European Journal of Sustainable Development Research
2025, 9(4), em0325
e-ISSN: 2542-4742
https://www.ejosdr.com/

MODESTUM

Research Article

OPEN ACCESS

Environmental management and non-financial reporting as tools for sustainable economic development

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Citation: Strielkowski, W., Freze, T., Korneeva, E., & Turgaeva, A. (2025). Environmental management and non-financial reporting as tools for sustainable economic development. *European Journal of Sustainable Development Research, 9*(4), em0325. https://doi.org/10.29333/ejosdr/16720

ARTICLE INFO

Received: 10 Apr. 2025

Accepted: 19 Jul. 2025

ABSTRACT

Our paper focuses on the critical roles of environmental management and non-financial reporting in supporting sustainable economic development, specifically focusing on the adoption and effectiveness of environmental, social, and governance (ESG) practices among small and medium-sized enterprises (SMEs). Utilizing data from 250 SMEs across seven Russian regions, the empirical model identifies significant determinants influencing ESG adoption, including managerial qualifications, company size, market access, financial resources, and governmental support. The study discusses various frameworks for non-financial reporting, emphasizing their ability to enhance corporate value, reputation, and stakeholder trust through transparency and accountability. Special emphasis is given to the ESG data book as a key instrument in improving the consistency and credibility of non-financial disclosures. Furthermore, the paper addresses critical issues of materiality and stakeholder expectations, highlighting their importance for reliable ESG reporting. Our results stress the urgent need for harmonized international ESG reporting standards, mandatory third-party verification, streamlined regulatory frameworks, targeted financial incentives, and digital innovations in reporting practices. The novelty of this study lies in its focus on the underexplored context of Russian SMEs, combining environmental management and non-financial reporting practices with a unique empirical investigation. The research aims to identify key determinants of ESG adoption and reporting efficacy, thereby filling the gap in current literature that largely overlooks smaller enterprises in emerging economies.

Keywords: environmental management, non-financial reporting, sustainable development, small and medium enterprises, ESG

INTRODUCTION

The discussion on sustainable development is impossible without consideration about environmental aspects and impacts from human activities (as from daily routine to manufacturing items and extracting materials) on the environment. An environmental aspect is a part of a company's operations, goods, or services that interact with or has the potential to interact with the environment. Environmental impact means any alteration to the environment, whether positive or negative, that is entirely or largely caused by an organization's environmental factors.

In this way, environmental management can be understood as a framework that embraces the impacts and the consequences of human activities on the air, water, and soil quality, as well as the atmosphere and biodiversity. Protecting the environment, maintaining life forms, and ensuring sustainability for future generations are the main focuses of environmental management. Undoubtedly, this can entail encouraging the use of renewable energy sources, lowering carbon footprints, and safeguarding endangered species. Therefore, the main goal of environmental management is to prevent, lower, or eliminate the negative environmental impact and transform various processes and attitudes towards sustainability. It encompasses various ways of natural protection, to control and prevent pollution, and support of biodiversity programs.

The planet's long-term survival is severely hampered by environmental contamination leading to global warming and climate change. It seriously affects the environment as well as human health and quality of life. According to some researchers, there is a crucial need for preventive environmental management and the strategic enforcement of environmental policies for combating global pollution (Di Chiacchio et al., 2024). Moreover, there is a requirement for

cooperation and coordination between stakeholders at different levels to achieve efficient environmental management and pollution control.

The professional backgrounds of environmental managers are diverse. It can be developed and applied, for example, in urban planning for designing more sustainable cities, in governmental studies for establishing environmental standards, or in enterprises for creating corporate social responsibility. In other words, policymakers, non-governmental organizations, or businesses require a multidisciplinary approach for managing those activities.

Some researchers emphasize the role of environmental sustainability predictors in small and medium-sized enterprises (SMEs), with an emphasis on the function of environmental management accounting (EMA) and environmental proactivity in utilizing the natural resource-based perspective theory to connect pollution prevention tactics to environmental sustainability (Hasan et al., 2024). Their findings demonstrate that efforts to reduce pollution led to the greater use of EMA, which improved environmental sustainability. Extra benefits of such measures can be found in increased corporate competitiveness, positive environmental impacts, and a sustainable future.

Furthermore, a potentially useful instrument for businesses looking to track and control their ecological effects is EMA. However, not enough research has shown conflicting findings, making the relationship between EMA and environmental performance (EP) unclear. Furthermore, little is understood regarding the ways in which EMA could affect EP. Some scholars denote that in the interaction between EMA and EP, green innovations act as a partial mediator (Awewomom et al., 2024).

However, environmental management is not yet a worldwide obligatory practice but rather a 'voluntary' certification scheme. Forward-thinking enterprises more and more often apply environmental management. Prominent sustainability assessment schemes in the United Kingdom, such as BREEAM (2024), incorporate environmental management concepts. Additionally, some non-profit organizations offer good environmental practice on site guidelines that can assist in identifying improved environmental practices on sites. Employers and communities are required to voluntarily establish environmental management systems (EMS) under the current regulatory framework in North America. These solutions, while not necessary, assist businesses in lowering waste, enhancing their corporate social responsibility, and avoiding liability for environmental harm.

EMS is a system that is used by many organizations to apply special frameworks for controlling, regulating, and mitigating environmental impact. The most common framework with a set of criteria for such goals has been developed by the International Organization for Standardization (ISO) and is called ISO 14000 (2025) environmental management, representing a well-known and widely accepted standard for environmental management. As a philosophy of constant growth, it is based on four consistent steps: plan, do, check, and act. The first step includes planning the goals and objectives as well as general actions of the environmental management plan. The second step incorporates the practices of implementation, training, and education. The third step comprises the application of monitoring and external or internal audits. The fourth step involves corrective or preventive actions as well as management review.

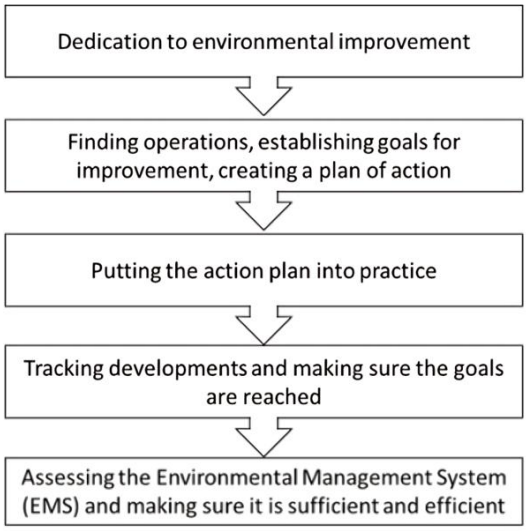

Figure 1. Five stages of the EMS (Source: Authors' own elaboration)

The EMS consists of five basic stages (see **Figure 1**).

The first stage embraces the idea of a dedication to environmental improvement that is enshrined in official policy. The second stage includes finding operations that have an adverse effect on the environment, establishing goals for improvement, and creating a plan of action to reach those goals. The third stage involves putting the action plan into practice and making sure that specific actions are taken to achieve it. The fourth stage comprises tracking developments to make sure goals are reached. The fifth stage encompasses assessing the EMS to make sure it is sufficient and efficient.

Some researchers emphasize the crucial need of environmental accounting, understood as the management of financial, quantitative, and qualitative data on the effects on the environment and the financial outcomes of environmentally relevant business operations (Appannan et al., 2023). Many businesses view the use of EMA and the implementation of environmental plans as crucial competitive advantages for improving corporate environmental management. Furthermore, the scholars explain that the implementation of the best practices of environmental management depends on top management involvement and better planning of corporate strategy that includes environmental issues.

This study has three main objectives:

(1) to assess the current state of environmental management and ESG reporting practices among Russian SMEs,

(2) to empirically identify internal and external factors influencing ESG adoption, and

(3) to evaluate how these practices contribute to sustainable development and corporate reputation.

This fills a critical gap in literature by expanding the geographic and organizational scope of ESG-related studies and by providing context-specific policy recommendations.

LITERATURE REVIEW

EP evaluation belongs to the broader framework of accounting tools to deal with financial and non-financial performance outcomes. Corporate social responsibility, integrated reporting (IR), sustainable development goals, global reporting initiative (GRI), task force on climate-related financial disclosure, and greenhouse gas reporting are just a few of the many types of reporting that fall under the umbrella term of non-financial reporting (Manes-Rossi et al., 2020).

Non-financial data is a crucial source of information for management decision-making in the current environment of changing economic relations (Mio et al., 2024). Without expanding its volume, the intra-company non-financial reporting system can be greatly enhanced by using a fair and realistic representation of the organization's performance in connection to sustainable development. Furthermore, it enables, on the one hand, more efficient formulation of the organization's strategic goals and, on the other hand, the timely planning of activities to accomplish them.

Usually, non-financial reporting concerns large corporations; however, SMEs as game players of the global supply chain can be involved, too. The target 12.6 of sustainable development goal 12 emphasizes the need for large companies to adopt sustainable practices and integrate sustainability information in their reporting (SDG12hub, 2024). Most businesses base their operations on the environmental, social, and governance (ESG) concept, whose indications are expressed in IR, to raise their ratings and preserve an exceptional reputation. Such non-financial disclosure positively influences companies' reputation, customer trust, and stakeholder support. It defines the character of communication between managers and key stakeholders, especially external investors, as far as they expect the information on how a company manages human resources; how it interacts with local communities; how it manages environmental risks and other aspects of ESG. Furthermore, to delineate a firm's total value, it was not enough only financial indicators; in these circumstances, voluntary initiatives became such an instrument for the company's performance.

Some years ago, non-financial reporting was considered a voluntary practice based on the absence of certain disclosure requirements placed on businesses (Ali et al., 2023). The importance of reporting environmental challenges has grown over time. However, the lack of common standards for such voluntary reports claimed for more systematic approaches and frameworks to produce more reliable outcomes.

Some scholars denote that companies that utilize an ESG strategy while preparing non-financial reporting adhere to corporate professional ethics, reduce legal and environmental risks, steer clear of other bad practices that harm a company's reputation, and ultimately boost the company's sustainability and shareholder value (Agarkova et al., 2024). Other scholars emphasize the positive influence of sustainability reporting on financial performance and corporate reputation (Rumyantseva et al., 2024). However, the aim of non-financial reporting is jeopardized by the reports' lack of authenticity and quality, which erodes the faith of all pertinent social and economic stakeholders in the system (Amran et al., 2024). Furthermore, the conceptual framework for non-financial reporting should systematically integrate sustainable development risks and opportunities (Abhayawansa & Adams, 2021). A lack of convergence between regulators and standard-setters does not allow non-financial reporting to become a universal instrument and method for different companies (Crous et al., 2022).

The industry in which the business works has an impact on the degree of regulatory compliance generated (García-Benau et al., 2022). Businesses that provide non-financial information in their sustainability reports have the highest disclosure rates.

Companies currently use a variety of ESG information disclosure methods as part of their immersion in the ESG agenda:

(1) yearly report,

(2) sustainability report,

(3) statements,

(4) data collections (ESG data book),

(5) reports on specific topics (such as the stance on climate change), and

(6) websites and special sites.

Depending on the business and its corporate style, as well as the preferences of stakeholders, there are various ways to communicate ESG data. Usually, this is:

(1) a distinct "sustainable development" section on the company website,

(2) customized mailings for every group,

(3) research reports,

(4) news with a unique tag in the press service section,

(5) environmental and social audit results,

(6) references and corporate policies or regulations on the management of specific ESG aspects, and

(7) statistical reviews, etc.

Furthermore, some companies, apart from basic non-financial reporting, release some thematic reports, for example, on human rights or corporate ethics that are written for a broader audience and sometimes are extended with graphics, tables and other additional visual elements.

Directive 2014/95/EU (2025) and EU guidelines 2017/C215/01 (Guidelines on Non-Financial Reporting, 2025) were released by the EU in 2016 to require European entities of public interest to communicate non-financial information to increase their accountability to their stakeholders. Some scholars denote that some European businesses showed a shared understanding of the need to disclose all relevant social and environmental information for remaining legitimate (Breijer & Orij, 2022). In addition, to satisfy the demands of stakeholders and investors on the overall degree of risk disclosure that businesses provide, disclosure on principal

risks and their management has also become more common in recent years.

However, there is enough critical discussion regarding the efficiency of non-financial reporting standards. The researchers stress that the only result of requiring non-financial reporting is an increase in the amount of information submitted annually; no significant organizational changes will result from this requirement (Pizzi et al., 2025; Posadas et al., 2023). Furthermore, the quality of non-financial reporting does not improve when it is made required; therefore, mandated non-financial dislocation may be viewed by preparers as a thorough best practice for accurately reporting their environmental, social, and economic performance (Carungu et al., 2021).

Moreover, business ignorance of non-financial activities, particularly biodiversity, may be the cause of crises like COVID-19, which could have a negative impact on the world economy (Hassan et al., 2021). Therefore, it is relevant to consider how to improve reporting quality by considering non-human elements and making it more thorough for stakeholders.

While global studies have addressed the benefits of ESG frameworks, limited empirical research connects these practices to ecological outcomes at the SME level in transitional economies. Our findings emphasize that SMEs that adopt structured ESG practices–often facilitated by EMS and non-financial disclosure–report more proactive ecological behavior, such as reduced emissions, improved waste management, and investments in clean technologies. Thus, the importance of this study is twofold: it demonstrates both the practical ecological benefits of ESG adoption and the necessity of policy alignment to support such initiatives in less-developed regulatory environments.

OVERVIEW OF REPORTING FRAMEWORKS

As was mentioned above, publicly disclosing details regarding a company's governance, social, and EP is known as non-financial disclosure. As a component of transparency and sustainability, it gives the stakeholders information about the main areas in which a business creates value; this value typically goes well beyond financial records (Vigneau & Adams, 2023). Moreover, it includes a wider range, including social responsibility, diversity and inclusion initiatives, environmental effects, and moral corporate conduct.

The main advantages of non-financial reporting for companies are, firstly, fostering confidence with key stakeholders (especially socially conscious investors) through commitment to more sustainable or ethical business practices. Secondly, NFR facilitates company development by emphasizing its reputational values. Thirdly, companies can easily identify areas for improvement and risk areas by focusing attention on innovations.

In order to create any non-financial reporting, it is necessary to determine key stakeholders and their main expectations. The procedure of materiality assessment is the identification and assessment of the most important topics relevant to an organization and its stakeholders (Torelli et al., 2020). Once these topics are identified, they are prioritized and reported in the organization's ESG reports.

The following processes are influenced by the chosen materiality perspective, and the evaluation's findings should concentrate on choosing win-win situations as well as on "tensioned topics," which suggest significant societal impact but lack a business rationale (Garst et al., 2022). In order to perform a materiality assessment successfully, it is necessary:

(1) create a well-designed stakeholder survey,

(2) ask stakeholders to rank their values by importance,

(3) analyze the information gathered,

(4) compare the assessment results with those of competitors,

(5) identify key issues to address during the assessment, and

(6) engage with stakeholders to understand their values and goals for the company's sustainable development.

As a result of these steps, so called "materiality matrix" can be determined (Ortar, 2020) The materiality matrix is a simple graph consisting of two axes: one axis shows the hierarchy of issues, and the second axis shows the most pressing topics for stakeholders or what could impact the overall performance and success of the business (Geldres-Weiss et al., 2021).

However, different non-financial disclosure standards determine materiality differently that perplexes the process of materiality assessment (Farooq et al., 2021). Some researchers even confirm that materiality analysis can strategically be misused to define report content without considering the interests of legitimized stakeholder groups and thus, does not improve the reports to those groups (Beske et al., 2020).

Global Reporting Initiative

This international independent organization has provided since 1997 global common language for various businesses to communicate their impact on sustainability (Global Reporting Initiative, 2025). With the headquarters in Amsterdam, the Netherlands, GRI has a global presence with its regional offices in Africa, Southeast Asia, Latin America, North America, South Asia, Europe, and the Middle East.

GRI Standards, declared in 2016, are a set of standards used globally to evaluate the sustainability performance of companies and organizations. For developing GRI Standards, the organization collaborates with businesses, investors, civil society, and labor organizations. Normally, GRI Standards can be divided into three groups:

(1) universal standards, which cover the most basic international norms that apply to all enterprises and organizations,

(2) sector standards, which include more specialized standards for specific sectors of enterprises and businesses, and

(3) topic standards, which incorporate specialized standards for specific topics within sectors.

GRI standards allow businesses to report on important sustainability issues (energy and water usage, greenhouse gas emissions, equal rights, etc.). Some researchers denote that sustainability reporting is more common among

manufacturing firms that look for outside validation for their work (Farisyi et al., 2022). Other scholars emphasize the possibility of reporting negative aspects (that is also included in the GRI framework) to endanger stakeholders' liability that leads to the creation of symbolic legitimation strategies (Zharfpeykan & Akroyd, 2023). In this way, the scholars provide a means of enhancing the overall "balance" of sustainability reporting, which will help to create a genuine and equitable perspective on sustainability disclosure. According to another study, voluntary environmental quality is linked to company value through both the cash flow and cost of equity components (Fuadah et al., 2022). It confirms the usefulness of parsing larger measures (such as voluntary environmental disclosure quality) when analyzing complicated connections, in addition to offering evidence on the relationship between voluntary disclosure quality and company value.

Integrated Reporting

IR Framework that was published in 2013 by the International Integrated Reporting Council (IIRC) is used by 75 countries worldwide (Integrated Reporting, 2025). This framework is aimed at delivering a holistic picture of promoted communication regarding value creation, preservation, and erosion. It is maintained by the IFRS Foundation, a global not-for-profit, public interest organization that aims to evolve superior, comprehensible, legally binding, and internationally recognized accounting and sustainability disclosure standards. Financial stability and sustainable development are aided by the cycle of IR and thinking, which leads to effective and profitable capital allocation. The integrated report contains material information regarding manufactured, intellectual, human, social and relational, and natural capitals in addition to financial capital.

Main goals of IR are:

(1) to enhance the quality of data that financial capital providers have access to in order to provide a more effective and fruitful distribution of money,

(2) to encourage a more unified and effective corporate reporting strategy that incorporates several reporting strands and conveys the entire spectrum of elements that significantly impact an organization's capacity to generate value over time,

(3) to increase stewardship and accountability for the diverse range of capitals (natural, manufactured, financial, human, social, and relational) and foster awareness of their interdependence, and

(4) to encourage integrated decision-making, thinking, and behavior that prioritizes the short-, medium-, and long-term production of value.

According to the research, IR has the potential to transform the way of thinking about corporate actions, aiming for incorporating long-term thinking about value creation (De Villiers & Dimes, 2023). Moreover, the release of the company's IR increases the stock exchange appeal of the company's shares and boosts shareholder trust in the business (Kuzmina-Merlinom & Abdurakhmanova, 2024). It confirms the research suggestion of the growing importance of the business's IR to investors and the favorable response of the financial market to its release.

Sustainability Accounting Standards Board

The Sustainability Accounting Standards Board (SASB) (2025) was established in 2011 in order to assist companies and investors in creating a common vocabulary about sustainability-related financial risks and opportunities, for example, an entity's cash flows, access to finance, and cost of capital over the short, medium, or long term. It connects businesses and potential investors through financial effects on sustainability. The framework is available in 77 industries in the USA.

The environment of corporate sustainability disclosure has grown increasingly complicated over time. Clarity and simplification in this environment were demanded by several international companies and investors (Parfitt, 2022). SASB has several benefits, such as being industry-related (explaining risks and opportunities in various industries), evidence-based, and market-informed for various markets, as well as being cost-effective (due to the objective reasons performed for potential investors). While GRI's implementation depends on the corporate governance mechanisms that are caused by sustainable and ethical principles, the adoption of SASB is influenced by elements that are directly tied to financial dynamics (Pizzi et al., 2023).

The SASB and the IIRC declared in November 2020 that they will combine to form the Value Reporting Foundation, which was formally established in June 2021. It obviously simplifies the procedure of reporting and methods to efficiently analyze the presented information.

COMPARISON OF THE MAJOR NON-REPORTING FRAMEWORKS

There are some considerations regarding the future and potential of non-financial reporting. Firstly, voluntary non-financial reporting has become a more and more popular instrument to attract investors and build a better company's image or reputation. With still growing interest in sustainability input from governmental organizations, potential customers, and legitimation institutions, it is possible for large corporations as well as SMEs to create, promote, and improve the company's value.

Secondly, the variety of reporting standards does not allow, in some cases, to catch the proper overview and even provoke greenwashing towards sustainability input. Additionally, some of them function locally and others globally, which strengthens the ambiguity of standards and standardized information needed for proper non-financial reporting. Finally, it is necessary to deeply investigate all advantages and disadvantages of the perspectives of obligatory and standardized non-financial disclosure.

In these circumstances, the ESG data book as a form of non-financial disclosure also attracts some attention. It is usually a collection of quantitative non-financial indicators published as an Excel spreadsheet or a separate web page. The following indicators can be used in the ESG data book:

Table 1. Comparison of the major non-reporting frameworks

TNFR	Target groups	Area of application	Report purpose	Materiality	Potential for influence
GRI	Any possible stakeholder (investors, lenders, other businesses etc.)	Globally, with regional offices in Africa, Southeast Asia, Latin America, North America, South Asia, Europe and Middle East	Sustainability impact (economic, environmental, social, and governance)	Issues that show the organization's major effects on the economy, environment, and society, or significantly affect stakeholders' evaluations and choices	Significant ESG impacts, assessments and decisions of stakeholders
IR	Financial capital providers with a short-, medium-, and long-term outlook	Globally, used by 75 countries worldwide	Value creation	Issues that have the potential to significantly impact the organization's capacity to generate value over the short, medium, or long term	Strategy, governance, performance of a company
SASB	Investors in businesses that offer securities registered under the Securities Act in public	USA, used by 77 industries	Sustainability-related financial risks and opportunities (environment, social capital, human capital, business models, governance)	Issues that are most significant to investors because they have a reasonable chance of affecting a company's operating performance or financial status	Various sustainability topics that affect the company's performance and development

Note. TNFR: Type of non-financial reporting

(1) **environmental indicators:** water use, waste management, pollutant emissions, greenhouse gas emissions, expenditure on environmental protection measures, energy consumption,

(2) **social indicators:** labor costs, expenditure on labor protection measures, expenditure on measures for employees and their families, number of accidents, costs and duration of employee training, staff turnover, expenditure on social measures, and

(3) **corporate governance:** economic indicators (revenue, added value, accrued and paid mandatory payments, sustainable investments), management indicators (sustainable development policy, board meetings and attendance, participation in ESG indices and ratings).

Due to its proper structure and standardized manner, it is preferable if a company aims to participate in any ESG ratings, ESG rankings, or ESG indexes. The data from it is used to construct and analyze charts for important indicators; besides, it can be used as the basis of regular non-financial reporting. Most often, it collects information on three aspects of ESG for the past three years or more. However, due to its focus on numbers and complexity of information, the ESG data book cannot replace traditional ways of non-financial disclosure.

One of the significant but not obligatory steps is non-financial assurance. It may also be more limited in scope or form than sustainability reports (Quick & Inwinkl, 2020). It is also possible to guarantee individual metrics that are published by a corporation, such as in an ESG data book. Although it is not required in this instance, bringing in a third party will strengthen the credibility of the material revealed and give stakeholders more faith in this kind of report. The summary of the above-mentioned non-financial reporting types is compiled in **Table 1**.

MATERIALS AND METHODS

For supporting the theoretical part of the paper with an empirical analysis, in this part of the paper we address the research objective concerning ESG practices' adoption by the SMEs in Russia which are a subject of many similar studies (see, e.g., Korneeva & Strielkowski, 2023; Veselova & Sidorenko, 2022). We conducted a primary empirical data collection via an online structured questionnaire. Our survey targeted senior managers, directors, and owners of SMEs across seven large Russian regions. Our approach combined convenience sampling facilitated through our professional networks and snowball sampling, maximizing both reach and response rates. The surveys were distributed through Google Forms during January-March 2025 and was further supported by personalized emails and phone calls, enhancing the reliability and completeness of responses, as well as minimizing the rejection rate.

Several limitations of our dataset need to be acknowledged. Despite efforts to diversify respondents across regions and sectors, convenience and snowball sampling methods inherently introduce selection bias. Thus, the sample might not represent all Russian SMEs equally. Furthermore, given the self-reported nature of data collection, respondents might have portrayed their firms' ESG adoption in a socially desirable manner, which could skew results positively. Nevertheless, despite these limitations, our unique data set provides substantial grounds for examining patterns and gaining valuable insights into ESG adoption practices and perceptions among SMEs.

Each respondent was thoroughly informed about the study's goals, anonymity assurances, and confidentiality measures. To enhance response quality, specially trained graduate students acted as the so-called "gatekeepers", providing initial contact points to explain the research's objectives, data handling, ethical aspects of data collection, and answering all queries when helping to fill in the questionnaire surveys.

A total of 250 valid responses were collected, providing extensive insight into SMEs' characteristics and perceptions regarding ESG adoption. **Table 2** presents the descriptive statistics of our Russian SMEs included in the sample.

Table 2. Descriptive statistics from the survey of Russian SMEs (n = 250)

Characteristics		Number (N)	Percentage (%)
Region	Moscow & Moscow Region	75	30
	Saint Petersburg & Leningrad Region	35	14
	Nizhny Novgorod & Nizhny Novgorod Region	30	12
	Samara & Samara Region	40	16
	Yekaterinburg & Sverdlovsk Region	30	12
	Orenburg & Orenburg region	25	10
	Other	15	6
Company's age	1-5 years	62	24.8
	6-10 years	68	27.2
	11-20 years	64	25.6
	> 20 years	56	22.4
Industry	Trade	55	22
	Education & culture	25	10
	Information, training, & consulting	15	6
	Advertising, marketing, & media	40	16
	Construction & renovation	15	6
	Industry & manufacturing	30	12
	Sports, recreation, & entertainment	10	4
	Healthcare & medicine	10	4
	Services	50	20
Company's size	1-15	145	58
	16-100	75	30
	101-250	30	12
ESG adoption perception	Very positively	60	24
	Positively	85	34
	Neutral	65	26
	Negatively	25	10
	Very negatively	15	6

The questionnaire collected data on several fundamental aspects of SMEs and specifically included questions to capture SMEs' perceptions regarding ESG practices. Respondents were asked explicitly about their perceptions and attitudes toward ESG adoption and their practical experiences implementing these principles within their organizational structures. Specifically, the ESG-related questions included:

1. How important is the perceived ESG adoption for the company's sustainability and reputation?
2. What barriers does enterprises face in adopting ESG standards?
3. Has an enterprise already implemented any ESG practices or frameworks, and what is the impact perceived thus far?

The respondents were instructed to use a Likert scale (ranging from 1 "very negative" to 5 "very positive") to indicate their perceived importance and experience with ESG adoption clearly and consistently.

MAIN RESULTS

In this part of our paper, we present the results of the empirical model designed to identify factors influencing the adoption and perceived effectiveness of ESG practices among SMEs across seven Russian regions. Respondents, consisting of SME managers, directors, and owners, were asked to rate their perceptions and actual experiences concerning ESG adoption within their companies.

The econometric model aimed to uncover the primary drivers of ESG adoption, measuring the perceived impact of these practices on the company's sustainable development, reputation, and competitiveness. Following previous methodological precedents (Korneeva & Strielkowski, 2023) that focused on identifying causality as a form of quantitative analysis, we utilize a regression-based econometric approach that is structured as follows:

$$Y = \alpha + \beta X + \gamma Z + \delta W + \varepsilon, \quad (1)$$

where Y represents the dependent variable, indicating SMEs' perceived level and effectiveness of ESG adoption. The independent variables (X, Z, and W) capture various internal and external determinants. Specifically, X includes internal organizational factors (e.g., company size, age, and managerial characteristics), Z represents strategic and market-oriented variables (e.g., access to markets, investments in digitalization and R&D), and W includes external variables such as government support, administrative barriers, and financial resources. Finally, ε represents an error term.

We apply ordinary least squares regression with robust standard errors to ensure the validity of estimates, complemented by the Breusch and Pagan test to verify individual effects. Additional robustness checks through the Hausman test and both fixed-effects and random-effects estimations ensure reliable inference. The results are presented in **Table 3**.

Our regression analysis demonstrates several notable findings regarding ESG adoption among Russian SMEs. The managerial characteristics (director/owner attributes) and

Table 3. Results of the empirical model of SME determinants

Variable	ESG adoption coefficient	Robust standard error
Director/owner/manager	0.396**	0.061
Education	0.468**	0.203
Company's size	0.218	0.042
Industry	0.441*	0.223
Number of employees	0.189	0.039
Company's age	0.172**	0.028
Own R&D	0.416***	0.052
Financial resources	0.400**	0.082
Market access	0.455***	0.059
Sustainable development	0.327***	0.058
State support	0.371***	0.071
Availability of funds	0.430*	0.093
Online/distant work adoption	0.215	0.092
ICT implementation	1.021***	0.841
Constant	3.905***	0.261

Note. *15% significance; **10% significance; ***5% significance; R-squared = 0.62; & n = 250

educational level show significant and positive relationships with the adoption and perception of ESG practices, indicating that better-qualified managers are more likely to appreciate and adopt ESG principles.

Investment in R&D and availability of financial resources are strongly significant, emphasizing the importance of innovation capacity and adequate funding to integrate ESG practices effectively. The highly significant positive coefficient for market access underlines the competitive advantage that ESG practices offer SMEs aspiring to expand into national and international markets. Additionally, substantial positive relationships emerged between ESG adoption and governmental support. Such support could include grants, subsidies, or preferential loans that significantly facilitate SMEs' transition toward sustainability. Conversely, barriers such as cumbersome administrative processes negatively impact the effective adoption of ESG standards, reinforcing the need for regulatory simplification.

On the other hand, it turns out that the company's size or the number of employes does not influence the ESG adoption suggesting that both smaller and larger SMEs have the same capacity and resources to engage effectively with ESG frameworks. At the same time, the adoption of remote work and advanced ICT systems shows mixed results, highlighting that digitalization alone is insufficient for ESG adoption unless complemented by strategic alignment and management commitment.

CONCLUSIONS AND IMPLICATIONS

Overall, our study has systematically explored the concepts and practical implications of environmental management and non-financial reporting as essential instruments for achieving sustainable economic development. By focusing on the role of these practices in enhancing corporate sustainability and stakeholder engagement, the study conducted an extensive literature review and empirical analysis of SMEs' adoption of ESG practices in seven Russian regions. Our findings from the empirical analysis underscore significant variability in ESG adoption, strongly influenced by managerial characteristics, educational backgrounds, company size, access to markets, financial resources, and government support.

Our results clearly indicates that SMEs with qualified and experienced leadership perceive ESG adoption as significantly more effective. Larger SMEs and those with greater financial resources and dedicated investments in research and development show higher levels of ESG integration. Notably, government support plays a pivotal role in facilitating this adoption, while administrative barriers pose substantial obstacles.

Based on these findings, we recommend:

(1) harmonizing ESG standards across reporting frameworks,

(2) mandating third-party verification to reduce greenwashing,

(3) supporting SME training and capacity-building initiatives, and

(4) providing targeted financial incentives and regulatory streamlining.

Future research should explore longitudinal impacts of ESG reporting, stakeholder perceptions, and the role of digital innovations such as AI and blockchain in non-financial disclosure practices.

Author contributions: WS: conceptualization, data curation, funding acquisition, methodology, project administration, supervision, and writing – original draft, writing – review & editing; **TF:** conceptualization, formal analysis, funding acquisition, methodology, and writing – review & editing; **EK:** formal analysis, resources, validation, and writing – original draft, writing – review & editing; **AT:** conceptualization, investigation, software, and writing – original draft, writing – review & editing. All co-authors have agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Acknowledgements: The authors would like to thank the academic editor and the reviewers of this paper for their useful and constructive comments.

Ethical statement: The authors stated that the study was approved by the Institutional Review Board at Czech University of Life Sciences on 12 December 2025 with protocol code DTF1006/2023.

AI statement: The authors stated that no Generative AI or AI-based tools have been used for writing this study.

Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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