively correlated. Bofinger et al. (2022) explained the latter concept as the increase in demand for ESG-engaged companies; these investment decisions have become a worldwide trend, leading to improved corporate financial performance, accompanied by enhanced regulatory initiatives. There is also a positive relationship between innovation and sustainability performance. To achieve their sustainability goals, it is clear that companies need to make an effort to improve their operations (Dicuonzo et al., 2022)

ESG performance is a multidimensional factor, one that, since the early 2000s, has increasingly been described by a single aggregate indicator or a generated proxy. Considering that the objectives of ESG metrics are well-defined, it still needs to be assumed that poor performance in one dimension can be mitigated by strong performance in another (Capelle-Blancard & Petit, 2017). The purpose of ESG rating systems is to provide a

ranking of companies according to objective performance criteria, which is extremely challenging, especially regarding their social aspects (Waas, 2021). These factors are undoubtedly relevant for interested parties and can provide a broad picture of how the company approaches sustainability. Currently, neither scoring nor reporting addresses the information asymmetry, and stakeholder theory still needs to be resolved (Bofinger et al., 2022). Regulators and investors are able to monitor and acknowledge corporations for their ESG efforts using ESG metrics and reporting, which provide crucial details about companies (Aksoy et al., 2022).

ESG metrics and standards for reporting are more likely to communicate with investors and regulators and less likely to satisfy customers' interest, which fundamentally affects firm sales (Aksoy et al., 2022). A universal framework is hard to create and may need to be revised as the importance of ESG dimensions might vary across countries and industries. A tailored approach to corporate sustainability issue reporting and measuring is required, considering the specific characteristics and priorities (Capelle-Blancard & Petit, 2017).

III.4. Conclusions

This article aimed to systematically analyse the literature regarding high-quality research on ESG rating, scoring, and reporting. The research intention was to draw particular attention to the growing awareness and importance of ESG/CSR activities to corporate sustainability. Each of the four pillars of this article opens up future research directions. We have identified a number of research gaps in these areas, such as the analysis of assurance and framework practices in ESG reporting, green financing, stock market regulatory considerations, banking perspectives and motivations, and internal corporate decisions and commitment issues. After reading this article, interested colleagues working in the areas of ESG reporting can identify the most appropriate topic for future research.

Based on the literature review results, most studies indicate that unconsciously used ESG ratings can lead to decisions based on incorrect considerations. ESG scores and ratings vary across agencies due to different goals, objectives, and geographies, and do not use the same databases, variables, weights, and measurement methods, which influences the inconsistencies, uncertainties, and misleading consequences when using them. Capturing sustainability, in general, is difficult, and aggregated ESG scores proved ineffective in

anticipating corporate scandals, underscoring the crucial need for comprehensive CSR-focused managerial education.

By looking deeper into the details of the rating methods, high levels of variation can be found, suggesting a substantial uncertainty about the validity of the rating companies. Some studies found positive financial gains associated with ESG metrics and reporting, while others discovered negative or neutral impacts in response to sustainability initiatives. It can be concluded that the positive association between ESG performance and corporate performance is more heavily emphasized in industries that are more closely scrutinized by stakeholders, such as finance and services. Increasing demand for ESG-oriented businesses can be expected to lead to better financial performance and better regulatory initiatives.

ESG ratings need more reliability, and ESG reports do not help increase credibility, transparency, and accountability. One of the primary purposes of ESG disclosure is to address information asymmetries while meeting the need for information from stakeholders. Various reporting frameworks are available, and the quality of disclosure still has its limitations. ESG reports are not standardised, do not perfectly represent a company's sustainability performance, require interpretations in context, and can be subjective. The greater the ESG disclosure, the broader the disagreement among ESG ratings, which indicates that ESG reports currently do not provide complete and comparable information on companies' sustainability. Consolidated and harmonized ESG ratings, with their objective approach, can settle the controversy, but a certain degree of subjectivity cannot be avoided.

Last but not least, with the spread of ESG approaches, the 'greenwashing' mechanism appeared among companies to better portray their sustainability perspectives. Many factors led to the evaluation of this movement, such as consumer demand for eco-friendly and conscious products and services and the need for more non-financial information, the complexity of measuring and the accountability of ESG scores, the lack of transparency, and weak regulations. Several potential solutions were proposed by the literature to standardize and uniformize the ESG rating, scoring, and reporting, and increased scrutiny is needed, which can be assured by independent auditing processes.

There has been considerable development in ESG reporting among companies and when creating rating systems, but there is still room for improvement, especially in terms of

transparency. A consistent, tailored, and standardized non-financial reporting framework is needed to enhance disclosure and rating tendencies. ESG practices are significantly shaped by European Union regulatory regimes, which trend needs to become a global movement to support consistent, transparent, and accountable sustainability-based decision-making. This cannot be achieved without improving the ESG-conscious education system and helping stakeholders to better understand the underlying assumptions.

In conclusion, our article not only provides researchers with a basis for further research by clustering the different aspects of environmental, social, and governance considerations but also highlights the long-term negative impact that a lack of regulation can have on businesses globally. The article highlights the EU's pioneering role in ESG regulation and draws the attention of other economic actors to the crucial importance of this area. It also provides insights to stakeholders, especially investors, on the gaps in ESG ratings, scoring, and reporting, which can help to inform and improve investment decisions.

As with every academic study, our analysis also has limitations in the case of ESG-influenced firm value and ESG-related investing. These topics were outside the scope of our research, as green finance is another excellent area of academic literature and has also been highly emphasized and connected to ESG performance due to its rating and reporting systems. However, future research can be carried out including these topics. Additionally, as the definition of ESG reporting is diverse, CSR literature could be considered at the same time. Furthermore, the selection of keywords is focused exclusively on the topic of this study.

IV. Review of preparations for CSRD: An examination of the hidden complexity of sustainability reports at Hungarian Public Interest Entities based on interviews

Building on the conceptual fragmentation identified in Chapter III, this published article moves to the Hungarian implementation context. It examines how public-interest entities interpret and operationalise emerging sustainability reporting requirements and identifies the organisational conditions needed to produce reliable, assurance-ready information. The chapter connects broader conceptual problems of ESG measurement with practical issues of governance, data collection, internal controls, organisational responsibility, and external assurance. The Hungarian ESG Act and its certification-oriented approach reinforce the relevance of these implementation challenges.

Among other things, one crucial limiting factor included the sampling frame. The original list sourced from Opten was not an official or comprehensive register of PIEs that had submitted NFRD disclosures in Hungary, and participation also depended on positive responses to the invitation. Although we cross-referenced the NFRD reporting status of the participating companies with publicly available disclosures, coverage error and self-selection bias cannot be ruled out. The results should therefore be interpreted as analytically transferable evidence obtained from an information-rich, targeted sample, rather than as evidence that can be statistically generalised to the entire Hungarian PIE population.

Abstract: This study investigates the organisational preparedness and challenges Hungarian Public Interest Entities (PIEs) face when implementing the Corporate Sustainability Reporting Directive (CSRD). This paper addresses a novel and relevant aspect of corporate sustainability, providing one of the first systematic, interview-based insights into an area of growing regulatory concern with limited empirical knowledge in the European Union's evolving sustainability landscape. Through semi-structured interviews conducted with sustainability leaders from eleven companies, this study reveals that regulatory alignment is enhancing reporting transparency, yet transitioning to externally assured non-financial data poses a substantial challenge. Interviewees repeatedly pointed to the assurance process as the forthcoming milestone and one of the most intricate aspects of sustainability reporting. This research suggests that fragmented data systems and rapidly changing reporting standards further impose difficulties for compliance with

reporting, which demands greater accuracy, transparency, and methodological rigor. The empirical results offer valuable insights for both practitioners and policymakers.

Keywords: qualitative interview, sustainability reporting, Public Interest Entities, Hungary, CSRD

IV.1. Introduction

Over the past two decades, sustainability reports have become one of the most important measures for linking corporate performance to broader social and environmental performance. Global challenges such as climate change, biodiversity loss, and social inequality have heightened expectations that companies should be accountable not only to their shareholders but also to a broader range of stakeholders (Jain & Tripathi, 2023). Against this background, the Corporate Sustainability Reporting Directive (CSRD) represents a paradigm shift in corporate reporting and accountability, mandating standardized, externally assured, and sustainability-related disclosures useful for economic decision-making across the European Union (EU). The shift toward comprehensive, standardized, and assured sustainability reporting is pivotal to the European Union's sustainability agenda. CSRD expands the scope and rigor of required disclosures, placing significant new demands on companies (European Commission, 2022). Understanding how organisations prepare and navigate these changes is essential for policymakers and practitioners aiming to promote sustainability and transparency in corporate practices.

Although the EU's objectives are ambitious in improving transparency, comparability, and reliability, there is still growing concern that the transposition and implementation of the CSRD is underestimated. Hungarian Public Interest Entities[1] (PIEs), due to their scale, regulatory exposure, and public visibility, offer a critical lens for identifying these implementation barriers. Despite apparent regulatory urgency, little is known about the organisational preparedness and practical obstacles these entities face during CSRD alignment.

This research addresses this gap by leveraging semi-structured interviews with ESG and sustainability leaders across eleven Hungarian Public Interest Entities. It sheds light on organisational and operational challenges that remain invisible in formal disclosures, such as problems with data transfer between departments, human resource constraints, and strategic uncertainty. This study is timely to inform policymakers, companies, and other

[1] According to Hungarian Law (Act LXXXV of 2015), Public Interest Entities include: (1) companies issuing securities admitted to trading on a regulated market (i.e. issuers), (2) credit institutions (with exceptions for the Hungarian National Bank (MNB), Hungarian Development Bank (MFB) and Hungarian Export-Import Bank (Exim Bank), which, while not credit institutions, may have PIE status due to listed bonds), (3) insurance companies (excluding small insurers and mutual insurance associations), and (4) investment firms.

decision-makers about the on-the-ground realities of sustainability reporting. The primary goal of this research is to critically examine the perception and reality of the challenges Hungarian companies face in preparing for compliance with the Corporate Sustainability Reporting Directive (IAASA, n.d.).

In short, this study aims to go beyond surface-level assessments of technical readiness and uncover deeper, often less visible barriers to effective implementation of CSRD. The research question is therefore:

> *What are the key organisational, strategic, and operational challenges Hungarian Public Interest Entities face in preparing for CSRD-compliant sustainability reporting?*

To answer this question, the article is structured as follows. Section 2 reviews the evolving literature on sustainability reporting and regulatory developments. Section 3 outlines the qualitative, interview-based research methodology and sampling procedures. Section 4 presents the empirical findings, structured thematically to examine the current state of sustainability reporting, key organisational and strategic challenges, the integration of ESG considerations into governance, and comparative insights between local and multinational entities. This project contributes empirical, qualitative insights to the broader academic and policy discourse on sustainability regulation, particularly in CSRD post-transition economies. Section 5 discusses the implications of these findings for policy and practice, while Section 6 concludes with recommendations and future research directions. This study seeks to inform both scholarly understanding and regulatory development by capturing grounded, practitioner-level perspectives.

IV.2. Literature review

The growing emphasis on corporate accountability, along with rising stakeholder expectations and a changing regulatory environment, has significantly increased the importance of sustainability reporting. As a consequence, organisations are under greater pressure than ever to transparently communicate their environmental, social, and governance impacts (Papafloratos & Fragidis, 2025). This paradigm shift shows that people are beginning to recognize that business and social well-being are connected, and it challenges the standard idea that companies should only focus on creating value by making

money for their shareholders (Yu et al., 2020). The increase in the number of sustainability reports can be explained by several factors, including growing pressure from stakeholders, regulatory requirements, and growing awareness of business risks and opportunities related to environmental, social, and governance issues (Bednárová et al., 2019). Stakeholders are demanding greater transparency and accountability from companies regarding their environmental, social, and governance, non-financial as well as financial performance (Amran & Ooi, 2014). Inadequate management of environmental, social, and governance risks can damage a company's credibility and reputation. Transparency and public disclosure can also help companies build trust with stakeholders, attract and retain employees, and improve their access to external capital (Oprean-Stan et al., 2020).

In response to the growing demand for greater transparency and accountability, the European Union has taken a leading role in advancing sustainability reporting practices. The CSRD introduced by the European Union marks a turning point in the development of sustainability reporting standards, as it gradually requires a wider range of companies to disclose detailed information on their sustainability impact, performance, risks, and opportunities (Taliento & Netti, 2020). This directive aims to enhance the comparability and reliability of sustainability information, enabling investors and other stakeholders to make more informed decisions (Katterbauer et al., 2022).

This new directive is expected to promote transparency and accountability among companies, encouraging them to integrate sustainability factors into their core business strategies (Masud et al., 2018). The shift to comprehensive sustainability reporting, though, is a big deal for a lot of companies, especially small and medium-sized entities, which need to comply with the complexity of new reporting standards and develop the skills needed to collect, analyse, and report sustainability data (Permatasari & Gunawan, 2023). Sustainability reporting provides stakeholders with helpful financial and non-financial information in a more open and reliable manner (Benameur et al., 2023).

Despite the increasing global momentum towards sustainability reporting, substantial research gaps remain in understanding the specific challenges and opportunities faced by companies in different national contexts, particularly in emerging economies such as Hungary. Hegedűs et al. (2023) concluded that Hungarian PIEs show inconsistent and often limited compliance with EU non-financial reporting requirements, which reveals major shortcomings in their preparedness for upcoming stricter sustainability regulations, like the

CSRD. Surman and Böcskei (2025) identified divergences in the way Hungarian SMEs interpret sustainability, underlining the differences in strategic and policymakers' orientations. While the EU promotes sustainable investments and non-financial disclosures in terms of sustainability and climate change (Bruno & Lagasio, 2021), the practical implications of these policy measures at the national level need further investigation. Although EU directives set out a common framework for sustainability reporting, their implementation and impact can vary significantly across EU Member States, depending on legal and institutional structures, business culture, and levels of economic development (La Torre et al., 2018). This is also supported by the fact that some EU countries have still not fully transposed the CSRD (Accountancy Europe, 2025). Understanding the localized impacts of ESG mapping could allow cross-country research comparisons (Papafloratos & Fragidis, 2025). Not to mention the firm size in terms of sustainability reporting, as Surman and Böcskei (2023) pointed out that SMEs are under increasing pressure, putting them in a more difficult position, not only in terms of reporting but also in terms of market competition.

There is a temporary suspension of certain CSRD reporting requirements, called the 'Stop the clock' initiative, which presents a complex challenge to the European Union's comprehensive ambitions for sustainability and corporate transparency. While this postponement reduces the immediate pressure on companies struggling with enhanced sustainability reporting, it also calls for a critical examination of the implications for the long-term direction of EU environmental and social governance (Nagy et al., 2025). It could also, unintentionally, slow down the integration of sustainability considerations into core business and investment decisions, undermining the EU's commitment to shift financial resources towards environmentally and socially responsible businesses (Poulle et al., 2024). Delaying action may allow companies to downplay sustainability initiatives, especially if they appear costly or complex, potentially slowing society's transition to a more sustainable economic model (Hamann et al., 2022).

In the meantime, many companies examine sustainability management and publish sustainability reports; however, the primary goal of these efforts remains unclear, indicating a need for the development of a clear strategy (Baumgartner & Ebner-Karestinos, 2010). Leadership commitment is key to successful quality changes, including the introduction of ESG practices, which is a significant step forward for any business.

(Kim & Li, 2021). Managers have many roles to play, including articulating a clear vision for the future, continuously improving systems, aligning the organisation, delegating authority, providing adequate training, caring for employees, and ensuring appropriate style and role modelling (Niu et al., 2022).

Companies are increasingly realizing that ESG is not just a fashionable term, but a fundamentally important business requirement that contributes to long-term shareholder value and competitive performance (Lee et al., 2022). Corporate social responsibility and ESG are closely linked, and both reflect responsible business practices by companies (Mariappanadar, 2025). Integrating ESG into corporate operations has numerous benefits, including better risk management, more efficient use of resources, increased employee engagement, and improved corporate reputation (Kim & Li, 2021). The evaluation of ESG indicators is key for investors to make informed investment decisions, especially when looking at non-financial performance factors like corporate governance structures (Ahmad et al., 2023). The integration of ESG criteria is not only a costing exercise but can also represent a competitive advantage for companies (Barbosa et al., 2023).

Current ESG ratings, scores, and reporting mechanisms are inconsistent, non-standardized, and lack transparency and assurance, leading to greenwashing risks, flawed decision-making, and an urgent need for harmonization and regulation (Jámbor & Zanócz, 2023). Mayer and Ducsai (2023) investigated the differences in the methodologies used by the most reputable ESG rating agencies and highlighted the issues associated with historical ESG data from many companies. There is an observable difference in environmental and ESG disclosures between European and Asian corporations. Therefore, regulatory authorities and policymakers can benefit from the results of studies to formulate comprehensive guidelines and practices for environmental disclosure and sustainability reporting to attain sustainability objectives (Almaqtari et al., 2023).

Furthermore, there is a gap in the literature concerning the role of financial information in influencing the quality of non-financial reporting based on sustainable development goals (Nechita et al., 2020). While some studies have explored the relationship between financial performance and sustainability disclosure, more research is needed to examine how economic factors influence the scope, accuracy, and credibility of sustainability information reported by companies. The effect of financial statements on sustainability has

to be investigated to determine if the annual financial data and disclosures influence sustainability disclosures.

The lack of research on sustainability reporting practices and CSRD readiness in Hungary represents a significant gap in the literature. It is particularly important given the growing importance of sustainability reporting in attracting investment from abroad and enhancing corporate reputation (Cicchiello et al., 2021). Prior research concentrated on organisational impediments to environmental actions at Hungarian firms (Zilahy, 2004), but more research is needed to examine the scope to which these barriers impact CSRD readiness. This study aims to contribute to filling this gap by providing insights into the current state of sustainability reporting practices in Hungary and the challenges and opportunities faced by companies in preparing for the CSRD.

IV.3. Research Design and Methodology

In this article, we show the behind-the-scenes aspects of sustainability reporting to provide a comprehensive view of stakeholders' current experiences, challenges, and perspectives. Between July and September 2024[2], eleven interviews were conducted to gather insights on non-financial reporting from recent years, focusing on companies previously covered by the Non-Financial Reporting Directive (NFRD). This includes large domestic companies of public interest that are now subject to sustainability reporting requirements under the CSRD starting in 2024. Each interview typically lasted one hour and included 2-3 experts from the respective companies. With the exception of the insurance sector, we successfully included banks and manufacturing/service companies in the review.

The research was conducted in two phases: first, companies were identified, and the sustainability reporting background was examined. This allowed us to understand how companies have addressed sustainability reporting in recent years. We used this background knowledge to prepare for interviews, having already gained an understanding of the strategic integration of sustainability within the company, the level of reporting, and the involvement of independent external auditors. This study aims to uncover background knowledge that would suggest sustainability is already integrated to some extent into the

[2] The information contained in this study for each company can be found in the ESG Körkép 2024 report, which was published based on our interviews in 2024 following approval by the companies (Ásványi et al., 2024).

strategic processes of companies. We also examined the external assurance dimensions used in companies' most recent ESG/sustainability reports or integrated reports. Due to the novelty of the topic and the recent introduction and continuous changes in legal requirements, our aim was to identify past experiences, present challenges, and future goals that are not yet captured in formal published documents of companies but are only present in the minds of those responsible for ESG (Bowen, 2009). Overall, the study aimed to collect context-specific, detailed, and sufficiently comprehensive data that may not necessarily be revealed in sustainability reports, to frame better current corporate strategies for sustainability transition and legislative preparation.

The methodological approach for this research centres on conducting semi-structured interviews with key individuals within Public Interest Entities. We chose semi-structured interviews to balance between exploring predefined topics and allowing for flexibility in exploring emerging topics, thereby ensuring a comprehensive understanding of the research topic (Sharma & Choubey, 2021). The companies interviewed are those pre-identified by Opten Ltd. to be under the scope of CSRD (and were those required to prepare non-financial reports by NFRD) and verified by us as falling within the statutory term of large Public Interest Entities in Hungary under the first phase of CSRD regulation. The focus on PIEs is based on the fact that they play a crucial role in the economy, and their awareness of regulatory monitoring and public accountability makes their operational and strategic decisions particularly relevant for academic research (Birt et al., 2017).

This qualitative research design is specifically tailored to gather in-depth insights into the perceptions, experiences, and strategies these entities employ in navigating the dynamic landscape of the Hungarian PIEs (Nawangsari & Sutawijaya, 2019). Triangulation is essential in qualitative research, particularly in interviews, as it enhances the validity and depth of research findings. While respondents often provide valuable insights into their experiences, their stories may be biased, incomplete, or influenced by memory or self-interest. Triangulation mitigates these limitations by supplementing data from semi-structured interviews with data from multiple methodological sources, such as document analysis, observations, and cross-checking by multiple researchers. Document analysis is particularly common, as it enables researchers to acquire extensive contextual knowledge about respondents and their circumstances, thereby improving the accuracy and reliability of data interpretations (Natow R. S., 2019).

These techniques were used throughout the analysis, starting with the formulation of the interview questions: in all cases, we conducted interviews after a preliminary document analysis, which explored the companies' experiences in sustainability reporting based on publicly available information. This allowed us to focus more specifically on the answers to the interview questions when asking further interpretative questions. We cross-checked the interview transcripts to ensure that both of us had arrived at similar conclusions, and we had each transcript validated by the companies themselves to confirm that what we had understood during the transcription process was indeed what the companies intended. Afterwards, the interviews were analysed and classified, thereby confirming the objectivity of the research findings.

The interview questions were explicitly tailored to the unique situation of each organisation, ensuring that responses were relevant and detailed, and truly reflected the organisations' current role in sustainability reporting (Adeoye-Olatunde & Olenik, 2021). The interviews followed a clear chronological order, beginning with past experiences and historical background, proceeding to the present, and concluding with hopes, opportunities, and plans for future growth. This timeline was intentionally created to illustrate how the organisation's sustainability efforts have evolved and changed over time, and to provide an idea of how these initiatives have developed and are expected to grow in the future (Longhurst, 2009).

In addition to the chronological dimension, we also grouped the interview questions thematically, moving from general, broad questions to more specific, company-focused topics (*Table 12*). The open-ended questions created a comfortable and open atmosphere for respondents, encouraging them to share their opinions honestly and experiences freely, while the semi-structured questions ensured that key areas of concern were thoroughly addressed (McIntosh & Morse, 2015). It also provided rich and detailed insights into the specific sustainability challenges and opportunities faced by companies (Lozano et al., 2018). The use of this type of interview allowed us to systematically explore sustainability practices while providing flexibility to explore new topics and individual experiences in greater depth (Adeoye-Olatunde & Olenik, 2021).

Table 12: Structure of the interview questions

Group of questions	Purpose of questions
General characteristics of the company (2 questions)	Getting to know the companies, exploring their activities, identifying industry specifics
Reporting practices in previous years (4 questions)	Exploring the extent to which reports comply with domestic non-financial reporting practices, and whether there are any related risks or challenges.
The current relevance of sustainability reporting in the company's operations (4 questions)	Exploring the role sustainability has been given in corporate life and how it is reflected in corporate operations and strategy
Complying with the requirements of the Corporate Sustainability Reporting Directive (4 questions)	The challenges and opportunities companies have found in CSRD and assurance processes.
Future perspectives and improvements (2 questions)	Further plans to integrate sustainability into business activities and advice for companies that are just starting or have not yet prepared their own sustainability reports

Source: Authors, based on interview data

The clear, time-based structure of finalized interview scripts was particularly useful when examining organisational functioning, institutional changes, and adaptation to rules, as it allowed respondents to share their experiences based on their insights (Tureta et al., 2021). This approach enabled a consistent understanding of the evolution over time of organisations' responses to sustainability challenges and opportunities (Adeoye-Olatunde & Olenik, 2021). The iterative nature of qualitative research allowed for the modification of interview questions as preliminary data analysis provided further insight, making it more efficient to elicit the necessary information (DiCicco-Bloom & Crabtree, 2006). Following these principles, this study has gathered comprehensive and rich data that provide a solid basis for understanding the challenges associated with corporate sustainability efforts.

The interview participants (*Appendix I.*) were selected based on a targeted sampling strategy, aiming at individuals in leadership positions or those directly involved in sustainability decision-making processes at the selected public interest banks and corporations. This approach made sure that the people in the sample had the knowledge and experience to give valuable insights into the research and interview questions. It should also be noted that the planned interviews began with the involvement of all relevant Hungarian Public Interest Entities in the scope of CSRD, and the sample was then formed based on their feedback, depending on whether we received positive feedback for

conducting the interviews. The interviews were conducted in the participants' native language, Hungarian, to ensure clear and sophisticated communication (Pratihari & Uzma, 2019).

After data collection, we aimed to transcribe the interviews as completely as possible. The transcripts were reviewed by both authors, and the combined versions were subjected to rigorous qualitative data analysis using NVivo, a software programme specializing in qualitative data management and analysis. *Table 16.* in Appendix I. shows the steps involved in data collection, processing, and analysis. This study employs a thematic coding method, in which the interview transcripts were systematically analysed to find patterns, topics, and concepts that kept coming up in relation to the research questions. The coding process was iterative, allowing for refining and expanding the coding system as new topics were identified in the data. The actual codes were generated from the existing literature and the research question (Loganathan et al., 2022). In addition, reflexivity throughout the research process was applied, critically examining assumptions, biases, and perspectives to minimize the impact on data analysis and interpretation.

IV.4. Results

In the next section, the analysis of results structured into three thematic areas is presented, which in many cases correspond to and supplement the literature review.

IV.4.1 Experiences from prior years

A set of frequently recurring challenges and lessons is presented in *Table 13* as the ‘greatest common denominators’. The purpose of the non-financial reports is to present the company's sustainability achievements, challenges, and changes and to meet the information needs of capital market participants, shareholders, investors, and analysts. Banking and industry interviews have consistently highlighted that aggregating sustainability data has become a complex, multi-level challenge. Entities need to gather data from countries with diverse regulatory environments, while covering an increasingly broad range of topics, including customer ESG profiles and Scope 3 emissions. Group-level compliance requires further coordination with foreign-owned companies, while the scope of supervisory reporting, particularly to the MNB and the EBA, has been constantly expanding. Collecting sustainability data is a significant challenge, particularly when information must be gathered from various parts of the company and external partners,

which necessitates substantial coordination and effective internal communication across different countries. Interviewees emphasized that reliable and consistent data require long-term, coordinated work across multiple departments, with several data collection cycles per year.

In several interviews, company executives emphasized that the strategic importance of sustainability reports should not be underestimated; they have become key documents for credibility, capital market confidence, and regulatory compliance. Large companies publish reports with increasing amounts of data every year and are also investing more energy in internal communication so that employees understand both the workload involved in preparing the reports and their value in terms of reputation. All of this resonated with the idea that, according to company executives, a culture of sustainability can only be built through gradual, consistent mindset changes. Several respondents literally stated that *'the mindset must be shaped continuously, step by step and consistently'* – internal training, thematic campaigns, and external partnerships can therefore become the drivers of change. CIB Bank Nyrt. said that *'Integrating data collection and analysis into the corporate management system is a huge challenge, and this goes hand in hand with continuously developing our employees' knowledge so that they can deal with sustainability issues in a professional way'.* This learning curve is not just about knowledge transfer, but also about transforming the logic of decision-making and risk management.

According to the research subjects, the most critical limiting factor for sustainability transformation is human and financial capacity. Many companies indicated that a lack of expertise and dedicated working hours hinders the development of ESG data collection, especially among smaller actors. Even large Public Interest Entities require several years of resource allocation to build control systems and auditable databases. The time-consuming nature of organisational preparation means that it is advisable to secure extra capacity during the planning phase. Continuous compliance with regulatory requirements is therefore not a one-off exercise, but a long-term, resource-intensive corporate programme. Richter Gedeon Nyrt. concluded that *'Sustainability information is generally collected from a variety of sources, which can make it difficult to harmonize and synthesize the data. Therefore, it is advisable to allocate adequate human resources and systems from the outset'.* Entities without an international parent company have to build everything from the ground up, while working under constant time pressure alongside their core activities.

Some of the interviews highlighted the rapidly changing EU-level rules (CSRD, ESRS, EU Taxonomy, SFDR, CSDDD) and Hungarian ESG laws as a concern. Companies were not only tasked with 'translating' and interpreting legal texts, but also with incorporating more than 1,100 new data reporting indicators under the CSRD and developing a double materiality assessment methodology. As a result, sustainability reporting has become a separate, cross-functional project at many companies.

Experienced preparers also pointed out that excessive data volumes can reduce the comprehensibility of reports. The market and investors prefer well-structured, visually supported content rather than an accumulation of indicators; therefore, companies are increasingly highlighting relevant indicators and presenting them in an easy-to-understand way using infographics. Also, the polarization of commitment level has an impact on data availability and quality, which means companies have experienced varying degrees of engagement to sustainability among corporate leaders and experts, particularly within the supply chain.

Table 13: Summary of prior years' experiences of companies preparing non-financial reports

Developing data collection and integration process	Collecting sustainability data is a significant challenge, especially when information needs to be gathered from different parts of the company and external partners, which requires significant coordination and effective internal communication.
Understanding the importance of reporting	Don't underestimate the value of sustainability reports. They present a significant and often overlooked challenge that is worth bringing to the attention of the colleagues.
Resources and time allocation	Reporting is 'extra work' that needs to be treated as a separate project. It can take up to 1.5-2 years of preparation and can be done more efficiently with serious IT support.
Interpretation of regulations and other requirements	Interpreting and adapting to new regulatory requirements is a time-consuming task for almost all companies during the first reporting period and changing data collection practices requires continuous updating.
Quality over quantity	Rather than focusing on the quantity of sustainability measures, prioritizing quality can yield better results.

Source: Authors, based on interview data

IV.4.2. Impact on corporate decision-making

Integrating sustainability data into corporate governance goes hand in hand with continuous training for employees, so it is essential for companies to put emphasis on both internal and external training. In addition, most interviewees are aware that, as the first to be involved, they play an exemplary role in sustainability reporting. They mentioned that they do workshops and other educational content to help their internal and external stakeholders understand ESG. OTP Bank Nyrt. is one of the pioneers in this area, as they mentioned, *'In addition to complying with legal requirements, OTP Bank produces sustainability materials that are easier to understand and more accessible to stakeholders'.*

Due to the approximately 1,100 indicators in the CSRD, the double materiality analysis, and the rapidly changing set of expectations, dedicated, cross-functional teams are needed instead of a single 'all-purpose' ESG expert. There is often a lack of knowledge on the advisory side, while companies have to deal with complex financial and operational details. Several respondents also emphasized the role of IT and resource development in supporting sustainability goals 'at all levels'. Due to the labour-intensive nature of manual data collection, several companies are already working on developing automated platforms for digital data automation. Magyar Telekom stated that most ESG data comes from outside the ESG team, and coordination success depends on aligning numerous data owners and audit-ready processes within the group, emphasizing the importance of expert roles in data management and reporting governance. MOL Nyrt. also formalise these tasks into a dedicated ESG coordination team that manages the entire reporting process*: 'We have a separate ESG coordination team that manages the entire reporting process and is able to think strategically in collaboration with individual managers'.* Raiffeisen Bank, meanwhile, treats preparation for CSRD as a separate project, carrying it out through cross-functional teams and, where necessary, forwarding it to ESG experts for in-depth review. This points to specialization of roles rather than expecting a single professional to know everything.

In addition, several market participants aim for the EU Taxonomy to serve as a common language, K&H Bank Zrt. referred to as a *'golden standard'* for investors and other stakeholders, reducing the risk of greenwashing through clear definitions. This includes standardizing ESG metrics and ensuring they are closely aligned with financial performance so that reports provide truly comparable, decision-supporting information.

Sustainability reporting extends beyond simple data collection, and it integrates sustainability metrics into strategic planning, risk management, pricing, and overall corporate governance. Companies are increasingly recognizing that the expectations of customers, investors, and financiers often go beyond legal requirements. In banking, ESG scores are integrated into credit assessments, and low scores can ‘induce reputational or credit risk’. In production companies, customer demands in the supply chain often require higher sustainability standards than mandated by law. With CSRD requirements, companies can expect external pressure to intensify, so transparency in sustainability reporting will not only be a compliance requirement but will also become critical to reputation and competitiveness. Several banks confirmed that open data reporting improves reputation and market position. Because these are profit-driven companies and major contributors to the economy, it is essential to contribute to increasing competitiveness or staying competitive. A recurring issue in interviews was that these growing external pressures are driving cultural change within organisations, from a traditional, ‘stability first’ top-down compliance approach focused on risk avoidance to a more participatory, bottom-up culture.

Based on the interviews, sustainability considerations have to be deeply embedded in strategic business decision-making, as these reports are not merely communication products but essential tools for risk management, product development, and governance systems. CIB Bank, for example, reported that following the NFRD and later the CSRD, the ‘sustainability report has become a real strategic tool that is integrated into all areas of the bank's operations’. Similarly, their publication's analysis highlights that the synergistic exploitation of sustainability and social responsibility dimensions will be a prerequisite for competitiveness in the future (CIB Bank Zrt., n.d.). The summarised results can be found in *Table 14.*

Table 14: Summary of impact on corporate decision-making

Employee education	Developing employee expertise is a key element in improving corporate sustainability performance. This affects and requires almost all areas of a company.
Developing specific roles	There is no such thing as a 'one-size-fits-all' expert. It is unrealistic to expect someone to handle operational details while also having a wide range of knowledge: still, the sustainability experts must have a broad range of skills.
Golden standards for transparent communication	The aim is for the EU taxonomy to become a generally understandable and clear gold standard for all stakeholders.
Thinking beyond regulatory compliance	It is not enough for companies to comply with regulatory requirements; they must also consider the growing sustainability demands of their customer base.
Enhanced strategic integration	Corporate sustainability practices should not only be an integral part of strategy but also strengthen market competitiveness.

Source: Authors, based on interview data

IV.4.3. Tips, best practices, and business opportunities

Five areas were identified for future development, as well as best practices for companies that are not yet preparing sustainability reports, and the summarised results can be found in *Table 15*. The logic is as follows: 'leadership – communication – culture – process – technology'. Based on the interviews, sustainability reports can turn into a real competitive advantage if they are backed by years of persistent commitment from management. Waberer's, for example, highlights nearly a decade of gradual development, in which reporting has become *'an integral part of everyday operations'* and the auditor is involved from the very beginning of the process. Some banks similarly emphasize that management is creating a culture '*step by step and consistently'*, because without a long-term vision, regulatory compliance alone does not create reputation or market advantages.

A common goal for the future is that sustainability reports should honestly present the results achieved and areas for improvement. Waberer's specifically mentions the confidence-building effect of 'transparent communication', while Richter considers it a strategic priority that all employees understand and spread the company's ESG messages. According to the banks, credible, well-structured external communication also improves access to funding and investor acceptance.

Several interviews revealed that a breakthrough in sustainability can be achieved not only through top-down management, but also by involving committed employees. Some companies' long-term plans include 'empowering enthusiastic colleagues to take the lead' because this enables rapid adaptation and innovation. Respondents identified internal awareness, achieved through training, company-wide environmental or social campaigns, and podcasts, as a potential competitive advantage. Companies preparing their first CSRD report should involve key areas and external partners as early as possible. Waberer's and K&H also emphasize early consultation with auditors to develop evidence and documentation systems together. MBH Bank and Magyar Telekom, on the other hand, warn that coordinating diverse internal data sources, standardizing definitions, and timing will be particularly resource-intensive in the first round.

Interviewees also suggest that companies start sustainability reporting gradually, developing their approach step by step while keeping their practices and sustainability goals aligned. This allows for continuous improvement without overburdening resources at the start. It is essential to balance sustainability initiatives with core business activities, as overly ambitious goals can give the impression that core business activities are secondary. Raiffeisen Bank Zrt. thinks that '*The key to success lies in adaptation and commitment to meeting CSRD guidelines and sustainability goals'.*

The key to the future is an automated, auditable data platform: K&H is already working on digitizing data to reduce the number of manual errors. CIB Bank has long-term plans to integrate the IT support needed for ESEF tagging and double materiality reporting, while OTP's in-house platform simplifies group-level data collection. As we can see, the interviews highlight that IT developments are essential for future quality and business expansion. They summarised their progress in sustainability reporting with *'However, this process is only the tip of the iceberg, as the real challenge lies in how to benchmark the data and integrate it into business operations to create real value for the bank'. – K&H Bank Zrt*.

Table 15: Summary of future targets and best practices for other companies

Step-by-step long-term management commitment	The benefit of the sustainability report lies not in the report itself, but in the years of dedicated work that have gone into it, which translates into market strength.
Clear corporate communication	Sustainability performance must be presented and areas for improvement acknowledged through honest and transparent communication.
Bottom-up initiatives for a sustainable corporate culture	Success can also come through bottom-up initiatives and motivation, enabling quick adaptation to economic changes and creating a real competitive advantage from sustainability reporting.
Internal coordination processes	Starting the reporting process early and coordinating work with other departments leads to better results.
Technology – IT support establishment	Integrating long-term IT support to improve the quality and scope of sustainability reports, in line with processes and regulatory requirements.

Source: Authors, based on interview data

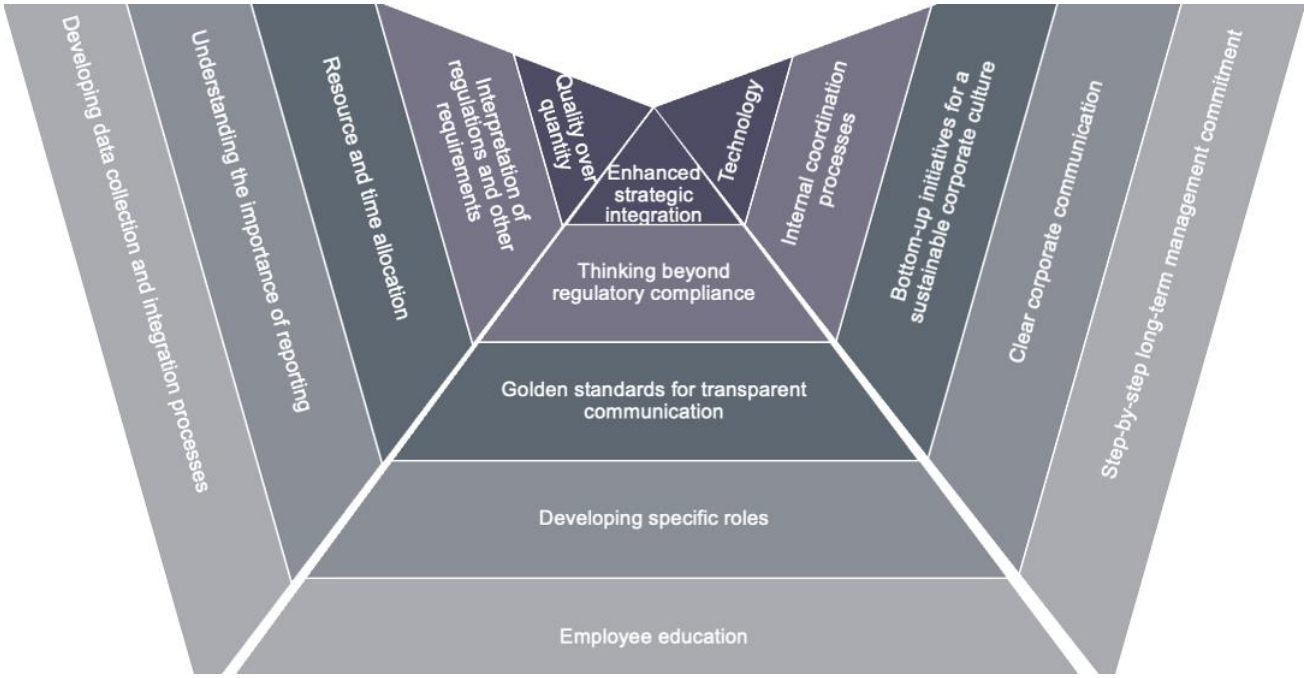
IV.5. Discussion

Based on interviews with eleven large Hungarian Public Interest Entities participating in the research, the most important experiences and challenges related to the introduction of CSRD can be clearly outlined. Focusing on PIEs is necessary because, compared to other companies, PIEs are subject to higher expectations and more rigorous legal obligations in terms of corporate transparency. In addition, these companies are the first to be involved in sustainability reporting and will remain so in the coming period. Examining PIEs' responses to CSRD provides early indicators of systemic challenges and practical solutions that may be relevant for other types of organisations as reporting obligations expand. Furthermore, the complexity and diversity of the challenges faced by PIEs makes the models developed for PIEs highly informative for both regulators and other firms seeking to navigate an evolving sustainability landscape.

Figure 12 presents the hierarchical clustering of the main thematic areas identified during the analysis of Hungarian PIEs for CSRD compliance. The left-hand side of the figure illustrates the challenges arising from past reporting practices, the centre of the figure shows the current challenges and reporting difficulties faced by companies, while on the right-hand side, future-oriented issues are highlighted. This structure visually summarises the CSRD transition, as Hungarian PIEs not only have to overcome long-standing structural

barriers but also adapt to the unique new requirements of the directive. This evolution reflects the argument of Katterbauer et al. (2022) that regulatory changes in transition economies bring existing operational constraints to the front. This complements the findings of Hegedűs et al. (2023), who argue that while inconsistent compliance is widespread in Hungary, the CSRD accelerates and enhances both previous and newly emerging challenges. Companies that had already prepared reports, whether with GRI standards or other frameworks, had a significant advantage. This is consistent with the Western European findings of Baumgartner and Ebner-Karestinos (2010). However, it differs from the literature that considers regulation to be a linear driver of change; therefore, a comprehensive and long-term strategic approach is still lacking in many cases.

Figure 12: Thematic clusters of Hungarian PIEs' CSRD compliance challenges in the past, present, and future



Source: Authors, based on interview data

In line with our findings, PIEs are moving away from a 'stability first' compliance model towards a stakeholder-driven, bottom-up adaptation model. Compliance with EU and international regulations is a foundational step, but interviewees strongly recommended that companies should not wait until requirements become mandatory for them; if they can, they should start voluntary, proactive compliance processes to better manage the complexity of the transition and strategies. These qualitative data support the idea put forward by Lee et al. (2022) that leadership and culture are key factors in ESG maturity.

Amran & Ooi (2014) also stated that stakeholder expectations often push companies much further than legal requirements would do, demanding deeper integration and innovative approaches to sustainability.

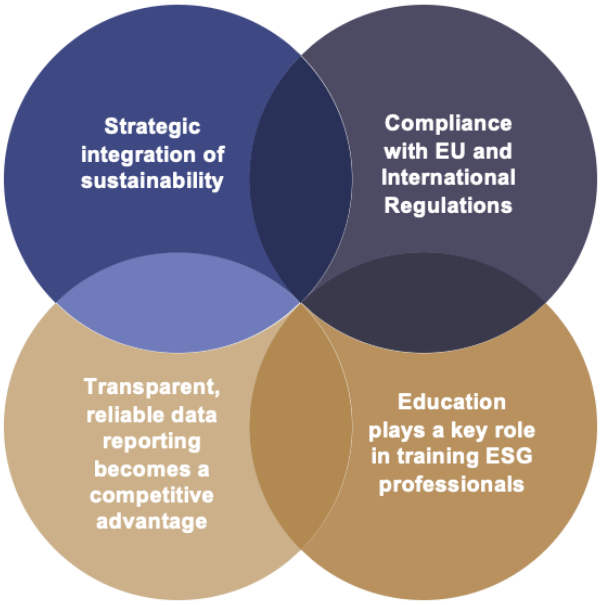
The CSRD outlines new reporting requirements, accompanied by strict and tight deadlines for disclosure, which will be validated by an independent auditor. Companies recognized that independent assurance of sustainability reports is becoming a mandatory regulatory requirement under the CSRD, rather than an optional practice, which significantly increases the complexity of reporting processes. This aligns with OTP's approach: *'In our reporting processes, we place great emphasis on the role of independent external assurance, which adds further trust and credibility to our published reports'.*

The development of transparent and standardized data reporting is also of paramount importance. Data collection, particularly for Scope 3 emissions and supply chain data, presents a significant organisational and technological challenge. According to companies, IT system development and early coordination are needed to address these challenges. Based on the interviews, it also became clear that the success of preparations for CSRD depends largely on honest, quality-focused communication. Instead of distorting data or greenwashing, transparency and openly presenting areas for improvement can build trust in the long term and provide a competitive advantage.

Figure 13 summarises the most important findings from the interviews for developing corporate sustainability. The increased demand for continuous education of ESG professionals and closer cooperation between universities and companies will be essential to maintaining high professional standards in sustainability. The crucial role of continuous professional training, improving internal knowledge sharing, and transparent communication is closely aligned with the points highlighted by Niu et al. (2022) and Kim & Li (2021), who emphasize capacity building and organisational learning as critical factors for ESG development. It is worth noting that the figure treats strategic data integration, transparent and reliable data systems, and regulatory compliance as equal to cultural and educational priorities – a subtle point that has rarely been highlighted in previous Western European or global studies, but which the respondents placed great emphasis on due to Hungary's recent rapid regulatory changes. This visualization, therefore, not only shows the interconnection of human and technical factors but also the

explicitly holistic approach that is necessary for the successful implementation of CSRD after the transition period.

Figure 13: Key findings from Hungarian PIEs on corporate sustainability development



Source: Authors, based on interview data

The relief of immediate reporting obligations through the 'Stop the clock' proposal may inadvertently signal a weaker commitment to corporate sustainability in the EU, which could lead to scepticism among stakeholders about the ambition and credibility of the EU's sustainability programme (European Council, 2025). This supposed uncertainty may undermine the effectiveness of sustainability reports as a mechanism for promoting changes in corporate behaviour and strengthening environmental responsibility. The Directive's impact extends far beyond mere compliance requirements, shaping companies' overall approach to sustainability (Torre et al., 2018). The question of whether the 'Stop the clock' directive weakens previous EU regulatory objectives requires further detailed analysis.

Reporting challenges are not stand-alone findings but are widely confirmed by the research of Bednárová et al. (2019) and Oprean-Stan et al. (2020), who also document the complexity of ESG data integration in Central and Eastern European countries. According to interviewed companies, the real benefit of sustainability reporting lies not in the document itself, but in the years of internal work, structured process organisation, and

education that underpin it. This research provides a significant empirical insight by being the first known study to systematically explore the challenges Hungarian Public Interest Entities face in implementing the CSRD through qualitative interviews. By gathering in-depth, firsthand perspectives from ESG professionals and corporate leaders, the study captures subtle barriers that are often absent from formal documentation or public reporting. The study also holds strong practical relevance by supporting corporate ESG professionals and auditors in identifying internal challenges to high-quality reporting. These results can help companies improve their reporting practices and prepare more effectively for regulatory monitoring, ultimately enhancing transparency and accountability.

The limitations of the research primarily concern the relatively small sample size, although it was carefully selected in terms of depth and quality, as well as the context-dependent nature of the findings. Future research could be extended to comparative studies in other EU Member States or specific industry analyses, longitudinal studies to monitor ongoing adjustments and adaptations, and quantitative analyses to validate the qualitative findings presented. Overall, although regulation suspension temporarily eases the immediate reporting pressure, companies should not let up on their sustainability efforts. As MOL Nyrt. concisely stated: *'Being sustainable is now a moral responsibility'.* Companies must therefore stay focused on promoting sustainable strategies and transparent reporting, ensuring that short-term regulatory adjustments don't hinder long-term sustainable development and the integration of environmental and social considerations into their core business.

IV.6. Conclusion

This study is one of the first to present a qualitative, interview-based insight into the specific challenges and responses of Hungarian organisations during the initial implementation of the CSRD. This systematic study of Hungarian Public Interest Entities' CSRD preparation offers insights distinct from SMEs or Western EU cases but contains knowledge that can be applied generally. Drawing from the insights shared by the interviewed companies, it is evident that sustainability reporting has evolved significantly, driven particularly by regulatory pressures. By capturing the experiences of practitioners in a post-transition EU economy, this research fills a critical gap in the European sustainability reporting literature. Even though the companies highlighted that the

sustainability report reflects long-term commitment, the value of the sustainability report lies not in the report itself, but in the years of dedicated work that went into it, making it a source of market strength and a model of best practice. One of the main influencing factors is corporate structure, which is given for companies, since a company with a foreign parent company faces different problems than one that wants to build its own sustainability reporting system independently at the domestic level.

In contrast to previous studies focusing on technical compliance, our results reveal the hidden complexity, organisational learning processes, and the importance of certainty in CSRD compliance. The value of this study lies in the practical guidance it provides, supporting both policymakers and business practitioners with evidence-based recommendations drawn from real-world business experience. The most important point that emerged from the interviews is that, although many organisations have made significant progress in their sustainability strategies and data reporting processes, auditing sustainability data is the next major milestone for them – and perhaps the most challenging element – in terms of compliance. However, the path to reliable assurance presents several challenges. These include ensuring accurate, complete, and consistent data collection, maintaining reliable methodologies, and establishing transparent processes that meet strict auditing standards. The interviewees noted that assured ESG data enables higher accountability and transparency, as it necessitates deeper internal coordination, thorough documentation, and increased cooperation among various parts of the organisation. It can also be argued that integrating sustainability considerations into business and strategic activities has been directly or indirectly influenced by the NFRD and other domestic requirements. With the introduction of the CSRD, this trend is further strengthening among companies.

Consistent handling and interpretation of definitions is a common problem among companies, which is a particularly complex task. In addition, tracking changes in data from year to year and developing a data collection structure can also be challenging, especially for larger companies and corporate groups that often engage in diverse activities. Data collection is further complicated by the dual logic of banks, which means that they not only have to produce their own sustainability data but also consider the sustainability data of their customers in order to optimize their internal operating processes. Therefore, it is vital that companies develop transparent and consistent reporting systems that allow them to

operate more effectively and accountably. However, the reliability and usefulness of these reports are currently limited, despite companies' commitment to providing accurate information.

Reporting and assurance require patience, time, and the involvement of experts from various fields, as well as the support of accounting colleagues. Most interviewed banks and companies have placed great emphasis on the timely preparation of the necessary reporting processes and data collection tasks, as well as on the double materiality assessment introduced as part of the new directive, which changes reporting practices. Although it is essential for all companies to strengthen their credibility in the external assurance process, they are aware that this requires a significant investment of resources on their part, as they have to deal with large amounts of new data and assurance under new systems, and even with completely new methods. Companies consider the first few years as a learning process, as the new regulations also pose challenges for auditors and require preparation.

It is good advice for companies to start preparing for CSRD early and educate their employees – even on a voluntary basis – so that they can set up their data collection systems in a thoughtful manner and have enough time to collect data and select the right people to carry out the relevant tasks. The current regulatory changes also allow time and space for this, with the ‘Stop the clock’ mechanism. The extensive experience and best practices presented by the featured Hungarian companies can support other domestic organisations as they navigate this transition, fulfilling one of the central aims of this publication.

Beyond these practical implications, this research enhances theoretical understanding of how institutions in emerging EU member states may respond to the complexity of regulatory requirements. By highlighting the importance of organisational culture, institutional maturity, and policy framing, this study also offers valuable insights for policymakers at both the European and national levels. These findings provide constructive feedback to refine sustainability reporting frameworks further, ensuring that future regulations balance ambition with practical feasibility in various economic contexts.

Ongoing regulatory changes – particularly those introduced by the Omnibus proposal – underscore the continued relevance of these empirical results, and their usefulness in helping business leaders and policymakers prepare for a dynamic regulatory environment. Future research can be built upon these findings through longitudinal studies that track the

development of compliance and assurance practices over time. Comparative research with other Central and Eastern European countries can deepen the understanding of region-specific challenges. Additionally, investigating the long-term effects of regulatory adjustments, such as the 'Stop the Clock' initiative, on organisational commitment to sustainability will provide further practical and theoretical insights. Finally, broader quantitative studies may also be needed to validate the patterns observed and to assess the effectiveness of emerging best practices within sustainability leadership.

Appendix I.

Table 16: The process of data analysis

Data collection	
Preparation	Understanding the sustainability regulatory environment. Identify a research gap on the need for in-depth insights into the development of sustainability reporting systems in companies. Definition of the research objective and methodology.
Conducting interviews	Mapping the scope of companies potentially involved in sustainability reporting. Contacting companies directly and indirectly to conduct interviews. Schedule online/offline appointments, with interview questions sent in advance. Conducting semi-structured in-depth interviews in about one hour Preparing and summarising transcripts. Sending transcripts back to the company for validation, making any necessary additions.
Data processing	
Before interviews	Literature review, preparation of preliminary notes. Explore corporate sustainability reporting practices using corporate websites and publications.
During interviews	Manual note taking (in a Word document) by the two interviewers.
After interviews	Clarification and collation of the manual notes and summary in a single document.
Data analysis	
Exploring results from interview data	Analysis of aggregated interviews based on merged and reviewed Word documents, with content analysis using NVivo software. Finding similarities and differences according to a preliminary structure of past experiences, present challenges, future plans, and good practices. Following the qualitative analysis, the results were corroborated with external sources, and the inconsistencies found in the analysis were identified and evaluated.

Source: Authors, based on interview data

Table 17: Sample characteristics

Eleven large Public Interest Entities in Hungary, of which	
Bank	7
Production/service company	4
Form of operation	
Zrt.	5
Nyrt.	6
Positions of interviewees	
ESG/Sustainability Expert	at 7 companies
ESG/Sustainability Director	at 2 companies
Capital Market Relations HUB Lead	at 1 company
Head of Strategy and Corporate Governance	at 1 company

Source: Authors, based on interview data

Table 17 summarises the information related to the interview subjects, which clearly shows that in nine of the eleven companies, separate managers and departments were established to handle sustainability issues for strategic reasons. In two cases, companies have integrated sustainability into their existing corporate structure.

Table 18: Summary of the experiences of the companies interviewed regarding sustainability reporting

Interview participants	**Entities' experience in sustainability reporting**
CIB Bank Zrt.	CIB Bank has been regularly preparing sustainability reports based on international standards in Hungary for more than 20 years and was one of the first banks to publish its sustainability information. Initially, they reported on their sustainability activities in the form of CSR reports, then in the NFRD, and from this year onwards, they plan to publish their reports in the framework of the CSRD. The preparation of sustainability reports is closely aligned with the Bank's business strategy, in particular the measurement and monitoring of the achievement of ESG objectives.
ERSTE Bank Hungary Zrt.	ERSTE Bank Hungary, one of the main operators in the Hungarian banking sector, has been preparing sustainability reports at group-level since 2013. As a member of the ERSTE Group, the Austrian-based company is one of the largest banking groups in Central and Eastern Europe to produce its annual non-financial reports. The domestic bank published its sustainability report in 2021, which did not yet mirror the structure of the parent company report but was a good experience for

Interview participants	Entities' experience in sustainability reporting
	the company. The bank's disclosure and reporting practices not only comply with local laws and regulations but are also closely aligned with Erste Group's international reporting processes.
K&H Bank Zrt.	K&H Bank has been committed to sustainability reporting since 2006 and has continuously expanded its efforts in this regard over the years. As a member of the KBC Group, it is indirectly considered a listed company through the Belgian Universal Bank. This ultimate parent company is included in the Non-Financial Reporting under the NFRD. In addition, K&H Bank prepares a domestic GRI Sustainability Report covering a wide range of topics in an understandable way. Even though there is currently no external assurance of the domestic report, through KBC, they have already encountered the tasks and challenges related to the assurance of sustainability performance.
Magyar Telekom Nyrt.	Magyar Telekom Nyrt., Hungary's leading telecommunications provider, pays special attention to sustainability, regularly reporting on this since 2002 with Group-wide reports. The sustainability performance report is prepared in accordance with strict international standards to ensure comparability and analysability. In order to ensure credibility and transparency, Magyar Telekom has its report assured annually by an independent external auditor, which also contributes to strengthening the transparency of the company.
MBH Bank Nyrt.	Magyar Bankholding Zrt. (MBH) was established in 2020 through the merger of 3 banking groups (MKB Bank, Budapest Bank, Takarékbank). MKB Bank and Budapest Bank prepared their first sustainability report in 2022, and from 2024, they are preparing a single sustainability report based on GRI standards. Being 100% Hungarian-owned banks, they have no foreign parent company, and their sustainability reports have not been externally assured by an independent third party yet.
MOL Nyrt.	Since 2008, the MOL Group has published an annual integrated report that includes both financial and non-financial performance, which since 2016 has been subject to independent third-party assurance to ensure reliability and credibility. The report also covers MOL's domestic and foreign interests and subsidiaries, refining

Interview participants	Entities' experience in sustainability reporting
	and petrochemical activities, logistics and R&D, as well as retail, consumer services and waste management.
OTP Bank Nyrt.	OTP Bank Nyrt. has been involved in social and corporate responsibility reporting since 2006 and has been at the forefront of sustainability reporting in the financial sector since 2015, with a strong commitment to ESG practices. These annual publications - produced as an integrated report since 2022 - will enable shareholders and other stakeholders to better understand and gain insight into the bank's performance and operational strategy. By continuously improving and integrating all aspects of its sustainability operations, OTP Bank aims to set an example in the industry, providing a sustainable future for stakeholders and the business.
Raiffeisen Bank Zrt.	Raiffeisen Bank has not yet prepared a separate domestic sustainability report in Hungary but has contributed data on its sustainability and ESG activities to the group-wide report of its parent company, Raiffeisen Bank International (RBI), which has been prepared every year since 2010 by RBI. Both RBI and Raiffeisen Bank Zrt. disclose their reports for the first time in the first quarter of 2024, according to the CSRD guidelines, which brings a significant change in the field of sustainability reporting. In Hungary, the sustainability reporting practices in the banking sector are not yet uniform, which will become more transparent and accountable to users, including rating agencies and investors, with the introduction of the CSRD Directive.
Richter Gedeon Nyrt.	Richter Gedeon Plc. ss one of Hungary's leading pharmaceutical companies. The company attaches great importance to sustainability and social responsibility, which is also inherent in the company's core business. The company has published sustainability reports since 2008, providing a comprehensive picture of the environmental, social, and corporate governance performance of Richter and its subsidiaries.
UniCredit Bank Zrt.	UniCredit's first sustainability report was published in 2003, and the Group has been producing integrated reports since 2014. It is important to note that the Hungarian subsidiary does not produce its own sustainability report but reports on its sustainability activities as part of the group-wide integrated report.

Interview participants	Entities' experience in sustainability reporting
	UniCredit Bank Hungary Zrt. has been reporting on its domestic sustainability performance in its own publication since 2021.
WABERER'S INTERNATIONAL Nyrt.	In recent years, Waberer's has made significant progress in sustainability practices and reporting, committing to environmentally responsible operations and continuously expanding its green services to meet customer needs. Initially starting with a Green Division, they have strengthened their commitment to the environment by establishing an ESG Directorate. The company is now pursuing an integrated sustainability strategy and, since 2021, has published its sustainability goals, which include environmental, social, and governance (ESG) aspects, in line with tightening regulatory requirements and market expectations.

Source: Authors, based on interview data

V. Non-financial reporting and assurance trends in selected Central European countries

Chapter V extends the Hungarian qualitative evidence into a regional quantitative context. While the third published article in Chapter IV identifies organisational challenges experienced by Hungarian public-interest entities, this study investigates observable patterns in reporting maturity and external assurance among companies in selected Central European countries. It therefore examines whether the transition from sustainability reporting to external assurance follows a measurable maturity path and whether this process differs across national settings.

Two clarifications should be made regarding the published analysis. First, the survival-analysis sample comprises the 67 companies that had published at least one non-financial report. The event is the publication of the first externally assured non-financial report, while companies for which no such event was observed by the end of the observation period are treated as right-censored at their last observed reporting year. Second, the regulatory comparison reflects the position as of January 2025 (see Section I.1). By the reference date, Poland had completed its transposition, and Hungary is accordingly best described as among the earliest, rather than the only, jurisdiction in the sample to have done so.

Abstract: This study examines how sustainability reporting and assurance enhance a company's environmental, social, and governance (ESG) impact. The Non-Financial Reporting Directive (NFRD) improved transparency in non-financial reporting, requiring companies to disclose policies, risks, and outcomes related to ESG issues. However, the Corporate Sustainability Reporting Directive (CSRD) expands on these requirements and enforces third-party assurance, reinforcing the European Sustainability Reporting Standards (ESRS). This shift forces companies in the scope of CSRD to enhance transparency, credibility, and accuracy, prompting the development of innovative assurance methods by auditors. My empirical research focuses on Central and Eastern Europe with comparator cases from Germany and Luxembourg, analysing twenty years of practice using LSEG/Refinitiv ESG data and Kaplan-Meier survival analysis. Research questions were posed about time-to-adoption and differences between external assurance providers. The research highlights Hungary as an early adopter of CSRD, which is trying to promote corporate compliance, while Austria is lagging behind. The analysis of audit

trends shows that Big4 firms have dominated auditing in recent years, with limited industry-specific deviations, while the role of sustainability expert assurance has tended to decline. Kaplan-Meier's survival analysis of assurance maturity shows that large firms typically introduce external assurance after about three years of reporting, and high-impact sectors adopt assurance earlier. The study highlights practical implications for companies preparing first-time ESRS reports with mandatory assurance and discusses limitations related to sample composition and regional scope.

Keywords: sustainability, assurance, transparency

V.1. Introduction

Financial reporting is a fundamental aspect of corporate transparency and accountability, and the role of audits in ensuring the reliability and accuracy of the reporting cannot be overstated (O'Dwyer & Owen, 2005; Boiral et al., 2019). Previously, accounting systems – both nationally and internationally – provided only limited information on companies' emerging environmental performance, facing challenges in measurement and standardization. Over the last two decades, there has been a growing need to communicate environmental, social, and governance (ESG) factors to external stakeholders. Therefore, consistent and conscious non-financial reporting should be developed (Gipper et al., 2025).

Auditing plays a vital role in the financial reporting process, as it provides an independent assessment of the accuracy and reliability of an organisation's financial statements. Accountants and auditors have historically claimed that their expertise enables them to objectively mediate uncertainty and construct accurate and fair accounts of corporate affairs, thereby allowing stakeholders to manage risks more effectively. Nonetheless, the importance of audit quality in maintaining the integrity of financial reporting cannot be overstated. High-quality audits can help to detect and prevent fraud, ensure compliance with relevant laws and regulations, and provide valuable insights into an organisation's financial health and performance (Sikka, 2009).

As the business landscape continues to evolve, the need for sustainability reporting and assurance has become increasingly pressing, particularly considering the upcoming Corporate Sustainability Reporting Directive 2022/2464/EU (hereinafter referred to as CSRD) requirements. There have been several regulatory changes in terms of the development of the non-financial reporting system. As a result, from the 2017 financial year onwards, Non-Financial Reporting Directive 2014/95/EU (hereinafter referred to as NFRD) required large public-interest companies to publish non-financial reports to create and promote responsible and long-term sustainable economic activity. The legislation sought to make companies more transparent, identify sustainability risks in their operations, and increase investor and consumer trust in companies.

NFRD is the outcome of claims made by stakeholders, even though they were not actively involved in its preparation (Biondi et al., 2020). Regarding trust, Directive 2014/95/EU has several implications, as the disclosure of environmental, social, and government issues can

direct the legitimization process of a firm from the perspective of its stakeholders. Enhancing this mindset, the CSRD was introduced in April 2021 to amend the NFRD to expand and incorporate audited reporting for all companies within its scope. Organisations disclosing non-financial information (NFI) can show performance to stakeholders, who can evaluate their non-financial disclosures compared to those found in other businesses.

Regulators are crucial in preventing misleading ESG information and holding companies accountable for their operations (de Freitas Netto et al., 2020). The CSRD aims to address issues like selective disclosure – such as 'cherry-picking' and 'greenwashing' – by making the European Sustainability Reporting Standards (hereinafter referred to as ESRS) compulsory and requiring third-party assurance for reports. Published on December 16, 2022, and entering into force on January 5, 2023, the CSRD expands the scope of organisations required to report, beginning in 2024, and seeks to align non-financial reporting with the rigor of financial reporting. One of its key objectives is to advance the EU's climate neutrality goals by 2050 (European Commission, 2023b). The European Financial Reporting Advisory Group (hereinafter referred to as EFRAG) is developing the ESRS, which the European Commission officially adopted on July 31, 2023 (European Commission, 2023a). From the first year of adoption, firms will need to adapt their operations to meet enhanced reporting requirements, including more thorough data collection. By raising the non-financial reporting standard to match financial reporting, the CSRD aims to address criticisms of current practices and mitigate greenwashing through mandatory third-party assurance. Combining these new regulatory requirements with quantitative survival analysis provides a practical framework and a 'call to action' for companies of all sizes preparing to meet these obligations.

This research aims to offer a comprehensive understanding of non-financial reporting practices and assurance services in Central and Eastern Europe prior to the first mandatory CSRD reporting period. It examines the decision-making processes behind the assurance of non-financial reports, drawing upon existing literature, regulatory developments, and quantitative analysis. Specifically, survival analysis is used to study patterns in the uptake of external assurance providers among the region's largest firms. By exploring the evolving landscape of sustainability reporting in Central Europe – considering historical precedents and the emerging CSRD obligations – this study demonstrates how accounting and non-financial reporting practices shape organisations' accountability for their environmental,

social, and governance impacts. It highlights the essential role of independent third-party assurance in verifying non-financial information and how credible, externally validated disclosure can enhance stakeholder trust and maintain more meaningful engagement with sustainability goals.

Building on prior work on sustainability reporting and assurance under the NFRD/CSRD context, this exploratory study addresses three questions:

- **Research question 1**. When do large firms begin obtaining external assurance of their sustainability reports? Was there a typical time-to-adoption?
- **Research question 2.** Does the time-to-adoption differ across industries and country groups?
- **Research question 3**. How has the assurance provider mix evolved over time?

Research questions 1 and 2 were addressed using Kaplan-Meier survival analysis (event: first assured report) with log-rank comparisons across sectors and country groups, and 3rd research question through descriptive trend analysis of assurer types.

The paper is organised as follows: it begins with an introduction that outlines the motivation and research questions. This is followed by a literature review and theoretical background, an overview of the regulatory context (NFRD/CSRD/ESRS), and a description of the data sample. The methodology employed includes Kaplan-Meier survival analysis and statistical comparisons. Next, the results are presented, addressing the research questions regarding time-to-assurance, industry and country differences, and the mix of assurers. The paper concludes with a discussion of the findings, implications, limitations, suggestions for future research, and a concluding summary.

V.2. Literature review

The demand for non-financial reporting on the current and long-term impacts of an entity's sustainable operations has been driven by the interest of sustainable, responsible investors, business partners, and consumers who wish to incorporate this information into their decision-making (Osemeke et al., 2016). The main goal of non-financial information disclosure is to encourage transparency and accountability for an entity’s stakeholders. Such disclosures usually take the form of non-financial reports, sustainability reports, ESG reports, or integrated reports (Global Reporting Initiative, 2013).

Meeting stakeholders' growing information demands, particularly since the introduction of ESG indicators in the early 2000s, has prompted corporate reporting to evolve into a more comprehensive representation of social, environmental, and governance data. In this context, companies need to integrate reporting mechanisms into their internal processes to collect and verify relevant sustainability metrics, thereby publishing increasingly advanced and high-quality information (Utz, 2019). Research shows that environmental, social, and governance considerations have become crucial for the largest business organisations. ESG scores, ratings, and audited non-financial reports offer valuable insights into firms' sustainability practices (Schiemann *&* Tietmeyer, 2022). Additionally, regulations have begun to encourage forward-looking disclosures, enabling firms to highlight future challenges and long-term strategies alongside standard retrospective accounting reports (Lippai-Makra et al., 2022).

Starting in 2017, the NFRD mandated that large Public Interest Entities in the European Union provide non-financial information annually, effectively ending the previous practice of purely voluntary disclosure. However, significant variations in the structure, format, and content of these reports emerged across Europe, raising concerns about the reliability and comparability of the published data (Bose 2020). Additionally, the rate of sustainability reporting began to rise during the NFRD period, particularly in Eastern Europe, where a 9% increase was observed compared to 2017; meanwhile, Western Europe experienced a slight decline (KPMG, 2022). Yet, these shifts did not significantly enhance overall reporting standards within the EU, as instances of 'greenwashing' and selective disclosure continued. In response, stakeholders and regulators started to advocate for more independent third-party assurance to boost credibility, thereby intensifying the conversation around formalized assurance services and standardized practices.

Some companies began auditing their sustainability information to improve disclosure credibility and voluntarily enhance confidence in non-financial data (Farooq *&* De Villiers, 2020). The International Auditing and Assurance Standards Board (IAASB) defines assurance engagements as:

> *"Engagement(s) in which a practitioner aims to obtain sufficient appropriate evidence in order to express a conclusion designed to enhance the degree of confidence of the intended users other than the responsible party about the subject matter information"* (IAASB, 2013, p.7)

Non-financial reporting holds the responsibility of providing high-quality information that fosters public trust. In certain sectors, companies can effectively manage their reputations and promote responsible practices by publishing transparent non-financial reports (Sethi et al., 2016). In accordance with legitimacy theory (Rahman-Alsayegh 2021), organisations often produce higher-quality reports to legitimize and justify their operations. While these reports generally present a wide range of sustainability data, any doubts about their accuracy can undermine public confidence, thus devaluing one of the company's most vital public communication channels (Sethi et al., 2016).

As the number of non-financial reports increases, so do the instances of greenwashing, making external assurance increasingly vital for stakeholders. Sustainability assurance serves as a method through which organisations can demonstrate their ethical commitment and the credibility of their disclosures, advancing sustainability and aligning with the concept of legitimacy in accounting and reporting. Indeed, a greater application of legitimacy theory in accounting research – especially concerning sustainability assurance – can assist ESG-oriented organisations in enhancing the clarity and reliability of their reported information (Utz, 2019). The core argument in this article is that sustainability assurance is a crucial indicator of legitimacy for a socially responsible company.

Greenwashing is defined as making misleading or unsubstantiated disclosures about the environmental, social, and government benefits of a product, service, or company's whole practice, which undermines the credibility of sustainability disclosures (O'Dwyer & Owen, 2005). The literature shows that greenwashing can emerge when companies selectively present positive information and omit detrimental data, thereby distorting stakeholders' perceptions (de Freitas Netto et al., 2020). Despite the increasing number of non-financial reports – particularly in the context of the NFRD – greenwashing remains a persistent concern, prompting calls for more rigorous verification and third-party assurance to strengthen transparency and accountability.

V.2.1. Non-financial reporting and assurance issues in the light of CSRD

Growing stakeholder awareness has underscored the importance of transparent and credible sustainability reporting. A cornerstone of the CSRD is the requirement to use the European Sustainability Reporting Standards. This standardized framework aims to mitigate cherry-picking and inadequate disclosures by obligating companies to report

comprehensively on environmental, social, and governance issues. The ESRS emphasizes a dual materiality perspective, requiring companies to disclose both how sustainability factors on their operations as well as the impact of their activities on society and the environment (EFRAG, 2023). The directive also introduces a phased expansion of coverage: starting from 2024, the CSRD implementation will gradually encompass a broader set of companies, including large entities, listed small and medium-sized enterprises, and even non-EU organisations with substantial business in the EU.

Following the first year of adoption, firms must develop strategies to ensure compliance with the new requirements, which aspire to elevate non-financial reporting to the same level of completeness and rigor typically seen in financial reporting. In doing so, the CSRD aims to address numerous criticisms of the preceding framework, including the need for greater comparability and reliability of sustainability metrics. The directive further mandates external assurance of sustainability information, beginning with limited assurance and eventually shifting toward reasonable assurance over time (European Commission, 2023b; Deloitte, 2024).

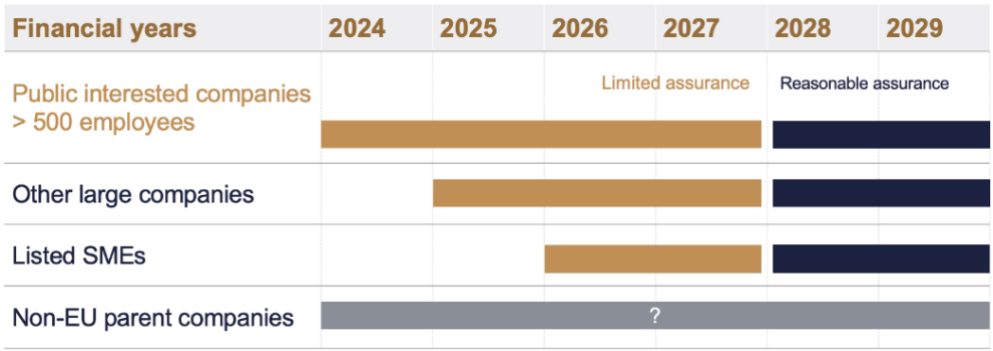
Limited assurance provides a lower level of assurance, typically expressed in a negative form ("nothing has come to our attention..."), with procedures that emphasize inquiries and analytical reviews and are less extensive than for reasonable assurance. Reasonable assurance provides a higher – though not absolute – level of assurance and is expressed in a positive opinion, requiring broader evidence gathering, expanded testing of data, processes, and controls. These distinctions are consistent with international assurance standards (IAASB, 2023).

According to a 2022 survey by KPMG, approximately 10,000 companies with compulsory reporting will increase to 50,000 by 2028. (KPMG, 2022). This will be the result of starting from 2025, all large companies (the exact details mentioned above), from 2026 listed small and medium-sized entities, small and non-complex credit institutions with captive insurance entities, and according to the plans lastly, the non-EU companies with substantial operations in the EU must prepare and disclose non-financial reports (PwC, 2023).

Under the CSRD, all disclosed sustainability data will require assurance from a statutory auditor or another qualified provider. Implementation phases begin with limited assurance during an entity's initial reporting year, as illustrated in *Figure 14*. All implementation

phases of the CSRD involve limited assurance, hence requiring entities falling within its scope to be granted limited assurance during their initial year of reporting. The practicability of shifting from limited to reasonable assurance for auditors and firms will be evaluated by the European Council. It will implement assurance requirements for (1) limited assurance by October 1, 2026, and (2) reasonable assurance by October 1, 2028, following this evaluation. The assurance provider will deliver an assurance report with an opinion regarding whether the company has effectively communicated its sustainability information in line with the requirements (Deloitte, 2024).

Figure 14: The CSRD's planned timing for non-financial reporting assurance for the period 2024-2029



Source: Own composition based on PwC, 2023

V.2.2. Non-financial reporting assurance experiences

As previously explained, non-financial reporting has evolved, and the assurance practices for non-financial disclosures have also changed. However, this development has been slower and more fragmented than financial audit processes (Jámbor & Zanócz, 2023). In contrast to the well-established standards for financial audits, sustainability assurance varies widely in depth and in different approaches. Organisations may opt for either limited or reasonable assurance engagements, with limited assurance generally involving fewer procedures, a narrower scope of evidence collection, and typically excluding detailed assessments of internal controls or IT systems (Boiral et al., 2019; IAASB, 2023).

A key driver behind the adoption of non-financial assurance is the pursuit of enhanced credibility. The voluntary nature of sustainability reporting has historically raised questions regarding the authenticity and accuracy of ESG data, thereby challenging stakeholder confidence. Third-party assurance helps strengthen trust by mitigating greenwashing and validating the company's stated commitments (Farooq & De Villiers, 2020; Glover &

Touboulic, 2020). Nevertheless, the lack of a single, universally accepted assurance standard has led to significant variability in how companies approach the process. Some restrict the assurance scope to select metrics or specific sections of reports, which can create confusion for external stakeholders about the depth and reliability of the overall disclosure (Jámbor & Zanócz, 2023; PwC, 2023).

Empirical findings indicate that the adoption of non-financial assurance was strongly influenced by regional regulations and industry-specific pressures. Companies headquartered in regions like the European Union and Japan – where regulatory frameworks surrounding sustainability are relatively strict – are more inclined to engage external assurance providers than those in jurisdictions with weaker mandates, particularly the United States. Moreover, high-impact sectors often experience more rigorous assurance processes due to increased public scrutiny and environmental risks, which is in contrast with other industries with lower ESG exposure (Bakarich et al., 2023).

The importance for auditors of defining and implementing standards that provide assurance of non-financial statements is emphasized. However, there is a debate on whether the audit profession should be involved in providing assurance of non-financial statements (Domaracká & Kňažková, 2020). Stakeholder perceptions of assurance providers and the credibility of non-financial statements have turned negative, and the impact of assurance providers on the credibility of non-financial statements has become context-dependent (Pflugrath et al., 2011). These studies highlight the importance of auditor independence and the quality of financial reports in ensuring accurate and reliable non-financial reporting.

Boiral et al. (2019) conducted a qualitative content analysis of assured sustainability reports from the mining and energy sectors, revealing that assurance statements often fail to provide substantive, credible verification. Instead, these statements frequently reflect a hyperreal practice, detached from critical sustainability issues and stakeholder concerns. Similarly, their analysis of assurance statements in environmental, social, and sustainability reports suggests that such statements do not necessarily enhance stakeholder transparency or accountability. The practice of sustainability assurance remains rooted in procedural accounting rhetoric and is often guided by assurance standards that are insufficiently aligned with the specific demands of sustainability reporting.

Alsahali and Malagueno in 2021 showed in their study that the increase in assurance in sustainability reporting lags behind the increase in reporting and that switching between assurers is a common practice among companies. The primary standards used to audit sustainability reports are International Standard for Assurance Engagements 3000 (ISAE 3000), issued by the International Auditing and Assurance Standards Board, and AA1000, issued by the non-profit organisation AccountAbility. Accounting firms engaged in sustainability assurance mainly use the ISAE 3000 standard, whereas assurance providers in engineering and consulting organisations mostly employ the AA1000AS standard.

AA1000AS is specifically designed to provide assured non-financial reports, with an emphasis on the quality of sustainability reporting and stakeholder engagement and the inclusive and responsive nature of the reports. ISAE 3000 is broader in applicability and more focused on auditor ethical compliance, quality management, and assurance engagement performance. Despite their differences (concluded in *Table 19*), these standards are based on quite similar principles (e.g., independence of the assurance provider, the scope of the audit, and assurance levels) and can be used together in the same assurance process, but differ in depth (Eugénio et al., 2022).

Table 19: Differences between the ISAE 3000 and AA1000AS standards

	ISAE 3000	AA1000AS
Approach and emphasis of standards	Widely applicable and based on principles and practice of professional accounting and assurance	More specific to sustainability and stakeholder engagement
Scope of standards	Application guidance	Stakeholder-based materiality assessment
Focus of the standards	How to audit the reports with pre-defined agenda	How to evaluate the reliability and reliance of reported information
Standard users	Mainly accounting firms	Both accounting and non-accounting firms

Source: Own composition based on Eldis n.d. and Boiral et al. 2019

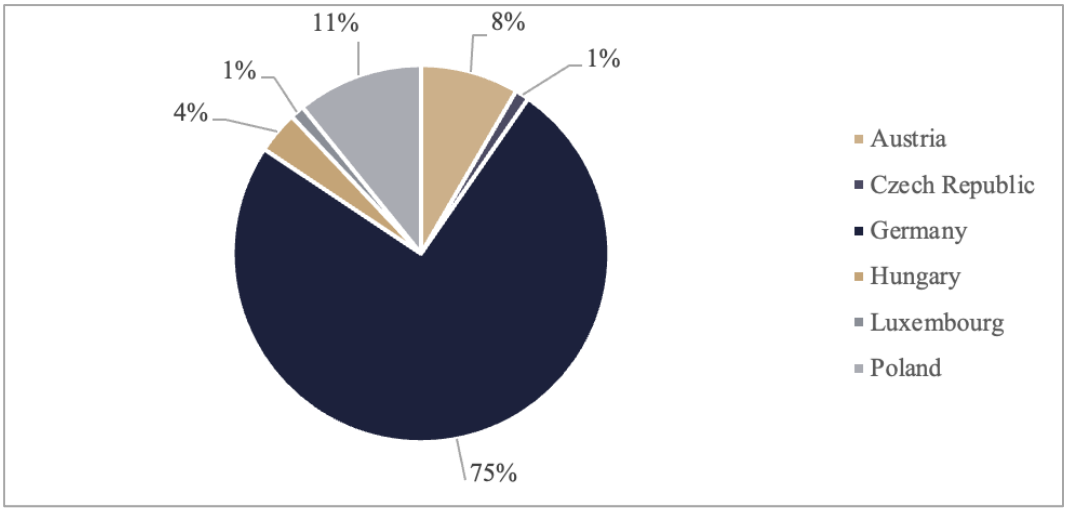
V.3. Methodology

This study employs a multi-faceted methodology, starting with a comparative analysis approach to examine the state of CSRD regulation and assurance practices in selected Central European countries, and conducts a comprehensive literature review to explore the importance of audits in financial reporting and the need for sustainability reporting assurance. The paper draws on a range of academic sources, including peer-reviewed journal articles and industry reports, to provide a thorough analysis of the topic. Considering that the new CSRD legislation makes mandatory the implementation of auditing processes from the first non-financial report, a question of assurance maturity of companies arises: *Are companies prepared to have non-financial reports externally audited in the initial reporting period?* In this regard, I prepared a quantitative analysis of companies' non-financial reporting assurance maturity using the Kaplan-Meier survival method. I used LSEG/Refinitiv ESG data to assess the level of assurance provided for non-financial reports. Besides, the review of CSRD regulations across selected Central European countries provide insights into the varying degrees of mandatory disclosure requirements and the level of harmonization across the region (Testarmata et al., 2020). This analysis helps to understand the institutional environment and the extent to which organisations are accountable for their environmental, social, and governance impacts.

The survival analysis using LSEG/Refinitiv data examines the trends in assurance practices for non-financial reports in Central Europe. This allows for an assessment of the reliability and trustworthiness of the information disclosed, as well as the potential drivers and barriers to the adoption of assurance services. (Nechita et al., 2020). By combining these complementary methodological approaches, the study aims to provide a comprehensive understanding of the current state of reporting and assurance practices and to provide insights into how these practices can support organisations' accountability and the reliability of non-financial information.

V.3.1. Data and sample

Figure 15: The proportion of companies in the selected countries



Source: Own composition based on LSEG/Refinitiv database

First, I used the LSEG/Refinitiv database to identify those large Central European entities that have ESG ratings by LSEG/Refinitiv. The composition of companies by country is shown in *Figure 15*, operating in 10 different industries. Then, I retrieved all available ESG ratings, reports, and assurance data for the selected companies, going back from 2022 to 2002. For my event-to-event analysis, I chose the Kaplan-Meier Survival Analysis.

The event in the Kaplan-Meier setting is the first externally assured sustainability report. The status variable indicates whether the event occurs within the window. Controls include industry and assurer type (accounting or engineering/consulting). Median survival times and compare survival curves are reported across sectors using log-rank tests. This survival analysis is a statistical method used to examine changes over time up to a given event. The Kaplan-Meier analysis can calculate the time taken from the start of an event to the occurrence of the tested event – e.g. in this case, the time from the first non-sustainability report to the first voluntarily, independently assured non-financial report – for individuals who were not otherwise lost from the sample, or until the end of the study (Szüle, 2016; Békés *&* Kézdi, 2021).

V.4. Results and discussion

It is vital to know the main similarities and differences between Central European Countries' CSRD transition; therefore, in the following chapter, I summarize them, focusing on the assurance of non-financial reports.

V.4.1. Comparison of CSRD transition in selected Central European countries

First, Hungary has been a leading country among European countries and has emerged as the clear frontrunner in implementing the CSRD among the countries under review, having already completed its national transposition. This early adoption helps Hungarian companies gain greater clarity on their reporting obligations and places them under pressure to comply with detailed sustainability disclosures. By contrast, Austria stands at the other end of the spectrum: a first official draft of the legislation was initially anticipated by the end of the second quarter of 2024, but it remains pending. It is also unclear when any formal text might be published (Kinstellar, 2024).

The Czech Republic occupies a middle ground by having already adopted some provisions of the CSRD for companies previously covered by the NFRD, enabling these entities to start reporting under the new framework as of January 2024. However, the accompanying legislation intended to expand the directive's requirements to a broader range of businesses is linked to a new accounting law that must be approved by the end of June 2024. Legislative disagreements regarding other aspects of this more comprehensive law, however, may necessitate pursuing the CSRD portion separately (Kinstellar, 2025).

Germany employs a systematic method and has moved to a second draft of its transposing law. This suggests that key stakeholders have begun an iterative dialogue with the government, although the timeline for the final version remains unclear. Meanwhile, Luxembourg is actively reviewing its draft, having shared a preliminary version for discussion and input from professional associations. While its stakeholder engagement is not as developed as Germany's, it is more solid than Austria's and the remaining parts of the Czech Republic's legislation. Poland is in a comparable position to Luxembourg and Germany, having issued its draft law in April 2024 and currently evaluating feedback from various professional organisations (PwC, 2024).

A common issue among these Central European countries is how policy agendas interact with legislative schedules, affecting the speed and efficiency of implementation of complex directives such as the CSRD. While the specificities of the optional aspects, such as increased requirements or phased deadlines, are still under discussion in many areas, it is clear that businesses in nations without finalized legislation are going to face tighter deadlines when the regulations come into force. The countries transposition of CSRD is detailed in *Table 20.*

Table 20: National transposition of CSRD

National transposition of CSRD	
Austria	No official draft has been released yet. The first draft was expected by the end of Q2/2024, but it remains pending. Due to the National Council election in autumn 2024, it's unclear when the first draft can be expected.
Czech Republic	The portion of the CSRD applicable to companies under the NFRD was approved in November 2023, effective from January 2024. The draft for the remaining companies is part of the new accounting law, which was expected to be approved by June 2024. However, due to discrepancies, it's uncertain if this deadline was met, and the CSRD-related section might be approved separately as an amendment.
Germany	The second draft of the CSRD was received, but as of January 2025, the legislation had not been adopted. Germany faced delays, and the European Commission initiated infringement procedures due to non-compliance with the transposition deadline.
Hungary	The CSRD has been transposed into national legislation.
Luxembourg	The first draft law was presented and was under discussion and review as of early 2025.
Poland	The CSRD implementation draft law was announced in December 2024 and entered into force on December 31, 2024.

Source: Own composition based on Accountancy Europe, 2025

It is important to note that the European Commission has proposed simplifying the CSRD regulations soon, potentially affecting the reporting requirements and timelines for companies. These changes aim to reduce the regulatory burden on businesses while maintaining transparency and accountability in sustainability reporting (European Commission, 2025). The progress of CSRD implementation in Central European countries in terms of assurance can be found in more depth in *Table 21*.

Table 21: CSRD implementation results in the selected countries regarding assurance

	Auditors	Independent Assurance Services	Assurance Report	Penalties
Austria	Not specified if auditors other than statutory auditors can audit the sustainability statement.	Not specified whether independent assurance services are allowed.	No details provided on whether the assurance report on sustainability needs to be included separately from the financial report.	No answer yet
Czech Republic	It is a company choice whether to use statutory auditors or other auditors for the sustainability statemen	Independent assurance services can audit the sustainability statement if the auditor has valid certification	It is not specified whether the assurance report on sustainability needs to be a separate section or part of the financial audit report.	Penalties can reach 3% of total assets
Germany	Both statutory auditors and other auditors are allowed to audit the sustainability statement.	Independent assurance services are not allowed unless specific conditions are met.	The opinion on the assurance of the sustainability report must be issued separately from the opinion on the financial statements.	Penalties similar to financial reporting
Hungary	Both statutory auditors and other auditors are allowed to audit the sustainability statement.	Independent assurance services are permitted.	The assurance report can either be included as part of the audit report or as a separate section.	Penalties similar to financial reporting, may need legislative amendment
Luxemburg	Statutory auditors and independent assurance services can audit the sustainability statement.	Independent assurance services are permitted.	The assurance report can be either a separate section or included as part of the audit report.	Penalties similar to financial reporting
Poland	Only auditors registered in Poland are allowed to audit the sustainability statement.	Independent assurance services are not permitted unless an IASP's report is reviewed by the statutory auditor.	The assurance report on sustainability cannot be included in the same report as the financial audit.	Penalties similar to financial reporting

Source: Own composition based on Accountancy Europe, 2025

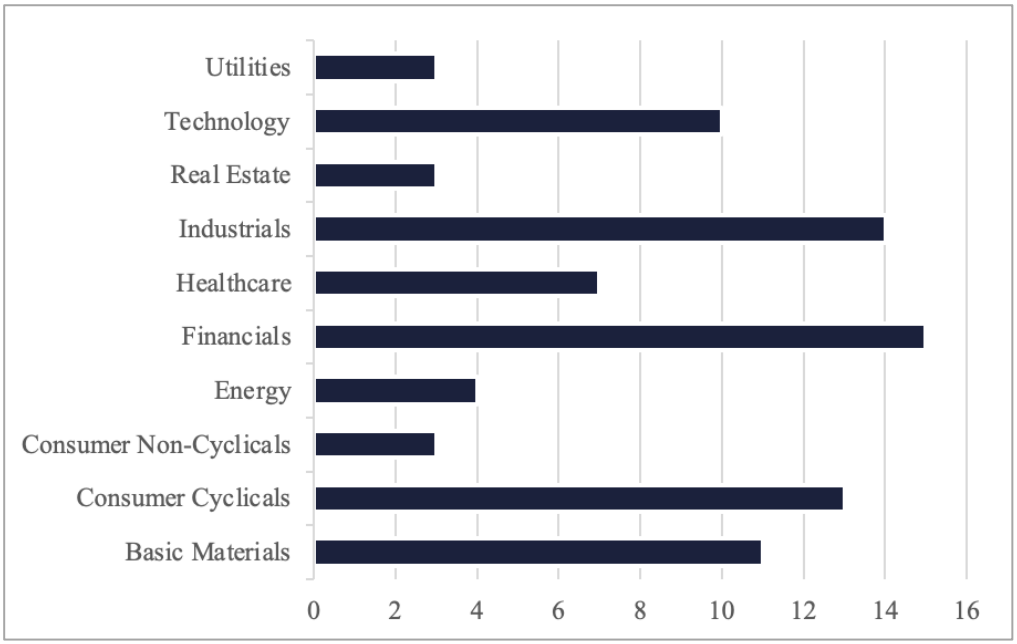
Only Hungary, Luxembourg, and Poland have decided to allow subsidiaries to use the exemption when preparing their sustainability report if their sustainability information is included in their parent's consolidated sustainability report. All countries (where there is a clear implementation) apply the ISAE 3000 auditing standard on a mandatory basis. The Luxembourg regulators plan to issue new standards in the near future.

V.4.2. Survival analysis

Reflecting the complexity of audit and external control processes, even a solid and well-established non-financial reporting system can face challenges during independent third-party assurance, not to mention small and medium-sized companies. Therefore, I investigated the number of years after non-financial reporting companies began to assure NFRs in general and looked for commonalities and patterns among the reporting companies.

Figure 16 illustrates the distribution of industries across the selected Central European countries, showing that the financials, industrials, and consumer cyclical sectors have the highest scores, indicating that these sectors dominate the measure. Consumer non-cyclical (business services), real estate, and utility appearances are significantly lower, which may indicate that they play a smaller role in the context. Meanwhile, the technology sector and the healthcare sector are mid-ranked.

Figure 16: Distribution of industries in the selected countries

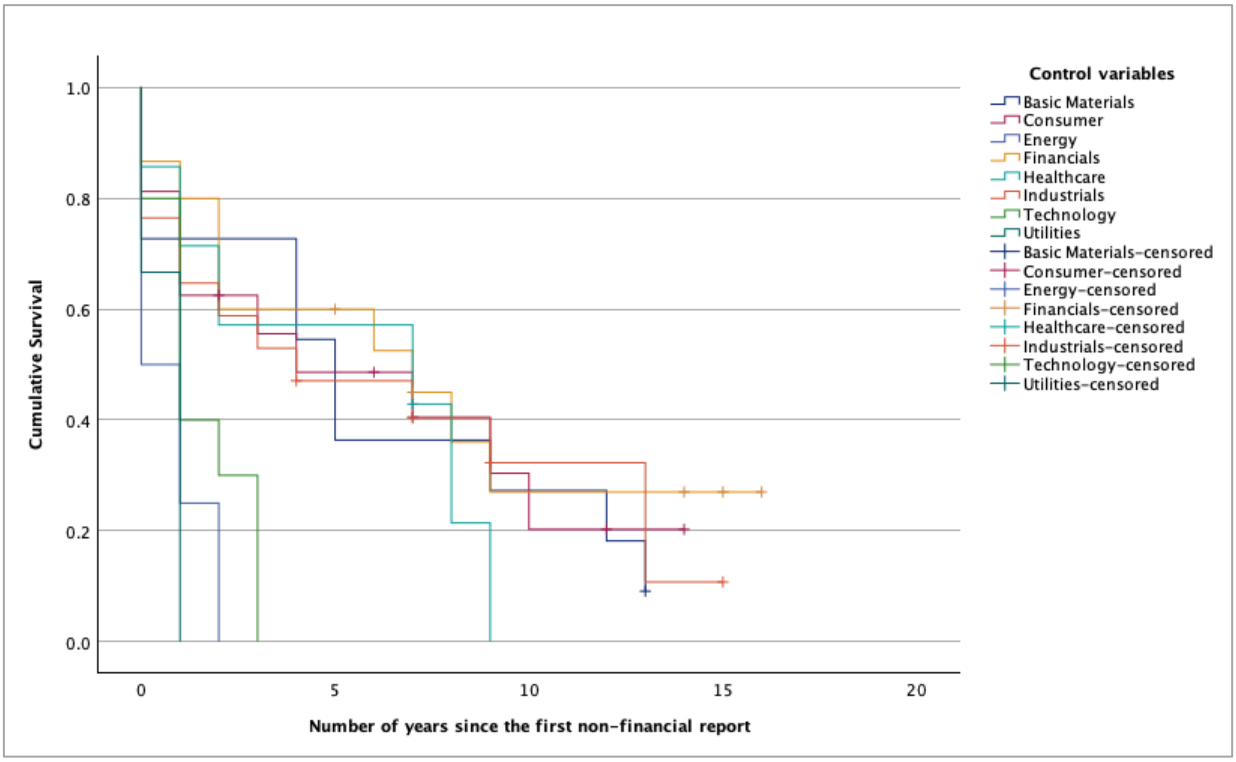


Source: Own composition

I have included in my analysis the financial years from the first non-financial report to the first audited report of the companies concerned. As a status variable, I have indicated whether the companies have ever voluntarily prepared reports. Overall, 67 companies out of the sample of 83 companies have already prepared a non-financial report to inform stakeholders about sustainability activities within the company. As a control variable, I wanted to examine two factors based on the results from academic literature. One is the industry in which the companies operate, and the other is the one that assures their non-financial reports.

According to my SPSS results – and answering Research Question 1 – the overall median survival time is 3 years (SE = 0.844; 95% CI: 1.347 - 4.653), consistent with log-rank comparisons across sectors, with a standard error of 0.844 and a 95% confidence interval ranging from 1.347 to 4.653. This means that taking all categories into account, the median value of Survival Time is 3 units (years), according to Kaplan-Meier's model, which means that companies took 3 years to audit their non-financial reports. The standard error indicates the level of variance of the estimate of the median, and the confidence interval suggests that it is 95% confident that the true median value of the overall survival time is between 1.347 and 4.653 units. It is important to note that the median is less sensitive to outliers than the mean. In my results, the overall survival time mean is 5.341, which is higher than the median. This suggests a bias in the distribution of the data, as some very high survival time values tend to pull the mean up.

Figure 17: Survival Functions using Kaplan-Meier model for company NFR assurance in selected Central European countries



Source: Own composition based on LSEG/Refinitiv database

Moreover, looking at the survival curves (*Figure 17*) and analysing them in detail by comparing one industry pattern to the remaining ones, I found that the Energy, Technology, and Utilities sectors are prone to have their reports assured by third parties significantly earlier than companies in other sectors, which answers Research Question 2. It is because the p-value of the survival analysis was lower than 5% for these three industries. The reason for this can be explained by the emergence of greenwashing scams in their industry dating back to the early 2000s. So, in the case of these companies, under pressure from peer companies and to avoid the disclosure of untruthful, not credible information, companies have been engaging auditors earlier, sometimes even in their very first reporting period, to focus on the assurance of their disclosed information.

In this sample of large European companies, I found that during the NFRD reporting period, the very first audited reports were often assured by engineering or consultancy firms. However, after some assurance switching, it became clear that accounting firms, particularly the Big Four firms (PwC, Deloitte, EY, KPMG), are the preferred providers of assurance among these companies (*Figure 18, Figure 19*). The rate of switching to consultancy firms was notably higher in the last period observed, highlighting the transition

toward more established accounting firms for assurance services. The Big Four firms dominated in this shift, as they have largely led the assurance efforts for these companies in recent years.

Figure 18: Assurance providers of the sampled companies

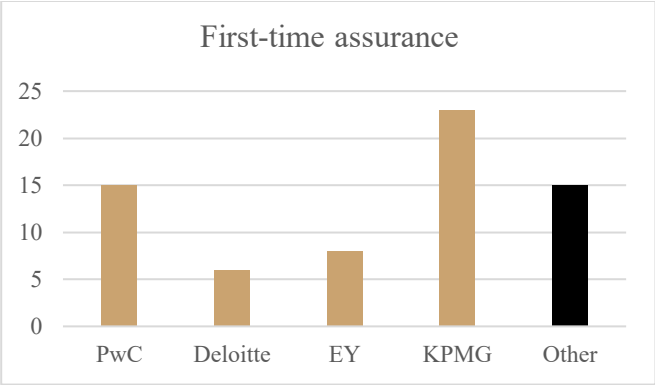
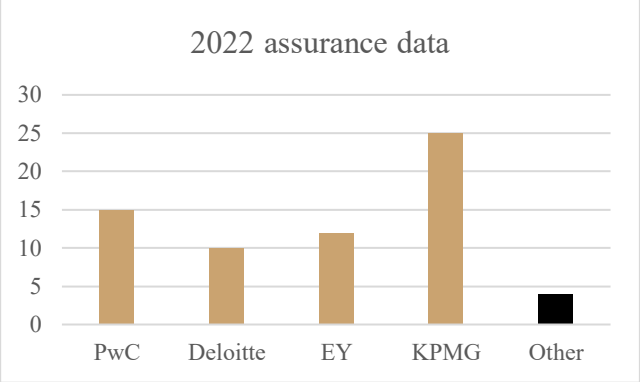


Figure 19: Assurance providers of the sampled companies in 2022



Source: Own composition

Research Question 3 can be answered as in this sample (2002-2022), assurance provision concentrates toward auditing firms – particularly the Big Four –, while engineering/consulting firms' share declines. In early NFRD years, first-time assurance was frequently performed by engineering or consulting firms, but switching patterns show a gradual consolidation toward accounting and auditing firms. This aligns with the CSRD's expected elevation of assurance rigour.

The overview below (*Table 22*) aims to provide stakeholders and researchers with a comprehensive understanding of current reliability and assurance issues in organisations and to contribute to the increasing research in the field.

Table 22: The considerations of non-financial reporting disclosure

Considerations of NFR assurance	Details of the considerations
Lack of assurance framework	A unified reporting assurance framework incorporates various aspects employed to assess corporations' non-financial information.
Accounting, consultancy, and engineering assurance companies	Accounting firms have started to dominate the market for assurance in non-financial reporting. However, engineering firms and other consultants still hold a significant share.
Stakeholders' perceptions	Stakeholders' perceptions of assurance providers and the credibility of non-financial reporting have changed, so addressing their concerns is becoming increasingly important.
Lack of comparability	The absence of a common standard and comprehensive guidance regarding the assurance of non-financial reports raises concerns about the ability to compare assurance results.
Assurer switching	Companies often switch between assurance providers for their NFR, which also raises concerns about the credibility of the information provided.

Source: Own composition

VI. Expected impact of assurance of the sustainability disclosure of large companies in the European Union

The final empirical article builds on the conceptual, Hungarian and Central European evidence presented in the preceding chapters. This submitted article examines whether the external assurance of sustainability information is associated with changes in ESG ratings and selected accounting-based financial indicators among large EU companies. The analysis addresses the outcome-oriented component of the dissertation's central research question by examining whether assurance is associated with measurable changes in the perceived quality of sustainability information and in corporate performance.

Abstract: This study examines the evolution of sustainability reporting assurance among large European companies and its association with disclosure quality and corporate outcomes, particularly in light of the growing mandatory use of the CSRD. While non-financial reporting has been compulsory for Public Interest Entities since 2017, assurance has remained largely voluntary and uneven across countries and sectors. The paper explores how the adoption of external assurance of sustainability reports relates to ESG ratings and selected financial indicators. Focusing on the early phase of CSRD implementation, when assurance becomes mandatory but initially in the form of limited assurance, the quantitative analysis tracks the development of assurance practices and their alignment with ESG ratings and EU sustainability requirements. Empirically, the study documents that, in the analysed sample, the first year of external assurance coincides with statistically significant changes in ESG ratings and selected financial metrics around the assurance event. ESG ratings are, on average, 5.9 points higher in the assurance year than in the previous year, and positive differences are statistically significant and distinguishable from zero during the first eight post-assurance years examined. These findings provide evidence of temporal associations between assurance adoption and ESG ratings, that are consistent with enhanced informational content, reduced information asymmetry and potentially more informed capital allocation decisions, while acknowledging that the observational design does not allow for strong causal claims about the effects of assurance of sustainability outcomes or market integrity.

Keywords: sustainability, assurance, CSRD, ESG, EU

VI.1. Introduction

The Corporate Sustainability Reporting Directive (Directive 2022/2464/EU, hereinafter referred to as CSRD) and its forthcoming mandatory assurance regime are expected to fundamentally reshape the sustainability disclosure landscape in the European Union. From 2017 onwards, large public-interest entities have been required to publish non-financial information under the Non-Financial Reporting Directive (Directive 2014/95/EU, hereinafter referred to as NFRD). Still, the CSRD extends both the scope and depth of reporting and crucially introduces compulsory third-party assurance of sustainability statements from the 2024 financial year onwards. This regulatory shift aims to enhance the reliability, comparability, and utility of sustainability information for decision-makers, and is expected to have substantial and long-term impacts on corporate practices related to the collection and disclosure of sustainability-related data (Ulrich & Metzger, 2022).

This research investigates the impact of mandatory assurance of the transparency, data quality, and overall reliability of sustainability reporting, as well as the translation of these changes into financial and non-financial outcomes for large EU companies. The new assurance requirements are likely to trigger adjustments in internal reporting infrastructures, including governance frameworks, internal controls, and data architectures, as firms adapt their systems to withstand rigorous external scrutiny in line with emerging EU assurance standards. Higher-quality, assured sustainability information should reduce information risk and information asymmetry for investors and creditors, with potential consequences for the cost of capital, market liquidity, analyst coverage, and broader market reactions to ESG performance (Christensen et al., 2024).

The topic is particularly salient for financial institutions, as banks and other credit institutions both underpin corporate financial stability and channel capital to carbon-intensive and sustainable activities (Deák & Sárvári, 2023). While academic and policy debates have often focused more on the ‘E’ and ‘S’ pillars, governance failures in the financial sector have been central to past crises, suggesting that strengthened governance through transparent ESG reporting and credible assurance is relevant not only at the firm level but also for the resilience of the financial system and the wider economy. At the same time, societal expectations regarding corporate transparency are rising; traditional financial reports are increasingly seen as insufficient to understand firms' long-term prospects and impacts, and stakeholders demand non-financial information that

signals how managers manage ESG-related risks and opportunities (Quick & Inwinkl, 2020).

The literature suggests that sustainability reports have become mainstream; however, their credibility remains a topic of controversy due to selective disclosure, jargon, and the risk of greenwashing (Xiao & Shailer, 2022). Voluntary stand-alone reports can enhance a company's reputation, but capital-market benefits appear to depend on high-quality, enforceable standards and credible implementation (Christensen et al., 2024). In response, the CSRD explicitly seeks to strengthen the reliability and comparability of sustainability disclosures by making limited assurance mandatory and harmonising practice through EU-level guidance. Empirical studies suggest that high-quality assurance can improve perceived credibility, narrow bid-ask spreads, and support a lower cost of capital when assurance extends beyond symbolic compliance (Quick & Inwinkl, 2020). However, the assurance market remains fragmented across providers, scopes, and levels (García-Sánchez et al., 2021).

More recent contributions highlight a broader role for sustainability assurance as a collaborative, learning-oriented process that can enhance reporting systems and help integrate sustainability into strategy and performance management (Channuntapipat, 2021). In the EU context, this process intersects with the European Sustainability Reporting Standards (ESRS), the EU Taxonomy – including indicators such as the Green Asset Ratio for banks – and external ESG ratings, all of which depend on disclosed data. The eco-efficiency literature also proposes that environmentally efficient firms may improve long-term profitability by reducing resource use, emissions, and waste. Where sustainability reporting and assurance faithfully capture such changes, assured disclosures may provide information about firms' risk profiles and value-creation potential, especially in the banking sector (Gyura et al., 2023). Against this backdrop, the EU's move to mandatory sustainability assurance under the CSRD creates opportunities for future quasi-experimental research in accounting, auditing, and finance. Such designs, however, require credible treatment and comparison groups, appropriate timing, and supported identification assumptions; the present study does not constitute a quasi-natural experiment (Benameur et al., 2023).

Given the observational nature of the data, the analysis is designed to identify patterns and associations rather than to establish strict causality. Firms voluntarily decide when to

introduce assurance, which implies possible self-selection: companies with stronger underlying ESG performance, better governance or different strategic orientations may be more likely to obtain assurance in the first place. In addition, the study relies on one provider's ESG rating methodology, so changes in scores may reflect both genuine improvements in underlying practices and adjustments in disclosure or rating models. The empirical results should therefore be interpreted as evidence of co-movement between assurance, ESG ratings and financial indicators in the analysed sample, while the mechanisms behind these relationships remain partly inferential. Empirically, this paper analyses how the transition to mandatory assurance is reflected in non-financial outcomes – such as changes in the structure and content of sustainability reporting and selected performance indicators – and in financial outcomes, captured by profitability, leverage, and shareholder-value metrics (ROE, ROA, EBIT, D/E, and EPS). Studying these dimensions jointly makes it possible to link the emerging assurance regime not only to disclosure quality and legitimacy, but also to the economic consequences of embedding assured sustainability information into firms' internal decision-making and external communications.

The article is consequently structured as follows: after the introduction, Section 2 reviews the academic literature on sustainability reporting and assurance, develops the theoretical background, and synthesises the main regulatory developments under the CSRD, ESRS, and related EU frameworks. Section 3 outlines the quantitative research design, detailing the data sources, sample construction, variable definitions, and econometric models employed to capture both non-financial and financial effects of the new assurance regime. Section 4 presents the empirical results, organised around changes in disclosure quality and capital market outcomes. Section 5 concludes by discussing the implications for regulators, standard-setters, and financial institutions, outlining the study's limitations, and proposing avenues for future research.

VI.2. Literature review for theoretical framework

Sustainability reporting has become a central instrument for communicating companies' environmental, social, and governance (ESG) performance, as stakeholders increasingly demand transparency on how firms manage non-financial risks and opportunities (Del Gesso & Lodhi, 2024; Boros et al., 2022). This practice can be interpreted through several theoretical lenses that explain why companies disclose ESG information and why they seek

to have it externally assured, providing a broad framework for situating the present research within existing knowledge (Lippai-Makra et al., 2024). Stakeholder, legitimacy and institutional theories highlight the role of external pressures and societal expectations, while agency, stewardship and resource dependence theories emphasise internal governance dynamics and strategic resource management; together, these perspectives underline that sustainability reporting is a complex phenomenon shaped by both constraints and opportunities (Lakhani & Herbert, 2022; Meqbel et al., 2025; Tavares & Dias, 2018).

From a stakeholder perspective, organisations rely on a diverse set of constituencies for resources, legitimacy, and survival, prompting them to provide transparent and comparable sustainability information to mitigate information asymmetry and maintain stakeholder support (Lippai-Makra et al., 2024). Empirical evidence suggests that investors, consumers, regulators, and civil society groups are increasingly pressuring companies to enhance their ESG disclosures; however, the absence of uniform standards has often hindered stakeholders' ability to make informed decisions and compare firms consistently (Zsóka & Vajkai, 2018). Legitimacy theory similarly frames sustainability reporting as a means for companies to obtain societal approval and signal conformity with prevailing norms, implying that firms use ESG reports strategically to protect their reputation, manage public scrutiny, and respond to evolving expectations about responsible business conduct (Hossain & Kibria, 2024; Raharja & Pramono, 2025). When disclosures are perceived as symbolic or 'greenwashed', however, public confidence erodes, and external assurance becomes a potential mechanism to restore legitimacy by validating reported information (Zik-Rullahi & Jide, 2023).

Institutional theory situates sustainability reporting within broader fields of regulatory, normative, and cognitive pressures, emphasising that disclosures emerge from constraints and expectations imposed on firms by their institutional environment (Seow, 2024; Sari et al., 2023). Coercive isomorphism compels organisations to adopt sustainability reporting through formal regulation and stakeholder demands, while mimetic isomorphism leads firms to imitate the reporting practices of successful or legitimate peers – particularly in times of uncertainty. Normative isomorphism arises from professionalization and shared values among experts, encouraging the diffusion of standardized sustainability reporting practices as markers of organisational legitimacy and professionalism (Amran & Haniffa, 2011). These isomorphic forces contribute to the widespread adoption of sustainability

reporting even in the absence of strong enforcement, but they also imply that the depth and authenticity of disclosures depend on managerial choices and organisational priorities, rather than regulation alone (Tavares & Dias, 2018). Managerial hegemony further underscores that powerful management teams can shape the scope and narrative of sustainability reports to align with their own strategic objectives, potentially downplaying negative impacts while highlighting favourable information (Şener & Karapolatgil, 2025).

Agency, stewardship, and resource dependence theories add complementary insights into the mechanisms that link reporting to corporate behaviour. Agency theory suggests that sustainability disclosures can reduce information asymmetries between principals (shareholders) and agents (management) by providing richer, decision-useful data on ESG performance, thereby aligning managerial incentives with shareholder interests and reducing agency costs (Tavares & Dias, 2018). Stewardship theory, by contrast, assumes that managers act as stewards motivated to maximize long-term organisational performance and societal well-being. From this perspective, sustainability reporting serves as a voluntary expression of responsible management and a tool to demonstrate commitment to broader stakeholder interests (Buallay & Al-Ajmi, 2020; Lakhani & Herbert, 2022). Resource dependence theory posits that firms utilize sustainability reporting strategically to manage external dependencies and secure critical resources from powerful stakeholders, such as investors, lenders, regulators, and customers, by signalling their responsiveness to environmental and social concerns (Meqbel et al., 2025).

Taken together, these theoretical perspectives suggest that sustainability reporting is not merely a compliance exercise but a strategic response to a complex interplay of internal motivations and external pressures (Lungu et al., 2025). While external forces can initiate reporting and shape its formal structure, internal governance dynamics, managerial preferences, and resource considerations ultimately influence the depth, credibility, and transformative potential of disclosures (Dewi & Safitri, 2023). This raises the critical question of whether sustainability reports genuinely reflect substantive changes in corporate practices or primarily serve symbolic functions, a question that has become central in recent academic debate and motivates the present study (Gnanaweera & Kunori, 2018; Du Toit, 2024).

VI.2.1. Greenwashing, assurance, and the credibility of sustainability reporting

Concerns about selective disclosure, boilerplate narratives, and greenwashing have led scholars and practitioners to question the credibility of sustainability reporting and to call for mechanisms that can enhance trust in ESG information (Lakhani & Herbert, 2022; Tyson & Adams, 2020). External assurance has emerged as a key institutional response to these credibility gaps: independent practitioners review or audit sustainability reports to provide an informed conclusion on whether the information is free from material misstatement, thereby reinforcing legitimacy among stakeholders who rely on non-financial data for decision-making (Raharja & Pramono, 2025; Simoni et al., 2020; Zsóka & Vajkai, 2018). Integrating assurance into corporate governance structures can strengthen accountability and transparency, mitigate greenwashing risks, and enhance organisational resilience, especially in contexts where sustainability assurance remains only partially regulated, and practices vary widely across firms and jurisdictions (Tyson & Adams, 2020; Yan et al., 2022).

The literature emphasises that external assurance can reduce agency costs and information asymmetries by subjecting ESG disclosures to independent scrutiny, which supports market stability and can improve overall performance when assurance is embedded in broader governance and risk-management systems (Hegedűs et al., 2023; Larrínaga et al., 2018). Effective assurance practices validate the reliability of sustainability reports, fostering stakeholder trust and enabling more accurate decision-making by investors and other interested parties (Pasko et al., 2021; Simoni et al., 2020). This enhanced credibility directly addresses greenwashing concerns by ensuring that firms provide accurate, verifiable information about their environmental and social initiatives, thereby safeguarding corporate reputation and reinforcing the substantive content of sustainability strategies (Esa et al., 2024; Pizzi et al., 2024). Where mandatory assurance requirements are absent or only emerging, voluntary assurance helps fill a regulatory gap and underpins a firm's willingness to subject its ESG reporting to heightened scrutiny (Alsahali & Malagueño, 2021).

Voluntary adoption of sustainability assurance is itself a strategic decision that conveys information about a firm's underlying sustainability performance and management quality.

Empirical studies indicate that companies with stronger ESG performance are more likely to voluntarily seek assurance, utilizing it to demonstrate their commitment to corporate responsibility, transparency, and internal controls (Mio et al., 2024; Simoni et al., 2020). This behaviour is consistent with signalling theory: costly disclosures, such as reports audited by independent assurance providers, function as credible signals of genuine commitment to sustainability, distinguishing these firms from those engaged primarily in symbolic communication (Baier et al., 2021; Hassan et al., 2020). Credible signalling through assurance can positively influence firm value and market perception, as investors interpret verified information as evidence of lower non-financial risk and stronger governance. At the same time, the perceived value of assurance is context-dependent, varying by provider type, region, industry, and company characteristics, which complicates attempts to draw general conclusions and underscores the need for further empirical research (Friske et al., 2022).

Building on this literature, the present study conceptualises ESG ratings as non-financial performance measures jointly shaped by firms' underlying sustainability practices, their disclosure choices, and the credibility conferred by external assurance. If assurance improves data quality and reduces greenwashing, ESG ratings should become more informative signals of firms' true environmental, social, and governance performance (Alsahali & Malagueño, 2021; Simoni et al., 2020). Moreover, theories capital-market consequences imply that more credible ESG information can be reflected in traditional financial indicators, such as return on equity (ROE), return on assets (ROA), earnings before interest and taxes (EBIT), the debt-to-equity ratio (D/E), and earnings per share (EPS) – through changes in perceived risk, cost of capital, and strategic resource allocation (Buallay & Al-Ajmi, 2020; Larrínaga et al., 2018). Accordingly, the empirical part of this paper examines how the introduction of sustainability assurance relates both to changes in ESG ratings and to the evolution of these key financial metrics around the assurance event.

VI.2.2. Evolving EU regulatory framework: from NFRD to CSRD

The European Union has played a pivotal role in institutionalising sustainability reporting by progressively expanding and tightening disclosure requirements. From the 2017 financial year onward NFRD required large public-interest entities to publish non-financial information covering environmental, social, and governance matters, with the aim of enhancing corporate transparency and fostering sustainable economic activity (European

Parliament, 2014). National transpositions, such as the Hungarian Accounting Act, incorporated these obligations into domestic reporting regimes; however, early research highlighted limitations regarding stakeholder involvement and the effectiveness of the Directive in driving substantive change (Biondi et al., 2020; Masiero et al., 2019). In practice, NFRD-based disclosures have often been criticized for their limited relevance, comparability, and reliability, as reports have remained largely narrative, flexible, and unreliable, limiting their usefulness for decision-making by investors and other users (Xiao & Shailer, 2022). Evidence suggests that when sustainability reports are assured by independent third parties, perceptions of credibility improve and information asymmetry declines, indicating that assurance can help unlock the potential of non-financial reporting (Quick & Inwinkl, 2020).

To address these shortcomings, the CSRD was adopted in December 2022, which significantly extended and intensified the EU's corporate sustainability reporting regime. This new Directive substantially enlarged the number of companies required to report, mandated the use of the European Sustainability Reporting Standards (ESRS) developed by EFRAG, and introduced compulsory external assurance of sustainability statements (European Commission, 2023a). The ESRS framework adopted a double-materiality perspective, requiring companies to report on both how sustainability issues affect their financial position and performance (outside-in) and how their operations influence society and the environment (inside-out) (EFRAG, 2023). By integrating double materiality, standardized metrics, and assurance, the CSRD aims to elevate sustainability reporting to the level of financial reporting, thereby enhancing its relevance for risk management, capital allocation, and stakeholder decision-making (Christensen et al., 2024).

The broader EU regulatory architecture further reinforces this shift toward rigorous, useful and reliable sustainability disclosures. The EU Taxonomy Regulation and its Delegated Acts define environmentally sustainable economic activities and associated key performance indicators, aiming to channel finance toward the green transition and to provide a common reference point for investors and financial institutions (European Commission, 2021a). These instruments link corporate disclosures to sustainable-finance objectives and prudential considerations, particularly in the banking sector, where climate and transition risks pose direct threats to financial stability. In this context, mandatory external assurance under the CSRD marks a significant policy innovation: it is expected to

improve data reliability and comparability, reduce information risk and, ultimately, support better-informed capital-market decisions. Embedding assured ESG data into governance and strategic management systems may also help firms transition from a compliance-oriented approach to sustainability towards one that treats sustainability as a competitive asset and an integral part of long-term value creation (Gipper et al., 2025).

VI.2.3. The Omnibus package and shifting assurance obligations

The EU sustainability disclosure regime was materially recalibrated through the Omnibus I process. The Commission presented its simplification proposals in February 2025 (European Commission, 2025), and the substantive amendments were subsequently adopted as Directive (EU) 2026/470, which entered into force on 18 March 2026 and must be transposed by Member States by March 2027. The reform narrows the number of undertakings subject to mandatory sustainability reporting, modifies aspects of scope and timing, and requires a substantial simplification of the ESRS. The Commission adopted revised ESRS delegated acts in July 2026. As of the date of this article, those acts were under scrutiny by the European Parliament and the Council.

The amended EU sustainability-reporting framework retains the double-materiality approach and limited assurance for undertakings that remain within the CSRD's scope, while narrowing the population of undertakings covered and simplifying the ESRS reporting requirements. Directive (EU) 2026/470 entered into force in March 2026; however, Member States must transpose the Directive by March 2027. Accordingly, until national transposition measures are in place, the interaction between the amended Directive and Member State law should be assessed on a jurisdiction-by-jurisdiction basis. The revised ESRS are generally applicable to financial years beginning on or after 1 January 2027, with transitional options for financial years beginning in 2026. For undertakings and assurance practitioners, these changes affect the entities subject to mandatory sustainability reporting and limited assurance, as well as the timing of those obligations. From a research perspective, the reforms may create opportunities for future quasi-experimental designs, but only where treatment and comparison groups, timing, and identification assumptions support a credible counterfactual. The present study, therefore, remains an observational analysis of voluntary and early mandatory assurance practices rather than a quasi-natural experiment (European Parliament & Council, 2026).

VI.2.4. Assurance levels in sustainability reporting

The assurance literature distinguishes between limited and reasonable assurance, which differ in the extent of evidence obtained, the procedures performed, and the level of confidence provided (Dumitru, 2016). Limited assurance provides a lower level of assurance than reasonable assurance; procedures are correspondingly less extensive and are determined by the engagement circumstances, and are not confined to inquiries and analytical review. The conclusion is ordinarily expressed in a negative form. Reasonable assurance provides a high, but not absolute, level of assurance, involves more extensive evidence-gathering, and ordinarily uses a positively worded conclusion on whether the sustainability information is prepared, in all material respects, in accordance with the applicable criteria. ISSA 5000 provides a stand-alone framework for both assurance levels (Gipper et al., 2025; García-Sánchez et al., 2021).

The CSRD originally sought a gradual transition from limited to reasonable assurance of sustainability statements, intended to align the rigour of ESG reporting with that of financial reporting and further reduce information asymmetry for investors and other stakeholders (European Commission, 2023b; García-Sánchez et al., 2021). The main differences between limited and reasonable assurance are described in Appendix II.

Directive (EU) 2026/470 removed the previously envisaged mandatory progression from limited to reasonable assurance. Sustainability statements of undertakings remaining within the CSRD scope, therefore, continue to be subject to limited assurance under the amended EU framework. For this study, the observable effects of early mandatory assurance should accordingly be interpreted as evidence predominantly relating to limited-assurance engagements, not to the higher level of assurance associated with reasonable assurance (European Parliament & Council, 2026).

VI.2.5. Synthesis and research gap

The literature portrays sustainability reporting and assurance as outcomes of intertwined stakeholder, legitimacy, institutional, agency, stewardship, and resource dependence mechanisms, all operating within a rapidly evolving European regulatory environment (Lippai-Makra et al., 2024; Lungu et al., 2025; Seow, 2024). At the same time, the EU's

move towards CSRD-based, ESRS-aligned and increasingly assured sustainability reporting – subsequently recalibrated by the Omnibus package – is only beginning to take effect, so that assurance is becoming mandatory for a broad set of firms but, for now, predominantly at a limited-assurance level (European Commission, 2025; Sidley, 2025).

This combination of theoretical insights and unfolding regulatory change reveals a clear research gap. A more comprehensive overview of the underlying literature is provided in Appendix III, which summarises the reviewed studies by (i) applied methods, (ii) regional allocation and (iii) regional breakdown. Existing empirical evidence on sustainability assurance largely stems from the pre-CSRD period, when assurance was voluntary or only loosely regulated, and therefore offers only partial guidance on how assurance operates in the emerging CSRD context (Alsahali & Malagueño, 2021; Quick & Inwinkl, 2020). There is still limited knowledge on how the presence of assurance, regardless of whether it is mandated or voluntarily adopted, that affects the informational content of ESG ratings and their translation into financial performance indicators such as ROE, ROA, EBIT, D/E and EPS, particularly in sectors that are central to financial stability, such as banking (Buallay & Al-Ajmi, 2020).

Furthermore, because the CSRD framework has only recently come into force, extensive post-CSRD panel data are not yet available. This necessitates examining the assurance effect across both the voluntary and initial mandatory phases. In this context, the scope and timing changes introduced by the Omnibus Directive generate additional variation in assurance regimes, prompting further questions about how different setups affect the credibility and economic consequences of sustainability reporting (European Commission, 2025; Sidley, 2025). Against this backdrop, the present study examines whether and how third-party assurance (irrespective of its voluntary or mandatory nature under the evolving CSRD framework) enhances the reliability of sustainability disclosures and ESG ratings, and whether such enhancements are associated with measurable changes in firms' financial outcomes around the assurance event.

VI.3. Research method

To assess how sustainability report assurance relates to firms' financial performance, the study constructs a panel of annual observations centred on the year in which each company's sustainability report is first externally assured (the "assurance year"). The empirical analysis relies on firm-level data from the LSEG (formerly Refinitiv) database, which covers publicly listed companies headquartered in the European Union. The final sample comprises 1,070 EU firms for which at least five consecutive years of ESG scores are available up to 2024[3]. To capture longer-term dynamics, the financial time series extends back twenty years from the first available year, with missing observations retained as such rather than interpolated, to avoid introducing artificial trends. We utilized the ESG score from the LSEG database, which offers a transparent, data-driven assessment of companies by measuring their relative performance and commitment across 10 primary environmental, social, and governance themes. The methodology utilizes more than 860 metrics to calculate percentile rank scores (0-100), which account for industry materiality and company size, ultimately providing investors with an objective tool for portfolio analysis and risk management.

The set of financial indicators (ROE, ROA, EBIT, D/E, and EPS) is chosen to provide a parsimonious view of accounting profitability, operating performance, leverage and per-share earnings around the assurance event. ROE and ROA capture equity- and asset-based profitability, which the literature links to the ability to monetize sustainability initiatives in the long term. EBIT reflects operating performance before financing and tax effects, allowing the analysis to isolate how assurance coincides with changes in underlying business profitability. The D/E ratio summarises leverage and capital-structure changes, which may respond to evolving perceptions of risk as ESG practices and disclosures develop, while EPS directly reflects the component of performance most salient to equity investors and may embed market reactions to more credible, assured sustainability information. Accounting indicators do not directly measure investor reactions; to analyse such effects, separate, market-based variables would be required, but accounting indicators can provide a comprehensive insight into them.

[3] While ESG data for 2024 was not yet available for all companies included in the analysis at the time of the study, the first available year may vary and may include data for 2023, depending on when the data became available.

The dynamics of these indicators are examined using two complementary reference frames. First, each fiscal year is compared with the immediately preceding year (PY framework), capturing year-on-year changes in the level of each metric. Second, the panel is re-anchored at the assurance year ("BY" framework), and subsequent years are compared with this base year, allowing the study to track the medium- and longer-term evolution of financial performance relative to the onset of assurance. For both frames, the empirical tests focus on changes (first differences) in each indicator, rather than levels, to mitigate firm-specific heterogeneity and pre-existing performance differences.

For each year–indicator combination, the analysis tests whether the distribution of changes differs significantly from zero. Paired mean- and median-based tests are used as complementary checks. The results are summarised in a compact matrix: "+" and "–" denote non-significant positive or negative shifts, while "sig +" and "sig –" indicate statistically significant increases or decreases. The "joint" columns report a mark only when both tests indicate a significant change in the same direction; otherwise, an "x" signals that the two tests do not provide concordant evidence. In this way, the upper panel of the summary table (PY) highlights immediate, year-on-year movements in profitability, leverage, and EPS around the assurance event, whereas the lower panel (BY) captures how these indicators evolve over a longer horizon once the assurance regime has been introduced. This design enables the distinction between short-lived level effects and more persistent trends in financial performance associated with sustainability assurance.

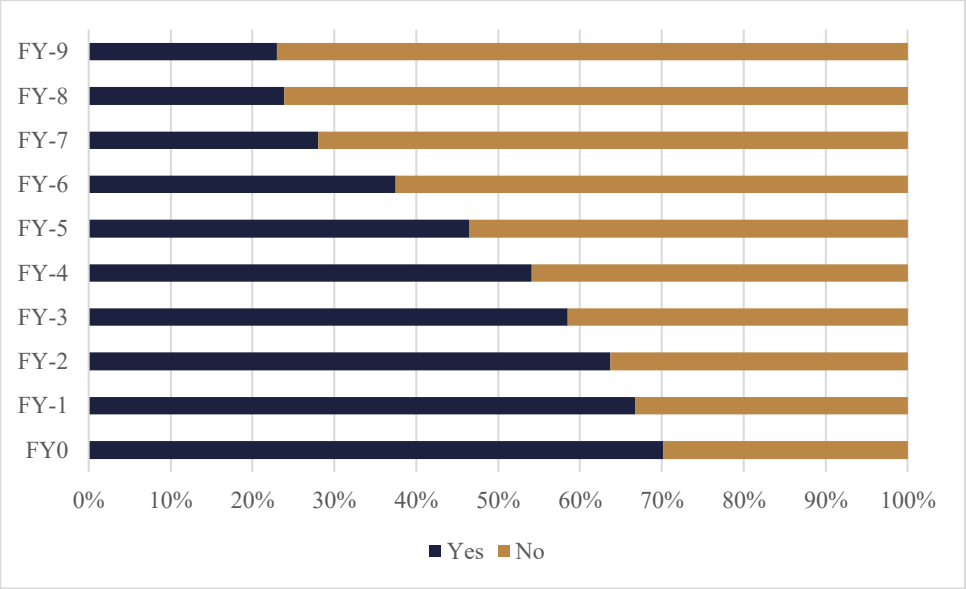
Therefore, the following research questions were proposed:

1. *Is the introduction of external sustainability assurance associated with changes in ESG ratings that may reflect differences in the quality and reliability of ESG information?*
2. *How do key financial performance indicators (ROE, ROA, EBIT, D/E, EPS) change following the introduction of sustainability assurance?*

VI.4. Research results

Before turning to financial outcomes, it is useful to characterise the evolution of assurance in the sample. *Figure 20* illustrates that the share of firms whose sustainability information is assured increases significantly over the observation period. While fewer than 5-7% of sample firms had assurance nineteen years before FY0, this proportion increases steadily and exceeds 70% in FY0. The absolute number of assured firms grows from around forty at the beginning of the period to more than 750 by FY0, indicating a progressive diffusion of assurance practices well before the CSRD's formal entry into force. This pattern is consistent with institutional and signalling perspectives, which suggest that firms gradually adopt assurance in response to stakeholder pressures, peer imitation, and evolving expectations regarding credible ESG disclosure.

Figure 20: Share of firms whose sustainability information was assured or not



Source: Own composition

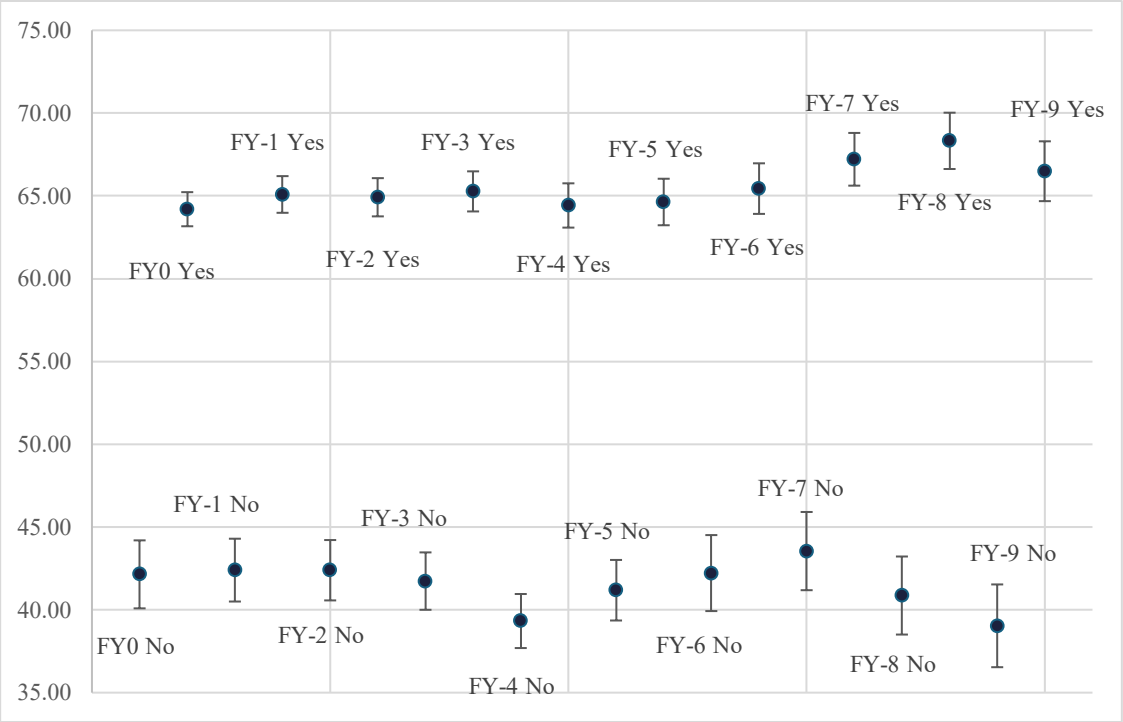
VI.4.1 Descriptive statistics

VI.4.1.1. Effect on ESG rating

Figure 20 illustrates the evolution of average ESG scores over the past 10 years for both assured and non-assured companies. To address the question of whether there is a significant difference between the average ESG scores of assured and non-assured companies, independent two-sample tests of expected values were performed at a 5% significance level. The application conditions of the test were met in all cases (sample size for both groups n > 100). To select the appropriate test statistic, homogeneity of variance

was examined in every case; this condition was not met in any year (Levene's Test for Equality of Variances Sig < 0.05). Consequently, the Welch test was used as the test statistic, where the Sig value was less than 0.05 in every instance, indicating a significant difference between the average ESG scores of assured and non-assured companies each year. The average ESG score for assured companies is significantly higher than that of non-assured companies. The corresponding 95% confidence interval estimates are shown in *Figure 21.*

Figure 21: 95% confidence intervals for the mean of the ESG score for assured and non-assured companies over the past 10 years



Source: Own composition

VI.4.1.2. Financial indicators

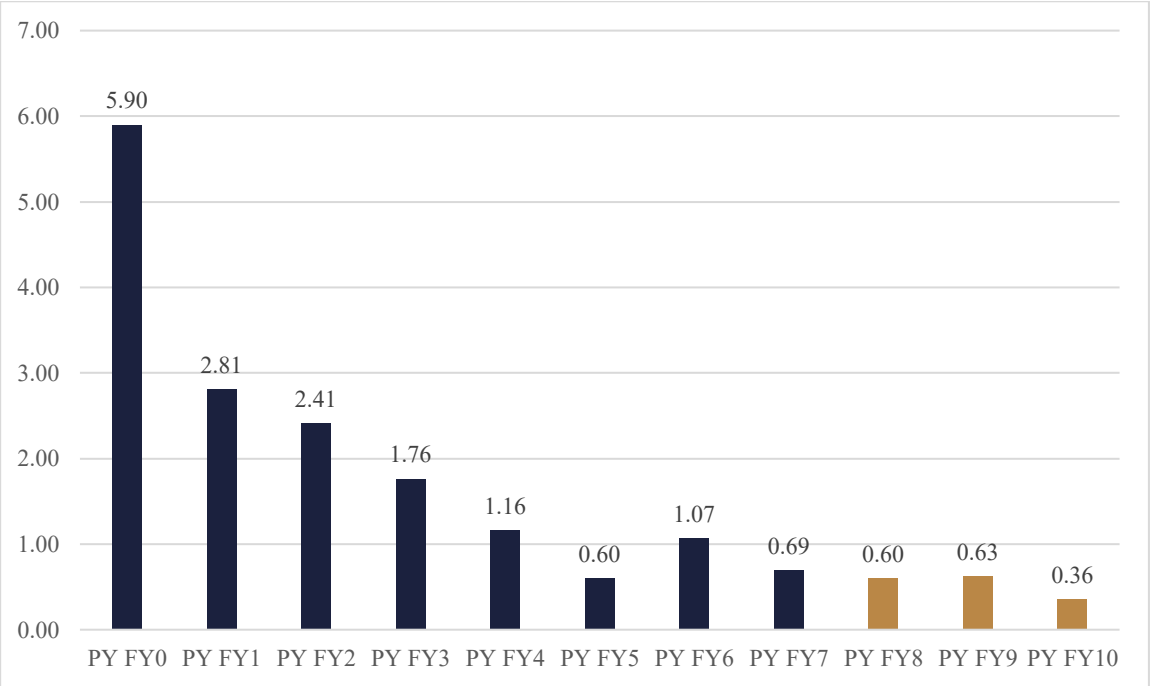
Several limitations arose in the analysis of the financial indicators. For some companies, certain indicators contained extreme outliers. These observations were retained; consequently, mean-based estimates and t-tests may be sensitive to influential values. The financial results should therefore be interpreted as descriptive and exploratory rather than robust. Future research should assess sensitivity to winsorisation or trimming and apply additional rank-based or median-based procedures. In addition, several indicators change sign over time, which limits the usefulness of logarithmic transformations and relative changes. Changes were therefore examined in absolute terms.

In the case of financial indicators, independent sample t-tests were also conducted; however, due to the presence of outliers, these results should be interpreted with caution. These results are presented in *Appendix IV.* for each financial indicator. Overall, we can conclude that these indicators do not consistently differ between assured and non-assured companies.

VI.4.2. Immediate year-on-year effects of ESG rating

First, the ESG score for a given year is compared to that of the previous year in absolute terms, illustrating the year-to-year trends in ESG scores. As shown in *Figure 22*, the largest average change occurs in the assurance year, when the ESG score is 5.9 points higher than in the previous year. The average change subsequently diminishes but remains positive throughout the period. At the 5% significance level, the difference is statistically distinguishable from zero during the first eight years. This pattern is consistent with an association between assurance adoption and higher subsequent ESG scores; however, the design cannot distinguish changes in underlying sustainability performance from selection, disclosure or rating-methodology effects (Quick & Inwinkl, 2020).

Figure 22: Average changes in ESG score compared to the previous year (PY)

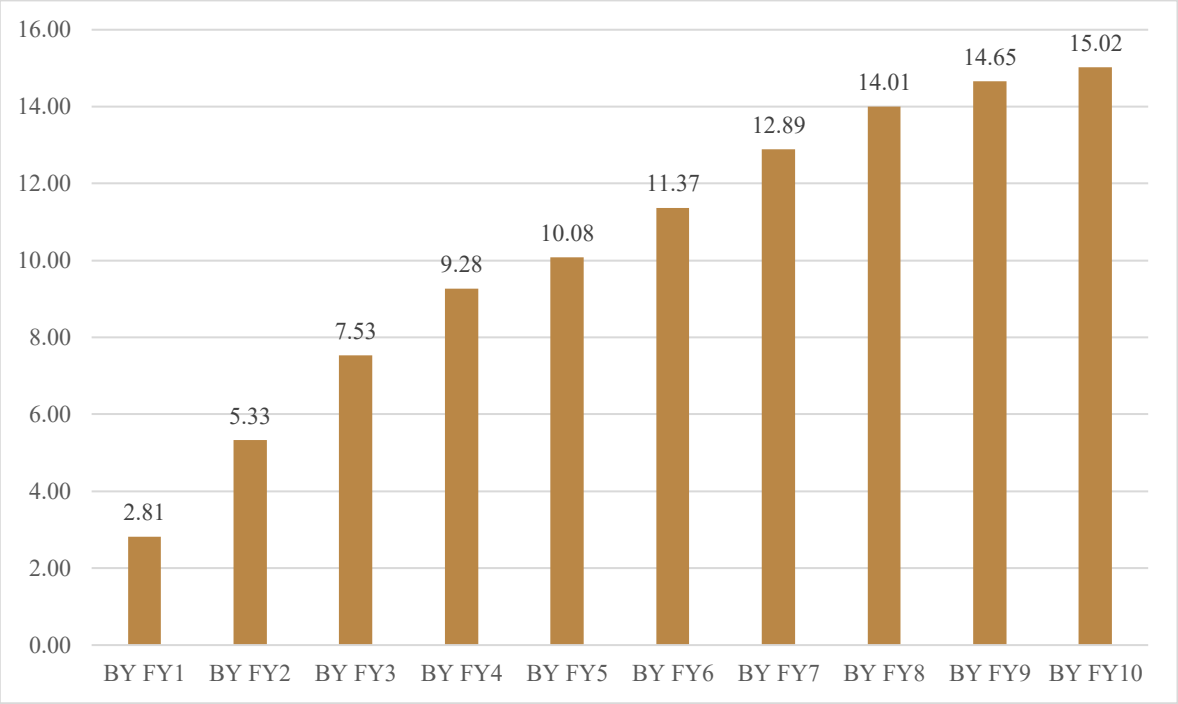


Source: Own composition

VI.4.3. Medium- and long-term effects relative to the assurance year of the ESG rating (BY)

Secondly, the ESG score was analysed in absolute terms relative to the assurance year. The first comparison is not statistically significant; therefore, the average difference increases relative to the assurance-year baseline (*Figure 23*). Among the 178 companies with observations extending for ten years or more, the average ESG score is 15.02 points higher at the end of the observed horizon than in the assurance year. The estimated differences are positive and statistically distinguishable from zero in each subsequent comparison ($p < 0.05$). This pattern is compatible with the learning-process interpretation proposed in prior research, but the present design cannot identify that mechanism or separate it from selection, disclosure and rating-model effects (Mio et al., 2024; Pizzi et al., 2024; Ulrich & Metzger, 2022).

Figure 23: Average changes in ESG score compared to the assurance year



Source: Own composition

VI.4.4. Immediate year-on-year effects of the financial indicators (PY)

Table 23: Changes in ROE, ROA, EBIT, D/E, and EPS relative to the immediately preceding fiscal year

	ROE			ROA			EBIT			D/E			EPS		
PY	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**
FY0	-	sig -	x	sig -	sig -	**sig -**	+	+	x	+	-	x	+	sig +	x
FY1	-	sig -	x	sig -	sig -	**sig -**	-	sig -	x	-	-	x	+	+	x
FY2	-	-	x	sig -	sig -	**sig -**	+	sig -	x	+	-	x	-	sig +	x
FY3	-	-	x	-	sig -	x	+	+	x	-	sig -	x	+	sig +	x
FY4	-	sig -	x	+	-	x	+	sig +	x	+	-	x	+	sig +	x
FY5	+	-	x	+	-	x	-	+	x	+	sig -	x	-	sig +	x
FY6	-	+	x	+	-	x	+	+	x	-	sig -	x	-	sig +	x
FY7	-	+	x	sig -	+	x	-	+	x	-	sig -	x	-	sig +	x
FY8	+	+	x	+	+	x	+	+	x	-	-	x	+	sig +	x
FY9	+	+	x	+	+	x	-	-	x	-	-	x	-	sig +	x
FY10	+	-	x	+	-	x	+	+	x	-	-	x	-	+	x

Source: Own composition

Table 23 shows changes in ROE, ROA, EBIT, D/E, and EPS relative to the immediately preceding fiscal year. In the assurance year, ROA decreases significantly under both the mean- and median-based tests, whereas the decline in ROE is significant only under the median-based test. The ROA result is therefore robust under the study's joint criterion, while the ROE evidence is test-specific. The observed pattern may be compatible with short-term implementation and compliance costs associated with assured sustainability reporting systems; however, the analysis does not directly identify or test this cost mechanism.

For EBIT, the mean and median-based estimates in the assurance year are positive but not statistically significant; accordingly, EBIT is not jointly significant under the study's criterion. The D/E ratio exhibits mixed, mostly non-significant movements. The median EPS is higher in the assurance year, suggesting that investors may interpret assured sustainability reporting as a positive signal and partially capitalize it into per-share earnings, even as traditional profitability ratios weaken. In the years following assurance, the PY panel exhibits heterogeneous patterns across indicators and horizons, with no single monotonic trend dominating the post-assurance period.

VI.4.5. Medium- and long-term effects relative to the assurance year of the financial indicators (BY)

Table 24: Changes in ROE, ROA, EBIT, D/E, and EPS relative to the first assured fiscal year

	ROE			ROA			EBIT			D/E			EPS		
BY	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**	**Mean**	**Median**	**Joint**
FY1	+	sig -	x	+	sig -	x	-	sig -	x	+	-	x	+	+	x
FY2	+	sig -	x	+	sig -	x	+	+	x	+	+	x	+	sig +	x
FY3	-	sig -	x	+	sig -	x	-	-	x	-	+	x	+	sig +	x
FY4	sig -	sig -	**sig -**	+	sig -	x	-	+	x	+	+	x	+	sig +	x
FY5	sig -	-	x	sig -	sig -	**sig -**	-	+	x	+	+	x	+	sig +	x
FY6	sig -	sig -	**sig -**	sig -	sig -	**sig -**	sig -	-	x	+	+	x	+	sig +	x
FY7	sig -	sig -	**sig -**	sig -	sig -	**sig -**	-	-	x	-	-	x	+	sig +	x
FY8	sig -	-	x	+	sig -	x	-	-	x	-	-	x	+	sig +	x
FY9	-	-	x	-	-	x	sig -	-	x	-	-	x	+	sig +	x
FY10	+	+	x	-	-	x	-	-	x	-	-	x	+	sig +	x

Source: Own composition

Table 24 re-anchors the analysis at the first assurance year and compares subsequent observations with this baseline. ROE and ROA are lower than their assurance-year values in several subsequent comparisons, although the direction and statistical significance vary across years and between the mean- and median-based tests. These results describe differences relative to the assurance-year baseline; they do not show whether profitability returned to a pre-assurance level. The pattern may be compatible with resource reallocation or continuing assurance-related expenditure; however, the data do not allow us to test these mechanisms directly.

EBIT shows a more scattered, less pronounced negative shift, suggesting that the effect on operating profit is weaker than on yield-based indicators. The D/E ratio continues to exhibit small, directionally mixed changes without a stable trend, suggesting that we do not observe clear, systematic changes in leverage around the assurance event in this sample. EPS, however, exhibits a different profile: over several post-assurance years, EPS changes are predominantly positive or non-significant, with multiple instances of statistically significant increases relative to the assurance year. This divergence between accounting profitability and EPS suggests that while firms may accept somewhat lower ROE and ROA in the wake of assurance, capital markets do not necessarily penalise them; instead, assured sustainability reporting may strengthen perceived credibility and support shareholder-value creation through signalling and reduced information risk.

Overall, the descriptive results indicate a combination of cost and signalling effects. The onset of sustainability assurance coincides with a short-term reduction in traditional profitability ratios and a more persistent moderate drag on ROE and ROA, consistent with higher reporting and system-building costs. At the same time, EPS reacts more favourably, pointing to potential benefits in terms of reputation and information risk that can offset these costs from an investor's perspective. The results motivate, rather than establish, explanations based on costs, credibility or information risk.

VI.5. Conclusion

This study examined how the adoption of sustainability assurance relates to the evolution of ESG ratings and selected financial indicators for large EU companies. The empirical results indicate associations between the first assurance year and higher ESG scores in the observed sample, but the design does not permit definitive causal conclusions. The analysis reveals that firms introducing external sustainability assurance experience significantly higher ESG ratings: in the assurance year itself, ESG scores increase by an average of 5.9 points compared to the prior year, and this positive shift remains statistically significant for the first eight post-assurance years.

When ESG scores are re-anchored to the assurance year, the observed differences increase over the subsequent horizon; among companies with ten or more years of observations, the average difference reaches approximately 15 points relative to the assurance-year baseline. This pattern, which shows both an immediate uplift and a persistent cumulative trend, is consistent with theories of organisational learning and legitimacy enhancement: external assurance not only validates existing ESG performance but also can catalyse internal processes, improve governance, enhance data collection and strengthen controls that support ongoing improvements in sustainability practices and their reporting (Mio et al., 2024; Pizzi et al., 2024; Ulrich & Metzger, 2022).

These findings contribute to the debate on whether ESG ratings capture underlying sustainability performance, disclosure practices, or a combination of both. By highlighting that assurance was associated with a sustained, statistically significant improvement in ESG ratings within the sample under study, the study provides evidence that the introduction of external assurance is generally associated with higher ESG ratings over the subsequent several years. This trend is consistent with an increase in information content

and a reduction in information asymmetry, although other explanations (such as concurrent changes in disclosure strategy or rating methodology) cannot be ruled out.

Simultaneously, the study examined how firms' financial performance evolves around the introduction of assurance, employing both year-on-year (PY) and base-year (BY) reference frames to distinguish short-lived cost effects from longer-term trends. The results reveal a nuanced picture consistent with a combination of compliance costs and positive signalling. In the immediate assurance year, profitability measures (ROE and ROA) decline significantly, which is compatible with the short-term implementation of assured sustainability reporting systems, including infrastructure investments, training and assurance fees (Christensen et al., 2024).

This short-term downturn is not fully reversed in the medium term: the BY analysis shows that ROE and ROA remain below their assurance-year levels for several subsequent years, suggesting a persistent moderate reduction in conventional profitability linked to ongoing sustainability investments and assurance costs. However, this sacrifice of profitability does not translate into shareholder value destruction. In contrast, earnings per share (EPS) increase significantly in the assurance year and maintain positive momentum over the medium and longer term, suggesting that capital markets may interpret assured sustainability reporting as a credible signal of improved governance, reduced non-financial risk and enhanced long-term resilience.

The strong, sustained growth in assurance adoption across the sample (from fewer than 5% of firms in the pre-CSRD period to over 70% by the assurance year) is consistent with the interpretation that many firms and stakeholders perceive assurance as valuable, even though this perception is not directly observed in the data, despite its short-term profitability costs. This divergence between accounting profitability and market value supports signalling theory: by subjecting sustainability information to rigorous external scrutiny, firms credibly communicate their commitment to genuine sustainability performance and integrated governance, which investors appear to reward through stronger per-share returns even when traditional return-on-capital metrics temporarily weaken.

Drawing on stakeholder, legitimacy, institutional, agency and related theories, the study suggests that external assurance operates simultaneously as a compliance response to regulatory and social pressures and as a strategic lever for enhancing corporate

transparency and market credibility. The evidence indicates that assurance can function as more than a symbolic gesture and may operate as a substantive governance mechanism that is associated with both higher-quality non-financial disclosures and a stronger strategic orientation towards sustainability.

The interaction between assurance and ESG ratings is relevant because the usefulness of ESG metrics depends in part on the quality of the underlying data. For banks and other financial institutions, more reliable sustainability information may support partner assessments and the integration of environmental and social risks into credit and investment processes. At a policy level, improved assurance could support more reliable sustainability information; whether this translates into systemic resilience, better risk pricing, or greater capital-market integrity remains an open empirical question.

Despite these contributions, several limitations warrant emphasis. First, the analysis is restricted to firms for which both financial and ESG assurance data are available, likely biasing the sample towards larger, more transparent companies and sectors with advanced reporting practices. This selection bias may overstate the average effect of assurance for the broader population of EU firms. Second, the study does not fully control for concurrent shocks, strategic corporate decisions or macroeconomic developments that may independently affect firms' performance around the assurance event. Third, while the PY and BY designs provide insight into the dynamics surrounding assurance adoption, the limited time-series depth (particularly for the post-CSRD period) restricts the ability to distinguish sustained trends from cyclical fluctuations.

Fourth, ESG ratings themselves are subject to measurement error, methodological differences between providers and inherent limitations in the assessment of sustainability performance. The study inherits these constraints and does not independently validate the rating methodology. Fifth, the analysis captures the presence and timing of assurance but has limited information on qualitative characteristics, such as scope, materiality, testing procedures, and provider credentials. Finally, the study covers an early phase of CSRD implementation, when limited assurance dominates, and the regulatory regime is still evolving. The findings may therefore not be extrapolated to a more mature amended CSRD regime or to voluntary reasonable-assurance engagements, which are outside the mandatory limited-assurance framework retained by Directive (EU) 2026/470.

A key limitation is potential self-selection into assurance: firms that choose to obtain external assurance may differ systematically from those that do not, in ways that are not fully observable in our data (for example, in ESG capabilities, governance quality, or strategic orientation). As a result, part of the observed differences in ESG ratings and financial performance around the assurance event may reflect these underlying differences rather than the effect of assurance itself. Moreover, the analysis is based on one ESG rating provider, whose methodology may change over time. In rating models, methodological adjustments cannot be completely separated from changes in the underlying ESG performance.

These limitations point to several directions for future research. Linking detailed assurance-report characteristics to firm-level outcomes would clarify how provider, scope, procedures, and assurance level relate to disclosure quality and financial performance. Comparative analyses across sectors and countries, including granular comparisons between banks and non-financial corporations, could reveal sector-specific mechanisms. Combining large-sample quantitative designs with qualitative and case-study approaches would help determine whether organisational changes reflect improvements in underlying sustainability performance or primarily in reporting. Longitudinal studies tracking ESG rating changes alongside assurance adoption, controlling for firm and industry fixed effects, would strengthen causal inference. As more CSRD-era data become available, such research can assess the effects of the amended limited-assurance framework and compare it with any voluntary use of more extensive assurance.

Appendix II.

Limited or reasonable assurance in sustainability reporting:

Sustainability assurance is provided at two main levels:

1. Limited assurance provides a lower level of assurance than reasonable assurance. The nature, timing and extent of procedures are less extensive and depend on the engagement circumstances; they are not limited to inquiries and analytical review. The conclusion is ordinarily expressed in negative form ("nothing has come to our attention…").
2. Reasonable assurance provides a high, but not absolute, level of assurance. It involves more extensive evidence-gathering and ordinarily culminates in a positively worded conclusion that the information is prepared, in all material respects, in accordance with the applicable criteria.

Under Directive (EU) 2026/470, the mandatory progression from limited to reasonable assurance was removed. Accordingly, sustainability statements prepared by undertakings that remain within the CSRD scope are subject to limited assurance under the amended EU framework. This statement concerns CSRD sustainability statements and should not be generalised to all ESG disclosures or to voluntary assurance engagements.

Implications of the Omnibus package for assurance:

1. The Stop-the-Clock amendments and the substantive Omnibus I reform alter the timing and scope of reporting and assurance obligations. Their practical application must also take account of national transposition.
2. The revised CSRD thresholds move some undertakings outside the mandatory reporting and assurance scope. Out-of-scope firms may choose voluntary reporting and assurance in response to contractual or market demand, but the CSRD does not require them to do so.
3. For researchers, the reforms may create opportunities for future quasi-experimental designs, provided that scope and timing changes generate credible treatment and comparison groups and that the relevant identification assumptions are supported.

Overall, the amended framework retains double materiality and mandatory limited assurance for undertakings remaining within scope, while narrowing the scope and simplifying reporting requirements. The reform preserves core elements of the CSRD but materially recalibrates its coverage and removes the previously envisaged mandatory transition to reasonable assurance.

Appendix III.

Table 25: Summary of literature research by applied methods

Main category	Method type	References
Quantitative methods	**Panel regression**	Alia et al. (2024); Chen et al. (2025); Dincer et al. (2023); Permatasari & Gunawan (2022); Uwuigbe et al. (2018);
	Linear regression	Al-Shaer (2020); Al-Shaer & Zaman (2018); Alia et al. (2024); Amran & Haniffa (2011); Buallay & Al-Ajmi (2020); Buallay & AlDhaen (2018); Dewi & Safitri. (2023); Fernandez-Feijoo et al. (2018); Gnanaweera & Kunori (2018); Hidayah et al. (2019); Kaspereit & Lopatta (2011); Tumwebaze et al. (2022)
	Content analysis	Gnanaweera & Kunori (2018); Hegedűs et al. (2023); Karai & Dragonya (2024); Nnedu (2024); Uwuigbe et al. (2018)
	Descriptive statistics/association analysis	Alsahali & Malagueño (2021); Dash & Dey (2023); Hegedűs et al. (2023)
Qualitative and mixed methods	**Interview and questionnaire-based research**	Amran & Haniffa (2011); Azzari et al. (2024); Ramos et al. (2013); Tumwebaze et al. (2022)
Literature review	**Theoretical/thematic review**	Gold & Taib (2020); Pinto & Bandeira (2013); Slater & Gilbert (2004); Tsagas & de Villiers (2020)
	Systematic review	Jámbor & Zanócz (2023)

Source: own composition

Table 26: Summary of literature research by applied regional allocation

Focus region category	Description	References
European Union focus	Direct focus on the European Union.	Hegedűs et al. (2023); Karai & Dragonya (2024); Kaspereit & Lopatta (2011); Ramos et al. (2013); Tsagas & de Villiers (2020)
Europe focus	More general European research (e.g., London as a financial hub).	Al-Shaer (2020); Al-Shaer & Zaman (2018); Chen et al. (2025)
Global focus	Studies examining a worldwide sample or multiple regions.	Alsahali & Malagueño (2021); Fernandez-Feijoo et al. (2018); Gold & Taib (2020); Jámbor & Zanócz (2023); Nnedu (2024); Permatasari & Gunawan (2022); Pinto & Bandeira (2013); Slater & Gilbert (2004)
Non-Europe regions focus	Studies explicitly focusing on areas outside Europe.	Alia et al. (2024); Amran & Haniffa (2011); Azzari et al. (2024); Buallay & Al-Ajmi (2020); Buallay & AlDhaen (2018); Dash & Dey (2023); Dewi & Safitri, (2023); Dincer et al. (2023); Gnanaweera & Kunori (2018); Hidayah et al. (2019); Tumwebaze et al. (2022); Uwuigbe et al. (2018)

Source: own composition

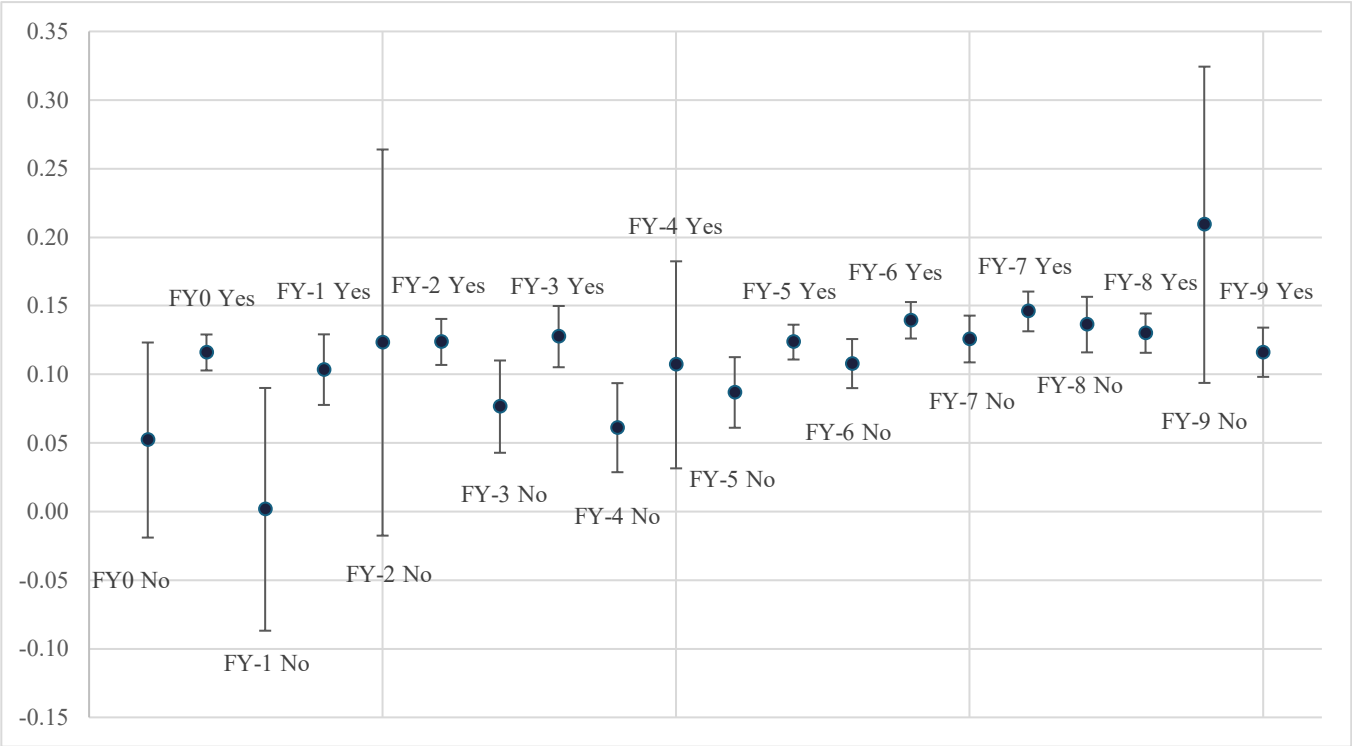
Table 27: Summary of literature research by applied regional breakdown

Continent/ region	References
Africa	Gold & Taib (2020); Tumwebaze et al. (2022); Uwuigbe et al. (2018)
Asia	Alia et al. (2024); Dash & Dey (2023); Dewi & Safitri, (2023); Dincer et al. (2023); Gnanaweera & Kunori (2018); Gold & Taib (2020); Hidayah et al. (2019); Hidayah et al. (2023); Slater & Gilbert (2004)
Europe	Al-Shaer (2020); Al-Shaer & Zaman (2018); Alsahali & Malagueño (2021); Fernandez-Feijoo et al. (2018); Gold & Taib (2020); Hegedűs et al. (2023); Karai & Dragonya (2024); Kaspereit & Lopatta (2011); Permatasari & Guanawan (2022); Pinto & Bandeira (2013); Ramos et al. (2013); Slater & Gilbert (2004); Tsagas & de Villiers (2020)
Latin America	Azzari et al. (2024); Fernandez-Feijoo et al. (2018); Gold & Taib (2020)
North America	Fernandez-Feijoo et al. (2018); Gold & Taib (2020)

Source: own composition

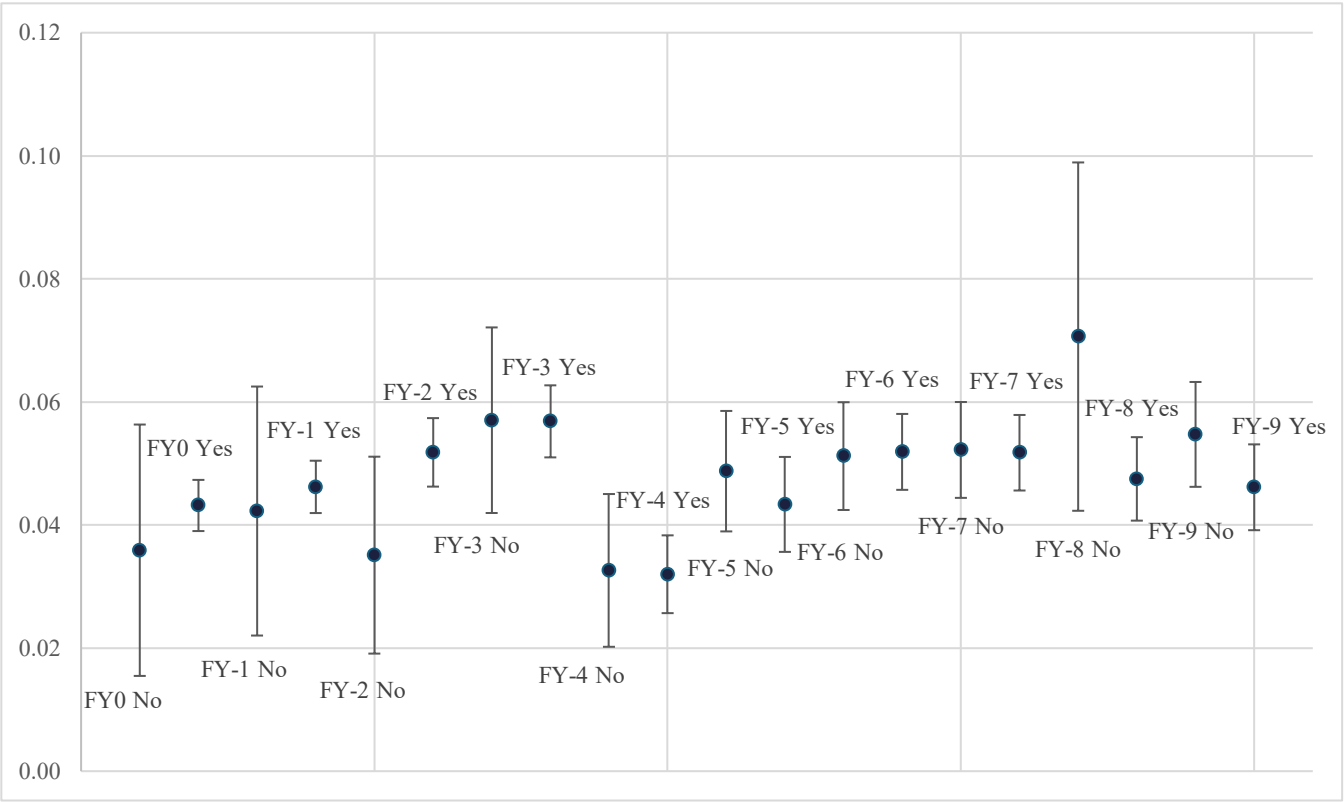
Appendix IV.

Figure 24: 95% confidence intervals for the mean in the case of ROE



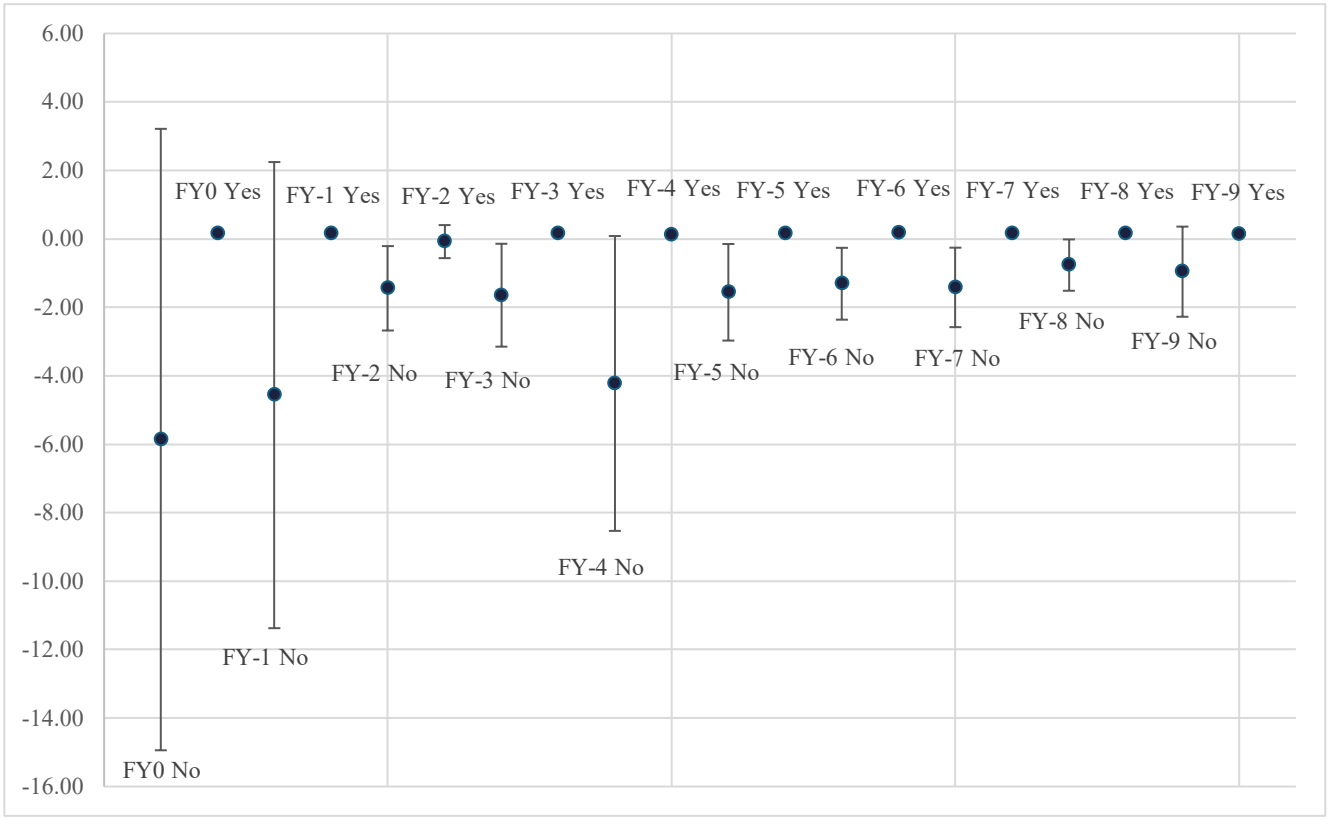
Source: Own composition

Figure 25: 95% confidence intervals for the mean in the case of ROA



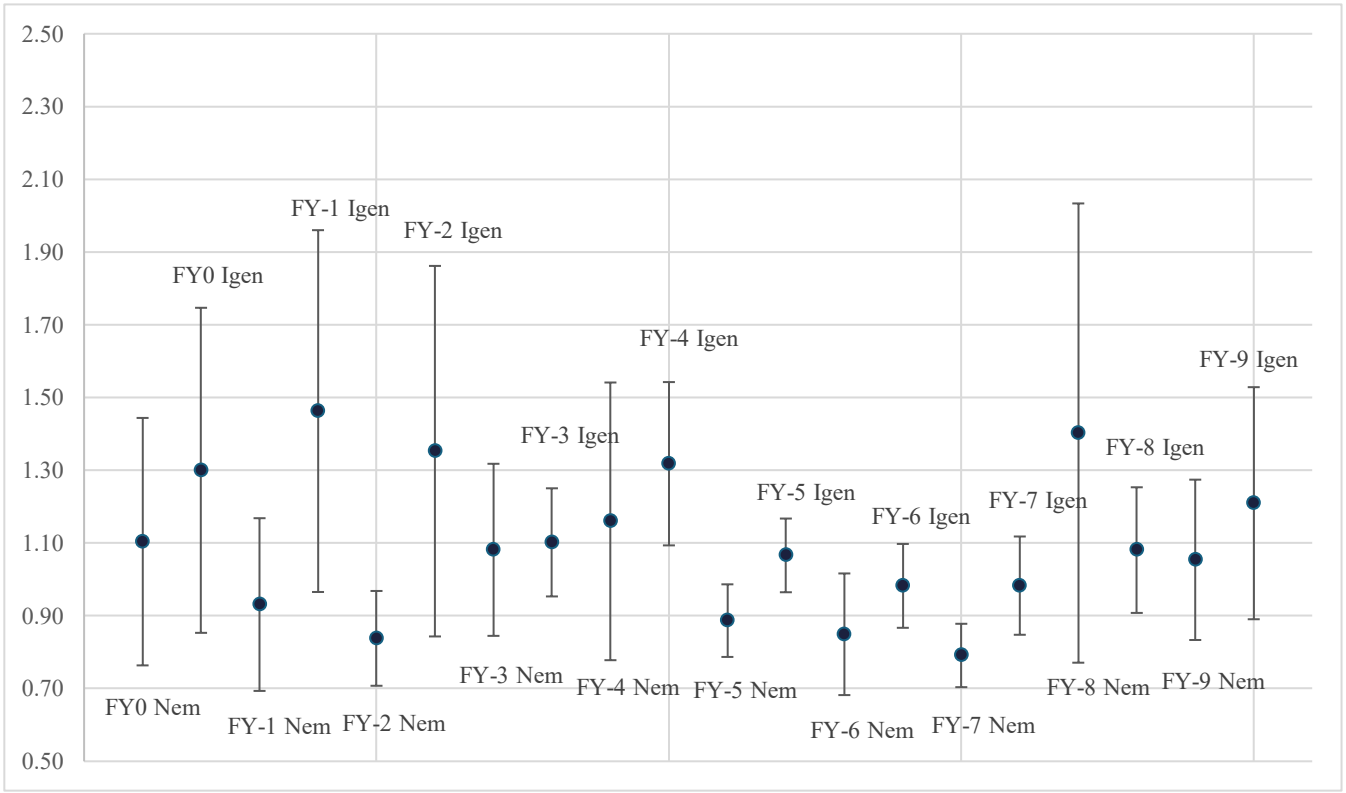
Source: Own composition

Figure 26: 95% confidence intervals for the mean in the case of EBIT



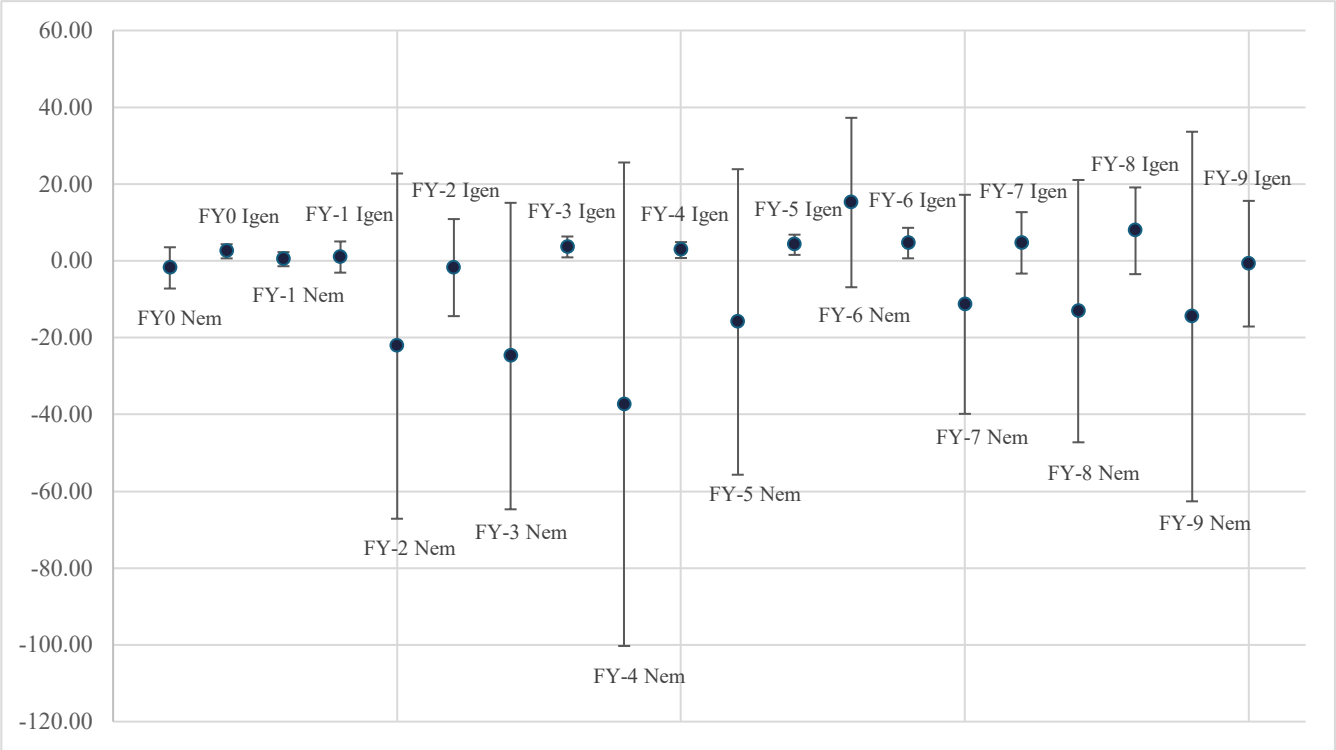
Source: Own composition

Figure 27: 95% confidence intervals for the mean in the case of D/E



Source: Own composition

Figure 28: 95% confidence intervals for the mean in the case of EPS



Source: Own composition

VII. Summary of the dissertation

Sustainability reporting and sustainability assurance have undergone rapid and profound changes in recent years, making the reliability and decision-making usefulness of ESG information a central issue for regulators, investors, and companies alike. In my doctoral dissertation, I examine how sustainability assurance can improve the quality, credibility, and reliability of non-financial information, thereby supporting the European Union's sustainability efforts. This topic is closely related to my professional career: through my work as a consultant, my postgraduate studies in ESG, and my university teaching activities, I am constantly dealing with the practical and theoretical challenges of ESG reporting, regulation, and assurance.

The dissertation follows an article-based structure built around four interrelated studies. The first article, a systematic literature review, maps the conceptual and methodological background of ESG reporting, ratings, and scores, and identifies key gaps in existing research related to measurement heterogeneity, the risks of greenwashing, and the limited role of assurance. The second article, based on interviews with Hungarian Public Interest Entities, examines how organisations prepare for CSRD-compliant reporting and reveals the hidden complexities of data systems, governance arrangements, and assurance readiness in a country-specific context. The third study analyses trends in non-financial reporting and assurance in selected Central European countries, documenting the uneven uptake of external assurance and the persistent heterogeneity of disclosure practices despite EU-level regulation. The fourth, quantitative article uses a large, EU-wide panel of listed companies to examine whether the introduction of external sustainability assurance is associated with changes in companies' ESG ratings and financial performance, and if so, how (*Table 28*).

In this concluding chapter, I first summarize the main research findings and limitations of each study in an integrated table, highlighting how they collectively answer the dissertation's overarching research question. This is followed by a synthesis of this knowledge in a conceptual framework that links EU-level regulation, national transposition, corporate sustainability reporting practices, and assurance outcomes. Building on the empirical findings of the four studies, the chapter then proposes a targeted research agenda addressing greenwashing risks, organisational transformation, the capital-market pricing of assured ESG information, and the real-economy impacts of mandatory assurance.

Table 28: Summary of the main research results of the dissertation

Articles	Main research result
The Diversity of Environmental, Social, and Governance Aspects in Sustainability: A Systematic Literature Review – (Jámbor & Zanócz, 2023)	ESG reporting and ESG ratings have become central in sustainable finance research, but there is substantial heterogeneity and subjectivity in definitions, methodologies, and rating practices. Four main themes are identified – ESG reporting, ESG ratings, ESG scores, and CSR - with quantitative methods dominating (65% of studies), followed by literature reviews (25%) and qualitative approaches (10%). The review finds that ESG scores and ratings often rely on diverse, opaque methodologies, leading to inconsistent assessments and potential misuse by firms and investors; ESG reports alone do not guarantee credibility, transparency or accountability. Weak regulation, measurement complexity, and low transparency create room for greenwashing and undermine trust, highlighting the need for stronger auditing/assurance of ESG information, clearer regulatory frameworks, and better education for decision-makers on how to interpret ESG metrics.
Review of Preparations for CSRD: An Examination of the Hidden Complexity of Sustainability Reports at Hungarian Public Interest Entities Based on Interviews – (Jámbor & Zanócz, 2026)	Hungarian Public Interest Entities have generally recognised the strategic importance of the CSRD and have started aligning reporting practices, but their preparedness is uneven and often overstated in formal disclosures. Companies face major challenges in fragmented and non-integrated data systems, weak internal controls over non-financial data, limited human resources and expertise, and uncertainty about evolving ESRS and assurance requirements. External assurance is perceived as the next major "bottleneck": firms regard it as one of the most complex and resource-intensive elements of CSRD compliance, and many are not yet ready for assured, investment-grade non-financial data. The study concludes that effective CSRD implementation in Hungary will require not only regulatory pressure but also capacity-building, clearer guidance, better data infrastructures and closer collaboration between firms, auditors and regulators.

Articles	Main research result
Non-Financial Reporting and Assurance Trends in Selected Central European Countries – (Zanócz, 2025)	Non-financial reporting has expanded substantially among large companies in the examined Central European countries, largely driven by the EU's NFRD and national transpositions, but the depth, structure and quality of disclosures remain heterogeneous. External assurance of non-financial information is still the exception rather than the rule, and where assurance is provided, it often takes the form of limited assurance with varying scopes and provider types. Cross-country comparison shows differences in the occurrence of reporting frameworks, the role of Big4 vs. other assurers, and the extent to which non-financial statements are integrated with financial reporting. Overall, the study concludes that although regulatory pressure has increased the reporting of non-financial information, Central European countries still face significant gaps in terms of assurance coverage and standardization. The research shows that firms in the observed sample typically obtained assurance after approximately three reporting cycles, with sufficient data quality and complexity. This highlights the importance of the upcoming CSRD system in improving the transparency, reliability, and comparability of sustainability information.
Expected Impact of Assurance on the Sustainability Disclosure of Large Companies in the European Union – (Zanócz & Bodó, n.d.)	Assured firms have significantly higher average ESG scores than non-assured firms in every year examined (Welch tests, 5% level). At firm level, the strongest increase in ESG scores is observed in the assurance year, averaging 5.9 points relative to the previous year, while significantly positive changes remain observable during the first eight post-assurance years. Relative to the assurance year, firms with at least ten years of available data exhibit an average cumulative increase of approximately 15 ESG points. These findings indicate a sustained temporal association between the introduction of assurance and higher ESG scores that is consistent with learning and legitimacy-based interpretations, but they do not establish a causal effect of assurance. Applying the study's robustness criterion (agreement of mean- and median-based tests),

Articles	Main research result
	the financial evidence is confined to a short- to medium-term decline in ROA and, in part, ROE, consistent with implementation and compliance costs. For EBIT, D/E and EPS the median-based patterns are not corroborated by mean-based tests, and D/E shows no systematic capital-structure break. A possible signalling channel suggested by EPS is reported as an observation requiring market-based measures, not as a finding.

Source: Own composition based on the research articles

VII.1. Summary of thesis statements

The four articles answer the specific research questions of the dissertation (*Table 1*) separately, while the main research question can only be answered by integrating their results. *Table 29* therefore condenses the main findings into thesis points and thesis statements. Each thesis point is a short, numbered summary of a finding, and the related thesis statement formulates the empirically or conceptually supported claim behind it. Theses T1–T4b are linked to the research question of the article they are derived from, while thesis T5 answers the main research question at the level of the dissertation.

In line with the observational designs of the empirical studies, the thesis statements express associations and patterns rather than causal effects, and they should be read together with the limitations summarised in *Table 30*.

Table 29: Thesis points and thesis statements of the dissertation

No.	Source (article, RQ)	Thesis point	Thesis statement
T1	**Article 1 (Chapter III.)** RQ1	*ESG information is conceptually and methodologically fragmented.*	The systematic review of 40 journal articles selected from Web of Science and Scopus shows that ESG research is organised around four thematic pillars (ESG reporting, ESG ratings, ESG scores and CSR in investments) and is dominated by quantitative, mainly global-sample studies (65%). Because rating providers rely on different data, variables, weights and methodologies, ESG ratings and scores are inconsistent and only partially comparable, and ESG reports alone do not guarantee credibility, transparency or accountability. This fragmentation creates room for greenwashing and provides the conceptual justification for harmonised reporting standards and independent assurance of ESG information.
T2	**Article 2 (Chapter IV.)** RQ2	*CSRD preparedness of Hungarian PIEs is uneven, and external assurance is the critical bottleneck.*	Based on eleven semi-structured interviews with ESG and sustainability leaders of Hungarian Public Interest Entities (2024), CSRD preparation is strongly regulation-driven, but organisational readiness is uneven and often less advanced than formal disclosures suggest. The main barriers are fragmented and non-integrated data systems, weak internal controls over non-financial data, limited ESG expertise and human capacity, and uncertainty about the evolving ESRS and assurance requirements. Interviewees regard external assurance as the next major milestone and the most complex, resource-intensive element of CSRD compliance; prior NFRD/GRI reporting experience and group structure shape readiness. Assurance-ready reporting therefore requires investment in data infrastructure, internal controls and competences, not only regulatory pressure.

No.	Source (article, RQ)	Thesis point	Thesis statement
T3a	**Article 3 (Chapter V.)** RQ3a	*External assurance follows a reporting-maturity path.*	Among 83 large listed companies from selected Central European countries (2002–2022), 67 of which published non-financial reports, external assurance is typically obtained only after a learning period: the Kaplan–Meier median time from the first non-financial report to the first externally assured report is three years (95% CI: 1.35–4.65 years; mean: 5.3 years). Assurance therefore appears as the outcome of accumulated reporting experience and data maturity rather than an immediate step.
T3b	**Article 3 (Chapter V.)** RQ3b	*Time-to-assurance differs by industry, and national assurance rules remain heterogeneous.*	Companies in the energy, technology and utilities sectors obtain third-party assurance significantly earlier than companies in other sectors ($p < 0.05$), which is consistent with stronger stakeholder and peer pressure and higher greenwashing exposure in these industries. At the same time, the national transposition of the CSRD and its assurance-related rules differed considerably across the countries examined, so companies start the mandatory assurance regime from different institutional positions.
T3c	**Article 3 (Chapter V.)** RQ3c	*The assurance market is consolidating towards audit firms, particularly the Big Four.*	In the early NFRD years, first-time assurance was frequently provided by engineering or consultancy firms; subsequent provider switching gradually concentrated the market in accounting and audit firms, above all the Big Four. This shift anticipates the more rigorous, ISAE 3000-based assurance regime of the CSRD, while frequent provider switching and the lack of a common assurance framework still limit the comparability of assurance results.

No.	Source (article, RQ)	Thesis point	Thesis statement
T4a	**Article 4 (Chapter VI.)** RQ4a	*The introduction of assurance is associated with higher and increasing ESG scores.*	In a panel of 1,070 EU-listed companies (Refinitiv/LSEG data), assured firms have significantly higher mean ESG scores than non-assured firms in every year examined. ESG scores increase by 5.9 points on average in the first assurance year compared with the previous year, the positive year-on-year changes remain significant during the first eight post-assurance years, and firms with at least ten years of data show a cumulative increase of approximately 15 points relative to the assurance year. This is a sustained temporal association consistent with organisational learning and legitimacy-based interpretations, not evidence of a causal effect of assurance.
T4b	**Article 4 (Chapter VI.)** RQ4b	*Assurance adoption coincides with a short- to medium-term decline in accounting-based profitability.*	Applying the study's robustness criterion, under which a change is treated as established only where mean- and median-based tests agree, ROA and, in part, ROE decline in the assurance year and remain below their assurance-year levels over the short to medium term, which is consistent with implementation and compliance costs. For EBIT, D/E and EPS the median-based patterns are not corroborated by mean-based tests; D/E shows no systematic capital-structure break. Because EPS is an accounting measure, it cannot evidence capital-market pricing; a possible signalling channel is therefore an observation for further market-based research, not a thesis of the dissertation.

No.	Source (article, RQ)	Thesis point	Thesis statement
T5	**Synthesis of Articles 1–4** Main RQ	*Assurance is embedded in a multi-level reporting-maturity process and can function as a credibility mechanism.*	Taken together, the four studies show that sustainability assurance is associated with more reliable sustainability reporting not as an isolated audit event but as part of a multi-level process: EU regulation and national transposition shape disclosure expectations; companies build the governance, data and control systems required for assurance-ready information; reporting maturity precedes assurance; and the introduction of assurance is associated with higher ESG scores alongside short- to medium-term profitability costs. The reliability of sustainability information therefore depends jointly on coherent standards, solid governance and data systems, and independent assurance.

Source: Own composition based on the research articles

VII.2. Cross-articles synthesis: from fragmented ESG information to assurance-ready sustainability reporting

The four articles comprising the thesis do not simply represent four independent research projects but rather form a research programme in which each article builds upon the previous one. Together, they describe the developmental process from conceptual fragmentation through regulatory formalisation, organisational implementation and assurance maturity to the analysis of results. The systematic literature review reveals the fragmented nature of ESG terminology, reporting practices, assessment methodologies and assurance approaches. The Hungarian interview-based study then examines how these conceptual and regulatory requirements are translated into organisational practice in a qualitative way. The quantitative study on Central and Eastern Europe examines whether sustainability reporting is evolving towards external assurance through an observable process of maturity. Finally, the EU-level analysis examines whether the introduction of external assurance is correlated with changes in ESG ratings and key financial indicators.

The overall findings suggest that assurance should not be viewed as an isolated audit event occurring at the end of the reporting process. Rather, assurance is embedded within a broader organisational and institutional framework. Regulatory requirements influence

disclosure expectations; companies design their governance systems, data systems and control mechanisms accordingly; the maturity of reporting enables external audit; and assurance can enhance the credibility of information and its usefulness for decision-making.

This overview contributes to the literature by bringing together, within a single integrated framework, the theoretical issues of ESG measurement, national-level implementation experiences, regional assurance practices and corporate-level outcomes. Furthermore, it explains why the quality of sustainability reports cannot be assessed solely on the basis of the volume of information disclosed, ESG ratings or compliance with official regulatory requirements. Reliable sustainability information requires coherent standards, robust governance, credible data, well-documented materiality assessments, and independent assurance or certification.

VII.3. Contribution to literature

Across the four studies, sustainability assurance emerges less as a narrow compliance requirement and more as a credibility-enhancing mechanism that supports the EU's broader sustainability reporting and regulatory objectives. Prior research has already linked higher reporting or audit quality to enhanced financial reporting credibility and investor confidence (Al-Shaer, 2020; Al-Shaer & Zaman, 2018) and has argued that governance structures such as audit committees are central to credible sustainability communication (Buallay & Al-Ajmi, 2020; Buallay & AlDhaen, 2018). At the same time, research on ESG metrics and ratings shows how heterogeneous methods and non-transparent weightings undermine the reliability and usefulness of decisions based on ESG information (Capelle-Blancard & Petit, 2015; Aksoy et al., 2022; Adams & Abhayawansa, 2022). Taken together, these findings suggest that assurance can function as a bridge between fragmented ESG measurement practices and stakeholders' expectations of consistent, useful information; precisely the role that my empirical results attribute to external assurance under the emerging CSRD regime.

The systematic literature review confirms and extends recent bibliometric research, which finds that ESG reporting and sustainable finance research has grown rapidly but remains conceptually fragmented and methodologically uneven (Jain et al., 2019; Benameur et al., 2025; Ahmad et al., 2023). Similar to previous criticisms of GRI-based disclosures, which

claim that they promote symbolic reporting and greenwashing (Boiral, 2013; Biondi et al., 2020), the review documents substantial divergence in how ESG scores, ratings and reports are defined, structured and interpreted. Studies on the evolution of ESG frameworks emphasise that this plurality reflects a still-developing infrastructural field rather than a stable measurement system (Bose, 2020; Alamillos & de Mariz, 2022). By organising this heterogeneous body of work into four thematic pillars—reporting, ratings, scores and CSR—and highlighting the dominance of quantitative, market-oriented approaches, my analysis supports the need for stricter assurance requirements and regulatory harmonisation (Adams & Abhayawansa, 2022; Bruno & Lagasio, 2021) and provides a conceptual justification for treating assurance as a structural response to weaknesses in ESG infrastructure rather than as a purely reputational signal.

The interview-based study of Hungarian Public Interest Entities shows that many firms are still at a beginner or intermediate stage of sustainability 'maturity', with fragmented data systems, weak internal controls and limited ESG expertise. This is consistent with previous research on sustainability strategies and reporting maturity, which documents a long and uneven path from symbolic sustainability practices to embedded ones (Baumgartner & Ebner-Karestinos, 2010; Amran & Haniffa, 2011; Bednárová et al., 2019). My findings add a CSRD-specific perspective: interviewees perceive external assurance as both a necessary step towards credibility and one of the most complex components of compliance, echoing global concerns about assurance capacity, ethical risks and the need for specialised expertise (Alsahali & Malagueño, 2021; Boiral et al., 2019; Bakarich et al., 2023). In line with these studies, the Hungarian case suggests that assurance will improve information quality only if it is accompanied by investments in ESG data infrastructure, internal control systems and professional competencies.

The comparative analysis of selected Central European countries confirms that the NFRD has broadened the scope of non-financial reporting, but also that the depth of disclosure and assurance practices vary considerably across jurisdictions and sectors. This regional heterogeneity is consistent with previous studies showing that EU-level requirements are often implemented merely as 'window dressing' when national institutions and enforcement mechanisms are weak (Biondi et al., 2020; Boros et al., 2022), as well as with evidence that ESG regulation can have uneven global and sectoral impacts (Bruno & Lagasio, 2021; Alamillos & de Mariz, 2022). Existing research on banking and capital

market regulation similarly points to the tension between ambitious EU-wide ESG policies and uneven national implementation (Bruno & Lagasio, 2021; Ásványi et al., 2024). By tracking the time elapsed before adoption and the composition of assurance providers, my findings empirically support the argument that the CSRD's transition towards a mandatory, more uniform assurance system is a key mechanism for making corporate sustainability disclosures more comparable across jurisdictions and improving the decision-usefulness of ESG information for investors (Adams & Abhayawansa, 2022; Bofinger et al., 2022).

The EU-wide panel analysis shows that firms with externally assured sustainability reports tend to achieve higher and more persistent ESG ratings than comparable non-assured firms, and that the strongest increases occur around the first year of assurance. This is consistent with previous findings that higher-quality sustainability reporting and assurance are associated with greater transparency and stronger governance (Al-Shaer, 2020; Al-Mashhadani & Almashhadani, 2023) and supports the argument that markets regard credible ESG information as valuable (Bofinger et al., 2022; Bruna et al., 2022; Barbosa et al., 2023). At the same time, my results show a short-term decline in ROE and ROA around the assurance year, consistent with implementation and compliance costs, alongside a positive and durable response in EPS, suggesting that capital markets partly reward assured reporting despite its internal costs (Bofinger et al., 2022). This pattern qualifies previous meta-analyses, which generally identify a positive association between ESG and financial performance (Al-Mashhadani & Almashhadani, 2023), by showing that both the timing and the transmission channels of this relationship may depend on assurance practices and on how markets price information quality.

Taken together, the four studies complement and extend a rapidly growing body of literature that maps the evolution of ESG reporting, assurance and sustainable finance (Benameur et al., 2023; Benameur et al., 2025; Ahmad et al., 2023). At a conceptual level, the dissertation confirms the need for harmonised standards and assurance as prerequisites for decision-useful ESG information (Adams & Abhayawansa, 2022; Bose, 2020), while adding a multi-layered empirical perspective by documenting gaps in organisational readiness, regional differences in implementation, and firm-level effects on ratings and financial performance. The findings are consistent with earlier critiques of impression management and greenwashing in sustainability reporting (Boiral, 2013; Boiral et al., 2019), yet they show that external assurance introduced under the stricter EU regulatory

framework could gradually transform ESG information from symbolic disclosure into more credible, decision-useful reporting. In doing so, the dissertation contributes to a research stream that treats assurance not only as a technical verification exercise but also as a governance instrument linking EU-level regulation, national transposition and firm-level sustainability transformation (Brunelli et al., 2021).

These articles may, however, be subject to further limitations regarding their application and interpretation, as summarised in *Table 30*.

Table 30: Limitations of the four empirical articles

Articles	Main limitations
Article 1 (Chapter III.)	The review is based solely on academic journal articles indexed in Web of Science and Scopus and therefore excludes relevant contributions from legal studies, environmental science, public policy and practitioner reports, which may limit the completeness of the conceptual picture. The search strategy relies on the 'ESG' keyword in titles, abstracts and keywords, so studies that discuss non-financial reporting or sustainability disclosure without explicitly using the ESG label may be under-represented in the final sample. The focus on English-language publications further narrows the coverage of country-specific or regional debates in other languages, which could be particularly relevant in the EU context.
Article 2 (Chapter IV.)	The qualitative sample is limited to eleven large Hungarian Public Interest Entities and ESG/sustainability leaders, which provides rich, contextual insights but does not allow for statistical generalisation to all Hungarian companies or to other EU jurisdictions. The voluntary participation of interviewees may introduce self-selection bias, as more advanced or motivated organisations could be over-represented. In addition, the findings capture perceptions and experiences during an early phase of CSRD implementation, so they may not fully reflect later adjustments once the regulatory and assurance environment stabilises.

Articles	Main limitations
Article 3 (Chapter V.)	The study focuses on a subset of large issuers from selected Central and Eastern European countries, which limits the generalisability of the results to smaller firms or other EU regions. The analysis relies on secondary database information and publicly available reports; differences in disclosure practices, data availability and ESG coverage across countries and sectors may affect the comparability of the indicators. The survival and trend analyses capture associations between regulatory changes, reporting maturity and assurance adoption, but cannot fully control for unobserved institutional factors or establish causal relationships. The descriptive nature of the Kaplan–Meier and country-level analyses also means that the identified patterns should be interpreted as features of the available data rather than as statistically validated trends for all firms in the region; furthermore, the analyses do not rule out endogeneity in firms' assurance decisions.
Article 4 (Chapter VI.)	The panel is restricted to EU-listed firms for which ESG scores and financial data are available over the observation period, which may bias the sample towards larger and more transparent companies. Assurance is measured at the report level and does not capture potential differences in assurance scope, standards or provider quality, which may influence both ESG ratings and financial outcomes. The empirical design identifies temporal associations between the first year of assurance, changes in ESG scores and shifts in financial indicators, but endogeneity concerns remain, as firms may self-select into assurance in anticipation of performance changes or in response to other unobserved strategic and operational factors.

Source: Own composition based on the research articles

VII.4. Future research directions in the context of sustainability assurance

Building on the empirical findings of this dissertation, *Table 31* outlines four main directions for future research on sustainability assurance. First, there is a need for studies that examine whether and how external ESG assurance mitigates greenwashing risk by analysing the occurrence of controversies, scandals, and regulatory sanctions among assured versus non-assured firms, drawing on prior work on impression management in CSR reports (Boiral, 2013). Second, future research should investigate organisational change processes through longitudinal case studies, focusing on how corporate governance, ESG data infrastructures and internal control systems are transformed in the course of CSRD implementation, particularly in financial institutions, in line with insights from the integrated reporting literature (Eccles et al., 2014). Third, the capital-market pricing of assured ESG information offers a rich agenda for panel analyses that track how investors value the first assurance year and subsequent periods in terms of yield spreads, volatility, and cost of capital across sectors and jurisdictions, extending earlier evidence on non-financial disclosure and financing costs (Dhaliwal et al., 2014). Finally, beyond information quality, further research should explore the real-economy consequences of mandatory assurance by assessing whether it actually contributes to emission reductions, energy-efficiency investments, and social programmes, building on studies that link climate risk and corporate behaviour (Krueger et al., 2020).

Table 31: Future research directions

Research area	Future research direction	Source to build on
Assurance and greenwashing risk	Empirical studies on the extent to which external ESG assurance reduces the risk of greenwashing, for example, by analysing the incidence of controversies, scandals, or regulatory sanctions.	Boiral O (2013). Sustainability reports as simulacra? A counter-account of A and A+ GRI reports. *Accounting, Auditing & Accountability Journal*, Vol. 26 No. 7 pp. 1036–1071, doi: https://doi.org/10.1108/AAAJ-04-2012-00998

Research area	Future research direction	Source to build on
Organisational change, governance and ESG data systems	Longitudinal case studies on how corporate governance, data infrastructures and internal controls are transformed during the implementation of the CSRD, with particular emphasis on financial institutions.	Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science, 60*(11), 2835–2857. https://doi.org/10.1287/mnsc.2014.1984
Capital-market pricing of assured ESG information	Further panel studies on how the market prices the first year of assurance and subsequent periods (e.g. yield spreads, volatility, cost of capital) across sectors and countries.	Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting. *The Accounting Review*, *86*(1), 59–100. http://www.jstor.org/stable/29780225
Real-economy impact of assurance of transition	Research analysing the extent to which mandatory assurance actually stimulates real emission reductions, energy-efficiency investments or social programmes, beyond its effect on information quality.	Krueger P, Sautner Z., Starks T. L. (2020). The Importance of Climate Risks for Institutional Investors, The Review of Financial Studies, 33(3), 1067–1111, https://doi.org/10.1093/rfs/hhz137

Source: Own composition based on the earlier read articles

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Declaration on the Use of Generative AI

I, Anett Zanócz, PhD student (Neptun code: THBPUA), hereby declare that I used a generative artificial intelligence system or service in the preparation of my article-based doctoral dissertation in the Finance, Management and Accounting Doctoral Program, as follows:

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