Review Article

UDC 005.332:330.34
JEL: L74, M14, Q01, Q56

FROM TRIPLE BOTTOM LINE LOGIC TO ESG OPERATIONALISATION: DEVELOPING A SUSTAINABLE BUSINESS MODEL FRAMEWORK FOR THE CONSTRUCTION SECTOR

Janis Butkevics *
BA School of Business and Finance of the University of Latvia,
Riga, Latvia
ORCID iD: 0000-0002-5610-3135

*Corresponding author
E-mail: janis.butkevics@lu.lv

Received: 16/01/2026
Revised: 23/02/2026
Accepted: 27/02/2026
Published: 30/03/2026

DOI: 10.61954/2616-7107/2026.10.1-10

© Economics Ecology Socium, 2026
CC BY-NC 4.0 license

Background. The construction sector is project-based and multi-actor, which means that early design and procurement decisions determine long-term environmental and social impacts. However, the Triple Bottom Line (TBL) framework remains too broad to guide daily trade-offs and produce the verifiable, comparable evidence that clients and regulators demand. Construction firms require an operational logic that translates sustainability aims into managerial levers, embeds them in project routines, and produces verifiable performance information suitable for assurance and procurement evaluation.

Purpose. This study develops a construction-tailored framework that translates environmental, social, and governance (ESG) themes into implementation architecture for sustainable business model innovation (BMI). The aim is to make ESG actionable at the level of value proposition design, key activities, partner governance, and value capture, while preserving proportionality and reporting readiness.

Findings. An integrative literature review and conceptual framework analysis produced three connected artefacts: (i) a VSME-aligned ESG theme structure; (ii) a Sustainable Construction Business Model Canvas; and (iii) an ESG–Business Model–KPI matrix with indicative metrics for embodied carbon via EPD/LCA, waste diversion and circularity measures, health and safety incident frequency (e.g., TRIR/LTIFR), and governance and compliance controls. The artefacts establish traceable linkages between ESG themes and business-model components, and translate them into decision rules relevant to tendering, procurement, and site management. The framework is calibrated for proportionality, enabling SMEs to adopt a minimum viable indicator set while allowing larger contractors to extend coverage to Scope 3 engagement, supplier due diligence, and assurance-ready data processes.

Implications. ESG is reframed from a reporting overlay into implementation architecture for sustainable business model innovation in construction. The proposed framework supports prioritisation, measurable performance management, and stakeholder transparency, and can be adapted to organisational size and data maturity. Future research should validate the hypothesised causal pathways through multiple-case studies, expert elicitation, and project-level KPI testing, including ex-ante dashboards that connect leading indicators to cost, risk, and schedule outcomes.

Keywords: Business Model Canva, Construction, ESG, Key Performance Indicators, Sustainability.

1. Introduction.

The construction sector operates under strict technical regulations and simultaneously faces growing pressure from investors, clients, and communities to demonstrate credible sustainability performance. In this context, a purely philosophical orientation, such as Elkington's triple bottom line (TBL), may not be sufficiently granular to guide operational decisions, manage risk, or provide transparent, comparable disclosure.

The environmental, social, and governance (ESG) framework has increasingly filled this gap by translating sustainability into measurable topics and management processes that can be embedded in strategy, operations, and reporting (Li et al., 2021; Puriwat & Tripopsakul, 2022; Sarajoti et al., 2023). For construction firms, ESG integration is not only a compliance task but also a pathway to business-model transformation and long-term competitiveness.

Despite this growing relevance, the literature remains fragmented, limiting its usefulness in management. Existing studies tend to address ESG as an assessment or disclosure domain or focus on individual sub-topics (e.g. carbon accounting, circular economy practices, safety performance, or governance controls) without specifying how these elements jointly reconfigure the business model. Consequently, there is limited guidance on how to translate ESG themes into a coherent implementation architecture that connects project-level decision-making (design, procurement, and site execution), supply chain governance, and value capture mechanisms.

Moreover, SMEs and project-based firms often face disproportionate reporting and data burden. However, research provides few proportionate operational templates that link ESG topics to measurable KPIs and specific business model components in a way that supports both implementation and comparability. This constitutes a practical and conceptual gap: the absence of an integrative, construction-tailored ESG framework that is simultaneously actionable, auditable, and aligned with sustainable business-model innovation.

This study aims to operationalise the sustainability dimensions relevant to the construction sector and propose an ESG framework that supports the implementation of sustainable business models. This study provides a structured synthesis of (i) environmental drivers and tools (environmental product declarations (EPD), life-cycle assessment (LCA), circularity), (ii) social mechanisms (stakeholder and value chain governance, occupational safety), and (iii) governance practices (ethics, internal control, compliance, and board competencies). This study addresses the following research question: How can ESG be structured as an actionable framework for implementing sustainable business models in the construction sector?

2. Literature Review.

A sustainable business model is understood as a firm's value-creation, delivery, and capture logic that is intentionally designed to generate economic value while reducing negative environmental impacts and improving social outcomes over the relevant life-cycle. This aligns with established research on sustainable business models, which treat sustainability as a redesign of the business model rather than an add-on program. Sustainable business models can be operationalised by clarifying which business model elements are transformed (e.g., value proposition, key activities, partner configuration, cost structure and revenue logic) and by specifying the mechanisms through which environmental and social value is created and appropriated (Boons & Lüdeke-Freund, 2013; Bocken et al., 2014)

The Business Model Canvas (BMC) developed by Osterwalder and Pigneur (2010) is widely used to structure and communicate business model elements. It has been extended in sustainability research through tools such as sustainable business model archetypes and (triple- or multi-layer) canvases.

However, construction is characterised by temporary multi-organisational project coalitions, one-off site production, high asset specificity, and long building life cycles that extend far beyond the project contract's time horizon.

e-ISSN 2786-8958
ISSN-L 2616-7107

As a result, the standard BMC- initially designed for more stable, firm-centric settings– requires adaptation to capture inter-project learning, risk allocation across contractual interfaces, and the distributed responsibility for environmental and social impacts over decades. In construction, the project-based delivery model, fragmented subcontracting, and life-cycle impacts require explicit integration of (i) circular material flows and waste prevention, (ii) life-cycle assessment and environmental product information to support procurement and design decisions, and (iii) stakeholder and partner governance mechanisms that secure labour standards, safety, and compliance across the value chain. ESG is not solely treated as reporting; it serves as an operational logic that specifies sustainability-related constraints, risks, and performance levers that drive business model transformation.

ESG has evolved into a practical navigation instrument that translates sustainability objectives into assessable criteria and disclosure structures. While TBL provides a broad normative direction, ESG enables organisations to manage non-financial factors systematically, including emissions, resource efficiency, occupational safety, human capital, and ethical governance (Li et al., 2021). Empirical research increasingly associates ESG integration with long-term financial performance and strategic resilience (Puriwat & Tripopsakul, 2022; Sarajoti et al., 2023).

The long-standing perception that “green thinking” conflicts with profitability has been challenged by the Porter hypothesis, which argues that well-designed environmental regulation and purposeful environmental management can stimulate innovation, raise resource productivity, and improve competitiveness (Porter & Linde, 1995). Consistent with this view, environmental management systems, such as ISO 14001, are associated with improved organisational performance in construction contexts (Khalim & Lee, 2020; Tambovceva et al., 2020). Hart and Milstein (2003) highlighted that strategies focused on reducing environmental impact and improving resource efficiency can generate “double dividends” through lower operational costs and improved financial outcomes.

Construction projects are embedded in complex networks of stakeholders and value-chain partners. Resource Dependence Theory posits that organisations depend on external resources that they do not fully control, motivating strategic collaboration and governance arrangements (Pfeffer & Salancik, 1978). Stakeholder theory further explains why managing stakeholder relationships is not merely a moral obligation but also a strategic, value-creating practice (Freeman & Phillips, 2002; Freeman et al., 2007; Parmar et al., 2010). In the context of sustainable business, stakeholders can become central change agents, influencing the strategic direction toward ESG and sustainability (Rezaee, 2016).

Governance systems shape a company’s ability to meet regulatory requirements, manage risk, and deliver sustainable performance. Research links corporate governance mechanisms to improved outcomes in construction industry development and value creation (Abdelsalam, 2023). Recent studies have highlighted governance competencies relevant to complex construction challenges, such as labour shortages, stakeholder management, and digital transformation (Chen & Lu, 2024; Zhang et al., 2024; Zhang et al., 2023). Compliance failures can have severe financial and reputational consequences, as illustrated by numerous case studies, such as the Carillion collapse (UK Parliament, 2018).

3. Methodology.

3.1. Research Design and Approach.

This study adopts an integrative literature review combined with conceptual framework development to translate sustainability challenges in the construction sector into an operational ESG logic suitable for sustainable business model innovation. The review covers the period 2021–2025 to capture recent conceptual and empirical developments relevant to ESG and the built environment. An integrative review is appropriate when the objective is to synthesise diverse conceptual and empirical contributions into new theoretical structures rather than statistically evaluate predefined hypotheses (Snyder, 2019; Torraco, 2005).

This design enables the consolidation of fragmented ESG-related knowledge into a coherent framework that can guide managerial decision-making and future empirical tests.

A structured search was conducted across major scholarly databases, including Scopus, Web of Science, and Google Scholar, using combinations of keywords related to construction, ESG, sustainable business models, circular economy, governance, occupational health and safety, life cycle assessment, environmental product declarations, and supply chain due diligence.

Following de-duplication and eligibility screening, the final synthesis drew on 118 academic sources published between 2021 and 2025. Sources were included if they were peer-reviewed journal articles or reputable academic books, explicitly relevant to construction or the built environment, and offered conceptual or empirical contributions to ESG topics, management instruments, or business model components. Only publications in English were considered. Non-scholarly commentary, documents lacking verifiable publication metadata, and sources without substantive analytical content were excluded.

The selected literature was analysed through iterative thematic coding across environmental, social, and governance dimensions. Initial codes were deductively derived from widely recognised ESG concerns in construction, including emissions and energy use, material circularity, waste management, occupational safety, stakeholder relations, ethics, compliance, and risk management.

These codes were refined inductively through repeated comparisons, merging, and differentiation until a stable set of non-redundant themes emerged. The synthesis integrated ESG themes, operational instruments enabling implementation, such as LCA, EPDs, building information modelling-supported material planning, due diligence processes, and governance mechanisms that allocate responsibilities, define decision rights, and structure information flows.

Conceptual framework analysis was used to formalise how the evidence informed the resulting model (Jabareen, 2009).

The construction logic followed five steps: defining the transformation object as the construction firm's business model; mapping ESG themes onto business model elements to identify where sustainability-related transformations occur; specifying indicative key performance indicators (KPIs) and data sources for each ESG–business model linkage; structuring the ESG themes according to the Voluntary Sustainability Reporting Standard for non-listed SMEs (VSME) logic by EFRAG to support reporting readiness; and conducting internal consistency checks by comparing thematic coverage and overlaps against established ESG standards and construction sustainability tools.

The VSME was selected as the applicable standard because it provides a proportionate, standardised template for SMEs to respond to ESG data requests from banks, investors, and other large counterparties. Given the SME-dominated structure of the construction industry, VSME provides an appropriate thematic backbone for indicator selection and reporting readiness, while allowing calibration to data maturity.

The outcome is operationalised through two artefacts: a Sustainable Construction Business Model Canvas and an ESG–Business Model–KPI matrix.

3.2. KPI Operationalisation and Calculation Logic

The ESG-Business Model-KPI matrix operationalises each theme through standardised calculation rules, including the following illustrative examples:

1. Greenhouse-gas intensity may be reported as tCO_2e per project or per m² using Scope 1-2 activity data (fuel and electricity) multiplied by published emission factors.

2. Waste diversion rate represents the proportion of total construction and demolition waste generated that is diverted from landfill through reuse, recycling, or other recovery pathways, expressed as a percentage.

3. Safety performance indicators include Total Recordable Incident Rate (TRIR) and Lost Time Injury Frequency Rate (LTIFR) that are calculated using widely accepted industry-standard formulas.

 e-ISSN 2786-8958
ISSN-L 2616-7107

4. Procurement "greening" can be measured as the share of spends covered by third-party verified EPDs or LCA-based embodied-carbon assessments.

These rules are illustrative templates intended for calibration to jurisdictional guidance, organisational boundaries, and data maturity. As a conceptual framework, no claims are made regarding empirical performance effects. Instead, an ex-ante applicability assessment illustrates how the ESG – Business Model – KPI matrix can be applied to a construction project type, namely new building delivery, by specifying measurable indicators and plausible managerial implications consistent with the reviewed evidence.

The methodological approach follows the principle that conceptual frameworks should be transparent to empirical testing. Future research should validate the framework through case studies, expert elicitation, and project-level KPI measurement, following established reporting and review protocols, such as PRISMA, to ensure transparent evidence selection (Page et al., 2021).

4. Results.

This study presents empirical results structured around the three ESG dimensions and synthesises them into an operational framework tailored to construction sector business models. Rather than treating ESG as a reporting overlay, the findings position it as a set of operational design variables that reshape value creation, delivery, and capture mechanisms within the construction industry.

Across the cases analysed, ESG themes became actionable only when translated into concrete managerial practices, decision rules, and performance indicators. The proposed framework operationalises ESG through measurable practices and KPIs embedded in project development, procurement, and contracting and stakeholder engagement processes. Importantly, economic performance is not conceptualised as a fourth pillar competing with ESG dimensions. Instead, it functions as a viability and value-capture condition for ESG-enabled business model transformation.

Accordingly, ESG initiatives persist only when they are structurally integrated into the cost architecture and revenue logic. Against this backdrop, the following sections examine each ESG dimension, identifying its sector-specific material drivers, operational practices, and implications for business-model configuration.

4.1. Environmental Dimension.

The construction sector contributes substantially to energy use and emissions, including greenhouse gases and local air pollutants (Sandanayake et al., 2019). These impacts are generated across the entire project life cycle, from raw material extraction, manufacturing, and transport, through on-site construction processes and equipment use, to building operation and end-of-life management (Ahmed et al., 2020; Roukoz & Ersenkal, 2023). Concurrently, construction and demolition waste streams impose additional environmental burdens while creating tangible opportunities for circularity through reuse and recycling.

This life cycle profile increasingly intersects with regulatory pressure in European Union member states, where climate-neutrality ambitions are translated into binding requirements. The Energy Performance of Buildings Directive (EU directive 2024/1275) accelerates the transition to zero-emission new buildings, setting deadlines for public buildings from 1 January 2028 and for all new buildings from 1 January 2030 (European Parliament & Council of the European Union, 2024). These timelines imply a rapid transformation across the value chain, pushing both material producers and construction firms toward lower-carbon inputs, higher energy-efficient solutions, and broader technological upgrades.

Against this backdrop, environmental performance can be improved using a set of mutually reinforcing operational levers.

First, material substitution and low-carbon procurement address the high embodied emissions associated with core construction inputs, especially cement and steel, by shifting demand toward lower-impact alternatives and more efficient production pathways (Costa et al., 2022; Sullivan et al., 2020).

e-ISSN 2786-8958
ISSN-L 2616-7107

Second, Environmental Product Declarations (EPDs) enable standardised, verifiable comparisons of environmental impacts across life-cycle stages, thereby strengthening procurement decisions and improving transparency for clients and regulators (Anderson & Moncaster, 2023).

Third, life-cycle assessment (LCA) provides a systematic decision-support tool for quantifying impacts across the building life cycle and prioritising interventions that deliver the most significant reductions (Dsilva et al., 2023; Keena et al., 2024).

Finally, the integration of low-carbon construction materials, including recycled construction materials and bio-based and natural-origin options such as hemp-lime and straw-based solutions, offers additional pathways to improve energy performance and reduce life-cycle emissions, provided that performance requirements and applicability are addressed in design and execution (Argalis et al., 2024; Dartois et al., 2017; Delehan et al., 2024; Jiang et al., 2020; Vanderschelden et al., 2021). Taken together, these levers demonstrate how environmental sustainability in construction can be operationalised: regulation sets the direction and pace, while procurement choices and assessment tools (EPDs/LCAs) translate ambitions into measurable and comparable decisions across materials, processes, and end-of-life outcomes.

4.2. Social Dimension.

The social dimension of sustainable business models in construction focuses on creating social value, alongside economic performance and environmental outcomes. In practice, this requires the management of relationships with stakeholders who can affect or be affected by project decisions. Therefore, stakeholder engagement, community participation, and transparent communication function not only as ethical commitments but also as operational mechanisms that build trust, reduce conflict, and support project continuity (Ibrahim, 2023). Typical stakeholder groups include clients, contractors and subcontractors, suppliers, public authorities, local communities, and environmental organisations (PMI, 2021; Tor & Mamman, 2025).

Within this stakeholder landscape, occupational health and safety represent a central social priority because they directly shape employee well-being and the firm's legitimacy. A strong safety culture can reduce incidents, strengthen employee loyalty, and lower turnover, generating both human and organisational benefits (Srivastava & Srivastava, 2023; Ott-Holland et al., 2019). Conversely, inadequate safety practices increase legal exposure and reputational risk (Liang et al., 2018), particularly in high-risk contexts such as hazardous waste management and asbestos handling, where failures can rapidly escalate into regulatory violations and public controversy. For example, in the United Kingdom, Procurement Policy Note (PPN) 06/20 (Cabinet Office, 2020) makes the explicit evaluation of social value mandatory in central government procurements, underscoring social performance as a competitive parameter in construction contracts.

Social value expectations reflect market and policy signals. From the client perspective, reputational considerations increasingly shape contractor selection: partnering with firms that can demonstrate credible ESG performance helps clients evidence their own sustainability commitments and corporate responsibility (Bloomberg, 2024; Hoseini et al., 2021). In parallel, public-sector procurement instruments, such as the UK Procurement Policy Note PPN06/20 (Cabinet Office, 2020, explicitly encourages consideration of social value in contract awards, signalling that social performance is becoming a competitive parameter rather than a voluntary add-on.

However, translating these expectations into consistent practice is challenging in a sector characterised by fragmented value chains and project-specificity. Construction supply chains for materials such as bitumen, steel, cement, and plastics are associated with heightened human rights and environmental risks, underscoring the importance of sustainable supply chain management (Nouri et al., 2019). This implies that contractor selection and supplier due diligence should go beyond permits and formal compliance to include workforce practices, safety performance and labour standards (Treptow et al., 2022).

When embedded systematically, such diligence strengthens trust among project actors and supports value co-creation by aligning social expectations with day-to-day delivery decisions (Cataldo et al., 2022).

Community relations represent a further social risk and value, with the consequences of weak engagement being immediate. Community opposition dynamics, often described through NIMBY (“not in my backyard”) and BANANA (“build absolutely nothing anywhere near anything”) phenomena, can trigger objections, appeals, and litigation, delaying permitting and delivery while increasing reputational exposure for both developers and contractors. Resistance intensifies when stakeholders perceive disproportionate local impacts, distrust decision-making processes, or feel excluded from meaningful participation (Wang & Gong, 2018). Beyond schedule and cost escalation, prolonged conflict can erode the social licence to operate, strain relationships with public authorities and amplify compliance and communication risks.

Accordingly, mitigating opposition requires an anticipatory engagement approach rather than a reactive communications strategy. Early stakeholder mapping, precise allocation of responsibilities between the developer and contractor (including grievance handling and impact mitigation), and structured, transparent communication throughout the project life cycle can reduce uncertainty and build procedural trust. Where appropriate, iterative consultation and documented responses to concerns can further enhance legitimacy and reduce the likelihood that disagreements will escalate into formal disputes (Witkowska-Dąbrowska et al., 2021; Fobbe et al., 2024).

4.3. Governance Dimension.

Governance influences ESG performance by determining how sustainability objectives are translated into strategy, how decisions are controlled and documented, and how transparently and ethically an organisation operates. In construction, where projects are complex, value chains are fragmented, and compliance exposure is high, governance becomes a core enabling condition for credible ESG implementation rather than a purely formal corporate requirement.

Empirical research links corporate governance mechanisms to outcomes and value creation in the construction industry, indicating that governance quality can materially shape organisational performance and long-term viability (Abdelsalam, 2023).

A central insight from the literature is that ESG outcomes depend on the competencies and oversight capacities of boards and executive teams. Effective governance requires the ability to manage sector-specific constraints and uncertainties, including labour shortages and market volatility (Chen & Lu, 2024). At the same time, governance must support stakeholder management, because construction firms operate under continuous scrutiny from clients, subcontractors, communities and regulators; governance structures that strengthen accountability and decision transparency can therefore enhance stakeholder alignment and reduce conflict (Zhang et al., 2024; Sulaiman et al., 2024). Governance is increasingly intertwined with digital transformation, as data quality, process standardisation, and technology adoption affect both operational efficiency and ESG monitoring and reporting capabilities (Zhang et al., 2023). Finally, governance mechanisms shape financial discipline and risk appetite, which remain critical in an industry prone to cost overruns, cash flow pressures, and contractual disputes (Abdullah et al., 2022). Within this broader governance agenda, evidence suggests that gender diversity in governance is associated with lower distress risk and stronger performance outcomes, reinforcing the relevance of board composition as governance lever (Aziz et al., 2023).

National governance frameworks provide an important reference point for translating these general principles into practical organisational designs. In Latvia, the “Corporate Governance Code” (Ministry of Justice of the Republic of Latvia, 2020) offers guidance on strategic planning, ethics, internal control systems, risk management, board composition, and transparency. This aligns closely with ESG expectations by emphasising not only strategic intent but also the organisational infrastructure required to deliver it, namely, defined responsibilities, decision controls, and transparent communication practices.

e-ISSN 2786-8958
ISSN-L 2616-7107

Risk management is a crucial link between governance and ESG implementation. Internationally recognised frameworks, such as COSO, provide structured approaches for identifying risks, designing controls, ensuring appropriate information flows, and monitoring performance over time. In construction settings, such systems support the proactive management of compliance risk, contractual exposure, supply chain disruptions, and reputational threats, while also creating the internal discipline needed for credible ESG data collection and disclosure. Thus, governance serves as an integrating mechanism, linking sustainability ambition to consistent execution, ensuring that ESG is embedded in everyday decision-making rather than treated as a standalone reporting exercise.

4.4. ESG Framework for Implementing Sustainable Business Models in Construction.

A literature review was conducted to develop an ESG framework to support the implementation of sustainable business models in the construction sector by transforming sustainability goals into operational themes that construction companies can manage and monitor. The framework responds to two persistent characteristics of construction: (i) material, environmental, and social impacts are distributed across fragmented value chains and project life cycles, and (ii) sustainability performance must be governed through accountable processes and substantiated with credible evidence for clients, regulators, and financiers. Conceptually, the framework follows the thematic logic of the VSME (EFRAG).

Although the thematic structure is intentionally generic, its implementation should be calibrated to the heterogeneity of the construction sector. For SMEs and subcontractors, a “minimum viable” implementation can prioritise: (i) compliance-critical governance controls (ethics, legal compliance, and a risk register); (ii) core occupational health and safety metrics; and (iii) a limited set of high-materiality environmental indicators (site energy and fuel use, construction and demolition waste diversion, and EPD coverage for key materials).

Larger contractors and developers may extend the framework by incorporating additional Scope 3 categories, supplier assessment and audit programs, biodiversity screening, and project-level embodied carbon optimisation. This staged approach preserves comparability at the thematic level while enabling indicator granularity, assurance intensity, and data architecture to scale with organisational capacity and ESG governance’s maturity.

4.4.1 Sustainable Construction Business Model Canvas and the Transformation Object.

Business model research suggests that sustainability transitions require more than incremental process improvements; they require changes in how firms create, deliver and capture value (Teece, 2010; Boons & Lüdeke-Freund, 2013). The BMC is a valuable tool for representing these interdependent elements and making trade-offs and complementarities visible across activities, resources, partners, customer segments, and financial architecture (Osterwalder & Pigneur, 2010).

This is particularly relevant in construction, where temporary multi-actor project organisations and fragmented supply chains mean that sustainability outcomes depend on coordinated decisions across design, procurement, site operations and end-of-life pathways (Gann & Salter, 2000; Winch, 2010). As a transformation object, the canvas links ESG themes to concrete organisational choices and produces a configuration that can be empirically examined.

The construction-specific logic embedded in the Sustainable Construction Business Model Canvas (Table 2) centres on life-cycle impacts, circularity, and legitimacy. A substantial share of construction impacts is embodied in materials and upstream processes, making procurement choices, supplier capabilities, and robust product data central to sustainability. Circular economy principles are operationalised through design-for-circularity, waste prevention and sorting, and deconstruction and reuse capabilities.

 e-ISSN 2786-8958
ISSN-L 2616-7107

This approach is consistent with circular economy research emphasising the need to adapt both product design and value networks, including reverse logistics and secondary material markets (Geissdoerfer et al., 2017; Pomponi & Moncaster, 2017). Stakeholder and governance mechanisms are included because construction projects face place-based opposition risks, permitting delays, and reputational exposure; early engagement, transparent communication, and grievance mechanisms translate legitimacy and social acceptance into manageable organisational practices (Freeman, 1984; Suchman, 1995).

Table 2. Sustainable Construction Business Model Canvas.

Key Partners	**Key Activities**	**Value Propositions**
• Material suppliers and producers • Recycling and waste management firms • Subcontractors and specialist contractors • Certification and assurance bodies • Academic institutions and NGOs (innovation and legitimacy support)	• Design for circularity • BIM-enabled material planning • LCA- and EPD-informed procurement • Waste prevention and on-site segregation • Site energy management • ESG and supply-chain due diligence • Deconstruction and material reuse expertise	• Energy-efficient and low-carbon project delivery • Circular material solutions • Life-cycle cost optimisation • Verified environmental performance (EPD- and LCA-informed)
Key Resources	**Customer Relationships / Stakeholder Engagement**	**Customer Segments**
• ESG, LCA and BIM competencies • BIM platforms and data management systems • Supplier and material performance databases • Health and safety capacity • Deconstruction and reuse capabilities	• Early-stage stakeholder mapping • Transparent and structured communication • Formal grievance mechanisms • Community engagement to mitigate opposition risks	• Public sector clients (green public procurement schemes) • Private sector clients seeking compliant, low-carbon and circular solutions • Tenants and end-users • Financiers and insurers requiring ESG-compliant performance evidence
Cost Structure	**Channels**	**Revenue Streams / Value Capture**
• Investment in low-carbon materials and technologies • Data systems and staff training • Compliance and third-party assurance • Cost savings from waste reduction • Cost savings from incident prevention (health and safety, regulatory compliance)	• Competitive tendering and procurement processes • Digital project management platforms • Sustainability reporting and client-facing dashboards	• Price premiums for verified low-carbon projects • Long-term maintenance and performance-based contracts • Secondary material resale • Financial incentives linked to waste diversion and environmental performance

The canvas supports transition by clarifying the operational and inter-organisational adjustments required for sustainable value creation and making their economic implications explicit. It reframes the offer from delivering a building to delivering verified performance, including energy efficiency, lower embodied carbon, circular material solutions.

It also includes life-cycle cost optimisation, reflecting established sustainability-oriented value proposition patterns (Bocken et al., 2014). It foregrounds capability building through BIM and data systems, ESG/LCA competencies, and procurement routines, which serve as dynamic capabilities that enable firms to sense requirements and seize market opportunities.

These capabilities also support reconfiguration of operations across heterogeneous projects (Teece, 2010; Gann & Salter, 2000).

It also highlights supply chain coordination and market access via upstream material producers, downstream recyclers, and assurance providers that increase credibility and reduce information asymmetry, supporting prequalification and differentiation in ESG-sensitive segments. Finally, it makes the value-capture logic explicit by showing how transition costs, such as low-carbon materials, data systems, training, and assurance, can be offset through avoided costs (waste disposal, incidents, non-compliance) and new revenues (premium low-carbon projects, performance-based service contracts, resale of secondary materials, and waste-diversion incentives), which is critical for financially viable sustainable business models (Boons & Lüdeke-Freund, 2013; Geissdoerfer et al., 2017).

4.4.2 ESG-Business Model Canvas-KPI Matrix (Indicator System).

The proposed ESG framework is operationalised as a matrix linking sector-material ESG themes to BMC components, indicative measurable KPIs/metrics, typical data sources and tools, and expected managerial impacts (Table 3). Rather than prescribing a fixed scorecard, the matrix is designed as a transparent template that can be calibrated to firm size, project type, and data maturity, while enabling project-level application and empirical testing.

The matrix design was motivated by three interrelated factors. First, sustainable business model research consistently shows that sustainability concepts generate managerial value only when translated into operational decision rules and measurable indicators. Performance measurement systems guide managerial attention, support organisational learning, and enable consistent implementation, which is an essential function in project-based industries such as construction, where practices and outcomes can vary significantly across sites and supply chains (Bourne et al., 2000; Gann & Salter, 2000; Kaplan & Norton, 1996).

Second, ESG framing requires traceability from sustainability themes to the organisational levers through which they are enacted. Mapping ESG themes onto BMC components makes this traceability by indicating where ESG affects value creation (value proposition), value delivery (key activities, resources, partners, and channels), and value capture (cost structure and revenue streams). This aligns with business model, which conceptualises the firm as an interdependent configuration of components rather than as a portfolio of isolated initiatives (Osterwalder & Pigneur, 2010; Teece, 2010).

Third, because construction-sector impacts and risks materialise across the full project life cycle and are mediated through multi-tier supply chains, an indicator system must combine site-level operational metrics with upstream product and procurement metrics such as EPD/LCA-based embodied carbon. Life cycle assessment and product environmental declarations are established mechanisms for quantifying embodied impacts and informing procurement decisions (Sonnemann et al., 2015a).

The KPIs proposed in Table 3 are represent a minimum set intended to be decision-useful for managers, measurable using available construction data systems and interpretable at the project level. Widely used performance measurement criteria guided KPI selection: relevance to material impacts and risks, controllability by project and procurement teams, comparability across projects and time, feasibility of data collection and verification, and linkage to value-capture mechanisms such as cost reduction, risk mitigation, revenue eligibility, or improved financing conditions (Bourne et al., 2000; Neely et al., 2005).

Finally, the inclusion of an explicit "expected impact on performance" column serves both analytical and managerial purposes. Analytically, it specifies hypothesised causal pathways that can be tested empirically; managerially, it supports implementation by framing ESG metrics as operationally and economically consequential rather than purely symbolic reporting, increasing the likelihood that indicators become embedded in routines such as tendering, procurement, and site management (Bourne et al., 2000; Teece, 2010).

e-ISSN 2786-8958
ISSN-L 2616-7107

Table 3. Indicator Matrix Operationalising the ESG Framework for Sustainable Business Model Implementation in the Construction Sector.

ESG Theme	BMC Component(s) Affected	Indicative KPI / Metric	Typical Data Source / Tool	Expected Performance Impact
E1 – Energy and GHG Emissions	Value Proposition; Key Activities; Cost Structure	tCO_2e (Scope 1–2) per project; percentage of renewable electricity; fuel consumption per m^2	Energy meters; fuel records; carbon accounting tools; LCA software	Reduced emissions and energy costs; enhanced regulatory compliance and bid competitiveness
E4 – Waste and Circular Economy	Key Activities; Key Partners; Revenue Streams	Percentage of construction and demolition waste (CDW) diverted from landfill; kg CDW per m^2; percentage of recycled content	Waste transfer notes; on-site segregation reports; recycler certification	Lower disposal costs; revenue from secondary materials; improved circular procurement readiness
E5 – Green Procurement	Key Partners; Key Resources; Value Proposition	Percentage of procurement spend on EPD-verified materials; embodied carbon intensity ($kgCO_2e$ per m^2)	Environmental Product Declarations (EPDs); LCA software; procurement systems	Reduced embodied carbon; greater transparency for clients and regulators
S1 – Workforce Health and Safety	Key Resources; Key Activities; Cost Structure	TRIR and LTIFR; training hours per employee; compliance rate for high-risk tasks	Health and Safety management systems; incident records	Fewer incidents, reduced downtime and legal exposure; improved workforce retention
S3 – Community Relations	Customer Relationships / Stakeholder Engagement; Channels	Number of grievances resolved; stakeholder satisfaction index; days lost due to disputes	Stakeholder registers; grievance logs	Reduced project delay risk; strengthened social licence to operate
G2 – Ethics and Transparency	Key Activities; Key Partners	Percentage of staff trained in compliance; number of substantiated misconduct cases; procurement audit score	Compliance training records; internal and external audit reports	Lower corruption and procurement risk; enhanced reputational protection
G4 – Risk and Compliance Management	Governance; Key Activities	Percentage of key risks with implemented controls; audit findings resolved; number of regulatory non-compliance incidents	Enterprise risk management systems; internal audit documentation	Increased organisational resilience; improved reporting assurance and financing conditions

 e-ISSN 2786-8958
ISSN-L 2616-7107

4.5. Illustrative Application to a Representative Construction Project (Ex-Ante Verification).

Consider a mid-size contractor delivering a new office building. The project team applies Table 3 during tender preparation and early design. For E1, the contractor defines a baseline for site energy and Scope 1–2 emissions (fuel and electricity), sets an internal target (e.g., % reduction versus comparable projects), and commits to reporting fuel use per m^2. For E4, the waste management plan specifies sorting streams, responsibilities, and a diversion target; recycling certificates provide evidence for the KPI. For E5, procurement requires EPDs for priority materials (concrete, steel, and insulation) and uses LCAs to compare design alternatives and translate embodied carbon reductions into bid values. On S1, a safety plan links training and high-risk task controls to TRIR/LTIFR tracking, and on G4, key compliance risks (subcontractor labour standards, hazardous waste handling) are logged with the assigned controls and audit checks.

The exercise produces a measurable ESG "project dashboard" that can be communicated to the client and later used for an empirical evaluation. Although this illustration does not provide outcome data, it specifies the decision points, indicators, and evidence sources required for real-project verification.

The ESG themes discussed above translate into specific risk exposures that can undermine project performance and business model viability if not actively managed.

Table 4, therefore, provides an illustrative ESG risk mapping that links typical construction sector risks to their likely business impacts, identifies the BMC elements in which these risks materialise, and proposes indicative controls and KPIs for monitoring and mitigation.

By connecting risk events to both operational consequences (e.g. delays, rework, legal exposure) and business model levers (e.g. value proposition, partners, cost structure), the table supports a more actionable integration of ESG risk management into procurement, project governance, and reporting routines.

Table 4. ESG Risk–Business Impact–BMC Element Matrix.

Illustrative ESG Risk	Potential Business Impact (Examples)	BMC Element(s) Affected	Indicative Controls / KPIs
Regulatory non-compliance with EPBD or embodied-carbon requirements	Ineligibility for tendering; design revisions and rework; financial penalties; reputational damage	Value Proposition; Key Activities; Cost Structure	Coverage of priority materials with EPD/LCA; embodied carbon intensity ($kgCO_2e$ per m^2)
Labour or health and safety violations within subcontracting tiers	Work stoppages; legal liability; exclusion from procurement frameworks; reputational damage	Key Partners; Key Resources; Stakeholder Engagement	LTIFR and TRIR; subcontractor prequalification rating
Community opposition resulting in permit delays	Schedule overruns; increased holding costs; scope modifications	Channels; Stakeholder Engagement; Revenue Streams	Number of grievances resolved; days lost to disputes; stakeholder satisfaction index
Weaknesses in ESG data quality or assurance (non-verifiable reporting)	Loss of client confidence; increased cost of capital; reduced tender evaluation scores	Key Resources; Key Activities; Revenue Streams	Data completeness rate; independent assurance status
Breaches of procurement integrity or ethical standards	Risk of contract termination; regulatory fines; reputational harm	Key Activities; Key Partners; Cost Structure	Percentage of staff trained in compliance; substantiated misconduct cases; procurement audit score

e-ISSN 2786-8958
ISSN-L 2616-7107

5. Discussion.

The contribution of this study is not the reuse of the generic E-S-G logic per se, but the construction-specific operationalisation of it:

- ESG themes are mapped to explicit business model elements, thereby defining the transformation object and mechanisms.
- An indicator system is provided through the ESG-Business Model-KPI matrix explicitly developed for construction companies, enabling quantitative project-level testing.
- The Sustainable Construction Business Model Canvas adds an Environmental and Social Impact block and specifies construction-relevant levers (circular material flows, EPD/LCA-informed procurement, and subcontractor governance).

Together, these artefacts translate reporting-oriented ESG topics into an implementation architecture that can be embedded in tendering, project governance, and value-chain management in construction companies.

The proposed framework clarifies how ESG can operationalise sustainability within construction business models by converting broad sustainability aspirations into a structured set of management themes that can be assigned, monitored, and reported.

Its first contribution is managerial: by articulating discrete ESG themes with an explicit governance locus, the framework supports accountability, internal control, and consistent data collection, which are preconditions for credible risk management and external disclosure.

Second, its strategic contribution is that by linking ESG themes to business model elements, it shows that ESG performance is not an “add-on” but an outcome of core choices about materials, partners, key activities, and the quality of stakeholder relationships. In this sense, the framework makes visible the mechanisms through which sustainability is translated into value creation, delivery, and capture in project-based settings.

Environmental implications are particularly time-sensitive in the EU context, given the accelerating regulatory requirements for building performance.

These timelines increase the value of anticipatory capability: firms that embed EPD- and LCA-informed procurement and design decisions can better foresee compliance constraints and strengthen their positioning in markets where clients and financiers increasingly demand verifiable low-carbon performance (Anderson & Moncaster, 2023; Dsilva et al., 2023). Simultaneously, the framework also underlines an implementation constraint: where procurement remains predominantly price-driven, the diffusion of EPD/LCA practices depends on whether contracting authorities explicitly request such information and assign it meaningful weight in evaluation. Regulatory pressure alone may be insufficient to shift market behaviour unless procurement practices align incentives with environmental performance objectives.

The social dimension emphasises that construction sustainability is inseparable from stakeholder and supply chain governance. Robust stakeholder engagement is a normative requirement and a practical risk-management function, as unresolved community concerns can escalate into objections, appeals, and delays. In this context, the NIMBY/BANANA dynamics discussed in the literature illustrate how social legitimacy affects project performance by influencing the schedule and cost. Supply chain due diligence is critical in fragmented delivery structures, where subcontractors and suppliers shape working conditions and social outcomes. Occupational health and safety is a foundational social priority, both ethically and economically, given the sector’s exposure to incidents, regulatory enforcement, and legal liabilities (Liang et al., 2018; Srivastava & Srivastava, 2023). The framework’s emphasis on safety and workforce practices supports both harm prevention and organisational resilience.

Consolidate these insights by positioning internal control systems, ethical procurement practices, and a compliance culture as prerequisites for implementing a sustainable business model. Without governance mechanisms that define responsibilities, embed controls, and enable reliable information flows, ESG commitments risk remaining declarative and inconsistent across projects.

 e-ISSN 2786-8958
ISSN-L 2616-7107

From a practical perspective, the framework supports prioritisation and sequencing: firms can begin with foundational governance controls (risk management, ethics, compliance, and partner governance) to establish accountability and data quality, and then progressively expand measurement depth and performance improvement across environmental and social themes. This staged approach is particularly relevant for construction firms with limited ESG maturity, as it aligns capability building with strategic integration and board-level oversight.

6. Conclusions.

This study contends that for the construction sector, ESG offers a more operational and decision-oriented sustainability logic than broad TBL framing because it translates sustainability objectives into themes that can be governed, measured, and communicated with greater precision. By consolidating key ESG drivers and implementation instruments relevant to construction, this study advances an ESG framework aligned with the VSME (EFRAG) thematic logic. It explicitly maps it to the business model canvas elements. This mapping is a substantive contribution because it clarifies that ESG performance is not external to the business model but is produced through core design and delivery choices, such as material and technology selection, partner and subcontractor governance, project execution practices, and the quality of stakeholder relationships.

The proposed framework provides a structured basis for organising sustainability initiatives across the three ESG pillars in construction. On the environmental dimension, it supports the systematic management of emissions and energy use, circularity and waste reduction, and the integration of decision-support tools such as EPD and LCA into procurement and design. On the social dimension, it foregrounds mechanisms of social value creation and risk management through stakeholder engagement, workforce health and safety, and supply chain responsibility.

On the governance dimension, it positions ethics, internal control systems, partner governance, and compliance as enabling conditions for consistent implementation and credible reporting. Together, these elements support a shift from ad hoc sustainability initiatives to a coherent portfolio of managed themes with clear accountability and evidence.

The analysis also implies that progress depends on aligned incentives across the institutional and market environments. Regulatory timelines and disclosure expectations create direction and urgency. However, procurement criteria, particularly the extent to which environmental information is required and weighted, are decisive in shaping the demand for verifiable low-carbon solutions. For clients and policymakers, this underscores the importance of procurement design and evaluation practices as levers for accelerating the adoption of EPD/LCA-informed decisions and circular solutions. For firms, the central practical implication is to treat ESG not as a reporting overlay but as an implementation architecture for sustainable business models that integrates strategy, operations, and governance into a single, accountable system capable of delivering measurable performance improvements alongside transparent stakeholder communication.

7. Limitations.

This study has several limitations. First, the study adopts a conceptual synthesis and framework development approach; consequently, its main contribution is analytical and design-oriented, rather than empirical. The proposed framework has not been statistically tested against firm-level performance outcomes, and causal claims about the effects of ESG practices on competitiveness or financial results, therefore, remain outside the scope of this study. Second, as with many framework-building studies, operational choices such as indicator selection, baselines, thresholds, data quality rules, and assurance procedures are context-dependent and may vary by firm size, project type, contract structure, and regulatory environment.

This variability may affect comparability across organisations and limit immediate generalisation without further specification of measurement protocols. Third, implementation feasibility may be constrained by data availability and governance capacity, particularly in fragmented supply chains, where subcontractors and material suppliers control a substantial share of ESG-relevant impacts and information. The study provides an ex-ante applicability demonstration and an indicator template, but does not include project-level measurement, financial impact scenario modelling, or statistical testing. This was a deliberate scope choice given the conceptual aim; however, it limits the claims about effect sizes.

Future research can enhance the framework's validity and practical usefulness along three complementary lines. First, the proposed KPI set and its mappings should be systematically validated, for example, through Delphi panels involving construction practitioners, clients, and other relevant stakeholders to ensure their validity. Second, multiple-case study research should collect KPI data across project phases to examine adoption pathways, implementation costs, and performance effects, particularly with respect to cost, risk, and schedule outcomes under different governance and procurement conditions. Third, scenario-based evaluation of alternative business model configurations (e.g. low-carbon procurement versus baseline practice) would enable the estimation of trade-offs in cost structure and value capture.

While also testing how procurement criteria, client requirements, and financing conditions influence the uptake of EPD/LCA-informed decisions and circularity. In parallel, methodological work is warranted better to integrate social and economic dimensions into life cycle approaches, advancing more comprehensive assessment models in line with calls for integrated sustainability assessment (Sonnemann et al., 2015b).

Funding Disclosure.

The research is financed by the Recovery and Resilience Facility project "Internal and External Consolidation of the University of Latvia" (No.5.2.1.1.i.0/2/24/I/CFLA/007).

Ethical Considerations.

This study is conceptual and does not involve human participants or primary data collection; therefore, ethical approval was not required. All sources are publicly available and appropriately cited.

Conflict of Interest Statement.

The authors declare that there is no conflict of interest.

AI Tool Usage Disclosure.

The manuscript was linguistically edited and structurally reorganised with the assistance of an AI language model. The author has reviewed and verified the content and takes full responsibility for its accuracy, originality, and integrity, including all interpretations and references.

REFERENCES

Abdelsalam, S. M. A. (2023). The effect of corporate governance mechanisms on construction industry growth. Marginal Journal of Management, Accounting, General Finance and International Economic Issues, 2(3), 804-819. https://doi.org/10.55047/marginal.v2i3.732

Abdullah, S. N., Aziz, A., & Azani, A. (2022). The effect of board independence, gender diversity and board size on firm performance in Malaysia. Journal of Social Economics Research, 9(4), 179-192. https://doi.org/10.18488/35.v9i4.3226

Ahmed Ali, K., Ahmad, M. I., & Yusup, Y. (2020). Issues, Impacts, and Mitigations of Carbon Dioxide Emissions in the Building Sector. Sustainability, 12(18), 7427. https://doi.org/10.3390/su12187427

Anderson, J., & Moncaster, A. (2023). Embodied carbon, embodied energy and renewable energy: a review of environmental product declarations. Proceedings of the Institution of Civil Engineers, Structures and Buildings, 176(12), 986–997. https://doi.org/10.1680/jstbu.21.00160

Argalis, P. P., Šinka, M., Andžs, M., Korjakins, A., & Bajāre, D. (2024). Development of new bio-based building materials by utilising manufacturing waste. Environmental and Climate Technologies, 28(1), 58-70. https://doi.org/10.2478/rtuect-2024-0006

Aziz, A., Chandran, K., Zakaria, N., & Foo, S. M. (2023). Board structure and firm performance of financially distressed companies: evidence from Malaysia. Quantum Journal of Social Sciences and Humanities, 4(5), 86-100. https://doi.org/10.55197/qjssh.v4i5.253

Bloomberg. (2024). Global ESG assets predicted to hit $40 trillion by 2030, despite challenging environment. https://www.bloomberg.com/company/press/global-esg-assets-predicted-to-hit-40-trillion-by-2030-despite-challenging-environment-forecasts-bloomberg-intelligence

Bocken, N., Short, W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. Journal of Cleaner Production, 65, 42–56. http://dx.doi.org/10.1016/j.jclepro.2013.11.039

Bourne, M., Mills, J., Wilcox, M., Neely, A., & Platts, K. (2000). Designing, implementing and updating performance measurement systems. International Journal of Operations & Production Management, 20(7), 754–771. https://doi.org/10.1108/01443570010330739

Cabinet Office. (2020). Procurement Policy Note 06/20: Taking account of social value in the award of central government contracts. https://www.gov.uk/government/publications/procurement-policy-note-0620-taking-account-of-social-value-in-the-award-of-central-government-contracts

Cataldo, I., Banaitienė, N., & Banaitis, A. (2021). Developing of sustainable supply chain management indicators in construction. E3S Web of Conferences, 263, 05049. https://doi.org/10.1051/e3sconf/202126305049

Cataldo, I., Banaitis, A., Samadhiya, A., Banaitienė, N., Kumar, A., & Luthra, S. (2022). Sustainable supply chain management in construction: an exploratory review for future research. Journal of Civil Engineering and Management, 28(7), 536-553. https://doi.org/10.3846/jcem.2022.17202

Chen, T.-F., & Lu, T.-T. (2024). Case study of the Grade a construction company on operational difficulties in Taiwan. International Journal of Application on Economics and Business, 2(1), 3141–3149. https://doi.org/10.24912/ijaeb.v2i1.3141-3149

Costa, L. C. B., Nogueira, M. A., Ferreira, L. C., Elói, F. P. d. F., Carvalho, J. M. F. d., & Peixoto, R. A. F. (2022). Eco-efficient steel slag concretes: an alternative to achieve circular economy. Revista IBRACON De Estruturas E Materiais, 15(2), e15201. https://doi.org/10.1590/s1983-41952022000200001

Dartois, S., Mom, S., Dumontet, H., & Hamida, A. B. (2017). An iterative micromechanical modeling to estimate the thermal and mechanical properties of polydisperse composites with platy particles: application to anisotropic hemp and lime concretes. Construction and Building Materials, 152, 661-671. https://doi.org/10.1016/j.conbuildmat.2017.06.181

Delehan, S., Vilčeková, S., Melehanych, H., Burdová, E. K., & Khorolskyi, A. (2024). A comparative assessment of the capabilities and success of the wood construction industry in Slovakia and Ukraine based on life cycle assessment certification standards. Frontiers in Environmental Science, 12, 1319823. https://doi.org/10.3389/fenvs.2024.1319823

Dsilva, J., Zarmukhambetova, S., & Locke, J. (2023). Assessment of building materials in the construction sector: a case study using life cycle assessment approach to achieve the circular economy. Heliyon, 9(10), e20404. https://doi.org/10.1016/j.heliyon.2023.e20404

European Parliament & Council of the European Union. (2024). Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (recast). Official Journal of the European Union, L series. https://eur-lex.europa.eu/eli/dir/2024/1275/oj/eng

Fobbe, L., Niss, C., & Hilletofth, P. (2024). Continuous and changing stakeholder engagement for organisational sustainability: proposing the stakeholder engagement flow model. Corporate Social Responsibility and Environmental Management, 31(6), 6061-6074. https://doi.org/10.1002/csr.2908

Freeman, R. E., & Phillips, R. A. (2002). Stakeholder theory: A libertarian defense. Business Ethics Quarterly: The Journal of the Society for Business Ethics, 12(3), 331–349. https://doi.org/10.2307/3858020

Freeman, R. E., Harrison, J. S., & Wicks, A. C. (2007). Managing for Stakeholders: Survival, Reputation, and Success, Yale University Press, New Haven. https://doi.org/10.12987/9780300138498

Gann, D. M., & Salter, A. J. (2000). Innovation in project-based, service-enhanced firms: The construction of complex products and systems. Research Policy, 29(7–8), 955–972. https://doi.org/10.1016/S0048-7333(00)00114-1

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Hart, S. L., & Milstein, M. B. (2003). Creating sustainable value. The Academy of Management Perspectives, 17(2), 56–67. https://doi.org/10.5465/ame.2003.10025194

Hoseini, S. A., Fallahpour, A., Wong, K. Y., Mahdiyar, A., Saberi, M., & Durdyev, S. (2021). Sustainable supplier selection in construction industry through hybrid fuzzy-based approaches. Sustainability, 13(3), 1413. https://doi.org/10.3390/su13031413

Ibrahim, F. (2023). Innovative strategy for sustainable business model development with value and social impact approach for economic sustainability. Journal of Contemporary Administration and Management (ADMAN), 1(3), 285-292. https://doi.org/10.61100/adman.v1i3.96

Jabareen, Y. (2009). Building a conceptual framework: Philosophy, definitions, and procedure. International Journal of Qualitative Methods, 8(4), 49–62. https://doi.org/10.1177/160940690900800406

Jiang, Y., Phelipot-Mardelé, A., Collet, F., Lanos, C., Lemke, M., Ansell, M. P., & Lawrence, R. (2020). Moisture buffer, fire resistance and insulation potential of novel bio-clay plaster. Construction and Building Materials, 244, 118353. https://doi.org/10.1016/j.conbuildmat.2020.118353

Kaplan, R. S., & Norton, D. P. (1996). The balanced scorecard: Translating strategy into action. Harvard Business School Press.

Keena, N., Rondinel-Oviedo, D. R., Pomasonco-Alvis, M., & Bouffard, A. (2024). Beyond green: integrating economic and social aspects to environmental life cycle assessments in Canadian housing. IOP Conference Series: Earth and Environmental Science, 1363(1), 012017. https://doi.org/10.1088/1755-1315/1363/1/012017

Khalim, S. M. A., & Lee, C. K. (2020). Implementation of environmental management system (EMS) in construction industry: investigation of success factors. Journal of Governance and Integrity, 4(1), 37-46. https://doi.org/10.15282/jgi.4.1.2020.5611

Liang, H., Lin, K., & Zhang, S. (2018). Understanding the social contagion effect of safety violations within a construction crew: a hybrid approach using system dynamics and agent-based modeling. International Journal of Environmental Research and Public Health, 15(12), 2696. https://doi.org/10.3390/ijerph15122696

Ministry of Justice of the Republic of Latvia. (2020). Corporate governance code: Good corporate governance recommendations for companies in Latvia. Latvian Corporate Governance Advisory Board. https://www.tm.gov.lv/en/corporate-governance-code

Neely, A., Gregory, M., & Platts, K. (2005). Performance measurement system design: A literature review and research agenda. International Journal of Operations & Production Management, 25(12), 1228–1263. https://doi.org/10.1108/01443570510633639

Nouri, F. A., Nikabadi, M. S., & Olfat, L. (2019). Sustainable service supply chain practices (SSSCPS): A framework development. International Journal of Productivity and Performance Management, 69(4), 813-833. https://doi.org/10.1108/ijppm-09-2018-0314

Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. Wiley.

Ott-Holland, C., Shepherd, W., & Ryan, A. M. (2019). Examining wellness programs over time: predicting participation and workplace outcomes. Journal of Occupational Health Psychology, 24(1), 163-179. https://doi.org/10.1037/ocp0000096

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Systematic Reviews, 10(1), 89. https://doi.org/10.1186/s13643-021-01626-4

Parmar, B. L., Freeman, R. E., Harrison, J. S., Wicks, A. C., Purnell, L., & de Colle, S. (2010). Stakeholder Theory: The State of the Art. Academy of Management Annals, 4(1), 403–445. https://doi.org/10.1080/19416520.2010.495581

Pfeffer, J., & Salancik, G. R. (1978). The External Control of Organizations: A Resource Dependence Perspective. Stanford Business Books.

Pomponi, F., & Moncaster, A. (2017). Circular economy for the built environment: A research framework. Journal of Cleaner Production, 143, 710–718. https://doi.org/10.1016/j.jclepro.2016.12.055

Porter, M. E., & Linde, C. van der. (1995). Toward a new conception of the environment-competitiveness relationship. The Journal of Economic Perspectives: A Journal of the American Economic Association, 9(4), 97–118. https://doi.org/10.1257/jep.9.4.97

Project Management Institute. (2021). A Guide to The Project Management Body of Knowledge (PMBOK guide) and The Standard for Project Management (7th ed.). Newtown Square, PA, USA.

Puriwat, W., & Tripopsakul, S. (2022). Unveiling the power of ESG: How it shapes brand image and fuels purchase intentions - an empirical exploration. HighTech and Innovation Journal, 3(4), 472–482. https://doi.org/10.28991/hij-2022-03-04-07

Rezaee, Z. (2016). Business Sustainability Research: A Theoretical and Integrated Perspective. Journal of Accounting Literature, 36(1), 48–64. https://doi.org/10.1016/j.acclit.2016.05.003

Roukoz, K., & Ersenkal, D. (2023). Environmental, Social and Governance-related Challenges in the Construction Industry (CIC 2023). Proceedings of the International Conference on Civil Infrastructure and Construction (CIC), 2023(1), 1238–1252. https://doi.org/10.29117/cic.2023.0153

Sandanayake, M., Zhang, G., & Setunge, S. (2019). Estimation of environmental emissions and impacts of building construction – A decision making tool for contractors. Journal of Building Engineering, 21, 173–185. https://doi.org/10.1016/j.jobe.2018.10.023

Sarajoti, P., Chatjuthamard, P., Papangkorn, S., & Phiromswad, P. (2022). Perspective chapter: The environmental, social, and governance (ESG) investment and its implications. In M. Sarfraz (Ed.), Corporate Social Responsibility in the 21st Century (Business, Management and Economics series). IntechOpen. https://doi.org/10.5772/intechopen.108381

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Sonnemann, G., Gemechu, E. D., Adibi, N., De Bruille, V., & Bulle, C. (2015a). From a critical review to a conceptual framework for integrating the criticality of resources into life cycle sustainability assessment. Journal of Cleaner Production, 94, 20–34. https://doi.org/10.1016/j.jclepro.2015.01.082

Sonnemann, G., Gemechu, E., Remmen, A., Frydendal, J., & Jensen, A. A. (2015b). Life cycle management: implementing sustainability in business practice. LCA Compendium – The Complete World of Life Cycle Assessment, 7-21. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-7221-1_2

Srivastava, N., & Srivastava, G. (2023). Role of occupational health and safety issues on employee commitment and employee retention. Journal of Informatics Education and Research. 3(2), 632-637. https://doi.org/10.52783/jier.v3i2.154

Sulaiman, N. N., Omar, A. J., Pakir, F., & Mohamad, M. (2024). Evaluating environmental, social and governance (ESG) practice among Malaysian public listed construction companies using FTSE Russell rating model. International Journal of Sustainable Construction Engineering and Technology, 15(1), 25-40. https://doi.org/10.30880/ijscet.2024.15.01.003

Sullivan, M. S., Chorzepa, M. G., & Durham, S. A. (2020). Characterizing the Performance of Ternary Concrete Mixtures Involving Slag and Metakaolin. Infrastructures, 5(2), 14. https://doi.org/10.3390/infrastructures5020014

Tambovceva, T., Urbāne, V., & Levins, J. (2020). Innovations in construction waste management: case of Latvia. Marketing and Management of Innovations, (3), 234-248. https://doi.org/10.21272/mmi.2020.3-17

Teece, D. J. (2010). Business Models, Business Strategy and Innovation. Long Range Planning, 43(2–3), 172–194. https://doi.org/10.1016/j.lrp.2009.07.003

Tor, M. A., & Mamman, J. E. (2025). A Review of Challenges Influencing Stakeholders Engagement in Construction Project Delivery. IOP Conference Series: Earth and Environmental Science, 1492(1), 012031. https://doi.org/10.1088/1755-1315/1492/1/012031

Torraco, R. J. (2005). Writing Integrative Literature Reviews: Guidelines and Examples. Human Resource Development Review, 4(3), 356–367. https://doi.org/10.1177/1534484305278283

Treptow, I. C., Kneipp, J. M., Gomes, C. M., Kruglianskas, I., Favarin, R. R., & Fernandez-Jardón, C. M. (2022). Business Model Innovation for Sustainable Value Creation in Construction Companies. Sustainability, 14(16), 10101. https://doi.org/10.3390/su141610101

Vanderschelden, B., Bossche, N. V. D., & Steeman, M. (2021). Hygrothermal Performance of Bio-Based Insulation Material in Wood-Frame Walls Exposed to Unintended Moisture Sources. 1st International Conference on Moisture in Buildings 2021 (ICMB21), Online. https://doi.org/10.14293/ICMB210063

Wang, M., & Gong, H. (2018). Not-in-My-Backyard: Legislation Requirements and Economic Analysis for Developing Underground Wastewater Treatment Plant in China. International Journal of Environmental Research and Public Health, 15(11), 2339. https://doi.org/10.3390/ijerph15112339

Witkowska-Dąbrowska, M., Świdyńska, N., & Napiórkowska-Baryła, A. (2021). Attitudes of communities in rural areas towards the development of wind energy. Energies, 14(23), 8052. https://doi.org/10.3390/en14238052

Zhang, B., Yang, M., Xiong, Y., & Liu, Y. (2024). Can digital transformation promote service innovation performance of construction enterprises? The mediating role of dual innovation. Sustainability, 16(3), 1176. https://doi.org/10.3390/su16031176

Zhang, C., Lv, L., & Wang, Z. (2023). Evolutionary game analysis for key participants' behavior in digital transformation of the Chinese construction industry. Buildings, 13(4), 922. https://doi.org/10.3390/buildings13040922