



Implementing double materiality in the textile and apparel industry: challenges, gaps and strategic responses

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ABSTRACT

This study provides a critical analysis of the implementation of double materiality within the textile and apparel industry, focusing on the practical challenges, implementation gaps, and strategic recommendations that arise from its application. With the enactment of the Corporate Sustainability Reporting Directive (CSRD), this principle has evolved into a regulatory requirement, yet its operationalization within the sector's complex and globally dispersed supply chains remains a significant hurdle. The paper moves beyond a mere conceptual comparison of the GRI, SASB, and ESRS frameworks, employing an interpretive and critical-synthesis approach to examine the structural and procedural obstacles hindering effective reporting. Key challenges identified include financial and resource constraints, technical and operational limitations, complexities in data collection, and a lack of supply chain transparency. The study's original contribution is its distinctive perspective that links regulatory design with practical realities, filling a gap by specifically addressing double materiality from an implementation, gap, and policy perspective within the textile and apparel industry. Consequently, it offers actionable, sector-specific recommendations for multiple stakeholders—including manufacturers, brands, and policymakers—to bridge the gap between theoretical frameworks and on-the-ground application.

I. INTRODUCTION

The concept of double materiality has gained prominence as a transformative approach in sustainability reporting, highlighting how corporate activities both affect and are influenced by environmental and social conditions [1, 2]. Double materiality is a broader approach that goes beyond purely financial aspects by considering both inside-out and outside-in perspectives. The outside-in view focuses on external factors such as investor demands, consumer expectations and regulatory requirements, while the inside-out view examines how an organization influences society, the environment and the wider economy [2]. With the enactment of the Corporate Sustainability Reporting Directive (CSRD) and the development of the European Sustainability Reporting Standards (ESRS), this concept has evolved from a theoretical principle into a regulatory requirement. It demands that companies integrate environmental, social, and governance (ESG) factors with financial performance, thus redefining corporate accountability. Within the textile and apparel sector, which is a globally dispersed, resource-intensive, and socially sensitive industry, this shift presents both opportunities and challenges due to its complex supply chains and uneven regulatory environments [3, 4].

This article builds upon our previously accepted study entitled “Double Materiality and Sustainability Reporting in the Textile and Apparel Sector”, which provided a conceptual and comparative analysis of the ESRS, GRI and SASB frameworks and mapped sector-specific material topics across these standards. While that study focused on the theoretical architecture and conceptual intersections of sustainability reporting frameworks, the present

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manuscript does not rely on empirical data from that work. Instead, it uses its conceptual foundation to examine implementation challenges, structural gaps and strategic responses related to the operationalisation of double materiality in practice.

The first study pinpointed essential sustainability issues and conceptual intersections among frameworks. However, the implementation of these principles remains unclear, especially in sectors such as textile and apparel which are characterized by significant variability among suppliers, nations, and institutional capabilities [5, 6]. This paper builds on this conceptual foundation by looking at the problems with bringing double materiality into practice in the textile and apparel industry, as well as the policy implications and systemic gaps that come up. Based on both literature and real-world reporting practices, it examines closely at how inconsistencies between frameworks, data gaps, and governance limits affect the accuracy of reports and the alignment of policies. This study connects theoretical frameworks with policy changes and how respondents actually report on sustainability. It gives new analytical insights and useful suggestions to help companies, regulators, and investors create more open, clear, and trustworthy sustainability reporting systems as a result of an interpretive, and critical-synthesis approach

To the best of the authors' knowledge, no comparable research has specifically explored double materiality from an implementation, challenge, gap, and policy perspective within the textile and apparel sector. This study therefore contributes a distinctive perspective that links conceptual design with practical realities and sector-specific constraints.

1.1. Overview of Sustainability Reporting Frameworks: GRI, SASB, and ESRS

Global sustainability reporting frameworks have evolved to address increasing transparency and accountability requirements while supporting the integration of environmental, social, and governance (ESG) performance into corporate strategy. The Global Reporting Initiative (GRI), initially established to improve environmental accountability, later expanded to encompass social, economic, and governance dimensions [7]. Its standards Universal (GRI 1–3), Sector, and Topic—define the overall structure of sustainability disclosures [8]. GRI's multi-stakeholder orientation aligns closely with the double-materiality principle by requiring companies to report both their external impacts and stakeholder-related outcomes [9, 10]. Although sector standards exist for energy-intensive fields such as oil, gas, and mining, a dedicated textile and apparel standard remains under development [11].

The Sustainability Accounting Standards Board (SASB), in contrast, focuses primarily on financial materiality from an investor perspective [12, 13]. It organizes ESG issues into five thematic dimensions—environment, human capital, social capital, business model & innovation, and governance—and defines 26 issue categories covering 77 industries [14]. For the textile and apparel field, SASB's "Apparel, Accessories & Footwear" standard specifies metrics linked to energy use, labor management, and supply-chain traceability. When used together, GRI and SASB complement each other by addressing both financial and impact perspectives, enhancing completeness and comparability of disclosures [15–17].

The European Commission mandated the European Financial Reporting Advisory Group (EFRAG) to establish the European Sustainability Reporting Standards (ESRS) in order to further improve the alignment between sustainability performance and financial reporting [18]. By using the Impact-Risks-Opportunities (IRO) model to

operationalize double materiality and differentiate between inward financial risks and outward impacts, ESRS was formally adopted in 2023 and took effect in January 2024 [19, 10]. Cross-cutting (ESRS 1-2), topical, and upcoming sector-specific standards make up its structure [20]. Companies must justify exclusions, conduct materiality assessments, and report governance, strategy, and performance metrics in accordance with ESRS guidelines.

Collectively, GRI, SASB, and ESRS represent the evolving architecture of sustainability reporting—from voluntary, stakeholder-driven models toward mandatory, double-materiality-based systems. Integrating these frameworks enables companies—particularly in complex sectors such as textiles—to capture both financial significance and broader environmental-social impact, ensuring greater transparency, accountability, and comparability in sustainability reporting [10].

Despite the conceptual complementarities among GRI, SASB and ESRS, companies in the textile and apparel sector operate within a fragmented sustainability reporting landscape characterized by overlapping requirements, inconsistent indicators and regulatory pressures across jurisdictions. To illustrate this structural disjunction between external reporting expectations and internal organizational realities, Figure 1 maps the fragmented framework landscape and the resulting implementation gap.

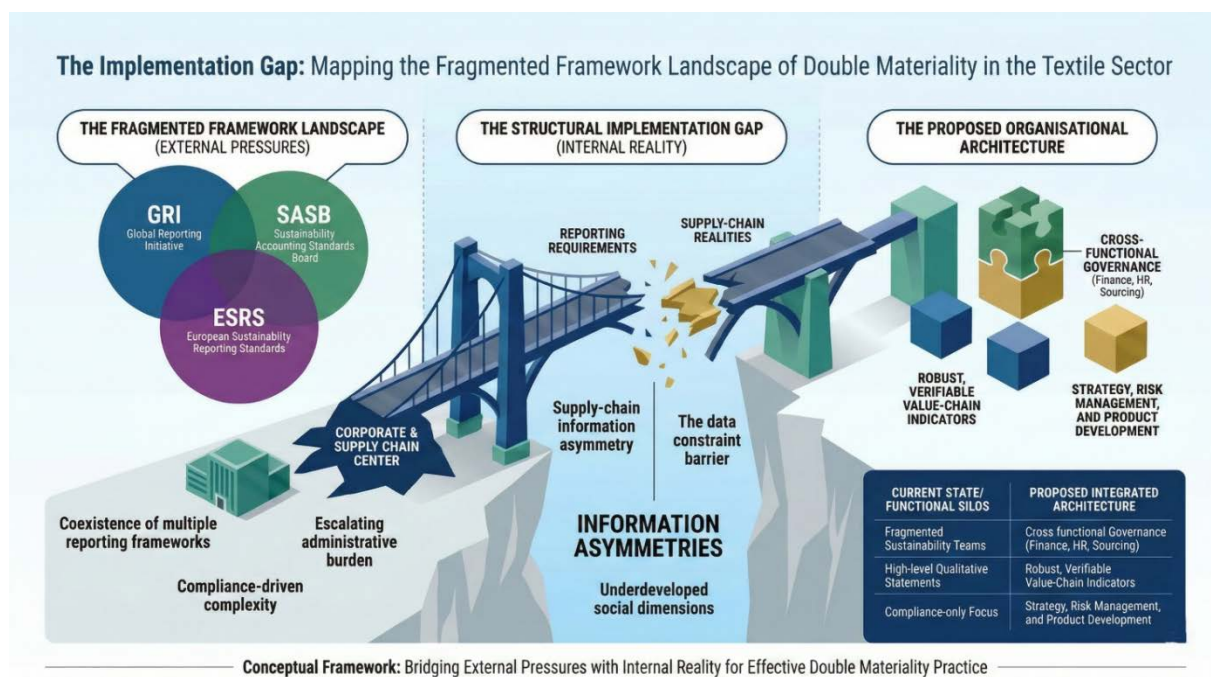


Figure 1. The implementation gap: mapping the fragmented framework landscape of double materiality in the textile and apparel industry

As shown in Figure 1, the coexistence of multiple sustainability frameworks creates external reporting pressures that converge on companies operating within complex global supply chains. However, internal organizational realities—such as data asymmetries, limited traceability and fragmented governance structures—create a structural implementation gap between regulatory expectations and operational feasibility.

The figure also highlights how this gap can be addressed through cross-functional governance, robust value-chain indicators and the strategic integration of double materiality into core decision-making processes. In this sense,

the fragmented framework landscape is not merely a reporting challenge but a structural governance issue that shapes how double materiality is interpreted and enacted in practice.

2. METHODOLOGY

Building upon the conceptual groundwork established in the previous study, this paper adopts a qualitative, interpretive, and document-based analytical approach to examine how the principles of double materiality are being operationalized within the textile and apparel sector. Unlike the first paper, which primarily offered a conceptual and comparative analysis of ESRS, GRI, and SASB, this study focuses on how these frameworks translate into policy enforcement, regulatory alignment, and on-the-ground reporting practices.

2.1 Search Strategy and Data Sources

Literature searches were conducted in ScienceDirect, Web of Science, SpringerLink, MDPI and Google Scholar between 2020 and 2025 using combinations of keywords such as ‘double materiality’, ‘CSRD’, ‘ESRS’, ‘sustainability reporting’, ‘textile’, ‘apparel’, and ‘supply chain’.

2.2 Inclusion and Exclusion Criteria

We included documents that: (i) explicitly address double materiality or closely related concepts (impact and financial materiality); (ii) discuss sustainability reporting frameworks (GRI, SASB, ESRS, EU Taxonomy); and/or (iii) provide sector-relevant insights for textile and apparel value chains.

While the primary focus was on textile and apparel, selected non-textile case studies were included when they offered transferable methodological or regulatory insights (e.g., early adopters of ESRS-aligned reporting in other industries). Purely technical LCA applications without a reporting dimension and documents unrelated to corporate disclosure or materiality assessment were excluded.

2.3 Analytical Procedure

All selected documents were subjected to qualitative content analysis. We coded passages related to (a) the operationalization of double materiality, (b) challenges and implementation gaps, and (c) proposed solutions or policy measures. These codes were then organized into thematic categories, which structure Sections 3–5 of this article.

3. POLICY EFFECTIVENESS OF ESRS IN DRIVING ENVIRONMENTAL AND ORGANIZATIONAL IMPROVEMENTS

It is certain that there is a practical effectiveness of the ESRS framework in motivating companies to take genuine environmental and operational actions. Reporting obligations increase transparency but do not automatically translate into performance improvements unless accompanied by strategic targets and investment planning. Firms that integrate double materiality assessments into management systems show clearer alignment between sustainability objectives and production decisions, particularly in energy, water, and circular-economy initiatives. Regulatory and market fragmentation, especially across supplier tiers, creates inconsistency in implementation and data comparability.

3.1. Impact of ESRS Regulations on Environmental Improvements

3.1.1. Environmental and climate reporting

Companies that must comply with ESRS and related laws must transparently disclose their environmental and climate performance. For instance, big businesses are required to report their Scope 1, Scope 2, and (if applicable) Scope 3 greenhouse gas emissions under the CSRD/ESRS framework [21]. Theoretically, this greater transparency encourages businesses to set goals for clean production and emission control. This effect is seen in practice: companies that report emissions in response to investor demands reduce their direct greenhouse gas emissions by an average of 7–10% in just two years, according to CDP data [22]. Additionally, businesses with climate transition plans aligned with 1.5°C achieved an average annual decarbonization of 8.3%, while those without such plans only managed 3.9% [22]. These findings indicate that sustainability reporting indirectly encourages companies to take more ambitious actions in carbon management and investment.

3.1.2. Renewable energy and efficiency investments

Because mandatory reporting forces companies to review their energy sources, renewable energy and energy efficiency have become priorities. For example, major Turkish apparel companies are rapidly increasing renewable energy use: Eren Perakende & Tekstil has invested in new solar installations totaling about 40 MW at its manufacturing facilities, aiming to source 100% of its electricity from renewable sources by 2030 [23]. Similarly, a sector survey has shown that Turkish textile firms are increasingly setting targets and projects for energy efficiency, waste reduction, and renewable energy [24]. These examples suggest that transparency obligations under ESRS support investments in renewable energy and clean technologies and primarily address impact materiality by reducing environmental externalities, while simultaneously influencing financial materiality through energy cost stabilization and regulatory risk mitigation.

3.1.3. Circular economy and material transformation

Reporting regulations also promote the use of recycled and sustainable raw materials. In Turkey's apparel industry, companies have targeted raising their current share of sustainable materials (37.9%) to 50.1% within the next three years [24]. Likewise, the EU's new waste-management rules will require member states, from 2025 onward, to separately collect textile waste and implement Extended Producer Responsibility (EPR) schemes [25]. Analyses have shown that, under these policies, increasing the EU-wide textile-to-textile recycling rate to 10% would cut CO₂ emissions by roughly 440,000 tons per year [25]. By comparison, the sector currently uses recycled fibers at only about 7–8% of its total fiber supply [26]. These low recycling rates highlight the need for reporting and additional regulations to drive investments into a circular economy. While circular economy investments represent a direct inside-out (impact materiality) response, while also shaping outside-in financial risks related to resource scarcity and regulatory tightening.

3.1.4. Waste Management and Clean Production Technologies

ESRS reporting also encompasses waste and water management. As noted in the Istanbul Chamber of Industry's roadmap, using production waste as raw material reduces CO₂ emissions and water consumption [27]. Because ESRS standards will require companies to include such clean production practices in their disclosures, they will indirectly encourage investments in these technologies. Clean production technologies thus illustrate the operational intersection between impact reduction and long-term financial resilience under the double materiality framework.

As seen in the previous sections, ESRS drives the companies toward sustainable technologies and energy sources and induces investments in these regards. Such shift will accelerate the emission reduction and ecological improvement in the long run [28, 29]. Consequently, the ESRS will have a positive impact on Environmental sustainability.

Despite the ESRS framework's clear potential to improve environmental performance and encourage cleaner production methods, its application throughout the textile and apparel value chain is still uneven. Financial, technical, and institutional obstacles frequently prevent the conversion of reporting transparency into actual operational advancement, especially in developing nations and multi-tiered supply networks. These implementation gaps and systemic issues are critically examined, insights are provided, and recommendations are given for better fulfillment of double materiality in textile and apparel industry.

4. CHALLENGES AND IMPLEMENTATION GAPS IN APPLYING DOUBLE MATERIALITY IN THE TEXTILE AND APPAREL INDUSTRY

The transition toward double materiality in sustainability reporting creates particularly acute challenges for the textile and apparel sector, characterized by low margins, complex global supply chains and uneven regulatory environments [3,4]. While frameworks such as GRI, SASB and ESRS provide guidance on impact and financial materiality, their practical application frequently falls short of policy ambitions, especially among small and medium-sized enterprises (SMEs) and suppliers located in developing economies [5, 6, 30]. In this section, we argue that the key implementation gaps are not merely technical, but structural: they reflect how economic pressures, institutional conditions and power relations in global value chains shape the way double materiality is interpreted and enacted in practice [31–34].

4.1. Financial and Resource Constraints

One of the most frequently cited obstacles is the significant financial and organizational investment required to operationalize double materiality [4–6, 30]. Textile and apparel companies, particularly SMEs and upstream suppliers, often lack dedicated sustainability teams, specialized expertise and robust data systems. Compliance with multiple frameworks, the commissioning of environmental and social assessments, and the development of internal reporting capacities all create additional costs that many firms struggle to absorb. In lower-income producer countries, these constraints are exacerbated by volatile demand, limited access to finance and high dependence on a small number of buyers [30, 31]. We argue that under these conditions, many companies tend to

adopt a minimal compliance approach, focusing on narrow disclosure requirements rather than strategically embedding double materiality into decision-making.

4.2. Technical and Operational Challenges

Even when financial resources are available, textile and apparel firms face substantial technical and operational challenges in collecting, managing and integrating sustainability data [3, 4, 32]. Legacy IT systems are often not designed to capture environmental and social indicators, and separate platforms may be used for production, logistics and compliance. This fragmentation makes it difficult to establish consistent, verifiable datasets across facilities and product lines. In many cases, data collection remains highly manual, increasing the risk of errors and limiting the frequency with which information can be updated. We contend that these technical and operational frictions encourage firms to treat double materiality reporting as an annual compliance exercise rather than a continuous management tool.

4.3. Complexities in Data Collection and Measurement

Double materiality requires companies to assess both the significance of their impacts and the financial relevance of sustainability-related risks and opportunities [3, 35]. For textile and apparel firms, this implies measuring a wide range of indicators spanning climate, water, chemicals, waste, biodiversity, labor conditions and community impacts [32–34]. Moreover, the life cycle of a textile moves through raw fibre, spinning, weaving, finishing, garment making, logistics, retail, use, end-of-life etc. which spread across countries causing “lack of visibility” and difficulty in collecting range of data needed for assessments, across networks, especially with long lead times and huge product ranges. Brands, suppliers, recyclers, certifiers etc. also hold data in various formats and platforms and use various indicators. Such methodological inconsistency, missing baselines, and non-harmonized indicators reduce comparability and auditability as well as the end-to-end traceability with value-chain-wide coverage needed for impact-side and financial-side materiality [36–38].

Yet many companies do not possess the methodological capabilities, tools or verification mechanisms needed to produce reliable and comparable data. Small suppliers in particular struggle to implement life-cycle assessments or comprehensive emissions accounting [35, 39].

In summary, it can be argued that, Scope 3 emissions accounting remains highly problematic in textile value chains, where upstream fiber production, dyeing processes and logistics often occur in fragmented, multi-country networks. Similarly, social indicators such as living wage benchmarks, overtime practices or subcontracted labor conditions lack standardized, verifiable datasets. These data gaps inhibit the development of robust double materiality indicators that simultaneously capture impact severity and financial exposure across tiers.

4.4. Supply Chain Complexity and Transparency

The sector is characterized by multi-tier, geographically dispersed supply chains, in which brands and retailers typically have limited visibility beyond their direct suppliers [32, 40]. Raw material origin and farming/production practices (e.g., farm, region, certification, pesticide and fertilizer use, water withdrawal, energy mix) are often absent or generic, making batch-level impact assessment impossible. In the process level, inputs and output like

chemicals, dyestuffs, auxiliaries, wastewater volumes and quality, emissions to air, solid waste etc. at spinning, dyeing, finishing stages are poorly measured or undisclosed, despite being the hotspot of this sector. Even the life cycle data is sometimes unreliable and generic, misrepresenting the reality [41, 42]. For example, reliable data on chemical usage at Tier 2 dyeing facilities, wastewater treatment performance at subcontracted units, living wage compliance at Tier 3 suppliers, or microfiber release from synthetic production processes are often incomplete or unverifiable. Without such granular data, companies struggle to conduct credible double materiality assessments that reflect both environmental impact severity and potential financial liabilities

Information asymmetries and power imbalances mean that upstream suppliers may be reluctant or unable to disclose sensitive data, fearing the loss of business or competitive advantage [30, 40]. We therefore argue that there is a structural gap between the double materiality information that brands are expected to report and the fragmented, incomplete data available from their supply networks.

4.5. Framework Complexity and Inconsistent Adoption

Textile and apparel companies must navigate a crowded landscape of reporting frameworks and regulatory initiatives, including GRI, SASB, ESRS, the EU Taxonomy and various voluntary schemes [3, 4, 32]. While this plurality can enhance completeness, it also introduces duplication and confusion, especially for firms that serve multiple markets [33, 34]. Differences in terminology, scope and indicator definitions complicate internal processes and make it harder to maintain consistency over time. In the absence of clear guidance on how to prioritize or align frameworks, many companies produce parallel reports that satisfy formal requirements without fully integrating double materiality into core management systems [39]. We argue that this fragmented architecture is itself a barrier to meaningful implementation.

4.6. Social Reporting Challenges

Environmental topics such as energy use, emissions or water consumption can often be quantified using established metrics, but social issues remain harder to measure and compare across contexts [40, 43, 44]. Key concerns in the textile and apparel sector – including living wages, forced and child labor, gender inequalities, health and safety, and community impacts – are embedded in complex socio-economic structures and frequently lack robust, standardized indicators [43, 44]. Although frameworks such as GRI and ESRS call for disclosures on human-rights due diligence and value-chain labor practices, many companies report only high-level qualitative statements. We argue that this measurement gap limits the extent to which double materiality assessments capture the full breadth and depth of social impacts in global production networks [40, 45].

4.7. Regulatory and Institutional Challenges

Finally, fragmented regulatory and institutional environments contribute to uneven implementation of double materiality [4, 45, 46]. While the European Union has taken a leading role through CSRD and ESRS, many producer countries have weaker or less harmonized sustainability regulations. Enforcement capacities are often limited, and incentive structures may not favor long-term investments in impact and risk management. International brands operate across jurisdictions with different expectations and timelines, which can result in inconsistent practices and a focus on meeting the most demanding regulatory requirement rather than developing

coherent global strategies. In line with the overall argument of this paper, we contend that without stronger policy coordination, capacity building and support for local institutions, the transformative ambition of double materiality-based reporting in the textile and apparel sector will remain constrained

5. CRITICAL RECOMMENDATIONS FOR IMPLEMENTING DOUBLE MATERIALITY IN TEXTILE SUSTAINABILITY REPORTING

Building on the implementation gaps identified in Section 4, we argue that double materiality in the textile and apparel sector can only move beyond formal compliance if it is embedded into core business decisions, rather than being treated as an isolated reporting exercise [3,4]. The evidence reviewed in this article shows that current practices are constrained not only by technical limitations but also by structural conditions such as cost pressures, fragmented regulations and asymmetric power relations in global value chains [30–34]. In this section, we propose an original, sector-specific set of recommendations and an organizational architecture for textile and apparel companies, complemented by targeted actions for policymakers and investors.

5.1. Recommendations for Manufacturing Companies

Based on our critical analysis and synthesis throughout this article, we have developed Table 1: a set of actionable recommendations for implementing double materiality in textile manufacturing companies. While many core functions and responsibilities are similar across organizations, departmental names and structures may vary. Therefore, these recommendations should be interpreted flexibly and adapted to fit each company's unique context and operational reality.

As shown in Table 1, the effective integration of double materiality into sustainability practices in manufacturing companies requires collaboration across various departments and a strategic mindset. The recommendations focus on essential areas such as leadership, data systems, employee training, and organizational culture. Below is a more detailed explanation of our recommendations presented in Table 1.

Adopt proactive sustainability practices: Textile companies, which generate significant environmental and social impacts, should lead in adopting proactive sustainability practices to protect credibility and anticipate risks and opportunities.

Integrate double materiality into business strategy: Double materiality should be embedded into core business planning, so that impacts on the environment and society, as well as related risks and opportunities, are considered from the earliest stages of decision-making.

Establish dedicated sustainability data systems: Instead of producing superficial reports, companies should build systems that continuously collect, store and analyze data on impacts, risks and opportunities, enabling year-to-year tracking of progress.

Develop a customized sustainability assessment matrix: Companies can integrate existing frameworks into a single, tailored assessment matrix that defines how materiality assessments will be conducted, including stakeholder engagement, data collection, analysis and reporting.

Table 1. Our recommendations for implementing double materiality in sustainability practices in textile manufacturing companies

Recommendation	Possible Theme	Main Responsible (Example)	Relevant Departments (Example)
Adopt Proactive Sustainability Practices	Leadership & Foresight in Sustainability	Top Management (CEO, General Manager)	-Sustainability Department (or Quality Management Systems if no dedicated unit) -Production Department - Research and Development / Product Development
Integrate Double Materiality in Business Strategies	Strategic Alignment of Sustainability in all Stages	Strategic Planning or Corporate Strategy Director	-Sustainability -Finance and Risk Management - Research and Development / Product Development -Supply Chain
Establish Dedicated Systems for Sustainability Data	Data-Driven Sustainability Management	Information Technology Director and Sustainability Manager	-Sustainability -Information Technology -Production (data input) -Quality Control
Develop a Customized Matrix for Sustainability Assessment	Framework Integration and Stakeholder Engagement for Better Systems and Evaluation	Sustainability Director	-Sustainability -Quality Management -Human Resources (for employee engagement) -Marketing and Sales (for stakeholder communication)
Invest in Systems and Training	Capacity Building for Double Materiality	Human Resources Director and Sustainability Director	-Human Resources (training programs) -Sustainability -Information Technology -Production and Operations
Reframe Sustainability Reporting as Strategic Awareness	Organizational Sustainability Culture	Top Management (CEO, General Manager)	-All departments (especially Production, Logistics, Procurement, Marketing)

Invest in systems and training: Given the novelty of double materiality and ESRS, firms should invest in assessment, data and reporting systems, and train staff to correctly understand and apply these requirements.

Reframe sustainability reporting as strategic awareness: Double materiality reporting should be seen not as a burden but as a tool for understanding the company's position and future, with all departments acting in line with this perspective.

Establish a cross-functional sustainability committee: To implement these recommendations effectively, companies should set up a cross-functional Sustainability Committee with representatives from key departments, ensuring organisational alignment, shared responsibility and the integration of double materiality into day-to-day operations.

We recommend establishing such a cross-functional committee, as it plays a key role in embedding double materiality into both strategic and operational decision-making. An example of a suggested hierarchical structure to support this committee's effective functioning is presented in Figure 2.



Figure 2. proposed hierarchical structure for a sustainability committee in manufacturing companies

The inclusion of diverse departments (as illustrated in Figure 2)—ranging from production and finance to human resources and IT—ensures a comprehensive and aligned approach to sustainability governance. This structure enables effective data sharing, early risk identification, and the integration of sustainability strategies that reflect both financial and environmental dimensions of double materiality.

As previously mentioned, while departments such as sustainability, production, human resources, quality control, planning, and etc. are commonly found in textile manufacturing companies, their names scopes, and hierarchical structures may differ between organizations. It is important to emphasize again that these suggestions should be adapted to suit each company's specific organizational structure, culture, and workflow.

The following section provides detailed strategic recommendations tailored to typical departments within textile manufacturing firms, based on our synthesis of practical insights and critical analysis.

5.1.1 Sustainability and/or ESG Department

5.1.1.1 Develop a materiality assessment framework

We recommend developing a structured materiality assessment framework tailored to the company's specific context. This framework should incorporate the principles of double materiality and align with global standards (e.g., GRI, SASB, ESRS). It should reflect the perspectives of key stakeholders—such as investors, customers, employees, local communities, and regulators. To ensure consistency and efficiency, standard procedures for materiality assessment should also be defined.

5.1.1.2 Stakeholder engagement and materiality matrix

A detailed stakeholder analysis should be conducted to identify relevant financial and impact materiality topics. These topics can then be mapped against disclosure requirements from leading frameworks. The result should be a materiality matrix that clearly highlights both overlapping and unique topics across frameworks (e.g., SASB, GRI, ESRS), considering the urgency and severity of each risk, opportunity, and impact.

5.1.1.3 Data collection and management system

We propose designing or improving internal systems for collecting high-quality sustainability data throughout operations and the value chain. These systems should ensure consistency, traceability, and regulatory readiness. Data should be stored in a way that supports comparison over time, enabling companies to track shifts in materiality topics as well as changes in related risks and impacts.

5.1.1.4 Regular review and updates

Materiality assessments should be reviewed and updated at least annually. It is critical to include relevant context (e.g., geography, supplier practices, customer expectations) in reporting, and to monitor regulatory changes, shifting stakeholder priorities, and industry best practices. This ensures reports remain relevant, comparable, and aligned with both internal and external expectations.

5.1.1.5 Reporting and disclosure

This department should coordinate the preparation of sustainability reports in accordance with the selected frameworks. Data collection must be accurate, complete, and transparent, with clear documentation from all involved departments. Reports should meet the methodological and disclosure requirements of GRI, SASB, or ESRS, depending on the chosen framework(s). Clarity, integrity, and accessibility are key to building trust and meeting compliance obligations.

5.1.2 Supply chain management department

Supply chain teams should integrate double materiality criteria into supplier selection, contracts and performance evaluation [30, 35, 40]. This includes setting expectations on transparency, emissions reduction, chemical management and labor practices, as well as engaging suppliers in capacity building and data collection.

Procurement decisions should be informed by materiality outcomes, recognizing that price-based sourcing alone is incompatible with many double materiality objectives.

5.1.2.1 Supplier assessment

We recommend that companies implement a system to evaluate and select suppliers based on environmental, social, and governance (ESG) criteria, reflecting both financial and impact materiality. In alignment with global frameworks, this department should take the lead in collecting relevant sustainability data from suppliers and monitoring their performance. Beyond basic compliance, this process should also involve open dialogue aimed at encouraging supplier improvements and alignment with the company's sustainability goals.

5.1.2.2 Collaboration and partnerships

A proactive and collaborative relationship with suppliers is essential for building a sustainable value chain. This department should coordinate mutual data sharing and joint initiatives to identify shared risks, opportunities, and material issues. By understanding how each party impacts the other, companies can create more resilient partnerships. Furthermore, providing guidance or support to suppliers—especially smaller or less mature ones—can enhance collective sustainability performance. This may include joint problem-solving workshops, shared access to best practices, or incentives for improvements.

5.1.3 Operations and production department

Operations departments are central to implementing impact-reduction measures identified through materiality assessments [32]. They should translate strategic sustainability targets into process improvements, resource-efficiency measures, waste reduction and cleaner technologies at facility level. We argue that involving production managers early in the materiality process increases the feasibility and effectiveness of proposed actions. Maintaining well organized records will also enable long-term tracking of changes in impacts, risks, and opportunities over.

The production department must be fully aware of the double materiality aspect of sustainability reporting. It should establish mechanisms to monitor and document disclosure topics such as energy and water consumption, emissions (both air and wastewater), pollution, and microfiber shedding.

5.1.2 Human resource department

Human resources play a critical role in addressing social dimensions of double materiality [40]. HR departments should integrate sustainability-related competencies into job descriptions, training programs and performance evaluations, while also supporting initiatives on occupational health and safety, diversity and inclusion, and living wages where applicable [40, 43, 44]. Linking these issues to the broader double materiality framework can help avoid treating them as separate, stand-alone programs. Employees at all levels should receive targeted training so that both impact and financial materiality considerations are integrated into everyday decisions and reporting.

5.1.5. Sales, Marketing, and Communication Department

The communication department should focus on maintaining strategic and effective communication with stakeholders. Stakeholders play a crucial role in identifying materiality topics; therefore, transparency and constructive engagement are essential. This department should also maintain connections with other companies to stay informed about industry best practices in this regard. In addition, the entire industry should strive to stay up to date with changes in reporting standards and adapt accordingly.

5.2. Recommendations for Buyers and Brands

Sales and marketing functions shape how double materiality commitments are communicated to customers, business partners and the public [43–45]. They should ensure that claims regarding environmental and social performance are accurate, balanced and aligned with verified data, thus reducing the risk of greenwashing [43–45]. At the same time, they can use insights from double materiality assessments to identify market opportunities for more sustainable products and services. We argue that positioning double materiality as a source of differentiation can create incentives for continuous improvement.

Taken together, these recommendations and the proposed organizational architecture demonstrate that double materiality implementation in the textile and apparel sector is not a purely technical exercise. It requires reconfiguring governance structures, decision-making processes and relationships along the value chain. By articulating these sector-specific, practice-oriented proposals, this article seeks to move the debate beyond conceptual discussions and towards concrete pathways for transformative change.

5.3 Recommendations for Regulators and Policymakers and Standard Setters

Policymakers and standard setters shape the environment in which double materiality is interpreted and implemented. Based on the review, we identify three priority areas:

5.3.1 Providing clear, sector-specific guidance

Textile and apparel companies require more detailed sector guidance that translates high-level concepts into concrete indicators, processes and examples [3,4,32]. Clarifications are particularly needed on value-chain coverage, social indicators and the treatment of SMEs, including how proportionality should be applied.

5.3.2 Supporting capacity building in producer regions

Many implementation challenges stem from limited institutional and technical capacities in producing countries [30, 45]. Public policies and international cooperation should support training programs, shared data platforms and pilot projects that enable manufacturers and suppliers to develop the skills and infrastructures needed for double materiality reporting and management.

5.3.3 Promoting alignment and interoperability

Regulators and standard setters should actively coordinate ESRS, GRI, ISSB/SASB and related initiatives to reduce inconsistencies in scope, definitions and timelines [3, 4, 46]. Some countries and regions have developed

their own regulations and reporting standards, reflecting local political priorities, legal systems, and economic structures. For example, EU prefers the newly developed ESRS as a legal requirement for the companies. But other regions may still use GRI or SASB as the reporting framework. Such differences naturally generate distinct definitions, scopes and emphases, leading to a fragmented landscape. Moreover, different standard setters pursue different goals and different stakeholders, leading to inconsistencies and incomparabilities in topic lists, indicators and narratives. Such coverage gaps and comparability gaps, especially for social issues also stem fragmentations. Specially, for a global supply chain of textiles that spread across various geographic regions throughout the world worsens the problems further. As a result, alignment and interoperability is much needed among various standards. Alignments among them will enhance comparability and transparency across jurisdictions and sectors, supporting better capital allocation and lower agency costs during reporting. Interoperability among standards for examples, easy transition from GRI to ESRS or vice versa will reduce the burden for the companies to meet different requirements for different regions. This will also help better ESG auditing and assurance [47–49]. We argue that structured interoperability between ESRS, GRI and ISSB/SASB standards should be prioritised to reduce duplication, conflicting definitions and reporting fatigue. Harmonised terminology and aligned materiality assessment methodologies would significantly mitigate the fragmented framework landscape identified in this study. Such alignment is especially important for globally operating textile and apparel brands, which otherwise face conflicting demands across jurisdictions, resulting in fragmented and potentially incoherent disclosures.

5.4 Recommendations for Investors

5.4.1 Integrate Double Materiality into Investment Decisions

Investors should incorporate double materiality into their investment decision-making processes by requesting double materiality sustainability reports, rather than focusing solely on financial materialities.

5.4.2 Consider Sustainability-Related Business Risks and Opportunities

Investment decisions should take into account the sustainability risks companies face, as well as their ability to respond to emerging opportunities. This broader view supports long-term value creation.

5.4.3 Include Non-Financial Risks in Financial Analysis

Non-financial risks, such as environmental and social challenges, can significantly affect long-term financial performance. Therefore, investors should assess these factors alongside traditional financial metrics when evaluating companies.

6. CONCLUSION

This review set out to examine how the principle of double materiality is being implemented in the textile and apparel sector, focusing on the interaction between regulatory frameworks, corporate practices and supply-chain realities. Drawing on regulatory documents, sector-specific literature and corporate practices, we have provided a critical synthesis of how impact and financial materiality are currently interpreted, where implementation gaps arise, and what kinds of organizational and policy responses are needed.

Our analysis yields five key insights:

Capacity and data constraints: While ESRS formally operationalizes double materiality through the combination of impact and financial materiality, textile and apparel companies – especially SMEs and suppliers in producing countries – face significant capacity, resource and data constraints that impede full implementation. Double materiality often remains confined to high-level statements rather than being translated into robust, verifiable indicators across the value chain.

Fragmented framework landscape: The coexistence of multiple reporting frameworks (such as GRI, SASB and ESRS) leads to fragmented and sometimes duplicative reporting practices. Combining these frameworks can enhance completeness, but it also increases complexity and administrative burden, particularly for firms serving multiple markets. In practice, companies often prioritize compliance with the most demanding requirements rather than developing a coherent double materiality strategy.

Supply-chain complexity and information asymmetries: Implementation gaps are most pronounced along multi-tier, globally dispersed supply chains, where traceability is limited and information asymmetries are widespread. Subcontracting, informal production and weak enforcement mechanisms undermine transparency and comparability, creating a structural gap between the double materiality information expected from brands and the incomplete data that suppliers are able or willing to provide.

Underdeveloped social dimension: Social dimensions of double materiality remain underdeveloped in practice. While environmental topics can often be quantified using established metrics, issues such as living wages, forced and child labour, gender inequalities and community impacts are more difficult to measure and integrate into decision-making. As a result, social topics are frequently addressed through qualitative narratives rather than systematic, comparable indicators.

Centrality of organizational architecture and governance: The review shows that double materiality cannot be reduced to technical reporting choices; it is fundamentally shaped by governance structures, internal accountability and cross-departmental coordination. We argue that without an organizational architecture that connects sustainability, procurement, production, finance, human resources and communication functions, double materiality will remain peripheral to core business decisions.

For practice and policy, these findings suggest that strengthening double materiality in the textile and apparel sector requires more than refining indicators or templates. At company level, double materiality outcomes should be explicitly linked to strategy, risk management, sourcing and product development. Cross-functional governance structures and clear departmental roles are needed to ensure that responsibilities are shared beyond sustainability teams. At the same time, realistic transition pathways and capacity-building measures must be developed for suppliers, particularly SMEs in producing regions, so that they can participate in data collection and performance improvements without bearing disproportionate costs. At policy level, greater coherence and interoperability between reporting frameworks, along with sector-specific guidance and support for institutional capacity in producer countries, are essential to reduce fragmentation and foster meaningful implementation.

A distinctive contribution of this article is the development of an original, sector-specific set of recommendations and a proposed organizational architecture for textile manufacturing companies. By outlining cross-cutting strategic priorities, stakeholder-specific actions and department-level roles, we seek to demonstrate how double

materiality can be embedded into day-to-day decisions rather than remaining a formal reporting requirement. We argue that such practice-oriented guidance is necessary to move the debate beyond conceptual discussions towards concrete pathways for transformative change in the sector.

Future research should build on these insights through empirical case studies of textile and apparel companies that are experimenting with double materiality implementation, including longitudinal analyses of how governance structures, data systems and supplier relationships evolve over time. Further work is also needed to develop methods and tools for capturing social impacts in a more systematic and comparable way, and to evaluate the effectiveness of different policy instruments and investor strategies in supporting double materiality. By combining conceptual development with empirical investigation, future studies can help clarify under what conditions double materiality becomes a driver of substantive sustainability transitions in the global textile and apparel value chain.

Use of AI Tools and Ethical Considerations

In this article, the ethical use of artificial intelligence has been considered in line with the framework set by the Council of Higher Education (YÖK, 2024) in its publication “Ethical Guide for the Use of Generative Artificial Intelligence in Scientific Research and Publication Activities of Higher Education Institutions” and the European Union’s Artificial Intelligence Act (Regulation - EU - 2024/1689)

AI tools (ChatGPT, OpenAI GPT-4o model) were used exclusively for grammar checking, improving language clarity, and enhancing textual coherence. Figure 1 was prepared by the help of NotebookLM. No conceptualization, critical insights, or original contributions of the study were generated by AI. All scientific content, analyses, interpretations, sector-specific topic identification, critical evaluations of ESRS–GRI–SASB frameworks, and the recommendations and conclusions presented in this paper are entirely the authors’ own work.

The originality of this article lies in its critical review and synthesis of reporting frameworks, the identification of implementation challenges, and the development of tailored, sector-specific recommendations for the textile and apparel industry. These insights, analyses, and contributions are the result of the authors’ own intellectual effort, literature engagement, and professional expertise. After using AI tools, the authors carefully reviewed and edited the full manuscript and took complete responsibility for its content and accuracy.

DATA AVAILABILITY

No research data was generated when writing this article.

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