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GREEN OR UNSEEN? A STUDY OF CORPORATE ENVIRONMENTAL TRANSPARENCY IN SERBIA

Zeleno ili nevidljivo? Studija o ekološkoj transparentnosti korporativnog sektora u Srbiji

Abstract

Amid accelerating climate change and rising global pollution levels, the transition to green and circular business models has become an urgent necessity. Corporate environmental transparency is central to this shift, serving both as a tool of accountability and a response to increasing regulatory and societal demands. This study examines the quality and determinants of environmental disclosures in the Annual Business Reports of companies operating in Serbia's most polluting industries, within a broader context of ecological transition. Using a manually collected dataset and a disclosure scoring framework, we assess variations in the substance and length of environmental reporting across firm characteristics, including size, legal form, ownership structure, industry, and international presence. The findings indicate that larger firms and those audited by Big 4 companies exhibit somewhat better environmental reporting, though overall transparency remains modest. Neither ISO 14001 certification nor inclusion in the Pollutant Release and Transfer Register (PRTR) is associated with significantly higher disclosure quality. A positive association is observed between unqualified auditor opinions and disclosure scores, yet auditors rarely address environmental omissions, even when companies fail to meet minimum legal requirements. These results suggest that environmental disclosures often serve symbolic functions rather than reflect genuine accountability - *seeming* rather than *being* green. Enabled by weak enforcement and limited public pressure, companies' environmental impact frequently remains unseen in the shadows of opacity. The findings underscore the need for stronger regulatory mechanisms and credible assurance practices to support a meaningful transition to sustainable corporate behavior.

Keywords: *environmental disclosures, corporate transparency, greenwashing, green transition, circular economy*

Sažetak

U svetlu ubrzanih klimatskih promena i rastućeg nivoa globalnog zagađenja, prelazak na zelene i cirkularne poslovne modele postaje sve urgentniji imperativ. Ekološka transparentnost kompanija zauzima centralno mesto u ovom procesu, predstavljajući istovremeno instrument „polaganja računa" zagađivača, ali i odgovor na sve veće regulatorne i društvene zahteve. Ova studija ispituje kvalitet izveštavanja o životnoj sredini najzagađujućih privrednih grana u Srbiji, u širem kontekstu ekološke tranzicije. Analizom Godišnjih izveštaja o poslovanju kompanija iz uzorka i korišćenjem metodologije bodovanja, ispitane su varijacije u sadržaju i obimu ekoloških obelodanjivanja u zavisnosti od karakteristika preduzeća, uključujući veličinu, pravnu formu, vlasničku strukturu, delatnost i karakter poslovanja. Rezultati ukazuju na to da velika preduzeća i klijenti „Velike četvorke" u proseku ostvaruju nešto bolje rezultate u pogledu kvaliteta ekoloških objava, iako je ukupni nivo transparentnosti generalno skroman. Posedovanje ISO 14001 sertifikata, kao ni listing u Registru ispuštanja i prenosa zagađujućih materija (PRTR) nisu povezani sa značajno višim kvalitetom izveštavanja. Ustanovljena je pozitivna veza između pozitivnog mišljenja revizora i kvaliteta izveštavanja o životnoj sredini, iako revizori retko ukazuju na propuste u ekološkim obelodanjivanjima, čak i kada preduzeća ne ispunjavaju minimalne zakonske obaveze. Ovi rezultati ukazuju na to da je izveštavanje o životnoj sredini kompanija u Srbiji skromno i da češće služi kreiranju zelenog imidža nego što reflektuje stvarno stanje. Pod okriljem slabe regulative i ograničenog pritiska javnosti, uticaj preduzeća na životnu sredinu ostaje nevidljiv - sakriven u senci netransparentnosti. Nalazi ukazuju na potrebu za snažnijim regulatornim mehanizmima i nezavisnim eksternim verifikacijama, kako bi se podržao suštinski prelazak kompanija ka održivom korporativnom ponašanju.

Ključne reči: *obelodanjivanja o ulaganjima u životnu sredinu, korporativna transparentnost, greenwashing, zelena tranzicija, cirkularna ekonomija*.

Introduction

Caring for the environment has evolved from the efforts of nature-loving individuals and non-governmental organizations into a defining imperative of global economic policy. The sobering truth that "*the future will either be green or not at all*"[1] serves as a grim reminder of humanity's urgent responsibility to treat nature not as an inexhaustible resource, but as a finite and fragile foundation for future life.

There is no doubt that today's pressing environmental challenges arose as a direct legacy of the prolonged dominance of neoliberal economic models and the systemic imbalances they produced. Much like a tiger devouring its prey, the deregulated, profit-driven economy of over-consumption paid little attention to the ecological limits of the planet, leading to widespread environmental degradation and the rapid depletion of natural resources. The world today is characterized by a stark imbalance in financial priorities, with governments collectively spending an estimated USD 500 billion annually on activities potentially harmful to nature, while public and private financial flows that degrade the biosphere significantly outweigh investments aimed at its protection and restoration [40].

This unsustainable trajectory has brought to the forefront the need to reconfigure the global economic system toward one that is human-centered, ecologically balanced, and sustainability-oriented. Known as the green transition, this transformation entails comprehensive changes to the technological, ecological, and institutional foundations of modern economies [23]. Its aim is to facilitate the shift toward a low-carbon, circular economy, regarded as a key enabler of sustainable industrial revitalization [6] and a core mechanism for achieving the United Nations Sustainable Development Goals (SDGs) set forth in Agenda 2030 [38]. Greening the economy involves minimizing environmental impact while promoting well-being and social equity [39], and is increasingly recognized not only as an ecological necessity but also as a unique development opportunity at both macroeconomic and microeconomic levels.

At the regional level, this transformation is embodied in the European Green Deal, which sets ambitious targets for climate neutrality, and more locally, in the Green Agenda for the Western Balkans, which outlines five strategic priorities [28]: (1) climate, energy, and mobility; (2) the circular economy; (3) pollution prevention and control; (4) sustainable agriculture and food production; and (5) protection of biodiversity [41]. As a candidate country for European Union membership, Serbia is expected to align with this agenda [8], a task made all the more urgent by the country's alarming levels of environmental pollution and the persistent lack of effective government response [9]. The Green Agenda is not merely a matter of regulatory convergence; it is increasingly regarded as a comprehensive development strategy with profound implications for Serbia's long-term socio-economic and ecological resilience [4].

Reforming the existing economic paradigm requires more than regulatory alignment - it calls for a fundamental redefinition of incentives and values. While institutional support and governance reforms are essential for achieving internationally agreed sustainability targets [21], enduring transformation ultimately depends on action within the private sector. In other words, the roots of a genuinely green economy must be planted deep within the corporate jungle. As both significant contributors to environmental degradation [20], and key actors in the economic system, companies are expected to assume a leadership role in driving the green transition. Embracing nature not just as a stakeholder, but as a core partner in long-term value creation, is no longer optional. It is, increasingly, a condition for future economic survival.

Successful implementation of the green transition hinges on three foundational elements [7]: (1) redefinition of economic rules; (2) adoption of a circular growth model; and (3) the creation of a platform for coherent, future-oriented economic policies. At the company level, this requires a strategic shift aimed at minimizing the environmental footprint of business operations.

The first step in this transformation involves the internalization of environmental externalities. Applying the "polluter pays" principle through green taxes, emissions fees, and environmental permits can help reduce ecological harm and correct market failures by ensuring

1 A quote attributed to Bob Brown, Australian politician and environmentalist.

that environmental costs are reflected in production and consumption decisions [12]. The second step is the embrace of circular business models, which prioritize efficient resource use and waste reduction. In contrast to the traditional linear model, circular approaches transform waste into input for new production cycles, thereby aligning economic growth with environmental sustainability [15]. Finally, the transition demands increased corporate transparency in environmental reporting, supported by consistent implementation of Environmental, Social, and Governance (ESG) frameworks. Together with the SDGs at the macro level, ESG principles at the firm level provide the structural foundation for enabling and tracking the progress of the green transition.

Nevertheless, despite a proliferation of sustainability rhetoric, "going green" often remains more of a slogan than a practiced reality. While the number of published sustainability reports continues to grow globally [17], an expanding body of research raises serious concerns about their credibility, exposing widespread greenwashing practices [31, 22]. Rather than fundamentally rethinking their operations to align with the Sustainable Development Goals, many companies persist with business-as-usual strategies, using voluntary ESG reports primarily as marketing tools to project a favorable public image [20].

Globally, markets continue to prioritize short-term profits over long-term planetary health, while geopolitical tensions and economic instability further hinder meaningful action [21]. In Serbia, environmental concerns are frequently eclipsed by more immediate political and institutional challenges. However, according to [9], the state of Serbia's environment is "so poor that it seriously threatens the health of all Serbian citizens, shortens the average life expectancy, and worsens the overall quality of life" [9, p. 4]. The environmental challenges that the country is expected to encounter in the coming decades, intensified by climate change, necessitate comprehensive, systemic responses and the implementation of ambitious and forward-looking policy measures [35]. As one of Europe's most polluted countries, Serbia is in urgent need of increased environmental investment, greater accountability for corporate polluters, and the establishment of effective enforcement mechanisms. Contrary to the common stereotype that "sustainable investments are not bankable" [19, p. 82] Lončar shows that Serbia actually offers numerous business opportunities that successfully reconcile seemingly conflicting criteria: profitability, acknowledgment in national strategic documents as key economic priorities, and alignment with the SDGs [19].

Against this backdrop, this paper underscores the critical importance of environmental transparency as a foundational pillar of sustainable development. As the global economy enters "an age of astonishing change, driven by polycrisis" [5, p. 1] it is increasingly evident that the transition toward sustainability is not progressing rapidly enough to avert the most severe consequences of climate change [27]. In the context of ongoing global and regional efforts to establish a unified, standardized, and universally applicable sustainability reporting framework, companies are under growing pressure to genuinely transform into sustainable enterprises, rather than merely portraying a green image through strategic communication.

However, lessons from the field of financial reporting clearly demonstrate that standards alone are insufficient. The effectiveness of any reporting system ultimately hinges on the presence of robust institutional infrastructure and enforcement mechanisms. In the Serbian corporate context, where even mandatory financial disclosures are frequently regarded as administrative burden to be circumvented, expectations regarding the quality, accessibility, and transparency of environmental reporting remain low. Available studies suggest that although non-financial reporting by Serbian companies is gradually expanding, it continues to vary significantly in both quality and transparency, often lacking substantive or verifiable data [30]. While companies are formally required to report on environmental investments within their Annual Business Reports, as stipulated by the Law on accounting [18], the absence of clear reporting guidelines renders environmental disclosure largely voluntary in practice. In such circumstances, managers tend to "stay silent" [1] - hesitant to disclose information related to environmental risks, as doing so could expose underlying financial vulnerabilities and potential liabilities, thereby raising concerns among stakeholders and potentially affecting the firm's reputation and market position [32].

In this context, this paper seeks to assess the current state of corporate environmental reporting in Serbia, with particular attention to the scope and substance of reported environmental activities. In addition, the study aims to identify key determinants of managerial disclosure choices, exploring how company-specific factors, such as firm size, legal form, ownership structure, level of public scrutiny and others, may influence transparency levels. By doing so, this research contributes to a deeper understanding of the role that corporate actors can, and must, play in advancing Serbia's green transition.

Environmental Reporting

The Evolution and Institutionalization

Corporate reporting on environmental issues has undergone a profound transformation, evolving from voluntary, reputational "damage control" disclosures, often prompted by major industrial accidents[2] and public scrutiny, into a structured and increasingly regulated component of contemporary sustainability reporting. Initially adopted by large corporations in heavily polluting industries during the 1970s and 1980s, environmental reporting gradually transitioned into a mainstream business practice. Over time, it has become mandatory in many jurisdictions, reflecting the growing institutionalization of sustainability as a governance, accountability, and risk management concern.

A significant milestone in this evolution was the establishment of the Global Reporting Initiative (GRI) in 1997. The GRI introduced the first globally recognized sustainability reporting framework, which remains widely adopted to this day. Initially focused on promoting corporate accountability for environmental performance, the scope of the framework was later expanded to include social, economic, and governance issues [11]. The publication of the first comprehensive GRI guidelines in 2000 enabled comparability in non-financial corporate disclosures, laying the groundwork for the development of modern sustainability reporting standards.

Further momentum was provided by the United Nations' 2004 report *Who Cares Wins* [43], which formally introduced the integration of environmental (E), social (S), and governance (G) factors into investment decision-making. This marked the emergence of ESG reporting as a distinct and influential framework, highlighting the financial sector's growing recognition of the materiality of non-financial risks and their relevance to long-term corporate performance and risk mitigation.

Following the adoption of the United Nations' Agenda 2030 in 2015, ESG reporting expanded as companies increasingly sought to demonstrate alignment with the Agenda's Sustainable Development Goals (SDGs), particularly those related to climate action, social equity, and institutional governance. In the same year, the Paris Climate Agreement repositioned climate change as a central concern in global economic and policy discourse. No longer seen solely through an environmental or ethical lens, climate change began to be understood as a systemic financial risk with significant implications for asset valuation, market stability, and long-term investment strategies. This shift prompted institutional investors to formally incorporate climate-related risks into portfolio management and financial decision-making processes. In response, the Task Force on Climate-related Financial Disclosures (TCFD) published its inaugural recommendations in 2017 [33], introducing a structured framework for the disclosure of climate-related financial risks. These risks were categorized into two principal domains: (1) transition risks, including regulatory change and stranded assets and (2) physical risks, such as damage to assets from extreme weather events and indirect impacts from supply chain disruption.

As ESG principles gained institutional legitimacy, environmental reporting increasingly moved beyond voluntary initiatives toward more formalized, regulatory-driven disclosure regimes. The mainstreaming of sustainability concerns gave rise to a proliferation of reporting standards, guidelines, and frameworks, resulting in what is frequently

2 For example, the 1989 Exxon Valdez oil spill in Alaskan waters (then the worst environmental disaster in U.S. history) mobilized global public and organizational pressure, sparking a movement that called for greater transparency and accountability from corporations regarding their environmental impacts. This momentum led to the development of a voluntary code of environmental conduct for companies, known as the Valdez Principles, marking the first coalition of environmentalists and corporate investors, and later on to the foundation of the Global Reporting Initiative (GRI) in 1997 [11].

described as an “alphabet soup” of disclosure initiatives[3]. However, the absence of standardization led to fragmentation and inconsistency in reporting practices, undermining the comparability and reliability of ESG disclosures. In response, both regulators and international organizations began introducing harmonized reporting mandates to enhance transparency, credibility, and decision-usefulness for investors and stakeholders.

One such regulatory milestone was the European Union’s adoption of the Non-Financial Reporting Directive (NFRD) in 2014, which required large public-interest entities with over 500 employees to disclose information on environmental, social, and governance risks as part of their annual reporting obligations. This directive was significantly strengthened with the adoption of the Corporate Sustainability Reporting Directive (CSRD) in 2023. The CSRD expanded the scope and depth of disclosure requirements and mandated alignment with the newly developed European Sustainability Reporting Standards (ESRS), thus reinforcing the shift from voluntary, reputational disclosures toward standardized, performance-based frameworks with legal enforceability and financial materiality.

The ESRS, developed by the European Financial Reporting Advisory Group (EFRAG), provide a detailed and comprehensive framework encompassing a broad spectrum of sustainability topics, including climate change, biodiversity, human rights, labor conditions, and corporate governance. Grounded in the principle of double materiality, the ESRS require companies to report not only on how sustainability matters affect their financial position, but also on how their activities impact the environment and society.

However, in early 2025, the European Commission adopted a package of proposals aimed at simplifying EU regulations and enhancing competitiveness. Notably, the package includes a proposal to limit the scope of the CSRD to only the largest companies - specifically, those with more than 1,000 employees. This approach concentrates sustainability reporting obligations on entities with the greatest potential impact on people and the environment. Additionally, the proposals seek to ensure that these reporting requirements imposed on large companies do not result in undue burdens for smaller enterprises within their value chains.

In parallel with regulatory developments at the regional level, global standard-setting bodies have also played a growing role in the formalization of sustainability reporting. A particularly significant development was the establishment of the International Sustainability Standards Board (ISSB) by the IFRS Foundation in 2021. The ISSB was created in response to widespread calls for a globally consistent and comparable set of sustainability disclosure standards that could serve as a baseline for capital markets. Its mandate is to consolidate and streamline existing reporting initiatives, thereby reducing fragmentation and enhancing the decision-usefulness of sustainability-related financial information.

In 2023, the ISSB released its inaugural standards: IFRS S1 (*General Requirements for Disclosure of Sustainability-related Financial Information*) and IFRS S2 (*Climate-related Disclosures*). These standards build upon the work of the TCFD and the Sustainability Accounting Standards Board (SASB), incorporating best practices from existing frameworks. Notably, the ISSB adopts a financial materiality lens, focusing on sustainability risks and opportunities that are likely to influence an entity’s enterprise value. This approach contrasts with the broader double materiality perspective adopted in the ESRS.

The ISSB standards aim to support the efficient allocation of capital by equipping investors with reliable, comparable, and relevant sustainability information. By aligning non-financial disclosure more closely with traditional financial reporting, the IFRS Foundation has positioned the ISSB as a key actor in the global convergence of sustainability standards.

Current Framework in Serbia

Corporate environmental reporting in the Republic of Serbia is primarily regulated by the Law on Accounting,

3 The term „alphabet soup“ [44] is is attributed to widely used acronyms related to sustainability disclosures, for example GRI (Global Reporting Initiative), SASB (Sustainability Accounting Standards Board), CSRD (Corporate Sustainability Reporting Directive), ESRS (European Sustainability Reporting Standards), TCFD (Task Force on Climate-related Financial Disclosures) and others.

which obliges companies to disclose information related to investments in environmental protection as part of their Annual Business Report (ABR). However, this requirement does not apply to micro- and small-sized legal entities, except those designated as public-interest entities (PIEs). Consequently, a substantial portion of the corporate sector remains legally exempt from publishing any form of environmental information, thereby limiting the breadth of sustainability-related disclosures across the economy.

By contrast, large public-interest entities employing more than 500 individuals are subject to more extensive obligations. These entities must prepare a non-financial statement, which forms an integral part of the ABR and includes information on the outcomes of their environmental protection activities. This requirement marks a formal, though modest, step toward the institutionalization of non-financial reporting within Serbia's corporate governance framework.

Despite the existence of these legal provisions, Serbia currently lacks official guidelines or standardized methodologies for the preparation and presentation of environmental disclosures. There are no nationally endorsed sustainability reporting standards, nor are there industry-specific frameworks that reflect the differential environmental impacts of various economic sectors. Nevertheless, it can be reasonably assumed that companies adhering to environmental regulations and legislation are motivated to assure their stakeholders of their environmentally responsible behavior [13]. As a result, they are likely to engage in the communication of their environmental activities, despite the absence of formalized reporting standards. However, in practice, this regulatory gap confers considerable discretion upon company management in determining the scope, depth, format, and presentation of environmental data. As a result, environmental reporting, while technically mandated for certain entities, remains highly variable and largely voluntary in practice.

This level of managerial discretion carries significant informational risks for stakeholders who depend on transparent, reliable, and comparable data for informed decision-making. Investors, regulators, and the broader public increasingly expect non-financial disclosures to meet standards of credibility, relevance, and consistency. Although the independent auditor's report can enhance the perceived legitimacy of disclosed information, its impact is inherently limited. Under current Serbian law, auditors are only required to comment on material misstatements in the ABR and assess its consistency with the financial statements and compliance with relevant legal provisions. Crucially, there is no requirement for auditors to verify the accuracy or completeness of environmental data, thereby constraining their role in safeguarding the integrity of such disclosures.

Although Serbia is not yet a member of the European Union, the introduction of the Corporate Sustainability Reporting Directive (CSRD) and the International Sustainability Standards Board (ISSB) standards is already beginning to influence sustainability reporting expectations within the Serbian corporate landscape. Companies with strong commercial linkages to EU markets, whether through exports, supply chains or financial partnerships, are increasingly expected to align with emerging European and global disclosure norms. In this context, both regulatory anticipation and market pressures are contributing to a gradual elevation of sustainability reporting standards among Serbian firms, particularly those seeking to enhance their competitiveness and credibility in international markets. Given Serbia's EU accession trajectory and the rising relevance of ESG performance to financial and reputational outcomes, it is imperative that Serbian companies begin proactively preparing for the introduction of more stringent, mandatory sustainability reporting requirements in the near future.

An Empirical Analysis of Environmental Disclosures by Serbian Companies

Research design, sample and data collection

In investigating the environmental reporting practices of Serbian corporate entities, our focus is on the most polluting industries, as defined by national regulation [29]. Environmentally sensitive sectors, such as energy, chemical manufacturing, agriculture and others are naturally subject to heightened public scrutiny. This, in turn, incentivizes companies to utilize non-financial disclosures as a means of signaling environmental awareness, demonstrating their commitment to nature preservation, and legitimizing their business operations [22].

We use the *Scoring* database to identify active companies operating within the relevant industries and focus on the ones required to prepare the Annual Business Report (ABR) in accordance with [18]. From a pool of 428 companies that met our criteria, a random sample of 100 was selected for analysis. We retrieved the ABRs of the sampled companies for the period 2021–2023 from the official General Purpose Financial Statements (GPFR) database maintained by the Serbian Business Registers Agency (SBRA). These reports represented the only publicly available ABRs at the time of data collection, conducted in the first half of March 2025. In addition to ABRs, we collected the audited GPFRs and corresponding Independent Auditor's Reports (IARs) for the same period.

We analyze the ABRs of the selected companies over the research period, focusing on the disclosure of information related to investments in environmental protection. We specifically examine the following aspects:

- Whether the company discloses any information on environmental investments and/or actions,
- Whether the company reports the actual amount of these investments,
- Whether the company provides other quantifiable measures of environmental impact related to its operations, and
- Whether the company shares substantive information on planned or ongoing environmental preservation initiatives and/or investments.

To evaluate disclosure quality, we assign a score of 1 if the company's ABR meets a specific information criterion and 0 otherwise. We then compute an annual Disclosure Score (DS) for each firm/year, with higher scores indicating better-quality disclosures. The DS ranges from 0 (for companies that do not disclose any environmental information) to 4 (for companies that disclose all four aspects).

Additionally, we assess the length of environmental disclosures and compute an annual Length Score (LS) for each firm/year, where higher scores indicate more extensive reporting (Table 2.).

Given the absence of official national disclosure guidelines for environmental reporting, a company's management holds considerable discretionary power in shaping environment-related information within the ABR. The Serbian Law on Accounting merely requires that the ABR include information on investments in environmental protection [18]. Consequently, a company can be deemed "compliant" without providing any substantial details on the environmental impact of its activities or the investments made to mitigate them, often resorting to the well-known statement that "the company did not have any significant environment-related investments". Accorindgly, our aim is not only to examine the levels of compliance, but also to gain a deeper understanding of the information these companies disclose and the factors driving their consciously chosen transparency levels. By seeking to uncover the underlying motives of management and how these influence reporting practices, we further analyze the impact of company-related factors, including size, legal form, ownership structure, and auditor type.

Table 1. Serbian companies from the most polluting industries[1] that have submitted their 2023 ABRs to the SBRA

Company's primary registered activity code	Number of companies	In RSD billion (GPFR for 2023)		
		Total Assets	Total Revenues	Total Net Profit
35.11	7	1,154	545	118
06.10	1	520	403	42
07.29	9	496	276	103
10.39	41	84	71	2
10.11	19	70	93	4
25.11	31	63	69	2
Other	320	2,524	1,952	57
Total	**428**	**4,911**	**3,408**	**328**

Source: Authors' calculations.

[1] The list of activity codes categorized as the most polluting industries is provided in [29].

We also consider the company's degree of public scrutiny, its presence in international markets and whether it holds certification for environmental management system standards (ISO 14001).

To identify company ownership, we relied on the websites of SBRA [34] and the Central Securities Depository and Clearing House [3]. We classified ownership as "concentrated" when a dominant shareholder was present and "diversified" otherwise. For closely held companies, we further examined the type of controlling owner, distinguishing between the state, domestic and foreign individuals and legal entities.

Following the financial reporting literature, we generally expect diversified companies to exhibit higher-quality disclosures compared to closely held companies. This expectation is typically linked to the mitigation of information asymmetries and agency problems common in corporate entities with a larger number of shareholders [10]. However, these assumptions are contingent on the strength and effectiveness of local enforcement mechanisms and the actual level of minority investor protection.

Within closely held companies, greater transparency levels are more likely among local subsidiaries of international groups, provided that the group (or the parent company) operates in jurisdictions with robust reporting infrastructure and effective enforcement mechanisms. Such companies can benefit from well-established group reporting practices and developed procedures, enhancing the overall quality and transparency of their local ABRs and GPFRs. However, these positive effects may diminish if the subsidiary holds little material significance for group reporting or if the group (or the parent company) operates in markets with weaker and more opaque reporting practices than those in Serbia. Consequently, the ultimate impact of a company's ownership structure on its reporting transparency can vary.

Table 2. Length Score

Length of environmental disclosures*	Length Score (LS)
1 sentence	1
Approximately half a page	2
Approximately one page	3
Between two and five pages	4
More than five pages	5

*No disclosures in the sample fell between one and two pages in length.
Source: Authors

The data on company size was obtained from the SBRA database of GPFR. Following local accounting regulations [18], companies are categorized as micro, small, medium, or large. We generally expect larger companies to provide more extensive environment-related disclosures. This expectation stems from their greater resources, including a larger, better-trained reporting staff, as well as their heightened exposure to public scrutiny [10]. Additionally, large-sized companies also have a significant number of non-transacting shareholders (such as their suppliers and customers), which can also incentivize their reporting transparency [2].

We use the same SBRA database to gather data on each company's legal form. Given their presence in the capital market, we expect listed companies (joint-stock companies) to generally exhibit more transparent reporting practices than private companies (limited liability companies and cooperatives). However, the overall inactivity and limited depth of the Serbian stock market may negatively impact corporate transparency levels. For public enterprises, we anticipate that heightened public attention will encourage management to provide more extensive environmental disclosures.

Auditors can enhance the quality of corporate disclosures by engaging in substantive discussions with management regarding both financial and non-financial reporting issues. High-quality auditors, in particular, possess both the expertise and the professional incentives to influence disclosure practices positively, thereby promoting greater transparency and credibility in corporate reporting [26]. We differentiate between Big4 and non-Big4 auditors, generally considering the former as an additional signal of a company's reporting quality. However, we acknowledge that the scope of an ABR audit is somewhat limited. Specifically, an auditor is required to assess the ABR's compliance with prevailing legal requirements and the company's GPFR, as well as to identify any materially significant misstatements in the ABR based on their understanding of the company's operations from the GPFR audit. Consequently, the impact of an auditor's reputation on disclosure quality may be less pronounced in ABRs than in GPFRs. While studies generally highlight the positive influence of Big4 auditors on the quality of their clients' financial statements [10], history reminds us that some of the largest financial reporting frauds involved Big4 audit clients with unqualified audit opinions.

Competitive pressure from foreign markets can incentivize more transparent reporting [25]. Companies operating internationally often need to comply with foreign environmental regulations to participate in global supply chains. We use revenue from foreign sales to distinguish internationally active companies from those operating solely in Serbia. However, the strength of this incentive depends on the stringency of foreign regulations and the effectiveness of their enforcement. Regrettably, data limitations prevent us from examining cross-country variations or assessing potential transparency drivers associated with a company's engagement in the EU market.

Greater media presence and public scrutiny can incentivize management to use the ABR as a communication tool, providing more extensive environmental disclosures to enhance or protect the company's public image. To capture this scrutiny, we use the Republic of Serbia's Pollutant Release and Transfer Register (PRTR) [36] as an indicator of heightened public attention directed at companies identified as major environmental polluters.

We also consider a company's possible ISO 14001 certification as a signal of its greater commitment to environmental responsibility. As a globally recognized standard for environmental management systems, ISO 14001 is widely promoted as an effective tool for enhancing organizational environmental performance [14]. Beyond environmental improvements, the adoption of ISO 14001 can also generate substantial economic benefits, such as reductions in operational and insurance costs, enhanced efficiency in energy and resource use, improved access to capital, decreased compliance and liability risks [24]. Accordingly, we expect certified companies to provide more comprehensive and substantive environmental disclosures. To determine whether a company holds an ISO 14001 certificate, we examine its ABR and official website.

Results and discussion

Between 2021 and 2023, the average company in our sample managed assets totaling RSD 9.1 billion and held equity amounting to RSD 4.7 billion (Table 3). During the same period, average total revenues reached RSD 7.3 billion, while average net profit stood at RSD 1.2 billion.

The sample is predominantly composed of companies that are medium-sized, or operate as limited liability companies, or have concentrated ownership structures (Table 4.). A majority of the firms also engage in international operations. Among closely held firms, the most common ultimate owners are domestic individuals and foreign legal entities (Table 4.). However, due to data limitations, we were unable to identify the actual (ultimate) owners of foreign entities, which may introduce bias into our findings (particularly if those foreign companies are themselves controlled by domestic individuals). The majority of the analyzed companies neither held ISO 14001 certification nor were listed in the Pollutant Release and Transfer Register (PRTR). Among business types, the most prevalent was *Manufacture of Metal Structures and Parts of Structures* (activity code 25.11).

Based on a sample of 100 ABRs from Serbian companies covering the period 2021–2023, Table 5. summarizes the main findings related to environmental disclosure practices. In 9% of the analyzed firm-year observations, the ABR was not publicly available. Due to data limitations, it was not possible to determine whether this unavailability was the result of a company's deliberate omission or simply because the company was not legally required to publish an ABR for the respective year (in accordance with [18]). Consequently, the compliance percentages presented in Table 5. are calculated based on the total number of available ABRs in the sample.

We find that in 85.35% of the analyzed cases, the company's ABR includes the heading "Information on the investments

Table 3. Key Financial Data for Sample Companies (in RSD million)

Item	Mean	Standard deviation	Minimum	Median	Maximum
Total Assets	9,099.22	32,251.07	285.17	1,766.73	354,696.10
Equity	4,679.74	15,969.31	0.00	781.01	147,601.15
Total Revenues	7,313.79	17,985.80	24.29	1,649.42	136,127.05
Net profit/loss	1,198.51	7,327.92	-18,308.79	89.32	82,333.35

Source: Authors' calculations based on 2021-2023 GPFRs.

into environmental protection", thereby meeting the minimum requirement for mandatory environmental disclosure, as prescribed by the law [18]. When analyzed by industry, the lowest compliance rate (0%) was observed among companies engaged in the *Manufacture of other chemical products*, the *Production of plastic items for use in construction*, and *Steel casting*. These industries, which collectively account for 4% of the available ABRs, provided no environmental information in their reports (data not shown in table).

Table 4. Structure of the Sample According to Selected Classification Criteria

Classification Criterion	Category	% of Total Sample
Company Size	Medium	70.00%
	Large	30.00%
Legal Form	Joint Stock Company (JSC)	6.00%
	Limited Liability Company (LLC)	91.00%
	Public Enterprise (PE)	2.00%
	Cooperative (COOP)	1.00%
Ownership	Concentrated	75.00%
	Diversified	25.00%
Ultimate controlling owner	Domestic individual	35.00%
	Foreign individual	2.00%
	Domestic company	4.00%
	Foreign company	31.00%
	State	3.00%
Primary registered activity code	25.11	12.00%
	10.39	9.00%
	22.29	6.00%
	10.11	5.00%
	25.15	5.00%
	Other	63.00%
ISO 14001 certified	Yes	30.00%
	No	70.00%
PRTR listed	Yes	22.00%
	No	78.00%
International operations	Yes	86.00%
	No	11.00%
	Unknown	3.00%

Source: Authors' calculations.

However, a deeper analysis reveals persistent issues regarding the transparency of environmental disclosures. Specifically, only 15.02% of the analyzed ABRs include information on the actual amount invested in environmental protection during the reporting year, while fewer than 10% provide additional quantifiable indicators of the company's environmental impact (Table 5.). In 12.45% of cases, companies relied on the generic statement that "no significant investments were made", without offering any further context or information on the environmental effects of their operations. A somewhat more favorable picture emerges when considering the substance of the disclosures: 41.39% of ABRs contain meaningful, activity-based information on environmental protection efforts, rather than purely boilerplate language.

We find that the average environmental disclosure score across the sample is 1.52, while the average length score is 1.79. This indicates that, on average, Serbian companies operating in the most polluting industries addressed

Table 5. Environmental disclosures in analyzed Annual Business Reports (ABRs) for the period 2021-2023

Primary registered activity code	Firm / years	Available ABRs	% of available ABRs				
			ABR contains information on the investments into environmental protection	ABR states the amount of environmental investments (larger than zero dinars)	ABR states that the company did not have any significant environmental investments	ABR contains substantive information on company's environment-protecting activities	ABR provides additional quantifiable measures of company's environmental impact
25.11	36	35	74.29%	5.71%	17.14%	17.14%	5.71%
10.39	27	23	78.26%	0.00%	30.43%	13.04%	0.00%
22.29	18	15	100.00%	33.33%	13.33%	33.33%	20.00%
10.11	15	14	100.00%	28.57%	7.14%	78.57%	21.43%
25.12	15	10	90.00%	20.00%	0.00%	20.00%	0.00%
17.21	12	12	100.00%	0.00%	0.00%	50.00%	0.00%
22.22	12	10	70.00%	0.00%	0.00%	30.00%	0.00%
07.29	9	9	100.00%	33.33%	0.00%	100.00%	66.67%
09.10	6	6	83.33%	0.00%	0.00%	83.33%	66.67%
10.12	3	3	100.00%	0.00%	100.00%	100.00%	100.00%
35.12	3	3	100.00%	100.00%	0.00%	100.00%	100.00%
Other	144	133	84.21%	16.54%	11.28%	42.86%	2.26%
Total	**300**	**273**	**85.35%**	**15.02%**	**12.45%**	**41.39%**	**9.89%**

Source: Authors' calculation.

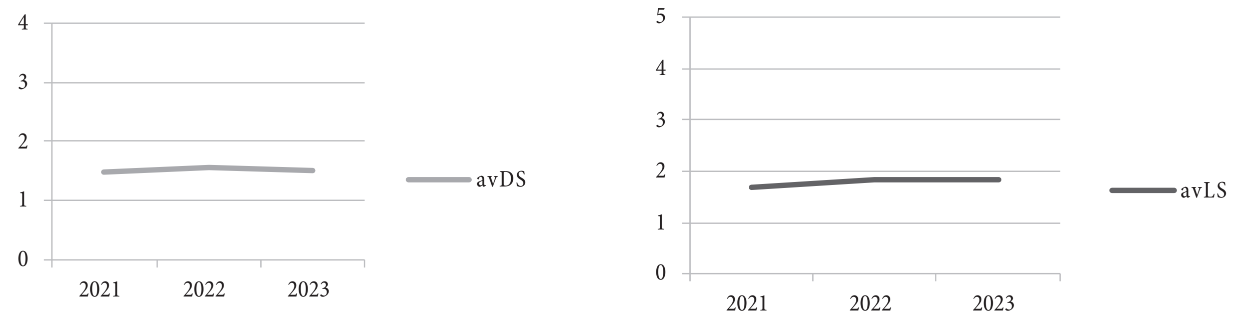
between one and two of the four analyzed informational items related to their environmental impact. Moreover, the average length of the environmental sections within the ABRs was less than half a page, with considerable variation observed, ranging from a single sentence to as many as 26 pages. Both scores reached a peak in 2022, slightly above the average, but declined in 2023, as illustrated in Figure 1. Half a page was the most common length of environmental disclosures, with approximately 65% of the available ABRs containing environmental investment information of this length. These findings clearly suggest that environmental reporting generally remains a low priority within the Serbian corporate sector and are consistent with the conclusions reported by [30].

The results illustrating how environmental disclosure practices differ based on various firm-specific characteristics are summarized in Table 6. Our sample consists of medium- and large-sized companies. The analysis shows that company size plays a notable role in shaping both the transparency and the length of the environmental information section within the ABR. Specifically, large-sized companies exhibited, on average, 68.36% higher disclosure scores and 61.48% higher length scores compared to medium-sized firms. This disparity may be explained by several size-related factors that incentivize large companies to enhance the quality of their environmental disclosures. These include greater public scrutiny, a broader base of transacting shareholders, and the availability of more substantial organizational resources. Larger firms are also more likely to have dedicated departments or staff responsible for non-financial reporting, in contrast to medium-sized companies, which may rely on their accounting departments to cover ESG disclosures.

The observed differences in average disclosure and length scores across legal forms are somewhat unexpected. Notably, the highest levels of transparency were found among cooperatives, whose disclosure scores were, on average, 71.43% higher than those of joint stock companies. We believe that this finding may be attributed to other, unidentified incentivizing factors. However, given that the sample includes only one cooperative (covering three firm-years), we refrain from making any generalizations, especially in light of the fact that this entity also recorded the lowest length score within the sample. Regarding other legal forms, listed companies, as expected, demonstrated higher disclosure scores than public enterprises and private companies. Nevertheless, the differences in the quality of environmental disclosures among these groups were relatively minor. On average, listed companies disclosed between one and two of the four analyzed informational items related to environmental impact. This limited scope of disclosure suggests that these firms cannot be considered particularly responsive to the informational needs of their capital providers, customers, or the general public.

We find that diversified companies generally exhibited slightly higher disclosure and length scores compared to closely held firms. However, companies with the state as a controlling shareholder substantially outperformed those controlled by private individuals or other legal entities in both the amount and substance of published environmental information. Specifically, firms in which the Republic of Serbia held the controlling stake reported, on average, 62.50% higher disclosure scores than those controlled by other legal entities, and 91.18% higher scores compared to companies controlled by private individuals. The differences in average length scores were similarly

Figure 1. Average disclosure (avDS) and length (avLS) scores for the period 2021-2023



Source: Authors' calculation.

pronounced - 63.32% relative to companies and 54.32% relative to individuals. These results are consistent with the findings of Wang et al., who report that, among listed companies in China, those under government control tend to exhibit higher-quality environmental disclosures [42]. We attribute these findings to increased public scrutiny of state-owned enterprises, particularly those operating in environmentally intensive industries, as well as efforts associated with the Republic of Serbia's ongoing alignment with EU accession requirements.

Within the subsample of subsidiaries (i.e., companies controlled by another company), those owned by foreign parent firms exhibited, on average, the highest disclosure and length scores. This finding aligns with the results of Tipurić et al., who observed a similar pattern in their study of Serbian pharmaceutical companies [37]. Therefore, it is plausible that the sound environmental reporting practices of foreign corporate owners have been transferred to their Serbian subsidiaries. However, the differences based on the parent company's country of residence (EU vs. non-EU) were relatively minor. One possible explanation is that these subsidiaries are not integrated into international supply chains and are instead primarily focused on the domestic market. Due to data limitations, this assumption could not be empirically verified.

The presence of companies in international markets also did not appear to have a substantial impact on the transparency or length of their environmental disclosures. Nevertheless, firms with foreign sales reported higher average disclosure (avDS) and length scores (avLS) compared to those operating exclusively in Serbia. As the companies in the sample do not disclose the geographical distribution of their foreign customers, it was not possible to identify the jurisdictions in which they operate. It is plausible that these markets are subject to less stringent environmental disclosure requirements than Serbia. Alternatively, it may reflect the limited relevance of these companies to their international partners.

Table 6. Company-specific determinants of environmental disclosures

Classification Criterion	Category	Average Disclosure Score (avDS)	Average Lenght Score (avLS)
Company Size	Medium	1.25	1.49
	Large	2.10	2.41
Legal Form	Joint Stock Company (JSC)	1.75	2.00
	Limited Liability Company (LLC)	1.51	1.77
	Public Enterprise (PE)	1.60	2.00
	Cooperative (COOP)	3.00	1.33
Ownership	Concentrated	1.49	1.76
	Diversified	1.63	1.86
Controlling shareholder of closely held companies	State	2.50	2.75
	Individual	1.31	1.78
	Company	1.54	1.68
Ultimate owner for subsidiaries	Domestic individual	1.28	1.50
	Domestic company	0.90	1.00
	Foreign company	1.66	1.80
Jurisdiction of the Controlling Parent Company (for foreign-owned subsidiaries)	EU	1.69	1.79
	Non-EU	1.62	1.81
Registered activity code (top avDS)	35.12	4.00	4.00
	24.10	3.00	3.30
	20.14, 20.52	3.00	2.00
ISO 14001 certified	Yes	2.07	2.23
	No	3.00	1.00
PRTR listed	Yes	1.46	1.76
	No	3.33	2.67
International operations	Yes	1.53	1.80
	No	1.47	1.70
Auditor	Big4	2.02	2.52
	Non-Big4	1.42	1.64

Source: Author's calculation.

With regard to industry type, the highest average disclosure and length scores were recorded in the *Transmission of electricity* (activity code 35.12), the *Production of pig iron, steel, and ferroalloys* (24.10), the *Manufacture of other basic organic chemicals* (20.14), and the *Manufacture of adhesives* (20.52). However, a company's inclusion in the Pollutant Release and Transfer Register (PRTR) did not appear to serve as a motivating factor for enhanced environmental disclosure. On the contrary, non-listed companies demonstrated significantly higher scores in both the length and substantive quality of the environmental sections of their ABRs. These findings are concerning, as they may indicate the absence of substantial public pressure that could otherwise encourage improved environmental reporting. Moreover, they may reflect a lack of effective enforcement mechanisms to compel highly polluting companies to be transparent about the environmental impacts of their operations.

Weaknesses in enforcement mechanisms are further underscored by the finding that companies certified under the ISO 14001 environmental management standard did not demonstrate higher levels of transparency, but merely provided lengthier environmental disclosures. These findings are consistent with the research of Jovanović and Janjić [16], who identify the creation of a socially responsible corporate image as one of the primary motivations for ISO 14001 certification among Serbian companies. In such circumstances the ABR may be used more as a marketing instrument than as a credible reflection of managerial accountability. Consequently, a cautious and critical approach is warranted when assessing the reliability and truthfulness of the environmental information presented.

Limited assurance may be provided through the statutory audit, as Serbian regulations (specifically, the [18]) require auditors to express an opinion on whether the company's ABR has been prepared in accordance with applicable legislation and is consistent with the GPFR for the same fiscal year. In addition, auditors are obliged to issue a statement indicating whether, based on their knowledge and understanding of the legal entity and its environment obtained during the audit, they have identified any material misstatements in the ABR, and to disclose the nature of such findings. However, our analysis reveals that environmental issues are seldom addressed by auditors. Notably, none of the independent auditor reports in our sample included any reference to environmental matters, even in cases where companies failed to meet the minimum legal requirement of disclosing information on their environmental impact and/or investments within the ABR. As expected, companies audited by Big4 firms demonstrated higher scores in both the length and substantive quality of their environmental disclosures.

Additionally, we analyzed the distribution of independent auditor's opinions and the corresponding differences in the substance and length of environmental disclosures (Table 7.). The findings indicate a positive association between the quality of financial reporting (reflected in the type of auditor's opinion) and the quality of environmental disclosures. Companies that received unqualified audit opinions generally provided more detailed and substantive environmental information in their ABRs. However, it is important to note that even in these cases the overall quality of environmental disclosures remained only slightly above average. In contrast, firms that received qualified, negative, or disclaimer of opinion reports tended to demonstrate notably weaker environmental disclosure practices.

Table 7. Environmental Disclosure Scores by Type of Auditor's Opinion

Type of Auditor's Opinion	Number of firm/ years	% of companies with available ABRs	avDS	avLS
Unqualified	226	82.78%	1.59	1.84
Qualified	36	13.19%	1.33	1.72
Negative	1	0.37%	1.00	2.00
Disclaimer of opinion	10	3.66%	0.80	0.90

Source: Authors' calculation.

Conclusion

Amid escalating global environmental risks and the pressing need for urgent, coordinated action, the role of corporate transparency has never been more critical. For years, environmental disclosures remained largely voluntary, resulting in fragmented and inconsistent reporting practices. Extensive managerial discretion in shaping sustainability narratives, combined with the lack of independent external assurance, has fueled the proliferation of greenwashing, turning ESG reports into marketing tools rather than instruments of accountability. Struggling to transition toward more circular business models, many companies have resorted to seeming rather than being green. However, the introduction of mandatory frameworks, such as the EU's Corporate Sustainability Reporting Directive (CSRD), the accompanying European Sustainability Reporting Standards (ESRS), and the global baseline established by the International Sustainability Standards Board (ISSB), marks a critical shift toward standardized, enforceable, and more credible sustainability reporting.

As one of the most ecologically burdened economies in Europe, Serbia faces an urgent need for decisive action in the field of environmental protection. This includes increased investment, enhanced regulatory frameworks, and stricter enforcement mechanisms. Companies, as key economic actors and direct contributors to environmental degradation, are expected to integrate sustainable development goals into their strategic planning and to assume greater responsibility for their environmental impacts. Although environmental reporting is formally mandated as a component of companies' Annual Business Reports (ABR), it currently allows for significant managerial discretion regarding both the scope and presentation of disclosures. This flexibility has led to wide variation in reporting practices, generating substantial informational risks for investors and other stakeholders. In light of Serbia's economic ties with the European Union and its aspirations for EU membership, domestic companies will increasingly be expected to align with more stringent environmental standards and reporting requirements in the coming years. Preparing for this regulatory convergence is not only a matter of compliance, but a necessary step toward long-term competitiveness and sustainability.

This paper has explored the evolving landscape of environmental reporting, with particular attention to the interaction between global sustainability frameworks and local corporate practices. Within the context of Serbia's corporate sector, the findings suggest that although mandatory disclosure of environmental investments holds promise for enhancing transparency and accountability, its implementation remains inconsistent and underdeveloped. Based on a sample of 100 Serbian companies operating in the most polluting industries, the overall level of environmental transparency is found to be low. On average, companies addressed only one to two of the four key informational items related to environmental impact. The length of disclosures varied widely - from a single sentence to 26 pages - yet the average environmental section in the ABR was less than half a page. Notably, only 15% of the analyzed reports included data on actual investments in environmental protection for the reporting year, and fewer than 10% provided any additional quantifiable indicators of environmental performance.

Our in-depth analysis confirms that company-specific factors do influence the level of environmental transparency, including company size, ownership structure, and auditor type. In particular, foreign corporate ownership appears to play a critical role in shaping reporting standards, indicating a top-down diffusion of best practices. Nonetheless, substantial gaps remain, especially among domestically owned firms that operate without external pressure or institutional incentives to improve disclosure. Notably, state-owned enterprises demonstrated significantly higher levels of transparency compared to those owned by private individuals or privately held companies, highlighting the potential role of public accountability in driving more comprehensive reporting. However, the pressure of public scrutiny did not appear to enhance the quality of environmental disclosures among companies listed in the Pollutant Release and Transfer Register (PRTR). Likewise, ISO 14001 environmental management certification was found to increase the length, but not the substantive quality of environmental disclosures, suggesting that companies may be using the certification more as a reputational signal than as a genuine tool for enhancing environmental performance and transparency.

Our findings highlight the importance of not only regulatory compliance but also deeper cultural and organizational transformation in promoting meaningful sustainability disclosure. As global reporting standards continue to converge and the integration of artificial intelligence streamlines the preparation of both financial and non-financial corporate reports, a critical challenge persists: ensuring that sustainability is not simply reported, but genuinely embedded within corporate strategy. The ultimate goal is to move beyond symbolic gestures and to transform what is currently unseen into something authentically green.

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