



The Role of Intellectual Capital in the ESG Strategies of Modern Companies

Marta *PODOBIŃSKA-STANIEC*¹⁾

¹⁾ dr inż.; AGH University of Kraków, Katedra Ekonomiki i Zarządzania w Przemysle, Wydział Inżynierii Ładowej i Gospodarki Zasobami AGH, Mickiewicza 30, 30-059 Kraków, Poland; ORCID: 0000-0002-3250-0646; email: mstaniec@agh.edu.pl

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Abstract

Non-financial reporting, conducted by companies for many years, has now been aligned with the ESG principles (Environmental, Social, Governance). The question of whether ESG reporting considers the intellectual capital of enterprises, which includes knowledge resources, competencies, relationships, and information about patents and innovation, is raised. Although it may seem intuitive that it should, the reality might be more complex. The author of this study attempted to explore this connection by formulating two main research questions: whether there is a relationship between the information contained in ESG reports and intellectual capital, and whether strategies for managing intellectual capital can provide stakeholders with relevant information about the long-term condition of the company. In the past, stock market indices promoting good practices and sustainable development played a role in assessing such issues; however, currently, the obligation to report on ESG aspects may serve as a foundation for better protection and management of most intangible assets held by organizations.

Keywords: *intellectual capital, ESG, improvement, raw material companies*

1. INTRODUCTION

Since 2024, under European Union regulations, companies have been required to regularly publish reports concerning social and environmental risks, as well as the impact of their operations on people and the environment. In other words, businesses must prepare reports covering three key areas: Environmental, Social, and Corporate Governance (ESG). These sustainability reports must comply with the Corporate Sustainability Reporting Directive (CSRD) and adhere to a unified set of sustainability reporting standards, known as the European Sustainability Reporting Standards (ESRS).

The initial set of ESRS includes two cross-cutting standards (ESRS 1 and ESRS 2) and ten topical standards focused on environmental, social, and governance matters. These standards constitute a mandatory framework outlining both the content and format of disclosures that companies are expected to provide under the CSRD. The cross-cutting standards apply universally to all enterprises, whereas the topical standards are subject to the principle of double materiality. Companies are required to disclose only those elements deemed material after conducting a double materiality assessment [1].

It is worth noting that non-financial reporting has been practiced across various industries for many years, albeit not in such a standardized form. Nonetheless, there has long been a growing awareness that a company's value is derived not only from its financial assets but also from its non-financial resources.

Given that, alongside ESG disclosures, organizations may also report either internally or externally, on information pertaining to intellectual resources, a fundamental question arises: does ESG reporting convey information about a company's intellectual capital? Are the components of intellectual capital adequately reflected in ESG-related disclosures? Intuitively, one might assume that they should be; however, is this assumption supported in practice?

The ESG domain is widely discussed, both in professional and academic circles. In fact, according to the Scopus database, a total of 4,173 publications in 2024 alone included the acronym "ESG" in their titles, abstracts, or keywords. This demonstrates the significance of discussing non-financial reporting methodologies. Given the scope and relevance of ESG, it is worth considering how the obligation to report non-financial information can be leveraged to benefit an enterprise or organization more broadly.

For this reason, the following research questions have been formulated:

Is there a relationship between ESG-reported information and intellectual capital?

Can information regarding company strategies related to the acquisition, development, transfer, and utilization of intellectual capital provide stakeholders with valuable insights into the enterprise's long-term outlook?

Has intellectual capital gained or lost relevance in the context of mandatory ESG reporting?

To date, stock market indices have been instrumental in addressing these inquiries by encouraging the adoption of sustainable practices and best practices by publicly listed companies.) In Poland, for instance, the Respect Index and the WIG-ESG index were among these. Currently, investors and researchers can refer to the Warsaw Sustainable Segment, which presents a list of financial instruments linked to sustainable development financing.

2. MATERIALS AND METHODS

SYSTEMATIC LITERATURE REVIEW (SLR)

In order to address the research questions outlined in the introduction of this study, the first step involved an analysis of existing literature on the topics of ESG and intellectual capital. The Scopus database was queried using a combined search for both concepts. As a result, it was found that there are rela-

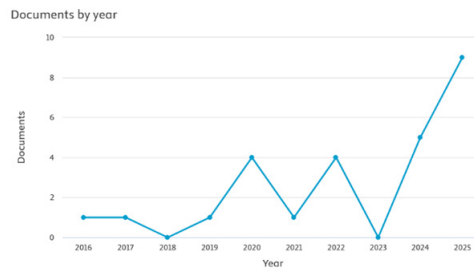


Fig. 1. Number of publications on ESG and Intellectual Capital by year of publication

Rys. 1. Liczba prac dotyczących tematów ESG i Kapitału Intelktualnego z podziałem na lata publikacji

tively few publications that include both "ESG" and "intellectual capital" in their title, abstract, or keywords. Specifically, the query yielded only 26 documents.

These publications date back to 2016, with a noticeable increase in recent years. The highest number of relevant articles appeared in 2024 (5 articles) and 2025 (9 articles), as illustrated in Figure 1. These most recent years are particularly significant in the context of current regulatory guidelines and developments related to the subject matter. Therefore, the subsequent review of the state of the art focuses exclusively on this recent period.

An analysis of the body of literature identified using the methodology described above leads to the conclusion that this is a niche topic—one that is not commonly explored by researchers focusing on ESG. However, this observation raises an important question: is this lack of attention justified?

Table 1 below presents the main thematic areas in which the concepts of ESG and intellectual capital have been discussed in the existing literature. Based on this analysis, several key directions of inquiry can be identified:

- ESG in relation to innovation, sustainable development, and transformation;
- ESG as a component of financial and investment strategy;
- ESG and financial performance / asset valuation;
- ESG in the context of ethical values and organizational virtues.

The classification of the reviewed literature by research area, thematic scope, and key links between ESG and intellectual capital is presented in Table 1. This study aims to explore the interrelationship between these two concepts: how a structured ESG methodology can contribute to the stimulation of a company's intellectual capital, and how investment in intellectual capital can enhance a company's positioning in terms of sustainability and long-term potential.

The existing body of literature reveals both common conclusions and some divergent perspectives. Encouragingly, many studies suggest that ESG has a positive impact on intellectual capital, and that intellectual capital, in turn, strengthens ESG's influence on other variables such as; innovation, investment readiness, and access to finance. This interplay is particularly visible in the context of the growing role of green finance.

Innovation appears to be a shared domain for both concepts: it is both an outcome of intellectual capital and, at the same time, often treated as a result or mediator of ESG. Thus, a clear overlap exists between the two frameworks. Howev-

er, one study [14] indicates that ESG may reduce the value of intellectual capital in the short term, particularly at a global level. Conversely, the authors of another study [3] argue that Green Intellectual Capital (GIC) and Green Finance (GF) do not directly influence ESG outcomes highlighting the need for innovation as a mediating factor.

Notably, ESG reporting is increasingly seen as an activity that promotes innovation and sustainable practices (e.g., green technologies and energy transition). Based on these insights, it may be inferred that companies actively engaged in ESG are more resilient to crises and better prepared for environmental change.

Moreover, the literature suggests that ESG is becoming a crucial component of investment assessment, attracting investors and improving access to financing. Interestingly enough, article [12] points out that environmental virtues such as curiosity and compassion are important sources of intellectual capital and should be considered foundational to an organization's culture.

DISCUSSION

By comparing Intellectual Capital and non-financial reporting based on the ESG framework, we can identify (illustrated in Figure 1) three dimensions common to both concepts. It is not difficult to find overlapping areas: both ESG and intellectual capital emphasize the human dimension, particularly employees. This shared focus also includes organizational culture, which influences both ESG practices and value creation, as discussed in [16].

Value creation itself constitutes another point of convergence. For instance, one of the oldest and most widely cited definitions of intellectual capital refers to it as "the difference between the firm's market value and its book value" [17–19]. This highlights that conveying comprehensive information about a company requires not only financial but also non-financial reporting. For many years, intellectual capital has been closely associated with various forms of valuation, and the same will increasingly apply to ESG related aspects.

Figure 2 presents a conceptual cycle illustrating the mutual influence between ESG and intellectual capital. It appears reasonable to assert that without intellectual capital, it is not possible to build a robust ESG strategy, and conversely, without creative and innovative ESG activities. The development of intellectual capital will remain limited.

When examining the relationship under study in greater detail, attention should be given to Figure 3, which outlines specific elements of intellectual capital that correspond to the individual ESG dimensions. This diagram serves as a syn-

Tab. 1. Summary of key research areas concerning the relationship between Intellectual Capital and ESG – own elaboration based on a review of academic literature (2024–2025)

Tab. 1. Przegląd głównych obszarów badawczych dotyczących relacji między Kapitałem Intelektualnym a ESG – opracowanie własne na podstawie przeglądu literatury naukowej (2024–2025)

References	Research Area	Thematic Scope	Key Links between ESG and Intellectual Capital
[2]	Innovation	Corporate innovation	ESG as a factor supporting innovation driven by intangible resources
[3]	Investment	ESG as a mediating factor	Intellectual capital mediates the ESG–investment relationship, influencing investor decisions
[4]	Sustainable Development	Green Intellectual Capital (GIC), Green Finance (GF), Green Innovations (GI)	ESG stimulates development of green IC and supports financing of sustainable projects
[5]	Stakeholder Relations	Investor relations, reputation	Better ESG performance strengthens firm reputation, enhancing relational IC value
[6]	Financing	Green bonds, blue bonds, green loans	ESG as a basis for developing green financial instruments supported by IC
[7]	Innovation	Green projects and innovations	ESG motivates implementation of green innovations based on knowledge and technology
[8]	Financial Performance	Company financial results	Intellectual capital can enhance the positive impact of ESG on financial outcomes
[9]	Organizational Efficiency	Impact of ESG on firm performance	Positive correlation of ESG with efficiency, strengthened by intangible assets
[10]	Intellectual Capital	ESG and intellectual capital value	Better ESG results translate into increased intellectual capital value
[11]	Valuation	Valuation of ESG indicators	Attempts to assign monetary value to ESG indicators based on IC models
[12]	Ethics and Culture	Environmental virtues as a common element	ESG and IC jointly form the ethical identity of an organization
[13]	Access to Finance	ESG, sustainability, and credit access	Intellectual capital as a moderator in the ESG–credit access relationship
[14]	Financial Performance	ESG and financial outcomes, role of IC	IC strengthens or weakens the impact of ESG on financial performance
[15]	Valuation of Intangible Assets	ESG and the value of intangible assets	ESG affects the value of IC and other intangible assets, especially in the EU

thesis of the preceding discussion and provides a structured summary of the key insights derived from the analysis.

When translating the subject of this study into the context of companies in the extractive sector, it is important to emphasize that intellectual capital, although often undervalued, is critically important in this industry. While it may appear that physical assets dominate sectors such as mining, oil, gas or metals, intellectual capital in fact plays a key role in driving operational efficiency, safety, innovation, and ESG compliance.

Where can these interrelations be observed most clearly? The first and most obvious area is the human factor. Employee competencies, which constitute of human capital, are highly specific in industrial settings. As experienced employees retire, essential knowledge resources often leave the organization with them. Therefore, effective knowledge management and training systems are essential, not only for maintaining performance but also for ensuring safety, productivity, and the company's reputation.

Modern technologies such as AI, IoT, mining automation, and risk prediction offer companies a competitive edge, yet they also demand specialized know-how and well-structured implementation processes. Environmental, quality, and emissions management systems (e.g., ISO 14001), which are part of a company's structural capital, are likewise essential for meeting ESG disclosure requirements.

This category of structural capital also includes efficient logistics, supply chain and extraction management capabilities based on industry-specific expertise that are difficult to replicate and thus represent a unique strategic asset for each organization.

A third dimension of intellectual capital with clear ESG relevance is relational capital, which encompasses reputation and stakeholder relationships. For resource-based companies, relationships with local communities, regulators, governments, and investors are vital. For example, access to mining concessions is often contingent upon a social license

to operate, which is fundamentally rooted in trust and acceptance.

Last but not least, it should be noted that an organization's ESG reputation and sense of responsibility can directly affect its access to financing, such as green bonds and ESG-aligned investment funds.

To illustrate these dynamics in practice, one can refer to companies like Shell and BP, which are actively investing in energy transition initiatives, developing both human and structural capital related to renewable energy, hydrogen, and carbon capture and storage (CCS) technologies [20–23].

In the Polish market, KGHM Polska Miedź serves as another relevant example. The company has made significant progress in developing both human and structural capital through HR transformation efforts: implementing coherent processes and tools to support the development of professional, managerial, and language competencies, as well as introducing e-recruitment systems and employee performance evaluations [24].

These initiatives, while predating current ESG reporting standards were documented in the company's 2021 CSR report, which highlighted advanced Industry 4.0 activities: underground personnel and machine tracking, broadband data transmission in mining galleries, a Center for Advanced Data Analytics (CZAD), the CuXRF robot for copper content scanning, digital documentation systems, automation of administrative, HR and financial processes [25].

All of these efforts are rooted in the development of intellectual capital, demonstrate a commitment to sustainable growth and a clear organizational awareness of environmental, social, and governance responsibilities.

CONCLUSIONS

Both the literature review and the comparison of the components of ESG and intellectual capital clearly indicate a strong interconnection between ESG and intellectual capital.

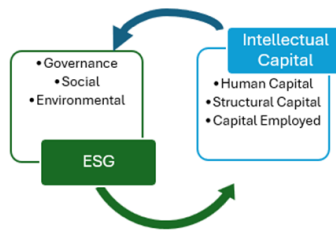


Fig. 2. The interdependence between ESG and Intellectual Capital

Fig. 2. Współzależność ESG i Kapitału Intelktualnego

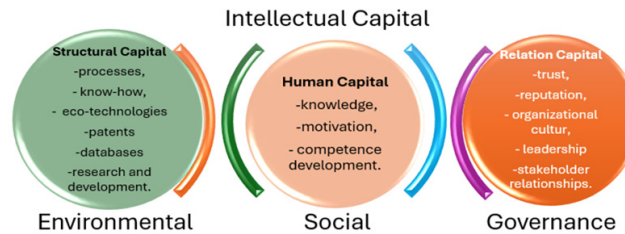


Fig. 3. The interrelationship between ESG elements and the components of intellectual capital in an organizational context

Rys. 3. Powiązanie elementów ESG z komponentami kapitału intelektualnego w organizacji

The implementation of ESG objectives leads to the strengthening of key elements of a company's intellectual capital, which in turn translates into its long-term value and competitive advantage. Analyzing this relationship according to the E-S-G dimensions, the following can be highlighted:

- Environmental (E) dimension: Companies investing in sustainable technologies, energy efficiency, and circular economy practices develop unique know-how and organizational structures capable of adaptation, this represents the growth of structural capital.
- Social (S) dimension: Responsible practices towards employees and the broader community foster the development of human capital by increasing engagement, innovation, and talent retention.
- Governance (G) dimension: Transparency, ethical management, and accountability contribute to building relational capital, the reputation and trust of investors, clients, and partners.

ESG is not only a manifestation of corporate responsibility, but also a factor that creates and reinforces intellectual cap-

ital. Over the long term, investments in ESG can drive higher innovation, better reputation and increased organizational value. Since this article has demonstrated the reciprocal nature of this relationship, it is also important to emphasize that investment in human capital development positively impacts the achievement of sustainable development goals.

The research questions posed have thus been answered, confirming that a relationship exists between ESG reporting information and intellectual capital. It has also been shown that both internal and external stakeholders represent important recipients of information related to intellectual capital and ESG reports. Such information may influence their willingness to maintain engagement with the organization, whether through investment, financial support, or simply being satisfied and motivated employees.

It is crucial for organizations to recognize that these two aspects of their activities, embedded in sustainability reporting and intellectual capital, coexist closely. Rather than overlooking this relationship, organizations should consciously leverage the knowledge of their interdependence to enhance strategic value creation.

Literatura – References

1. Commission Delegated Regulation (EU) 2023/277 of 3 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=OJ:L_202302772
2. Lee, H. (2025). Does ESG Performance Drive Firm-Level Innovation? Evidence from South Korea. *Sustainability*, 17(4), 1727. <https://doi.org/10.3390/su17041727>
3. Lei, X., Deng, F., & Chin, T. (2025). Intellectual capital as catalysts translating ESG performance into investment willingness: evidence from Chinese private enterprises. *Journal of Intellectual Capital*. <https://doi.org/10.1108/jic-07-2024-0202>
4. Gidage, M., & Bhide, S. (2025). ESG Performance and Green Innovation Nexus: Insights from Indian manufacturing Titans. *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.70041>
5. Sulaiman, N. N., Omar, A. J., Pakir, F., & Mohamad, M. (2024). Evaluating environmental, social and Governance (ESG) practice among Malaysian public listed construction companies using FTSE Russell Rating model. *International Journal of Sustainable Construction Engineering Technology*, 15(1). <https://doi.org/10.30880/ijscet.2024.15.01.003>
6. Aggarwal, S., Dsouza, S., Joshi, M., Antoun, R., & Phan, D. H. T. (2025). Environmental, social and governance investing: systematic literature review using ADO model. *Journal of Accounting Literature*. <https://doi.org/10.1108/jal-11-2024-0319>
7. Khan, S., Pinglu, C., Ullah, A., & Qian, N. (2025b). Facilitating sustainable corporate growth in China: Examining the role of transition finance, green technology innovation, and ESG strategies in the path to sustainability. *Journal of Environmental Management*, 389, 126085. <https://doi.org/10.1016/j.jenvman.2025.126085>
8. Fauzi, M. R., Abdurahman, L., Lubis, M., Fakhurroja, H., & Wihayanti, T. (2025). A Systematic Literature Review of Research Trends on Firm Performance Using Regression Analysis for Firm Strategic Recommendation: Measurement and Factors that Affect Firm Performance. In *Lecture notes in networks and systems* (pp. 461–471). https://doi.org/10.1007/978-981-96-1747-0_38
9. Panko, M., & Glova, J. (2024). Global Trends and Slovak Republic focus on environmental, social and governance research. *TEM Journal*, 2863–2874. <https://doi.org/10.18421/tem134-22>
10. Pham, C., Liu, S., & Chen, S. (2024). Corporate ESG performance and intellectual capital: International evidence. *Asia Pacific Management Review*, 29(3), 306–346. <https://doi.org/10.1016/j.apmr.2023.12.003>
11. Weir, M., & Sugai, P. (2025). Calculating monetary value for ESG scores: A case study on GNO. In *Contributions to management science* (pp. 269–289). https://doi.org/10.1007/978-3-031-86362-2_13
12. Bugdol, M., Borys, T., & Puciato, D. (2024). The concept of pro-environmental organisation vs. environmental virtue theory. *Economics and Environment*, 90(3), 897. <https://doi.org/10.34659/eis.2024.90.3.897>
13. Campanella, F., Ferri, L., Serino, L., & Zampella, A. (2025). Exploring the link between sustainable performance and credit access: the moderating role of intellectual capital. *Journal of Intellectual Capital*. <https://doi.org/10.1108/jic-06-2024-0191>
14. Chunya, R., Ting, I. W. K., Kweh, Q. L., & Le, H. T. M. (2024). The dynamic role of intellectual capital in moderating ESG practices and financial performance in the Chinese A-Share manufacturing sector. *The Singapore Economic Review*. <https://doi.org/10.1142/s0217590824500516>
15. Lanzalonga, F., Oppioli, M., Calandra, D., & Secinaro, S. (2024). The impact of ESG performance on intangible assets and intellectual capital in the food and beverage industry. *Management Decision*. <https://doi.org/10.1108/md-09-2023-1664>
16. Podobińska-Staniec, M. U., Sukiennik, M., Kęsek, M., Oleksak, K. (2024). Organisational culture based on ESG standards and knowledge management – premises for implementation for the mining industry. *Gospodarka Surowcami Mineralnymi – Mineral Resources Management*, 40(4), 183-205. <https://doi.org/10.24425/gsm.2024.152720>
17. Edvinsson, L. and Malone, M.S. (1997), *Intellectual Capital: Realizing your Company's True Value by Finding its Hidden Brainpower*, Harper Business, New York, NY.
18. Mouritsen, J., Larsen, H.T. and Bukh, P.N.D. (2001), "Intellectual capital and the 'capable firm': narrating, visualising and numbering for managing knowledge", *Accounting, Organization and Society*, Vol. 2Nos 6/7, pp. 735-62.
19. Stewart, T.A. (1997), *Intellectual Capital*, Nicholas Brealey Publishing, London. Sveiby, K.E. (1997), *The New Organizational Wealth: Managing and Measuring Knowledge-based Assets*, Barrett-Kohler, San Francisco, CA.
20. <https://www.hydrogeninsight.com/production/shell-will-spend-up-to-1bn-annually-on-hydrogen-and-ccs-in-2024-and-2025/2-1-1467919>
21. <https://www.reuters.com/sustainability/climate-energy/bp-construct-5-10-green-hydrogen-projects-this-decade-ceo-says-2024-07-30/>
22. <https://www.bp.com/en/global/corporate/what-we-do/hydrogen.html>
23. <https://www.shell.com/news-and-insights/scenarios/the-2025-energy-security-scenarios.html>

24. <https://raportcsr2020.kghm.com/spoleczenstwo-2/dzialania-w-sferze-pracowniczej-i-poszanowania-praw-czlowieka/polityka-hr-kghm-polska-miedz-s-a/>
25. <https://raportcsr2021.kghm.com/nasza-strategia/dobre-praktyki-i-kluczowe-osiagniecia-w-realizacji-strategii-kghm/>

Rola kapitału intelektualnego w strategiach ESG współczesnych przedsiębiorstw

Raportowanie niefinansowe, realizowane przez przedsiębiorstwa od wielu lat, obecnie zostało podporządkowane zasadom ESG (Environmental, Social, Governance). W związku z tym pojawia się pytanie, czy raportowanie ESG uwzględnia kapitał intelektualny przedsiębiorstw, czyli zasoby wiedzy, kompetencji, relacji, a także informacje dotyczące patentów i innowacyjności. Choć intuicyjnie wydaje się, że tak powinno być, rzeczywistość może być bardziej złożona. Autor niniejszego opracowania podjął próbę zbadania tego powiązania, formułując dwa główne pytania badawcze: czy istnieje zależność między informacjami zawartymi w raportach ESG a kapitałem intelektualnym oraz czy strategie zarządzania kapitałem intelektualnym mogą dostarczyć interesariuszom istotnych informacji na temat długofalowej kondycji przedsiębiorstwa. W przeszłości rolę w ocenie takich aspektów pełniły indeksy giełdowe promujące dobre praktyki i zrównoważony rozwój, jednak obecnie to właśnie obowiązek raportowania aspektów ESG może stanowić fundament do lepszej ochrony i zarządzania większością aktywów niematerialnych, jakimi dysponują organizacje.

Słowa kluczowe: kapitał intelektualny, ESG, doskonalenie, spółki surowcowe