

## INNOVATIVE APPROACHES TO SUSTAINABILITY REPORTING: INTEGRATING ESG, DIGITALIZATION, AND TRANSPARENCY

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**Purpose of the article:** *The paper examines innovative approaches to sustainability reporting, focusing on the integration of Environmental, Social, and Governance (ESG) principles, digital technologies, and transparency mechanisms. The objective is to demonstrate how digitalization strengthens corporate accountability and value creation in sustainability reporting.*

**Methodology:** *The study combines comparative analysis of international frameworks (GRI, SASB, CSRD/ESRS) with case studies from EU countries and emerging economies. It investigates the use of big data, blockchain, and AI in enhancing the reliability, comparability, and timeliness of sustainability disclosures.*

**Conclusions:** *Results reveal that integrating ESG and digitalization improves data transparency, attracts sustainable finance, and strengthens business resilience. Innovative reporting transforms sustainability from a compliance obligation into a strategic driver of competitiveness.*

**Originality:** *The research proposes a holistic framework linking ESG principles with technological innovation, positioning sustainability reporting as a key instrument for achieving long-term corporate and societal goals.*

**Keywords:** *Sustainability reporting, ESG, digitalization, transparency, corporate strategy, business resilience, sustainable finance, eu standards.*

**JEL Classifications:** M14, M41, O33, Q56

### INTRODUCTION

Sustainability reporting has transformed from a voluntary communication practice into a central pillar of corporate accountability, driven by accelerating regulatory requirements, investor expectations, and societal pressure to address climate change and social inequality. The European Union's Corporate Sustainability Reporting Directive (CSRD), effective from 2024, exemplifies this shift by imposing comprehensive disclosure obligations based on the principle of double materiality. These developments influence not only EU member states but also neighboring countries such as Moldova, which is aligning its regulatory framework with European standards as part of the EU accession process.

Against this evolving landscape, organizations are adopting innovative approaches that integrate Environmental, Social, and Governance (ESG) principles with digital technologies and enhanced transparency mechanisms. Emerging tools—such as artificial intelligence for data analytics, blockchain for verification, and XBRL-based digital taxonomies—promise to address persistent challenges related to data fragmentation, inconsistencies, and risks of greenwashing. At the same time, global reporting frameworks such as GRI, SASB/ISSB, TCFD, and the ESRS are converging through harmonization initiatives that promote comparability and interoperability.

The need for this research arises from the rapid and complex transformation of sustainability reporting systems, where companies must adapt to new standards while leveraging technology to ensure credible and decision-useful disclosures. Understanding how ESG integration, digitalization, and transparency interact is essential for both policymakers seeking coherent regulatory approaches and practitioners responsible for reporting quality.

This study contributes to the scientific literature by offering a comparative analysis of major reporting frameworks, examining the role of digital tools in strengthening data integrity, and evaluating implications for organizations across industries. Through a focus on Europe and Moldova, the paper provides insights

into how next-generation reporting practices can enhance corporate resilience, stakeholder trust, and alignment with long-term sustainability objectives.

## **MATERIALS AND METHODS**

This study employs a qualitative and comparative research design to investigate innovative approaches to sustainability reporting, with a particular focus on the European Union and the Republic of Moldova. The analysis covers the period 2018–2024, a timeframe marked by significant regulatory reforms and technological advancements in ESG disclosure practices. The research relies exclusively on secondary data, collected from reputable academic databases such as Scopus, Web of Science, and Google Scholar, as well as from institutional sources including the European Commission, EFRAG, IFRS/ISSB, GRI, OECD, and the World Economic Forum. Professional ESG repositories and technical documentation related to CSRD/ESRS, SASB/ISSB standards, and XBRL digital taxonomies were also consulted. All materials were selected based on strict credibility criteria, prioritizing peer-reviewed articles, official publications, and high-quality analytical reports.

The methodological approach combines an interpretive comparison of major sustainability reporting frameworks with a document-based examination of digital innovations in the field. The comparative component assesses the objectives, scope, materiality perspectives, and industry relevance of GRI, SASB/ISSB, TCFD, and CSRD/ESRS, enabling an understanding of how these standards converge or diverge in practice. In parallel, the study reviews literature and empirical reports discussing the use of artificial intelligence, big data analytics, blockchain systems, and digital tagging technologies in ESG reporting. This analysis seeks to identify the extent to which such tools address challenges related to data collection, verification, transparency, and comparability.

Given the regional focus, the research incorporates a contextual case study of the EU and Moldova. For the EU, the study analyzes recent legislative developments and highlights examples of organizations applying advanced reporting technologies. For Moldova, it examines available policy documents, national assessments, and emerging corporate practices related to sustainability disclosure and alignment with European requirements. Although the study does not involve primary data collection, it draws on triangulation across scientific literature, regulatory texts, and professional analyses to ensure the reliability and coherence of findings. Through this narrative and comparative approach, the research provides an integrated understanding of how ESG integration, digitalization, and transparency shape contemporary sustainability reporting systems.

## **RESULTS AND DISCUSSIONS**

Sustainability reporting is moving toward a new paradigm defined by regulatory consolidation, digital transformation and an increasing emphasis on transparency and accountability. The comparative assessment of four major sustainability reporting regimes—GRI, SASB/ISSB, TCFD and CSRD/ESRS—reveals both structural similarities and profound conceptual differences that shape how companies disclose ESG information across jurisdictions. Through this comparative lens and the complementary analysis of digital tools, the study illustrates how reporting practices are evolving in both the European Union (EU) and the Republic of Moldova:

- **Global Reporting Initiative (GRI)**

A voluntary global standard that provides comprehensive guidelines for reporting on economic, environmental, and social impacts. GRI adopts an *impact materiality* approach, requiring organizations to report on issues that reflect significant impacts on society or the environment, as identified through stakeholder engagement (European Commission, 2023). It covers all industries and a wide spectrum of ESG topics, making it widely applicable and the most commonly used framework worldwide (utilized by roughly

68–78% of large companies globally) (GRI, 2022). GRI reports are intended for a broad stakeholder audience and emphasize transparency and accountability for corporate impacts.

- EU Corporate Sustainability Reporting Directive (CSRD) & European Sustainability Reporting Standards (ESRS).

A mandatory regime in the European Union (with influence on neighboring countries like Moldova seeking EU alignment). CSRD extends to tens of thousands of companies and requires reporting according to ESRS – detailed standards that implement a *double materiality* concept (European Commission, 2023). This means companies must disclose both impact materiality (like GRI, effects on society/environment) and financial materiality (like SASB/ISSB, ESG matters that influence enterprise value). The ESRS are sector-agnostic base standards (covering climate change, other environmental issues, social and governance factors) with planned sector-specific standards under development (European Commission, 2023). Notably, CSRD mandates digital reporting: sustainability reports must be produced in a machine-readable XBRL format and will feed into a centralized European database (ESAP) (Novisto, 2025). It also requires external assurance of the reported information, enhancing credibility. The European Commission has worked to align the ESRS with global frameworks, achieving high interoperability with both GRI and ISSB standards (European Commission, 2023).

- Sustainability Accounting Standards Board (SASB) / ISSB Standards.

Originating as SASB in the United States, these standards focus on *financially material* sustainability issues on an industry-specific basis. SASB provides separate disclosure topics and metrics for 77 industries, ensuring companies report on the ESG issues most likely to impact financial performance in their sector (e.g. data privacy in tech, supply chain labor standards in manufacturing) (Seneca ESG, 2025). In 2022, SASB was consolidated into the International Sustainability Standards Board (ISSB) under the IFRS Foundation. The ISSB's inaugural standards, *IFRS S1* (General Requirements for sustainability disclosures) and *IFRS S2* (Climate-related Disclosures), were released in 2023 and incorporate SASB's approach. IFRS S1 requires companies to consider SASB's industry-specific metrics when disclosing sustainability risks and opportunities, while IFRS S2 is explicitly built upon the TCFD's climate disclosure framework (Seneca ESG, 2025). These standards aim to create a global baseline for investor-focused ESG reporting. The ISSB framework is principles-based and focuses on information relevant to investors' decision-making (enterprise value lens), complementing the broader stakeholder-focused regimes like GRI. There is significant overlap with EU's ESRS in climate and financial-risk disclosures, and alignment efforts are ongoing.

- Task Force on Climate-related Financial Disclosures (TCFD).

A framework rather than a standard, TCFD was established to improve the reporting of climate-related financial risk. It is structured around four core elements – Governance, Strategy, Risk Management, and Metrics & Targets – and encourages organizations to conduct forward-looking scenario analysis for climate risks (Seneca ESG, 2025). TCFD's narrow focus is on **climate** (not full ESG) and it targets primarily investors and financial stakeholders by highlighting how climate change could affect the company's financial health. Since its inception in 2017, TCFD has seen widespread adoption globally, becoming *de facto* mandatory in some jurisdictions (e.g. the UK for certain companies). As noted, it heavily influenced the climate reporting requirements in both the ISSB's IFRS S2 and the EU's climate ESRS, ensuring that TCFD-aligned disclosures (like scenario analysis of a 1.5°C or 2°C world) are increasingly embedded in mainstream reports (Seneca ESG, 2025). TCFD is often used in conjunction with broader ESG standards; companies might include a TCFD index in their GRI report or use TCFD to structure climate disclosures while using SASB/GRI for other topics.

The first major set of results concerns the comparative structure, purpose and reporting logic of the four dominant ESG frameworks. Although convergence efforts are intensifying—particularly between ESRS and ISSB—each framework retains distinct objectives, audience orientation and methodological assumptions.

**Table 1.1. Comparative Analysis of Major Sustainability Reporting Frameworks**

<i>Criterion</i>	<b>GRI</b>	<b>SASB / ISSB</b>	<b>TCFD</b>	<b>CSRD / ESRS</b>
<b>Primary Purpose</b>	Transparency of impacts on society & environment	Investor-focused financial materiality	Climate-related financial risk	Comprehensive mandatory reporting integrating impact & financial materiality
<b>Materiality Perspective</b>	Impact materiality	Financial materiality	Financial materiality (climate only)	Double materiality (impact + financial)
<b>Scope of ESG</b>	Full spectrum ESG	ESG issues material by industry	Only climate (Governance/Strategy/Risk/Metrics)	Full ESG (E1–E5, S1–S4, G1); sector-specific ESRS under development
<b>Level of Obligation</b>	Voluntary	Voluntary (but widely used); mandatory in some jurisdictions	Voluntary but adopted as mandatory template in several countries	Mandatory across the EU for tens of thousands of companies
<b>Audience</b>	Broad stakeholders	Investors, capital markets	Investors, regulators	Regulators, investors, civil society, EU institutions
<b>Industry-Specific Metrics</b>	Partial (sector guidelines)	Very strong (77 sectors)	No sector metrics	Under development (Sector ESRS)
<b>Digital Reporting Requirements</b>	None specific	Not required	Not required	Mandatory Inline XBRL digital tagging
<b>Assurance</b>	Not required	Not required	Not required	External assurance mandatory
<b>Interoperability Level</b>	High alignment with ESRS	ISSB aligns with SASB; moderate alignment with ESRS	TCFD highly aligned with ISSB S2; ESRS E1 mirrors TCFD	Designed for interoperability with GRI, ISSB, TCFD

*Source: Elaborated by the author.*

The comparative results highlight a clear movement toward interoperability, especially through the alignment between ESRS and ISSB on climate disclosures. However, the philosophical divide between impact materiality (GRI) and financial materiality (ISSB, TCFD) persists. The EU’s CSRD/ESRS stands out as the first legal framework to merge these two perspectives into a unified reporting paradigm, establishing a new global benchmark.

From a scientific perspective, this hybridization improves the comprehensiveness and decision-usefulness of sustainability reporting and allows researchers to conduct richer analyses that account for both financial and societal implications of corporate performance.

A notable trend across the global sustainability reporting landscape is the ongoing convergence among major ESG frameworks (World Economic Forum, 2023), driven by the need to reduce duplication, enhance comparability, and simplify compliance for companies operating across multiple jurisdictions. In practice, organizations in 2025 no longer rely on a single reporting framework. Instead, they adopt a hybrid reporting strategy, combining the strengths of several standards to respond simultaneously to regulatory requirements, investor expectations, and broader societal demands. For example, the TCFD framework is commonly used to structure climate-related governance and scenario analyses, SASB/ISSB metrics provide industry-specific indicators relevant to financial performance, while GRI or ESRS standards ensure broad coverage of environmental, social, and governance impacts. This blended approach reflects a recognition that sustainability performance is multi-dimensional and cannot be captured adequately by one framework alone.

The increasing alignment between ISSB and ESRS marks an important step toward global standardization. In core areas—particularly climate disclosures—substantial overlap now exists between the two regimes, enabling companies to meet both with a single set of consistent, high-quality data. Despite

this progress, significant conceptual differences remain. GRI retains a strong emphasis on impact materiality, requiring companies to disclose how their activities affect the environment and society. In contrast, ISSB focuses on financial materiality, prioritizing disclosures relevant to enterprise value and investor decision-making. These philosophical distinctions influence both the scope and structure of the disclosures, shaping how companies assess and report sustainability issues. The EU's double materiality model, foundational to the ESRS, seeks to bridge this divide by mandating that companies report from both perspectives, offering a comprehensive and nuanced understanding of sustainability risks, dependencies, and impacts.

For Moldova, which has historically applied a voluntary and limited non-financial reporting approach—and required only minimal disclosures from large public-interest companies—the shift toward this new generation of ESG standards presents both challenges and opportunities. Aligning with EU expectations implies adopting reporting systems that demand significantly greater breadth (coverage of the full ESG landscape) and depth (quantified metrics, digital tagging, and external assurance). This alignment will require investment in institutional capability, methodological expertise, and technological infrastructure. Nevertheless, it also creates an opportunity for Moldovan companies to strengthen transparency, build stakeholder trust, enhance competitiveness, and prepare for integration into European value chains.

Overall, the findings indicate that global sustainability standards are moving steadily toward interoperability, establishing a more coherent and harmonized architecture for ESG reporting. This convergence elevates expectations for transparency and accountability in all industries, reduces uncertainty for multinational companies, and supports the development of reliable, comparable datasets essential for scientific research, evidence-based policymaking, and informed investment decisions.

A second group of results reveals that digital technologies dramatically improve the quality, credibility and comparability of sustainability reporting. Evidence from international reports and corporate cases shows that AI-driven data systems reduce reporting errors, blockchain increases traceability and trust, and mandatory digital tagging (XBRL) enhances accessibility and comparability. Our analysis identifies several domains where digital innovation is enhancing data quality, compliance, comparability, and decision-making in ESG reporting:

**1. AI and Big Data improve data completeness, real-time monitoring and materiality assessment.**

Companies using AI generate higher-quality ESG datasets, improve carbon accounting accuracy, and reduce inconsistencies.

**2. Blockchain enhances data integrity and decreases greenwashing risk.**

Immutable ledgers allow auditors and investors to verify sustainability metrics directly at the source.

**3. Inline XBRL transforms reporting into machine-readable data.**

This leads to high comparability across countries and sectors, enabling macro-level research on ESG patterns.

**4. ESAP (EU) centralizes sustainability disclosures, creating a scientific infrastructure for future comparative studies.**

From a scientific standpoint, digitalization contributes directly to a more robust empirical base, allowing for large-scale statistical analyses and time-series tracking of corporate sustainability trajectories.

**5. Decision-Making and Strategic Insights.**

The ultimate purpose of improved ESG reporting is to inform better decisions – by corporate managers (for strategy), by investors (for capital allocation), and by policymakers (for regulation). Digital tools amplify the decision-usefulness of sustainability data. With big data analytics, companies can derive insights from ESG information that were previously hidden.

6. Blockchain for Trust and Traceability.

A special mention is warranted for blockchain, given its distinct value in enhancing transparency. Blockchain's distributed ledger can record sustainability data (e.g., a product's carbon footprint or a supplier's labor compliance) in a way that is visible and verifiable by all permissioned parties. This creates a single source of truth that stakeholders can trust. For instance, a smart contract could automatically flag if a company's reported emissions exceed a certain limit, prompting an audit. While energy use and scalability remain considerations, ongoing advances (like more energy-efficient blockchain protocols and integration with IoT for automated data feed) are addressing these concerns. Thus, blockchain and related digital innovations act as transparency mechanisms, reinforcing the reliability of sustainability information which, in turn, underpins more effective decision-making by all stakeholders.

In summary, the infusion of digital technologies into sustainability reporting is enhancing every stage of the reporting cycle – from data collection to disclosure to analysis. Companies embracing these tools are generally better equipped to produce high-quality ESG reports that meet rigorous standards and serve the needs of regulators, investors, and society. Digitalization, however, also demands new skills and governance (for example, ensuring data security and privacy, managing algorithmic transparency, etc.), meaning organizations must evolve their capabilities in tandem with technology adoption. The next section will illustrate how these dynamics play out in practice, through case highlights in the EU and Moldova.

In the EU's mature sustainability landscape, many companies and initiatives exemplify the integration of ESG reporting with digital innovation and transparency. A notable case is the use of blockchain for supply chain sustainability by Carrefour, one of Europe's largest retail chains. Beginning in 2018, Carrefour pioneered a blockchain ledger (in collaboration with IBM's Food Trust platform) to trace products like chicken, eggs, milk, and produce from farm to shelf. Each product's journey – including dates, locations, farm practices (e.g., non-GMO, no pesticides) – is immutably recorded and accessible via QR codes on the packaging (Novisto, 2025). This allowed consumers to instantly verify the sustainability and quality attributes of what they were buying. The blockchain initiative not only increased transparency but also built brand trust; Carrefour reported that products with blockchain traceability saw faster sales growth, as consumers placed greater confidence in those items (Shukla, 2025). This example shows how marrying ESG information (e.g., organic certification, animal welfare data) with digital tools (blockchain and mobile technology) can enhance stakeholder engagement and accountability. It addresses the "last mile" of sustainability reporting – communicating trustworthy data to the end-user – and suggests a model that other companies in food, apparel, or commodities can emulate to combat fraud and greenwashing in supply chain claims.

Another EU example lies in how companies are harnessing AI to improve both sustainability performance and reporting. Royal Dutch Shell, a major energy company, has invested in AI-based predictive analytics to optimize operations and maintenance of its assets (like refineries and wind farms). According to discussions at the World Economic Forum, Shell's use of AI-driven predictive maintenance has enabled it to run equipment more efficiently, reduce downtime, and extend asset life – leading to lower greenhouse gas emissions and improved safety, thereby aligning operational metrics with ESG goals (World Economic Forum, 2023). The data from these AI systems feed into Shell's sustainability reporting, providing granular, real-time evidence of improvements (for instance, energy saved or emissions avoided due to AI optimizations). What makes this a leading practice is the feedback loop: AI not only helps report data but also drives the performance that the data represents, creating a virtuous cycle of improvement and disclosure. Many European industrial companies are following suit, deploying Industry 4.0 technologies (IoT sensors, big data, AI) for resource efficiency and then transparently reporting the gains. The implication is that digital innovation can make sustainability reporting more forward-looking and action-oriented, rather than just retrospective compliance.

On the standards integration front, European firms have also been early adopters of combining multiple frameworks in reporting. As mentioned earlier, Nestlé (though Swiss-based, it operates heavily in the EU market) provides a compelling case of dual-framework reporting. In its recent sustainability reports, Nestlé aligned with TCFD by presenting detailed climate scenario analyses (how climate change could impact its agriculture supply chain and operations) and describing governance structures for climate oversight. Concurrently, Nestlé utilized SASB standards to report quantitatively on industry-specific ESG issues such as water usage in production, responsible marketing practices, and nutritional profile improvements in its food products (Seneca ESG, 2025). By doing so, Nestlé addresses both investor concerns (climate risk, governance) and broader stakeholder issues (product responsibility, community impact) in one integrated report. The company's experience has been that combining frameworks yields a more robust communication: TCFD's rigorous climate risk disclosure builds credibility with investors and regulators, while GRI/SASB disclosures satisfy NGOs, consumers, and employees who seek a wider ESG accountability. This case underscores how *transparency is maximized when companies voluntarily hold themselves to multiple global standards* – essentially meeting the highest requirements across frameworks. It also foreshadows regulatory directions: with CSRD enforcement, such integrated reporting will become more common (and indeed required) among EU companies.

Finally, at a systemic level, the EU's development of the European Single Access Platform (ESAP) can be highlighted as a case of public-sector innovation for transparency. Although still in progress, ESAP is envisioned as a centralized online platform where all financial and sustainability information of EU companies (especially those under CSRD) will be available in a structured, searchable format (Bahnaru, 2024). This is analogous to EDGAR in the US (for financial filings) but broader, covering ESG data. The creation of ESAP demonstrates the EU's commitment to not just mandate disclosures but also to democratize access to them. When launched, it will allow anyone – from a Moldovan SME supplier to a French investment firm to a civil society researcher – to retrieve and compare companies' ESG reports easily, thus increasing the practical transparency of reporting. The platform's development is closely tied to the push for digital tagging (XBRL) of reports, making it a case example of how *digital infrastructure underpins transparency at scale*. The expectation is that ESAP will enhance comparability across companies and countries, shed light on laggards versus leaders in sustainability, and possibly spur competitive improvements (peer pressure via public data). It may also inspire similar initiatives beyond Europe, in line with calls for a global repository of sustainability data.

Moldova, as an aspiring EU member and an emerging economy, provides a contrasting yet instructive context. While sustainability reporting is less mature in Moldova than in Western Europe, recent developments indicate a clear trajectory towards integration with European standards and innovative practices. Moldova has begun to introduce ESG disclosure requirements, at least for certain enterprises. Since 2019, large public-interest entities in Moldova (e.g. public companies or state-owned enterprises with over 500 employees) have been required to include non-financial information in annual reports (Bahnaru, 2024). This threshold mirrors the EU's earlier Non-Financial Reporting Directive (NFRD) threshold (500 employees), signaling deliberate alignment. For the vast majority of companies, reporting remains voluntary, but there is growing motivation to adopt international standards to remain competitive and attractive to investors. According to a 2024 study, an increasing number of Moldovan companies have started using frameworks like GRI or referencing emerging ESRS guidelines on a voluntary basis, recognizing that demonstrating ESG performance is becoming important for market access and investment. This trend is supported by the Moldovan government and central bank. The National Bank of Moldova's Sustainable Finance Roadmap (2024–2028) explicitly emphasizes the importance of ESG reporting and disclosure in corporate governance, and it outlines plans for adopting ESG disclosure guidelines in the

financial sector. Such high-level commitment indicates that Moldova is laying the policy groundwork to eventually mandate and standardize sustainability reporting, in line with EU CSRD requirements.

A significant case highlight in Moldova is the collaborative effort to build capacity for sustainability reporting among businesses. For instance, in June 2025, a national conference titled “*Navigating Sustainability Reporting: EU Requirements and Moldovan Integration*” was convened in Chişinău (with support from international development partners) to educate and prepare Moldovan companies for the EU’s CSRD and related standards. This event brought together EU experts, local regulators, and company representatives, and is part of a broader pattern of knowledge transfer. It exemplifies how Moldova is proactively seeking to bridge the gap by learning from EU experiences and leveraging technical assistance. Another concrete example is the partnership between Moldova’s Ministry of Economic Development and Digitalization and international donors (like the EU and Sweden) to integrate ESG and green economy principles. In a 2024 Q&A, a Moldovan State Secretary highlighted that meeting EU accession requirements involves not only environmental policy alignment but also encouraging private sector ESG investment and using “cutting-edge technologies” to implement and monitor sustainability practices (World Economic Forum, 2023). This acknowledgement is leading to pilot projects where, for example, Moldovan agribusinesses explore digital solutions (satellite monitoring of crop sustainability or blockchain for organic certification) to meet EU market standards. While these are early and on a smaller scale, they serve as test cases for the country.

A few leading companies in Moldova have begun publishing sustainability reports, providing early case studies. One such pioneer is Orange Moldova, a telecom company, which has voluntarily released ESG reports aligning with its parent Orange Group’s sustainability strategy. These reports have included data on energy efficiency (with digital smart metering of their network infrastructure), community initiatives, and governance policies, partially referencing GRI indicators. By doing so, Orange Moldova illustrates that multinational subsidiaries can transfer best practices to the local context, acting as catalysts for broader adoption. In the financial sector, some Moldovan banks have started integrating ESG criteria into their annual reports and credit risk assessments, ahead of formal regulation. They are experimenting with digital risk assessment tools (sometimes provided by international partners) that screen clients on ESG factors, which in turn necessitates the banks to report on these factors in aggregate. Although detailed case documentation is limited publicly, the Eastern European Journal for Regional Studies analysis notes the benefits for Moldovan companies that embrace ESG reporting: increased transparency can strengthen investor confidence and potentially open access to sustainability-linked financing (World Economic Forum, 2023). For example, a Moldovan winery aiming to export organic wine to EU markets may obtain better financing terms or partnership opportunities if it can demonstrate compliance with GRI or EU environmental standards in a transparent report.

The Moldovan cases also shed light on challenges typical for developing contexts: limited expertise in ESG reporting, costs of implementing digital systems, and the need for education. The 2024 study on Moldova’s ESG reporting challenges points out that companies need to invest in training and to integrate ESG considerations into business strategy to truly improve reporting (Bahnaru, 2024). In other words, reporting should not be a stand-alone exercise but part of a strategic shift. Encouragingly, the same study and government voices have recommended exactly that: *integration of ESG into business strategy, investment in education, and alignment with international standards* are seen as the way forward (Bahnaru, 2024). Moldova’s journey, therefore, is a case of incremental but steady progress – moving from minimal disclosure to a future where, likely, CSRD-equivalent requirements will apply, and where digital and transparent reporting will be indispensable for economic integration with the EU. The coming years will likely produce flagship examples (perhaps the first Moldovan firm to publish a CSRD-compliant report, or a tech startup offering ESG data services locally) that can inspire wider adoption. For now, the highlighted

cases serve to demonstrate both the aspiration and initial steps towards innovative sustainability reporting in an emerging market context.

### **Policy and Practice Implications**

The foregoing analysis carries important implications for policymakers, regulators, and corporate practitioners seeking to enhance sustainability reporting through ESG integration, digitalization, and transparency:

**1. Harmonization of Standards.** For policymakers, a clear lesson is the value of **interoperability and harmonization** among reporting frameworks. The EU's coordinated effort with ISSB and GRI to align ESRS disclosures (European Commission, 2023) should be a model for other jurisdictions. Regulators in different countries (including Moldova as it drafts new regulations) can reduce complexity for companies by ensuring that local requirements map onto globally accepted standards. This not only eases compliance for multinational companies but also improves the comparability of data across markets. Global convergence – such as recognizing ISSB standards as a baseline and allowing dual reporting – will facilitate cross-border investments and benchmarking of ESG performance. Policymakers should also actively participate in international platforms to continuously update and refine standards, ensuring they keep pace with emerging issues (e.g., biodiversity, supply chain due diligence) and technological possibilities.

**2. Mandatory Digital Reporting Infrastructure.** The move towards mandatory digital reporting infrastructure has significant policy implications. Governments and securities regulators should invest in systems like the ESAP to collect and disseminate ESG data. By requiring machine-readable formats (XBRL) and creating central repositories, regulators can vastly improve transparency and oversight capabilities. For instance, supervisory bodies could more easily analyze sectoral risks (like climate risk concentration in banking) using centralized data. The policy implication for Moldova and similar economies is to plan for digital compliance systems now – perhaps by adopting the EU's digital taxonomy or building reporting portals – so that as ESG disclosure rules tighten, the means to implement them efficiently is already in place. Additionally, regulators might consider incentives or phased approaches: e.g., initially subsidizing the cost of XBRL tagging for small companies or providing free software tools, to encourage uptake of digital reporting.

**3. Capacity Building and Education.** Both policy and practice must address the human capital aspect. The best standards and tech are of little use if companies lack understanding or skilled personnel to apply them. Therefore, a key implication is the need for **capacity building** in ESG reporting and data management. Governments (and international donors in developing countries) should sponsor training programs, certification courses, and knowledge exchanges on sustainability reporting. For example, incorporating ESG accounting into university curricula or offering workshops on how to use AI for carbon accounting can build a pipeline of experts. Companies, for their part, should invest in upskilling their staff or hiring specialists (such as Chief Sustainability Officers or data scientists with ESG focus). The Moldovan experience of holding national conferences and dialogues highlights the benefit of multi-stakeholder engagement in education – regulators, businesses, and experts coming together to demystify new requirements. This collaborative approach can smooth the transition, especially in regions where reporting is nascent.

**4. Integrating ESG into Core Business Strategy:** For corporate practitioners, one practical implication is that **sustainability reporting should be integrated into core business processes**, not treated as a separate, after-the-fact task. As suggested in the literature (Bahnaru, 2024), firms that weave ESG metrics into their strategic planning and operations (via balanced scorecards, management KPIs, and internal dashboards) find it easier to collect data and report meaningfully. This integration ensures that reporting is based on real performance improvements rather than being a superficial PR exercise. It also positions companies to respond to the growing emphasis on external assurance of reports – if sustainability data is

managed with the rigor of financial data internally, then assuring it externally becomes feasible and credible. Boards of directors should thus treat ESG reporting as part of the corporate governance mandate (echoing the 'governance' in ESG), establishing oversight committees and internal controls for sustainability information similar to financial reporting controls.

**5. Leveraging Technology Strategically.** Companies should actively **leverage technology** to enhance their sustainability reporting and performance. The cases and analysis show tangible benefits from doing so – improved data accuracy, efficiency gains, and actionable insights. However, technology investments should be strategic: firms need to assess which tools address their biggest pain points or opportunities. For instance, a manufacturing company with a complex supply chain might prioritize blockchain or supply chain traceability software to manage scope 3 emissions data, whereas a service company with large offices might invest in IoT sensors and AI to optimize energy use in buildings. Importantly, companies must also be mindful of the challenges: adopting a blockchain solution requires ensuring that partners (suppliers, auditors) are on-board with using it; implementing AI requires quality data and avoiding biases. There is also an implication around **data privacy and security** – as more ESG data is collected (especially social metrics involving employees or communities), companies must handle this data responsibly and transparently to maintain trust.

**6. Preventing Greenwashing and Strengthening Assurance.** A policy implication tied to transparency is the importance of robust anti-greenwashing measures and assurance. As sustainability claims become more scrutinized, regulators may need to enforce stricter penalties for fraudulent or misleading ESG disclosures, similar to penalties for financial misstatements. The EU's requirement of external assurance for CSRD reports is a step in this direction. Other jurisdictions should consider mandating at least limited assurance for key ESG metrics, gradually moving towards reasonable assurance as methodologies mature. From a practice standpoint, companies should prepare by establishing internal audit trails for their ESG data – for example, maintaining clear documentation of how a carbon footprint was calculated or evidence for each social indicator reported. This not only prepares them for assurance audits but also deters any temptation to embellish figures. Blockchain can aid here by providing immutable records, but even with traditional systems, the focus should be on verifiability. Ensuring transparency in methodology (i.e., being open about how data is collected and calculated) is also a best practice that can mitigate skepticism.

**7. Benefits for Emerging Markets and SMEs.** The integration of ESG reporting and digital tools is not just a burden; it can be an opportunity, especially for emerging markets and smaller firms. Policymakers in those contexts (like Moldova) should articulate the business case for sustainability reporting: improved access to export markets, alignment with EU supply chain requirements, attraction of foreign investment, and possibly better credit terms for those with strong ESG performance. Support programs (grants, technical assistance) can help SMEs adopt simple digital tools (even as basic as cloud-based data tracking or template software for GRI reporting) to get started. On the corporate side, SMEs should view transparent ESG reporting as a way to differentiate themselves and integrate into global value chains. Often, large multinationals require their suppliers to report certain ESG data; a proactive small supplier that uses a cloud platform to monitor, say, labor conditions or energy use might gain a competitive edge. The implication is that embracing these trends early can future-proof businesses against more stringent requirements and reputational risks.

In summary, the push towards integrated, tech-enabled, and transparent sustainability reporting is reshaping the expectations on both companies and regulators. The implications call for a concerted effort: aligning rules internationally, building capacity, embedding ESG into strategy, and smartly deploying technology. Success in these areas can create a virtuous cycle where transparency leads to trust, trust enables greater investment in sustainability, and that investment yields better ESG outcomes that are then transparently reported. For Europe and Moldova, this alignment is particularly critical as they move together towards shared sustainability and economic goals.

## CONCLUSIONS

This study has examined how innovative approaches – spanning international standards, digital technologies, and transparency mechanisms – are converging to elevate sustainability reporting in the European Union and Moldova. The comparative analysis of major frameworks (GRI, CSRD/ESRS, SASB/ISSB, TCFD) revealed a clear trajectory towards more comprehensive and aligned disclosure requirements, combining the strengths of each and applying across all industries. At the same time, the infusion of digitalization into ESG reporting is transforming it from a static, compliance-oriented practice into a dynamic, data-driven one. Tools such as AI and big data analytics are improving the granularity, timeliness, and accuracy of ESG information, while blockchain and XBRL are enhancing trust and comparability of disclosures on an unprecedented scale. The case examples illustrated that these innovations are not merely theoretical: EU companies are already leveraging them to add value (e.g. greater consumer trust through supply chain transparency, operational efficiencies through AI), and Moldova is taking important initial steps to join this new paradigm of reporting.

Several key conclusions emerge. First, integration is paramount – integration of ESG topics (environmental, social, and governance aspects must all be addressed coherently), integration of standards (to avoid fragmentation and duplication in reporting), and integration of technology (embedding digital tools into the reporting cycle rather than treating them as add-ons). Companies and regulators that embrace an integrated approach are likely to achieve more meaningful and impactful sustainability reporting outcomes. Second, transparency and accountability have risen to the forefront: stakeholders no longer accept vague narratives or unsubstantiated claims; they demand hard data, external verification, and the ability to access and analyze information easily. In response, reporting is becoming more quantitative, standardized, and publicly accessible, a trend reinforced by regulations like the CSRD and platforms like ESAP. This bodes well for stakeholder trust – as sunlight is said to be the best disinfectant, greater transparency is leading to greater corporate accountability on ESG matters.

Third, digital innovation acts as an enabler and accelerator of good reporting practices. The research suggests that companies using advanced digital reporting practices are not only better at reporting but often better at sustainability performance itself. This feedback loop indicates that the investments in reporting capabilities can drive real change (for example, measuring emissions comprehensively is the first step to managing and reducing them). Policymakers should thus view digital reporting infrastructure as part of the broader toolkit for sustainable development and provide support accordingly.

For Moldova and other emerging economies, a concluding insight is that aligning with these global trends is both challenging and worthwhile. The path to fully integrated ESG reporting is a journey requiring policy reforms, capacity building, and cultural shifts in corporate governance. Yet, as the EU experience shows, the end result – a more transparent business environment – can yield benefits like increased investor confidence, improved risk management, and alignment with international sustainability goals. Moldova's proactive efforts to synchronize with EU standards and adopt digital transparency tools reflect a recognition of those benefits and should continue to be encouraged and supported.

Finally, this article opens avenues for further inquiry. Future research could empirically assess the impact of digital reporting on corporate ESG performance (e.g., do companies with blockchain-verified data achieve better sustainability outcomes, or how do investors price the difference between assured and non-assured ESG data?). There is also scope to explore the social dimension: how increased transparency influences stakeholder behavior and trust in different cultural contexts. As sustainability reporting evolves, it will be crucial to ensure that it remains a means to an end – the end of sustainable development – rather than an end in itself. The innovative approaches discussed here, particularly the fusion of ESG, technology, and transparency, hold great promise in making reporting a powerful lever for positive change. Achieving that potential will require continued collaboration between standard-setters, technology providers,

companies, and civil society to keep pushing the frontiers of what sustainability reporting can accomplish. In conclusion, the integration of ESG, digitalization, and transparency is not just improving reports – it is gradually improving the sustainability of business practices themselves, especially in regions committed to this forward-thinking agenda.

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