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

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THESIS SUMMARY

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

for Ph.D. dissertation

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Budapest
2026

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I. Research background, context and relevance

I.1. Research problem and gaps

Sustainability reporting has become a central corporate reporting and accountability issue because environmental, social, and governance (ESG) matters increasingly affect companies' risk profiles, access to finance, strategic resilience, and stakeholder relationships. At the same time, conventional financial statements do not fully capture climate-related, environmental, social, and governance-related risks and opportunities. Corporate sustainability reporting is intended to address this information gap, but its decision usefulness depends on the quality, comparability, and credibility of the disclosed information (Christensen et al., 2024; Eccles et al., 2014; Amran & Ooi, 2014).

The European Union has progressively formalised this area through the Non-Financial Reporting Directive (NFRD), the Corporate Sustainability Reporting Directive (CSRD), the European Sustainability Reporting Standards (ESRS), the EU Taxonomy and sustainable-finance disclosure rules. The framework links corporate reporting with double materiality, value-chain considerations, and external assurance (Directive 2014/95/EU, 2014; Directive (EU) 2022/2464, 2022; European Commission, 2021; EFRAG, 2023; Deloitte, 2024). In Hungary, EU requirements are complemented by the domestic ESG Act, ESG certification requirements, and prudential ESG expectations for credit institutions (Ásványi et al., 2024; European Banking Authority, 2025; Hegedűs et al., 2023).

The central challenge is that ESG information is not automatically reliable simply because it is published or rated. ESG rating agencies use different methodologies, data sources, and weights (Berg et al., 2022; Christensen et al., 2022; Capizzi et al., 2021). Companies may rely on selective or narrative disclosures and forward-looking information, such as transition plans and value-chain estimates, which can be difficult to verify (Boiral, 2013; Biondi et al., 2020). Greenwashing and information asymmetry, therefore, remain material concerns. External assurance may help reduce these concerns by strengthening data collection, documentation, internal controls, and independent assurance (Alsahali & Malagueño, 2021; Channuntapipat, 2021; Farooq & de Villiers, 2020).

The dissertation investigates the evolution of sustainability reporting and assurance at several analytical levels. It examines the conceptual fragmentation of ESG-related research, the organizational challenges experienced by Hungarian public-interest entities

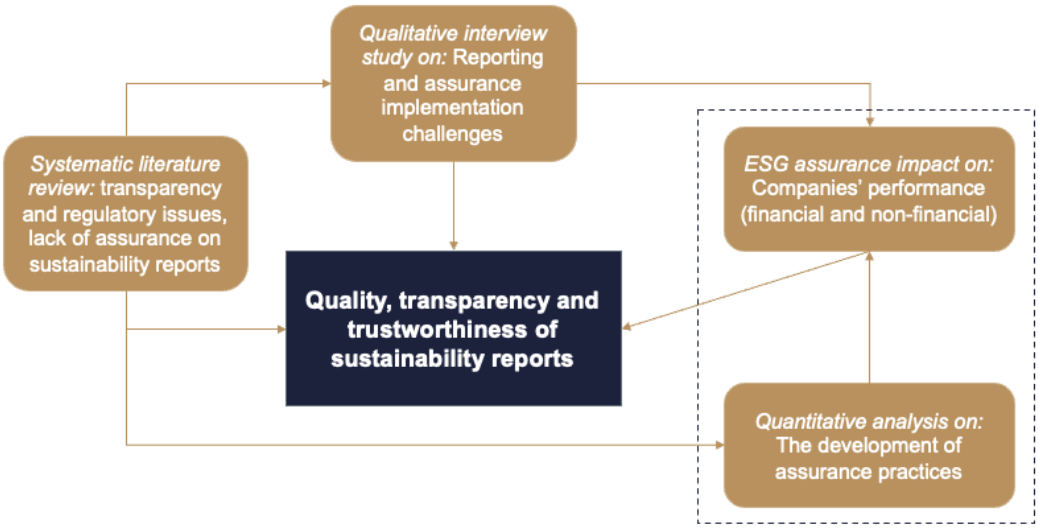
(PIEs), regional assurance-maturity patterns in Central and Eastern Europe, and the association between the first external assurance engagement, ESG ratings, and financial indicators among EU-listed companies.

I.2. Research objectives and questions

The dissertation addresses four interrelated research gaps. First, the conceptual and methodological literature remains fragmented across ESG reporting, ratings, scores and CSR research (Berg et al., 2022; Christensen et al., 2022). Second, limited evidence explains how organisations develop assurance-ready sustainability reporting processes (Channuntapipat, 2021). Third, Central and Eastern European evidence on the timing and maturity of assurance adoption remains sparse (Dinh et al., 2023; Boros et al., 2022). Fourth, the empirical relationship among sustainability assurance, ESG information quality, and financial performance has not been sufficiently examined within a unified framework (Alsahali & Malagueño, 2021).

The overall objective is to explain how sustainability assurance can contribute to the reliability and decision usefulness of corporate sustainability information in the evolving European regulatory environment (European Parliament and Council, 2026; IAASB, 2024). *1.* Figure *1* illustrates how the interconnected empirical stages support the logical progression of the research.

1. Figure: Connection between dissertation articles and central research topic



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

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 (Channuntapipat, 2021; Bakarich et al., 2023). Through the combination of theoretical review, qualitative interviews, and quantitative analyses supplemented with panel data, the research aims to construct an integrated understanding of how sustainability assurance can enhance the credibility of non-financial information and support the broader goals of the European sustainability agenda (Maxwell, 2012; Békés & Kézdi, 2021; Directive (EU) 2022/2464, 2022). Therefore, the following comprehensive research question was formulated.

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?*

The purpose and research questions of the included articles are shown in *Table 1.*

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

Articles	Research objectives	Research questions
Article 1	**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	**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?

Articles	Research objectives	Research questions
Article 3	**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	**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? **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

II. Research methods applied

The dissertation's mixed-method approach aims to ensure both conceptual depth and empirical validity. The systematic review provides the conceptual foundation. The Hungarian interview study investigates organisational mechanisms behind reporting implementation (Maxwell, 2012; Mathison, 1988). The Central European comparative analysis examines the adoption of assurance and reporting maturity. The EU-wide quantitative analysis investigates whether the adoption of assurance is associated with changes in ESG ratings and selected financial indicators. As shown in ***Error! Reference source not found.*** *2,* this design combines theory, organisational practice, regional patterns and firm-level outcome evidence (Békés & Kézdi, 2021; Bowen, 2009).

2. Table: Research design

Conceptual mapping	Hungarian implementation	Regional maturity	EU-wide outcomes
Article 1 Systematic review	*Article 2* Interviews and documents	*Article 3* Comparative and survival analysis	*Article 4* ESG and financial panel evidence

Source: Own composition.

By integrating these findings, the dissertation aims to advance theoretical understanding of sustainability reporting and assurance while offering practical recommendations for practitioners navigating the shifting requirements of the CSRD landscape (Directive (EU) 2022/2464, 2022; IAASB, 2024; Channuntapipat, 2021). This section summarises the main research design features of the dissertation's four empirical studies, and *Table 3* presents, for each article, the research title, applied methods, and underlying data sources in a comparable format.

3. Table: Research methods applied and data used

Research	Research methods	Research data
Article 1.	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.	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.	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.	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

III. Research results and contributions

The research results are presented below in a structured, itemised form. The results build sequentially from conceptual mapping to organisational, regional and EU-wide empirical evidence.

III.1. The Diversity of Environmental, Social, and Governance Aspects in Sustainability: A Systematic Literature Review

This first study lays the conceptual foundations of the dissertation and answers RQ1: what ESG concepts and trends have emerged in the corporate world over the past few decades. The article responds to a specific gap: ESG reporting had spread across almost every field of economic policy and decision-making, yet no coherent synthesis structured the ideas behind it, and the terms ESG, CSR and non-financial information were used interchangeably without an agreed definition (Tarquinio & Posadas, 2020; Kotsantonis & Serafeim, 2019).

The methodology is a systematic literature review following a structured search and screening protocol. An online search in Web of Science and Scopus used the keyword "ESG" in title, abstract or keywords, restricted to English-language journal and review articles in business, management and accounting, economics and finance. The initial search returned 1,944 records; after removing 561 duplicates, 1,383 remained, of which 76 survived title and abstract screening and 40 were retained after full-text assessment. The selected studies were published between 2013 and 2023, mostly with global samples, and were classified into thematic categories, regions and methodologies, with two rounds of author discussion to resolve conflicting classifications.

The results identify four thematic pillars – ESG reporting, ESG ratings, ESG scores and CSR in investments – and show a clear methodological imbalance: quantitative designs dominate with 65% of studies, followed by literature reviews (25%) and qualitative approaches (10%). Substantively, the review documents pervasive heterogeneity and subjectivity. Rating agencies differ in purpose, scope, geography, databases, variables, weighting and aggregation rules, so scores diverge systematically; convergent validity depends on industry and country, and naive use of ratings can therefore be actively misleading (Widyawati, 2021; Gyönyörová et al., 2021; Dorfleitner et al., 2015; Dupuy & Garibal, 2022; Capizzi et al., 2021).

Aggregated ESG ratings proved ineffective at anticipating corporate scandals (Utz, 2019). A particularly important finding is counter-intuitive: greater ESG disclosure is associated with wider disagreement among rating agencies, meaning that reporting volume alone improves neither comparability nor credibility (Christensen et al., 2022). The review concludes that ESG reports do not by themselves increase credibility, transparency or accountability, and that weak regulation, measurement complexity and low transparency jointly create the space in which greenwashing emerges (Boiral, 2013; Yu et al., 2020; Dinh et al., 2023).

Consequently, the literature points to three remedies: independent assurance of ESG information, clearer and harmonised regulatory frameworks, and education of decision-makers in how to interpret ESG metrics (Rezaee et al., 2023; Adams & Abhayawansa, 2022; Utz, 2019).

The contribution to the dissertation is threefold. First, it establishes the conceptual and terminological baseline on which the three subsequent empirical chapters build and identifies precisely the inconsistencies that limit the comparability and credibility of sustainability information. Second, it reframes assurance theoretically: assurance appears not as a reputational add-on but as a structural response to the weaknesses of the ESG information infrastructure – the interpretation that the dissertation's central research question then tests empirically (Rezaee et al., 2023; Dinh et al., 2023). Third, it defines the research agenda of the whole thesis by naming the unaddressed gaps, notably assurance and framework practices in ESG reporting, and by documenting the EU's pioneering regulatory role, which motivates the subsequent Hungarian, Central European and EU-level analyses (Alamillos & de Mariz, 2022; Dinh et al., 2023). In doing so, this article also justifies the dissertation's methodological choice to complement the quantitative approach with qualitative, interview-based evidence.

III.2. Review of preparations for CSRD: An examination of the hidden complexity of sustainability reports at Hungarian Public Interest Entities based on interviews

Moving from concepts to implementation, this study answers RQ2: what key organisational, strategic and operational challenges Hungarian Public Interest Entities (PIEs) face in preparing for CSRD-compliant sustainability reporting. Its motivation is that the CSRD represents a paradigm shift in corporate reporting, yet almost nothing was known empirically about organisational preparedness in a post-transition EU economy, and formal disclosures systematically conceal the barriers that matter most (European Commission, 2023; Hegedűs et al., 2023; La Torre et al., 2018; Taliento & Netti, 2020).

The design is qualitative and two-phased. First, document analysis of the companies' earlier NFRD, sustainability and integrated reports established their reporting history, the degree of strategic integration and their existing external assurance arrangements (Bowen, 2009; Natow, 2019). Second, eleven semi-structured interviews were conducted between July and September 2024 with ESG and sustainability leaders – typically two to three experts per company, each interview lasting about an hour, conducted in Hungarian. The sample was targeted: entities pre-identified by Opten Ltd. and verified as large Hungarian PIEs in the first CSRD wave, covering banks and manufacturing and service firms, with insurance largely absent. The interview guide combined a chronological logic (past experience, present practice, future plans) with a thematic progression from general to company-specific issues (Longhurst, 2009; McIntosh & Morse, 2015; Adeoye-Olatunde & Olenik, 2021).

Transcripts were cross-checked by both authors, validated by the companies themselves, and analysed in NVivo using iterative thematic coding, triangulation and reflexivity checks (Natow, 2019; Loganathan et al., 2022).

The results show that Hungarian PIEs recognise the strategic importance of the CSRD and have begun aligning their practices, but that preparedness is uneven and frequently overstated in formal disclosures. Nine of the eleven companies had created dedicated sustainability functions. The dominant constraints are fragmented, non-integrated data systems; weak internal controls over non-financial data; limited human resources and expertise; inconsistent interpretation of definitions; and uncertainty about the evolving ESRS. Scope 3 emissions and supply-chain data are singled out as the hardest data problems; banks face an additional dual logic, needing both their own and their clients'

sustainability data. Crucially, interviewees identify external assurance as the next major milestone and the most complex, resource-intensive element of compliance: many firms are not yet ready to produce assured, investment-grade non-financial data, and they treat the first years as a learning process for auditors as well (Bednárová et al., 2019; Oprean-Stan et al., 2020; Permatasari & Gunawan, 2023). Thematic clustering also reveals a cultural shift from a "stability first", top-down compliance mindset towards participatory, bottom-up adaptation, and respondents place education, professional training, and university–business cooperation on a par with data systems and regulatory compliance. Firms that had already voluntarily reported under the GRI enjoyed a marked advantage, and the "Stop the clock" relief is seen as an opportunity for preparation rather than a reason to slow down (European Commission, 2025).

The contribution of the dissertation is to provide the organisational mechanism layer. It explains why aggregate reporting and assurance patterns look the way they do, showing that assurance improves information quality only when accompanied by investment in data infrastructure, internal controls, and competencies. It provides the first interview-based evidence on Hungarian CSRD preparation, links the conceptual to specific governance and data management practices, and formulates the maturity hypothesis and its assessment indicators (Baumgartner & Ebner-Karestinos, 2010; Kim & Li, 2021; Niu et al., 2022).

III.3. Non-financial reporting and assurance trends in selected Central European countries

This chapter scales the Hungarian qualitative evidence up to a regional, quantitative level, asking whether the move from sustainability reporting towards assurance follows a measurable maturity path. It addresses three questions: when large firms begin obtaining external assurance and whether a typical time-to-adoption exists (RQ3a), whether that timing differs across industries and country groups (RQ3b), and how the assurance provider mix has evolved (RQ3c).

The methodology combines a comparative regulatory analysis with event-history statistics (Directive 2014/95/EU, 2014; Alsahali & Malagueño, 2021; Boiral et al., 2019; Farooq & de Villiers, 2020). The regulatory part reviews national CSRD transposition and assurance rules in selected Central and Eastern European countries with Germany and Luxembourg as comparators. The empirical part draws on Refinitiv ESG data covering 2002–2022 for 83 large listed entities across ten industries, of which 67 had already published a non-financial report. Kaplan–Meier survival analysis was estimated in SPSS. 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 company's first non-financial or sustainability report and its first externally assured report. Companies that had not obtained external assurance by the end of the observation period were treated as right-censored at their last observed reporting year. The event-status variable was coded 1 if external assurance occurred during the observation period and 0 if the observation was right-censored. Kaplan–Meier survival curves were estimated separately by industry and country group, and differences between groups were assessed using log-rank tests. Assurance-provider type was analysed descriptively among firms that had obtained assurance (Békés & Kézdi, 2021).

Based on the regulatory status observed at the study's reference date of 24 January 2025, the selected countries showed markedly uneven progress in transposing the original CSRD framework. Hungary was among the earliest jurisdictions in the examined sample to complete transposition, whereas Austria had not yet published a draft at that reference date; the Czech Republic, Germany, Luxembourg and Poland were at different intermediate stages of implementation. Among countries with sufficiently clear national provisions, ISAE 3000 was identified as the prevailing assurance standard, while the availability of the subsidiary exemption also varied across jurisdictions (Accountancy Europe, 2025;

Kinstellar, 2025; PwC, 2024). These findings should therefore be interpreted as a dated comparative snapshot rather than as a description of the regulatory position prevailing at the completion of the dissertation. Subsequent EU-level reforms (particularly the Stop-the-Clock measures and Directive (EU) 2026/470) altered the scope, timetable and national implementation context of the CSRD and require separate consideration when assessing the framework as it stood in 2026 (European Parliament and Council, 2026).

The survival analysis answers RQ3a with a median time-to-assurance of three years (SE = 0.844; 95% CI 1.347–4.653); the mean of 5.341 years indicates a right-skewed distribution driven by late adopters. In the observed sample, firms typically obtained assurance after approximately three reporting cycles, which is consistent with a reporting-maturity interpretation. For RQ3b, the energy, technology and utilities sectors obtain assurance significantly earlier ($p < 0.05$), plausibly because early-2000s greenwashing scandals and peer pressure in these high-impact industries pushed firms to engage assurers sometimes in their very first reporting period (Bakarich et al., 2023; de Freitas Netto et al., 2020; Utz, 2019). For RQ3c, provider composition consolidates over time: early NFRD-era first-time assurance was often performed by engineering or consulting firms, but switching patterns show a decisive shift towards accounting firms, with the Big Four dominating by 2022 and the share of sustainability-expert assurers declining. Overall, reporting has broadened substantially under the NFRD, yet assurance remains the exception rather than the rule and, where present, is predominantly limited assurance with heterogeneous scopes (Alsahali & Malagueño, 2021; Eugénio et al., 2022).

The contribution to the dissertation is to convert "readiness" into an observable, measurable construct. By quantifying the roughly three-cycle maturity threshold, sectoral timing differences and the professionalisation of the assurance market, the chapter supplies the empirical bridge between the organisational barriers documented in Section III.2 and the outcomes examined in Section III.4. It also provides a practical benchmark and a "call to action" for firms facing first-time ESRS reporting with mandatory assurance, and it substantiates the argument that the CSRD's uniform assurance regime is the key instrument for making formal disclosure requirements regionally comparable (Directive (EU) 2022/2464, 2022; EFRAG, 2023; European Commission, 2023; IAASB, 2023).

III.4. Expected impact of assurance on the sustainability disclosure of large companies in the European Union

Having established in Section III.3 that assurance typically follows a reporting-maturity path of approximately three reporting cycles, the final empirical article turns to what is observable once assurance has been introduced. It addresses the outcome-oriented part of the dissertation's central research question by examining whether the introduction of external sustainability assurance is associated with changes in ESG ratings (RQ4a) and selected financial indicators (RQ4b). This focus responds to evidence that sustainability assurance can strengthen the credibility, transparency and decision usefulness of disclosed ESG information, while the relationship between assurance, ESG metrics and financial outcomes remains context-dependent and requires further empirical examination (Quick & Inwinkl, 2020; Alsahali & Malagueño, 2021; Simoni et al., 2020; Bakarich et al., 2023).

The design is a firm-level panel built around each company's assurance year, using LSEG (formerly Refinitiv) data for 1,070 EU-headquartered listed firms with at least five consecutive years of ESG scores up to FY2024; financial series extend back up to twenty years, with missing values retained rather than interpolated. The LSEG ESG score aggregates more than 860 metrics into percentile ranks adjusted for industry materiality and size. Because the LSEG score partly reflects the breadth of disclosure, it is used as a proxy for the quality and reliability of ESG information rather than as a direct measure of it – a limitation that follows directly from the rating heterogeneity documented in Section III.1.

Two complementary reference frames are used: PY, which compares each year with the previous one, and BY, which re-anchors the panel at the assurance year. Tests are run on first differences to mitigate firm heterogeneity. Because Levene's tests indicated non-homogeneous variances in every year, Welch tests were used for assured-versus-non-assured comparisons. One-sample and paired mean and median tests assess whether changes differ from zero, and results are reported in a PY/BY effect matrix. Following the study's robustness criterion, a change is considered established only when the mean- and median-based tests agree.

The results first document diffusion: the assured share rises from under 5–7% nineteen years before the assurance year to over 70%, and from roughly forty to more than 750 firms – evidence of adoption well before the CSRD took effect (Amran & Haniffa, 2011; Baier et al., 2021; Hassan et al., 2020). Assured firms have significantly higher mean ESG scores

than non-assured firms in every year examined. At firm level, the strongest average increase in ESG scores is observed in the assurance year, amounting to 5.9 points year-on-year, and significantly positive changes remain observable for the first eight post-assurance years. In the BY frame, firms with at least ten years of available data show an average cumulative increase of approximately 15 points, with significant positive changes in every year examined. These temporal patterns are associated with the introduction of assurance and are consistent with organisational learning and legitimacy-based interpretations; however, the research design does not establish that assurance caused the observed changes (Channuntapipat, 2021; Mio et al., 2024; Pizzi et al., 2024; Ulrich & Metzger, 2022).

Financially, the picture is deliberately nuanced and is reported according to the study's robustness criterion. The cost-side evidence is confined to ROA and, in part, ROE: accounting-based profitability declines in the assurance year and remains below its assurance-year level over the short to medium term. This pattern is consistent with, but does not establish, an interpretation based on system-development expenditures, training costs and assurance fees, and it corresponds to the Hungarian interviewees' perception of assurance as the most resource-intensive element of CSRD compliance (Section III.2). For EBIT, D/E and EPS, the median-based patterns are not corroborated by mean-based tests, and D/E provides no evidence of a systematic capital-structure break (Christensen et al., 2022; European Commission, 2023). EPS, being an accounting measure, cannot in any case evidence capital-market pricing; a possible signalling channel is therefore reported as an observation warranting further examination with market-based measures, not as a finding (Quick & Inwinkl, 2020; Baier et al., 2021; Friske et al., 2022).

The contribution to the dissertation is the quantified outcome layer that closes the argument. It provides evidence that the introduction of assurance is associated with patterns consistent with a substantive governance mechanism rather than merely a symbolic gesture. It also refines the prevailing positive ESG–performance narrative: the robust financial evidence points to short- to medium-term implementation costs (ROA and, in part, ROE), whereas a possible signalling benefit remains an open question for market-based research (Tyson & Adams, 2019; Yan et al., 2022). Together with the preceding chapters, it supports the interpretation that assurance is not an isolated audit event but the point at which regulation, governance and reporting maturity translate into credible, decision-useful sustainability information (Channuntapipat, 2021; Pasko et al., 2021; Simoni et al., 2020).

IV. 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 organizations 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.

IV.1. Main research results of the four articles

Table 4 summarises the main research results of each of the four articles constituting the dissertation.

4. Table: 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 earlier written articles

IV.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.

IV.3. Main thesis statement

Sustainability assurance does not automatically guarantee the substantive quality of corporate sustainability performance or reporting. The main thesis of the dissertation is that sustainability assurance can contribute to more credible, comparable and decision-useful sustainability information when it forms part of a coherent reporting, governance and control environment – robust governance arrangements, documented materiality assessment, reliable data systems and effective internal controls. This conditional interpretation rests on the convergence of conceptual, qualitative, regional and firm-level evidence from the four studies. Because the studies are observational, the dissertation does not establish that assurance itself caused the observed changes in ESG scores or financial indicators, nor does it directly estimate the moderating role of these organisational characteristics.

The four articles answer the specific research questions (*Table 1*) separately, while the main research question can only be answered by integrating their results. *Table 5* therefore condenses the findings into thesis points and thesis statements: each thesis point is a short 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 from which they are derived, and T5 answers the main research question. In line with the observational designs, the thesis statements express associations and patterns rather than causal effects.

5. Table: Thesis points and thesis statements of the dissertation

No.	Source (article, RQ)	Thesis point	Thesis statement
T1	**Section III.1/** 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	**Section III.2/** 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	**Section III.3/** 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	**Section III.3/** 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	**Section III.3/** 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	**Section III.4/** 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	**Section III.4/** 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

IV.4. Scientific and practical contributions

Table 6 summarizes the scientific and practical contributions of the dissertation below:

6. Table: Scientific and practical contributions of the dissertation

Contribution	Content	Users
Theoretical	Integrates ESG fragmentation, organisational reporting maturity, assurance practice and outcome-related evidence.	Accounting, sustainability-reporting, auditing and finance researchers.
Methodological	Combines systematic review, qualitative interviews, regional comparative analysis and EU-wide quantitative evidence.	Researchers applying mixed-method or multi-level designs

Contribution	Content	Users
Corporate practice	Demonstrates that assurance readiness requires governance, data ownership, documentation, internal controls and cross-functional collaboration.	CFOs, sustainability leaders, internal auditors and audit committees.
Policy makers and supervision	Shows that formal reporting rules need implementation capacity and assurance-market development.	Regulators, standard setters, supervisory authorities and professional bodies.

Source: Own composition.

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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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