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# Formalising *Sustainability Management* as a Core Process Group in Project Management

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## ABSTRACT

Sustainability has become a strategic imperative for organisations, yet widely used project management standards such as the PMBoK sixth and seventh editions still do not formalise how sustainability should be embedded across project work. This gap matters because PMBoK-based processes shape governance, roles, documentation and performance expectations; without explicit mechanisms, teams lack a shared language, defined decision points and consistent metrics to translate ESG priorities into planning, execution, monitoring and closure. As a result, sustainability is often treated as an optional add-on, applied inconsistently, weakening stakeholder alignment, encouraging short-term optimisation and reducing ESG accountability and long-term value creation. Grounded in stakeholder theory and the natural resource–based view, this paper proposes a new PMBoK core process group and knowledge area called sustainability management. This research methodologically adopts a conceptual and standards-based analytical approach, combining systematic mapping, alignment and extension of sustainability principles across PMBoK sixth and seventh editions. By formalising sustainability management as a dedicated process group and knowledge area, the study advances existing project management literature by translating sustainability from a dispersed normative orientation into an explicit, auditable and repeatable governance architecture.

## 1 | Introduction

Sustainability is increasingly recognised as a defining challenge for the project management profession; yet a structural tension persists in its main bodies of knowledge. On the one hand, the PMBoK has progressively expanded its language around responsibility, long-term value and broader stakeholder expectations; on the other, it still offers limited procedural and structural formalisation of how sustainability should be systematically embedded across project processes in a structured and repeatable way (Gareis et al. 2010; PMI 2018, 2021; Silvius 2017). This gap becomes more visible as contemporary project environments are now shaped by ESG-oriented governance and reporting logics, which demand traceability, materiality-based prioritisation and measurable impacts at the project level (Mariani et al. 2025; Marques et al. 2023; PMI-GPM Sustainability Joint Venture 2025). In operational terms, these governance pressures translate into a growing need for project-level accountability mechanisms that can demonstrate not only what sustainability intentions are declared, but how they are operationalised through decisions, controls and auditable evidence along the project life cycle. As ESG oversight increasingly relies on verifiable documentation, decision rationales and performance indicators, projects are expected to provide structured 'evidence trails' linking strategic sustainability commitments to concrete trade-offs, approvals and monitoring routines. In parallel, other methodologies and standards have begun to incorporate sustainability more explicitly through alternative approaches such as PRiSM and the GPM P5 Standard for Sustainability (Planet,

People, Product, Process, Prosperity) by the Green Project Management (PMI-GPM Sustainability Joint Venture 2025) or through formal updates to widely adopted standards such as PRINCE2 seventh edition and ISO 21500/21502, but comparative discussions still highlight uneven coverage, especially limited operational guidance in processes, roles and artefacts (ISO 2020, 2021; Lovrenčić Butković and Silvius 2025; PeopleCert 2023; Soares et al. 2024). Against this background, the 'structural' issue is not the absence of sustainability principles per se, but the lack of a shared procedural grammar at the project level, more precisely, explicit decision points, role responsibilities, artefacts and metrics through which ESG-related expectations can be translated into routine project governance. Against this backdrop, sustainable development is gaining increasing attention in both public and private sectors, prompting organisations to reevaluate long-standing practices and align them with a paradigm that values not only economic results but also social and environmental impacts. This shift has redefined competitiveness, now increasingly tied to stakeholder management and the responsible use of resources (Greenland et al. 2022). One significant consequence of this evolution is the growing emphasis on sustainability in both production processes and post-consumption strategies, especially in areas such as strategic planning and product development (Gibbin et al. 2023; Nudurupati et al. 2022). Innovative efforts are thus being steered towards inclusive and forward-looking solutions that safeguard both present and future generations. This heightened awareness of sustainability extends beyond organisations to a wide array of stakeholders, including governments, communities and consumers, who are increasingly demanding environmental responsibility, waste reduction and ethical governance. These expectations are reshaping decision-making across all organisational levels. Crucially, this reshaping has governance implications: Sustainability commitments increasingly require demonstrable accountability, internal controls and consistent performance evaluation routines that connect strategic ESG goals to operational execution. In this context, project management, as the application of tools, skills and knowledge to achieve specific goals, is also transforming (Sankaran et al. 2021). In particular, projects are increasingly expected to evidence their contribution to ESG objectives and organisational sustainability commitments, thus extending the traditional 'iron triangle' logic towards a multidimensional view of performance and accountability (Mariani et al. 2025; PMI-GPM Sustainability Joint Venture 2025; Silvius 2017). However, without formalised process architecture, project teams often lack agreed decision rules and comparable performance criteria for sustainability-related trade-offs (for instance, schedule/cost versus carbon footprint, supplier ethics, community impacts, etc.), leaving accountability dependent on discretionary choices rather than embedded governance routines. Thus, it is widely acknowledged that incorporating sustainability constraints expands the scope of decision-making in projects and unlocks new opportunities. Indeed, studies have shown that integrating sustainability into all project phases, from initiation to closure, can enhance long-term value, improve efficiency and deliver higher quality outcomes (Bocchini et al. 2014; Silvius et al. 2013). This growing relevance has led to increased scholarly and professional interest in embedding sustainability into project management discourse, including renewed attention to stakeholder orientation as a core condition for managing projects sustainably (Eskerod and Huemann 2024; Freeman 1984). Nevertheless, a persistent gap remains between theory and practice. Although many studies have developed indicators for evaluating sustainability (Brent and Labuschagne 2006; Talbot and Venkataraman 2011) and others have proposed conceptual frameworks that treat sustainability as a new and emerging paradigm in project management (Pasian and Silvius 2016; Silvius 2017), a formalised and systematised approach for integrating sustainability into project processes is still lacking (Gareis et al. 2010). Recent analyses reinforce this diagnosis: Even where sustainability is now mentioned in major standards, it is not consistently translated into explicit process logic, artefacts and repeatable decision routines across the project life cycle (Lovrenčić Butković and Silvius 2025; Marques et al. 2023; Soares et al. 2024). Consequently, even though project management professionals and academics increasingly advocate for sustainability, there is still no clear consensus on how to operationalise it in a structured and repeatable way. From a governance perspective, this shortfall also limits auditability and comparability across projects, as sustainability-related performance evaluation often relies on heterogeneous indicators and informal reporting practices rather than standardised checkpoints and control artefacts. As several authors have pointed out, the current lack of a common framework makes it difficult for project managers to apply consistent methods and tools to achieve sustainable outcomes (Labuschagne et al. 2005; Sánchez 2015; Sarkis et al. 2012; Silvius and Schipper 2015; Valdes-Vasquez and Klotz 2013). This deficiency is particularly evident in large and complex projects, where sustainability aspects are frequently overlooked or deliberately excluded (Martens and Carvalho 2016a; Thamhain 2014). Although literature increasingly calls for sustainable project outcomes, research remains scattered, and there is a need to synthesise these contributions into a coherent, formalised methodology (Martens and Carvalho 2016a). As Singh et al. (2012) highlighted, the field still requires significant research to develop actionable tools, techniques and methodological foundations. Earlier contributions that mapped 'impact areas' for integrating sustainability into project management remain relevant, but they also underscore the need to move from principled claims to operational structures (Tharp 2012). In other words, the core challenge is to move sustainability from an aspirational orientation to a governable project-level logic, embedded in decision gates, artefacts, metrics and routines that make accountability actionable. For these reasons, this paper aims to address this gap by proposing the formalisation of sustainability management as a new process group and knowledge area within the PMBoK framework. The proposal is grounded in stakeholder theory (Freeman 1984) and the natural resource–based view (NRBV) (Hart 1995), which emphasise that project value cannot be assessed solely through financial performance but must also consider social and environmental dimensions. Building on a conceptual analysis of the PMBoK's sixth and seventh editions, the study outlines how sustainability can be embedded into process groups, knowledge areas, principles and performance domains. In doing so, the paper introduces a structured set of sustainability-oriented processes, along with a dedicated principle that promotes sustainability *by design* and *by default*. Importantly, the

proposed architecture is intended to reconfigure project-level governance by making sustainability an explicit object of decision-making and performance control, by introducing standardised decision checkpoints, shared metrics and traceable artefacts that support accountability routines (e.g., escalation paths, approvals, monitoring and reporting cycles) consistent with ESG governance expectations. The dual logic, sustainability *by design* and *by default*, supports the integration of sustainability from the earliest stages of project planning and ensures it is treated as a core dimension throughout execution, control and closure. By offering both theoretical grounding and practical structure, this work contributes to the evolution of project management methodology. It provides a systematic approach to sustainability integration, offering project managers, educators and institutions a framework aligned with global sustainability imperatives and the strategic objectives of contemporary organisations (Soares et al. 2023).

## 2 | Theoretical Background

### 2.1 | Theoretical Foundations of Sustainability Integration in Project Management

Over the past three decades, the concept of sustainability has evolved from a broad, normative principle into a multidimensional construct that integrates environmental, social and economic dimensions (Elkington and Rowlands 1999). This evolution has increasingly influenced the field of project management, prompting scholars to investigate how sustainability can be embedded into governance structures, operational routines and decision-making processes (Gareis et al. 2010). The literature demonstrates growing attention to integrating sustainability principles across diverse project-based industries. Reviews consistently highlight that sustainability integration encompasses three interconnected pillars: environmental responsibility, social equity and economic viability (Orieno et al. 2024; Soares et al. 2023). To operationalise these pillars, several tools and frameworks have been proposed, such as life cycle assessment (LCA), stakeholder engagement strategies and sustainability balanced scorecards (Kehinde 2025; Orieno et al. 2024). Notable progress has also been made at the strategic and portfolio levels, where sustainability-oriented mindsets and assessment frameworks have been developed (Aghajani et al. 2023). Sector-specific contributions include the construction industry, which has developed 82 sustainability indicators spanning the triple bottom line (Stanitsas et al. 2021), and the manufacturing sector, where ISO standards are widely recognised as benchmarks for sustainable practices (Li-Yao and Misopoulos 2020). Nevertheless, significant obstacles remain, including the absence of standardised guidelines, difficulties in measuring sustainability outcomes and resistance to changing traditional practices (Orieno et al. 2024). Scholars agree that future research should aim to establish standardised metrics and leverage new technologies to enhance sustainability in project management. The theoretical foundations of this discussion build on the idea that sustainable development requires balancing profitability, environmental preservation and social responsibility (Shenhar and Dvir 2007; Elkington and Rowlands 1999). This triad was formalised in the 2030 Agenda for Sustainable Development (UN, 2015), which introduced 17 Sustainable Development Goals (SDGs) that serve as a global reference point for both public and private organisations. As projects become more complex and resource intensive, with direct implications for local communities, sustainability is no longer optional but a strategic and operational necessity (Martens and Carvalho 2016b). However, integrating it into project management remains problematic. Frameworks such as ISO 21500 or PRiSM have attempted to bridge the gap; however, mainstream standards like the PMBoK still lack explicit methodological guidance (Thamhain 2014). Research has shown that sustainability is often treated as an external consideration, detached from the formal project life cycle, and that available tools remain underdeveloped for everyday project practices (Brones et al. 2014; Marcelino-Sádaba et al. 2015). Historically, economic sustainability has dominated business decision-making, overshadowing environmental and social goals. This approach, however, is shifting towards a more holistic understanding that recognises the necessity of integrating all three sustainability dimensions into projects and organisational activities (Cole 2005; Silvius et al. 2013). Evidence increasingly suggests that sustainability-oriented projects generate long-term value and higher stakeholder satisfaction (Brammer and Millington 2008; Martínez-Perales et al. 2018). Two theoretical lenses are particularly relevant here. Stakeholder theory (Freeman 1984) posits that value is co-created through relationships with multiple stakeholders, highlighting ethical responsibility and long-term engagement as fundamental to sustainability (Freeman and Dmytriyev 2017). In parallel, the NRBV emphasises environmental capability as a source of competitive advantage, reframing sustainability as a strategic asset rather than a compliance issue (Hart 1995). These lenses are mobilised as design-oriented interpretive frameworks, to specify what sustainability integration should 'look like' in terms of governance routines, artefacts, checkpoints and decision criteria, rather than to develop new theoretical constructs or to empirically test causal relationships. Accordingly, we pursue a theory-informed governance and process design approach, drawing on established theoretical lenses to articulate concrete design principles and requirements for embedding sustainability within PMBoK-consistent structures.

Despite these contributions, the translation of theory into practice remains fragmented. Much of the literature proposes general principles or broad objectives, but only a limited number of works offer structured methodologies to guide project managers in embedding sustainability into processes, tools and deliverables (Martens and Carvalho 2016a; Sánchez 2015). Sustainability is often treated as a moral imperative rather than an integrated component of project governance (Alsayegh et al. 2020). Moreover, there is still no consensus on how to operationalise sustainability in the most widely adopted methodologies, such as the PMBoK sixth and seventh editions, despite a long-standing recognition of its importance in project contexts (Köhler et al. 2012; Labuschagne et al. 2005; Singh et al. 2012).

This gap underscores the need for a comprehensive and systematic framework that can integrate sustainability throughout the project life cycle. The objective of this article is to contribute to this discussion by systematising sustainability, understood in its

triple environmental, social and economic dimensions, within project management processes. Therefore, the theoretical contribution lies in offering a structured conceptual rationale that converts established sustainability perspectives into a coherent set of project-level mechanisms, aligned with PMBoK logics and usable for governance, decision-making and performance control.

### 2.2 | The Project Sustainability Management (PSM) Overview

The need to embed sustainability into project management has become increasingly urgent, driven by both the growing complexity of organisational initiatives and the escalating global environmental and social challenges that projects inevitably face. Scholars have emphasised that projects are not merely instruments for delivering products or services, but also powerful levers for shaping institutional and societal change (Marcelino-Sádaba et al. 2015; Martens and Carvalho 2016a; Silvius et al. 2013). Within this context, the literature on sustainability in projects has developed along three main thematic streams. A first stream concerns strategic alignment, arguing that sustainability must be explicitly integrated into the strategic objectives of projects to foster innovation, reduce risks and enhance long-term competitiveness (Calero and Piattini 2015; Thomas and Lamm 2012; Van den Brink et al. 2012). A second stream emphasises project governance, focusing on the role of decision-making structures, stakeholder engagement and resource allocation in ensuring that sustainability principles inform every stage of the project life cycle (Aarseth et al. 2017; Huemann and Silvius 2017). A third stream deals with measurement and accountability, calling for the adoption of performance indicators and reporting frameworks such as the triple bottom line (Elkington and Rowlands 1999) and the Global Reporting Initiative to systematically evaluate projects in their economic, environmental and social dimensions (Labuschagne et al. 2005; Silvius and Schipper 2015; Singh et al. 2012). From these research streams, the concept of PSM has emerged as a structured attempt to operationalise sustainability in project contexts (Silvius and Schipper 2015). PSM does not propose a new theoretical paradigm but rather reframes existing project management approaches by making sustainability an explicit and integral concern. According to leading scholars such as Silvius, Gareis and Martens, PSM requires systematically embedding sustainability principles, derived from frameworks such as the triple bottom line and stakeholder theory, into all phases of the project life cycle, from initiation to closure (Gareis et al. 2010; Martens and Carvalho 2016b; Silvius and Schipper 2015). This reframing moves beyond rhetorical commitment: it requires the development of processes, tools and practices that make sustainability actionable in day-to-day project management. Consistent with this view, the present study does not claim to extend stakeholder theory or NRBV as theories, but to use them to inform the design logic of a PMBoK-consistent sustainability governance structure. In practical terms, PSM entails the adoption of multi-criteria decision-making models (Fiksel et al. 1999; Thabrew et al. 2009), integrated stakeholder engagement strategies (Freeman and Dmytriyev 2017) and formal alignment with institutional sustainability goals, such as the UN SDGs and the Global Reporting Initiative. This represents a transition from viewing sustainability as a constraint to considering it an enabler of value creation and organisational transformation (Brammer and Millington 2008; Martínez-Perales et al. 2018). Despite these advances, however, the literature on PSM remains fragmented. Its relationship with broader domains such as strategic management and project governance is often implicit rather than fully articulated. Furthermore, no standardised methodology has yet been formalised within mainstream project management standards. Against this backdrop, this paper does not position PSM as a novel theory, but rather as a structured extension of existing project management logic, filling a methodological and operational gap. Specifically, it argues for the formalisation of PSM as a new process group and knowledge area within the PMBoK framework, thereby systematising sustainability, environmental, social and economic into the core of project management practice. In Table 1, an overview of key contributions to the PSM concept is provided to support the key themes discussed in this section. The table is visually simplified and reduced in scope to avoid redundancy and to better function as a reference for the practical dimensions of PSM within organisations.

### 2.3 | Operationalising PSM

Building on its conceptual foundation, PSM is increasingly regarded as a structured operational approach for embedding sustainability principles into project practices. Rather than positioning project management as a purely technical or administrative function, PSM elevates it to a strategic role that supports environmental, social and economic performance throughout the project life cycle (Martens and Carvalho 2016a; Silvius et al. 2013). Thus, the integration of sustainability within the Project Management Process Groups (PMPGs), initiating, planning, executing, monitoring and controlling, and closing, provides a systematic way to embed sustainability considerations at each project phase (PMI 2018, 2021). Through this structure, PSM enables project teams to align with corporate sustainability objectives while delivering measurable outcomes across the TBL, economic prosperity, environmental responsibility and social equity (Elkington and Rowlands 1999).

To make this integration effective, PSM leverages a range of well-established tools and mechanisms. LCA and social impact assessment (SIA) offer methods for evaluating a project's sustainability impacts holistically, while key performance indicators (KPIs) allow managers to track sustainability progress in a data-driven manner (Labuschagne et al. 2005; Silvius 2017; Singh et al. 2012). Additionally, the inclusion of diverse stakeholder perspectives, from community groups to environmental regulators, ensures that projects are designed and executed with a broader societal mandate in mind (Freeman 1984; Freeman and Dmytriyev 2017). Importantly, this framework supports not only compliance and measurement but also organisational learning and transformation. By embedding sustainability into core project processes, organisations can enhance risk management, improve resource efficiency and increase long-term project resilience (Brones et al. 2014; Sarkis et al. 2012; Carvalho and Rabechini Junior 2015). Moreover, this integration fosters a sustainability-oriented mindset within project teams, influencing decision-making beyond individual projects and contributing to cultural change at the organisational level (Martens and

**TABLE 1** | Project sustainability management overview. *Source: Authors.*

| Key aspects | Insights | References |
|---|---|---|
| Integration challenge | Organisations must reconcile short-term operational efficiency with long-term environmental and social objectives, embedding sustainability across processes. | Marcelino-Sádaba et al. (2015); Martens and Carvalho (2014) |
| Strategic importance | Integrating sustainability into project management strengthens strategic alignment, enhances long-term viability and increases investor and stakeholder confidence. | Thomas and Lamm (2012); Van den Brink et al. (2012); Marcelino-Sádaba et al. (2015) |
| Corporate reputation | Sustainable practices consolidate corporate reputation and social responsibility, reinforcing brand value and customer loyalty. | Labuschagne et al. (2005) |
| Business innovation | Beyond regulatory compliance, sustainability drives innovation and competitive advantage through circular and resource-efficient business models. | Calero and Piattini (2015) |
| Economic and environmental interconnection | Economic growth and environmental protection are interdependent, necessitating that firms adopt eco-friendly strategies. | Gareis et al. (2010); Silvius et al. (2013); Aarseth et al. (2017) |
| Project management as a change mechanism | Project management serves as a key instrument for translating sustainability goals into business strategies through structured implementation frameworks. | Marcelino-Sádaba et al. (2015); Labuschagne et al. (2005) |
| Role of the sustainability indicators | Sustainability indicators support progress monitoring, impact assessment and continuous improvement of corporate practices. | Labuschagne et al. (2005); Singh et al. (2012); Silvius and Schipper (2015); Marcelino-Sádaba et al. (2015) |
| Triple bottom line dimensions | The triple bottom line enables performance evaluation beyond profit, integrating financial, environmental and social dimensions (people, planet, prosperity). | Silvius et al. (2013); Fiksel et al. (1999); Keeble et al. (2003); Azapagic (2004); Shen et al. (2011); Labuschagne et al. (2005) |
| Multi-stakeholder approach | A multi-stakeholder perspective ensures inclusive decision-making and facilitates the adoption of sustainable practices. | Fiksel et al. (1999); Dalkmann et al. (2004); Ugwu et al. (2006); Thabrew et al. (2009); De Brucker et al. (2013); Dobrovolskienė and Tamošiūnienė (2015); Martens and Carvalho (2017) |
| Global frameworks supporting PSM | Global frameworks such as the GRI and UN indicators provide standardised guidelines that align organisations with international best practices. | GRI Global Reporting Initiative (n.d.); United Nations (2007) |

Carvalho 2016a). Life cycle thinking is another foundational principle of PSM, promoting a *cradle-to-grave* view of projects that includes upstream impacts and downstream consequences (Ugwu et al. 2006). This perspective encourages teams to consider environmental and social costs not only during project execution but also in design and planning phases, thereby

reinforcing long-term sustainability goals. Finally, the PSM framework is inherently oriented towards continuous improvement. It evolves alongside sustainability best practices and global standards, enabling organisations to update their project practices in alignment with emerging challenges and stakeholder expectations (Silvius and Schipper 2015).

By systematising these practices within the structure of the PMBoK process groups and aligning them with established sustainability frameworks, this paper proposes a formalisation of PSM as a dedicated knowledge area. This contributes to the project management literature primarily as a governance and process design contribution, providing theory-informed and PMBoK-consistent operational architecture for sustainability integration, rather than claiming theory-building or theory-testing advances. This contributes not only to advancing project management theory but also to equipping organisations with actionable, repeatable tools for embedding sustainability in project strategies. PSM thus becomes both an operational model and a strategic enabler, bridging sustainability goals with project execution realities and transforming project management into a driver of long-term organisational value (Calero and Piattini 2015; Silvius et al. 2013).

### 2.4 | Positioning Stakeholder Theory for *Sustainability by Design* in Project Management

Stakeholder theory provides both a normative and instrumental rationale for embedding sustainability into project governance, reframing success beyond the classic time–cost-quality constraints towards long-term stakeholder value and organisational legitimacy (Freeman 1984; Silvius and Schipper 2015). Operationally, stakeholder salience (power, legitimacy, urgency) informs the definition of sustainability requirements, the construction of risk registers, the engagement strategies and the acceptance criteria across the PMBoK sixth edition processes (e.g., Collect Requirements, Identify Stakeholders, Plan Stakeholder Engagement) (PMI 2018), while aligning with the PMBoK seventh edition principles and performance domains (stakeholders, value, stewardship, systems thinking, measurement, uncertainty) (Eskerod and Jepsen 2016; PMI 2021). Hence, stakeholder theory is employed as an organising lens to specify governance-relevant mechanisms (who is accountable to whom, through which artefacts and decision routines), not as an empirical theory to be tested within the study.

### 2.5 | The NRBV and Implications for Project Management Process Design

The NRBV conceptualises environmental capabilities, pollution prevention, product stewardship and sustainable development, as strategic resources that inform process design choices in project management (Hart 1995). Mapping NRBV to project management processes clarifies inputs, decision gates and outputs that protect or enhance environmental and social assets: in planning, life cycle–oriented requirements and sustainability KPIs; in executing, supplier selection and make–buy decisions that internalise environmental externalities; in monitoring and controlling, change control with ESG impact analysis; in closing, benefits realisation extended to post project environmental and social outcomes (PMI 2018, 2021). This architecture makes sustainability *by design* and *by default*, bridging the process-based approach of the PMBoK sixth edition with the principle/domain-based governance of the PMBoK seventh edition (PMI 2021). NRBV is thus used to derive design principles and decision criteria that can be embedded into PMBoK processes (e.g., life cycle costing, eco-design constraints, ESG impact screening), rather than to claim or test performance effects.

### 2.6 | Alignment With PRiSM/GPM P5, ISO 21500 and ISO 21502

To root the contribution in current practice, the proposal aligns with: (a) PRiSM and the GPM P5 Standard (people, planet, prosperity, process, product), which operationalise sustainability at project level and map practices to the UN SDGs (PMI-GPM Sustainability Joint Venture 2025); (b) ISO 21500:2021 (context and concepts), offering a governance context for project, programme and portfolio management; and ISO 21502:2020 (guidance on project management), providing practice level guidance applicable across delivery approaches (predictive, iterative, agile, hybrid) (ISO 2020, 2021); (c) stakeholder/TBL-based contributions consolidated in monographs and reviews (Eskerod and Jepsen 2016; Silvius 2017). Our formalisation of a PMBoK-consistent sustainability management process group, covering planning, managing, checking and assessing sustainability, acts as a bridge between the conceptual what and the operational how in PMI logic (PMI 2021). This alignment strengthens the study's positioning as a practice-relevant process architecture contribution anchored in established standards.

### 2.7 | A Conceptual Linkage From Theories to the PMBoK Sixth and Seventh Editions

To operationalise these theoretical foundations within the PMI framework, we propose a direct mapping that translates abstract theoretical constructs into tangible project management artefacts. The following linkages illustrate how theoretical principles inform specific PMBoK components: stakeholder theory—inputs/tools/outputs: salience-informed requirements; engagement strategies; acceptance criteria; issue logs; ethics/transparency controls (Freeman 1984; PMI 2018, 2021). NRBV—decision rules: make–buy with environmental capability screening; life cycle costing; eco design constraints in WBS and Definition of Done (Hart 1995; PMI 2018, 2021). Governance and tailoring (PMBoK seventh edition): sustainability gates; measurement domain with ESG KPIs; change principle requiring ESG impact analysis for all change requests (PMI 2021; Silvius 2017). These linkages consolidate theoretical underpinnings and make the contribution auditable against recognised standards, while preserving PMI terminology (process groups, principles, performance domains) (PMI 2021). Importantly, this mapping is presented as a conceptual design rationale that strengthens coherence between theories and PMBoK components; it is not intended as an empirical validation of outcomes, but as a transparent justification for the proposed governance and process architecture.

## 3 | Research Method

This study adopts a qualitative and conceptual methodology with an interpretive approach (Denzin and Lincoln 2000). The objective is to explore how sustainability principles can be systematically embedded into project management by analysing and enhancing the formal structures of the *PMBoK guide*, specifically the sixth and seventh editions. Given the standards-based nature of the study, we apply a transparent and replicable integration protocol, combining structured document analysis with a criteria-driven coding logic to ensure traceability from sustainability requirements to PMBoK components (processes, principles and performance domains). Our integration follows these steps: we first introduce the impacts of sustainability into the PMPGs and knowledge area processes of the PMBoK sixth edition; we then combine sustainability management into the principles and even into the domains of the PMBoK seventh edition. Finally, we present the proposal for PSM. Across all steps, 'sustainability elements' are treated as operationalisable units, for example sustainability-related requirements, decision criteria, artefacts, checkpoints and performance indicators, rather than generic statements of intent.

### 3.1 | Research Design and Process

Our proposal begins by describing the influence of sustainability management on each of the 49 processes outlined in PMI's process groups practice guide of the PMBoK sixth edition (PMI 2018). Each process belongs to a process group (initiation, planning, execution, monitoring and control, and closure) that is developed in conjunction with each knowledge area (integration, scope, schedule, cost, quality, resource, communication, risk, procurement and stakeholder). The research process is visually summarised in Table 2. For each of the 49 processes, we conducted a structured reading and coding of decision points embedded in the process purpose and outputs; governance-related controls, baselines, and change mechanisms; and artefacts and registers that can host sustainability-relevant information (e.g., requirements documentation, risk registers, procurement documentation, performance reports). The result is a process-level mapping template that records where and how sustainability can be embedded, enabling consistency across processes and comparability across process groups.

**TABLE 2** | Research process. *Source: Authors.*

| Phases | Description | PMBoK focus |
|---|---|---|
| Phase 1: Mapping integration | Mapping sustainability issues onto the 49 processes of the PMBoK sixth edition's process groups | Process groups + knowledge areas |
| Phase 2: Aligning principles | Aligning sustainability dimensions with the 12 principles in PMBoK seventh edition | Project principles |
| Phase 3: Extending domains | Integrating Sustainability into the eight performance domains of PMBoK seventh edition | Performance domains |

### 3.2 | Criteria for Integrating Sustainability Into PMBoK Processes

To ensure transparency and analytical rigour, the integration of sustainability into PMBoK processes follows a set of explicit and replicable criteria, consistent with conceptual theory-building approaches in management research (Meredith 1993; Wacker 1998). Sustainability is incorporated into a process, principle or domain when at least one of the following conditions is met, as follows:

- **Decision relevance:** The process involves managerial decisions that materially affect environmental, social and governance (ESG) outcomes, particularly in areas such as scope definition, procurement and risk responses (Müller and Lecoeuvre 2014; Too and Weaver 2014).
- **Stakeholder impact:** The process directly shapes stakeholder inclusion, legitimacy or long-term value creation beyond immediate project outputs, in line with stakeholder-oriented project governance perspectives (Eskerod and Huemann 2024; Freeman 1984).
- **Life cycle influence:** The process affects upstream or downstream impacts across the project life cycle, including resource use, environmental externalities and post-project outcomes (Labuschagne et al. 2005; Silvius and Schipper 2015).
- **Governance and accountability:** The process defines baselines, controls, acceptance criteria or change mechanisms through which sustainability commitments can be verified, monitored and audited (Müller and Lecoeuvre 2014; PMI 2018).
- **Value creation beyond the iron triangle:** The process contributes to long-term organisational or societal value, extending success criteria beyond time, cost and quality constraints (Shenhar et al. 2001; Silvius 2017).

These criteria were applied consistently across all analytical phases (see Table 2) to determine whether sustainability should be embedded as a constraint, a decision variable or a performance metric within each PMBoK component, thereby reducing interpretive ambiguity and enhancing methodological traceability (Jaakkola 2020; MacInnis 2011). To address selection and prioritisation explicitly, we applied the criteria in two consecutive passes. First, each process, principle and domain were selected screening to identify all potential sustainability insertion points. Second, insertion points were prioritised according to

their governance criticality, defined as the extent to which they shape irreversible commitments (e.g., scope baseline, procurement strategy), define formal decision gates (approvals, change control) and enable auditability through traceable artefacts and measurable indicators. High-priority elements were those linked to baselines, control routines or external-facing reporting needs, whereas lower-priority elements were treated as contextual guidance or optional tailoring cues. This prioritisation logic is recorded in the mapping template and is reflected in the density of sustainability integrations across process groups and domains.

The three-phase framework (mapping, alignment, extension) is designed as a cumulative analytical sequence rather than a descriptive overview, following established approaches to conceptual framework development (Jaakkola 2020; Wacker 1998).

Phase 1. Mapping integration involves a systematic examination of all 49 processes of the PMBoK sixth edition to identify where sustainability-related decision points already exist implicitly, such as through enterprise environmental factors, stakeholder requirements or risk categories (Gareis et al. 2010; PMI 2018). The objective of this phase is diagnostic: to reveal structural gaps, redundancies and points of fragility where sustainability remains reactive, fragmented or contingent on external pressures rather than governed through formal project mechanisms (Marcelino-Sádaba et al. 2015; Silvius 2017). Operationally, for each process we documented which sustainability elements are relevant, where they can be embedded (inputs, tools and techniques, outputs) and which governance mechanism they activate (checkpoint, artefact update, KPI monitoring or escalation trigger).

Phase 2. Aligning principles shifts the analysis from procedural logic to normative governance by aligning sustainability dimensions with the 12 principles of the PMBoK seventh edition (PMI 2021). This phase evaluates the extent to which sustainability is legitimised as a guiding criterion for managerial behaviour, stewardship and long-term value creation, while simultaneously identifying the absence of explicit operational anchors that ensure repeatability across projects (Eskerod and Jepsen 2016; Silvius 2017). Here, selection focused on principles that directly shape accountability behaviour (e.g., stewardship, value, stakeholders, systems thinking, measurement, risk and change), and prioritisation favoured principles that can be translated into explicit routines, such as sustainability-related acceptance criteria, decision rationales and measurement conventions.

Phase 3. Extending domains translates conceptual alignment into operational completeness by integrating sustainability into the eight performance domains of the PMBoK seventh edition (PMI 2021). This final phase enables the formalisation of sustainability as a repeatable managerial capability, culminating in the proposal of a dedicated sustainability management process group that bridges principles and processes through defined artefacts, baselines and governance routines (Müller and Lecoeuvre 2014). Systematic incorporation at this stage was ensured by requiring that each domain includes, at minimum, an explicit sustainability-related objective, one or more supporting artefacts or registers and at least one decision or control routine that can be monitored over time.

Therefore, Table 3 provides an overview of how sustainability considerations have been incorporated into each of the process groups, based on the PMBoK sixth edition framework. The PMBoK sixth edition adopts a process-oriented and prescriptive methodology, further elaborated in the *Process Groups Practice Guide*. By contrast, the PMBoK seventh edition (PMI 2021) introduces a more flexible and principle-based framework, designed not to replace but to complement the previous edition. It accommodates a variety of project management approaches, including those based on process groups. Unlike its predecessor, the seventh edition moves away from detailed, sequential processes. Instead, it presents 12 overarching principles, *stewardship*, *team*, *stakeholders*, *value*, *systems thinking*, *leadership*, *tailoring*, *quality*, *complexity*, *risk*, *adaptability* and *resilience*, and *change*, that offer adaptable behavioural guidance across diverse project contexts. These principles serve as foundational elements for effective project management and are intended to be applied collectively, without a predetermined sequence (see Table 3 for details). These principles are realised through eight performance domains: *stakeholders*, *team*, *development approach and life cycle*, *planning*, *project work*, *delivery*, *measurement* and *uncertainty*. Each domain comprises interrelated activities that are essential to achieving project objectives and delivering outcomes. Unlike processes, these domains are nonlinear, interconnected and mutually reinforcing, enabling a holistic and adaptive approach to project execution. In alignment with this framework, our study integrates sustainability considerations within each performance domain, thereby promoting a comprehensive and systemic application of sustainability principles throughout the project life cycle. The proposed integration is illustrated in Table 4.

### 3.3 | Limitations and Boundary Conditions

This study is subject to several methodological limitations inherent in conceptual and standards-based research designs (Jaakkola 2020; Meredith 1993). First, the proposed framework has not yet been empirically validated in live project environments; accordingly, the study demonstrates analytical coherence and standards compatibility rather than behavioural or performance outcomes (Eisenhardt 1989; Wacker 1998). Second, the analysis is bounded by the PMBoK sixth and seventh editions, which, while widely adopted, do not represent the full spectrum of project management methodologies, such as PRINCE2 or purely agile frameworks (Calero and Piattini 2015; PMI 2021). Third, sustainability criteria are operationalised at the level of governance logic rather than quantitative thresholds; as such, the framework requires contextual tailoring to project scale, sector and sustainability materiality, consistent with prior work on sustainable project management maturity and adaptation (Kehinde 2025; Silvius and Schipper 2015).

In addition, to delimit applicability more explicitly, the proposal should be interpreted within the following boundary conditions, which affect feasibility, governance intensity and the choice of sustainability elements to prioritise:

- Organisational ESG maturity: Organisations with more developed ESG governance, data availability and accountability routines can implement a denser set of metrics and

**TABLE 3** | Combining sustainability management into process groups and knowledge areas of the project management PMBoK sixth edition. *Source:* Authors.

| Process Groups | Combining *sustainability* into Project Management Process Groups PMBoK sixth edition |
|---|---|
| **Initiating** | In the Initiating Process Group, sustainability is introduced in the '**develop project charter'** process by integrating environmental, social and economic principles into the project's foundational document. The business case provides justification aligned with sustainability strategies and includes a cost–benefit analysis considering ROI, NPV, IRR and broader impacts. These evaluations support project selection and shape the charter. In '**identify stakeholders**', sustainability broadens stakeholder engagement through transparency and collaboration. Lessons from past projects enhance stakeholder identification for current sustainable initiatives. |
| **Planning** | The integration of sustainability into the Planning Process Group begins with the process **of developing the project management plan**, which involves identifying, organising and integrating all subsidiary plans into a single, comprehensive document. This plan incorporates sustainability management principles and provides a structured framework for all sustainability-related actions, ensuring that sustainability policies, criteria, guidelines and constraints are explicitly integrated across all planning components.<br>The process **plan scope management** defines the criteria and procedures for managing the project scope, including sustainability concerns. It helps prioritise competing needs and ensures alignment with sustainable objectives, such as designing products with long life cycles, ease of maintenance, recyclability, portability and the use of recycled materials.<br>The process **collect requirements** is adapted to capture needs related to sustainability. Requirements may need to be updated to reflect environmental or social dimensions or to accommodate new needs concerning sustainable product or service characteristics.<br>The **define scope** process aggregates all collected requirements into a clear and comprehensive statement, including sustainability dimensions. Environmental considerations include climate action, energy efficiency, circular economy practices, water optimisation and biodiversity protection. Social aspects include product safety, inclusiveness, innovation, data security and brand reputation. Governance aspects include compliance, anti-corruption and ethical business conduct.<br>The **create WBS** process decomposes the project into manageable components, ensuring that the work required to achieve sustainability objectives is explicitly included. The WBS should also reflect sustainability-related management work consistent with the organisation's values.<br>The process **plan schedule management** incorporates sustainability management principles into schedule planning. While respecting the classic time–cost-quality balance, it introduces a fourth constraint: maximising sustainable value for stakeholders.<br>The process **define activities** breaks down the WBS into activities that may include specific sustainability elements.<br>The process **sequence activities** may require adjustments to accommodate sustainable sequencing logic, including the increased use of Start-to-Finish relationships for tasks performed manually.<br>The process of **estimating activity durations** considers the time required for activities with significant social or environmental impacts. Duration estimates may be adjusted to support inclusive Team needs or allow sufficient time for critical, sustainable processes, such as water purification.<br>The process **develop schedule** integrates both sustainability constraints and previously defined logic into a coherent timeline.<br>The process **plan cost management** defines principles and methods that reflect sustainability. Costs can be reduced through better resource efficiency and by mitigating environmental and social risks.<br>The process **estimate costs** includes sustainability-related elements, such as environmental technologies and social impact mitigation, in line with planning guidelines.<br>The process **determine budget** includes all sustainability commitments as part of the overall financial plan.<br>The process of **plan quality management** is key to sustainability, as it defines criteria and quality standards that reflect sustainability in deliverables and processes, as outlined in the project scope.<br>The **plan resource management** process defines how human and material resources will be estimated and utilised in a sustainable manner, thereby improving social behaviour and organisational reputation.<br>The process **estimate activity resources** defines the methods and criteria for estimating resources, considering sustainability in both quantity and type.<br>The **plan communications management** process incorporates ethical and transparent communication strategies, particularly in light of the growing number of stakeholders involved in sustainability topics.<br>The process **plan risk management** includes sustainability within its framework. Sustainability issues may raise the overall level of project risk due to added complexity and new constraints.<br>The process of **identifying risks** expands risk categories to include environmental, social and governance risks.<br>The processes of **performing qualitative risk analysis** and **quantitative risk analysis** are adapted to assess ESG risks.<br>The **plan risk responses** process includes specific strategies to address environmental, social and governance risks.<br>The **plan procurement management** process supports sustainable procurement, encompassing circular economy principles, life cycle cost analysis, equal opportunities, regulatory compliance and human rights.<br>The **plan stakeholder engagement** process develops strategies to ensure the transparent and inclusive involvement of stakeholders in the medium to long term, with respect to sustainability. |

(Continues)

**TABLE 3** | (Continued)

| Process Groups | Combining *sustainability* into Project Management Process Groups PMBoK sixth edition |
|---|---|
| **Executing** | In the Execution Process Group, sustainability is integrated into several critical project activities. The **direct and manage project work** process ensures that all work, including sustainability-related actions, is performed in accordance with the project management plan. **Manage project knowledge** supports the use of existing knowledge and the creation of new insights, fostering a culture of sustainability and organisational learning. **Acquire resources** secures all necessary assets, from human to material, to support project execution in accordance with sustainable principles. **Implement risk responses** applies planned risk responses, minimising threats and maximising opportunities, with long-term consideration for financial, environmental and social sustainability. **Manage quality** translates sustainability-augmented quality management recommendations into operational practices, in alignment with the organisation's quality policy. **Develop team** builds team capability, improves collaboration and optimises the Team's work environment to support performance. **Manage team** addresses the administration of daily human resource activities, emphasising professional relationship management in a sustainable context. **Manage communications** upholds transparency and ensures effective communication with stakeholders. **Conduct procurements** defines the procurement scope and handles supplier selection and contracting, playing a key role in sustainable supply chain practices. **Manage stakeholder engagement** implements stakeholder engagement strategies that align with sustainability commitments, reinforcing collaboration to meet stakeholder needs and expectations. |
| **Monitoring and controlling** | In the monitoring and controlling process group, sustainability plays a key role in several processes. The process of **monitoring and controlling project work** is essential to track performance, assess progress, identify deviations and stabilise sustainable baselines, both at the global project level and within each Knowledge Area. The process **perform integrated change control** evaluates each change request by examining all consequences, including environmental and social implications, before authorising or rejecting implementation. **Control scope**, **control schedule**, **control costs**, **control quality**, **control resources**, **control communications**, **control risks**, **control procurements** and **control stakeholder engagement** are context-specific processes that operate within the broader integration of sustainability monitoring and address common sustainability concerns in each specific Knowledge area. The process **validate scope** ensures that sustainability-related tasks and requirements have been fulfilled according to the acceptance criteria defined in the scope, before seeking formal approval from clients or stakeholders. |
| **Closing** | In the closure process group, the **close project or phase** process ensures all project activities are finalised, including sustainability requirements. Before closing, a final verification is conducted, documents are preserved, and lessons learned are analysed to incorporate sustainable management into future operations. |

controls, whereas low-maturity contexts may require a staged adoption focused on a limited number of high-materiality indicators and checkpoints.

- Sectoral context and materiality: The relevance and measurability of sustainability elements vary by sector (e.g., emissions-intensive versus service-based projects), which implies that the proposed architecture must be tailored through materiality-based prioritisation.
- Regulatory and reporting environment: In jurisdictions or industries characterised by stricter sustainability disclosure, due diligence or assurance expectations, the value of traceable artefacts and auditable routines are higher, while in less regulated contexts adoption may depend more on voluntary governance and stakeholder pressure.
- Project complexity and stakeholder plurality: The architecture is most beneficial where projects are large, interdependent and exposed to multiple stakeholder claims, whereas smaller or less complex projects may implement a lighter version emphasising key decision gates and minimum viable ESG metrics.
- Delivery approach and tailoring needs: While the proposal is expressed in PMBoK-consistent terms, it requires tailoring across predictive, iterative, agile or hybrid delivery approaches, especially regarding the timing and cadence of sustainability checkpoints, the granularity of artefacts and the integration of ESG criteria into backlog and acceptance practices.

These limitations are consistent with the study's objective to provide a formal governance architecture that can subsequently be subjected to empirical testing and contextual refinement (Jaakkola 2020; Meredith 1993).

## 4 | Results and Discussion

Our results provide an explicitly comparative and process-oriented account of how sustainability is currently embedded within the PMBoK framework and, crucially, how it can be formalised in PMI language without distorting the internal logic of either edition. Therefore, results should be read as a set of analytical insights and a design output, rather than empirical findings in the conventional sense. In particular, the main outcome is a conceptual and architectural contribution, namely a formal sustainability management process group and knowledge area, expressed in PMBoK terminology and designed to render sustainability governable and auditable through artefacts, checkpoints and routines. The analysis demonstrates two complementary findings. First, sustainability is already *present* in both PMBoK editions, but it appears either as an implicit contextual constraint (PMBoK sixth edition) or as a dispersed value- and principle-based orientation (PMBoK seventh edition). Second, this presence remains insufficiently actionable because it does not translate into a stable procedural architecture with defined artefacts, governance responsibilities and traceable decision routines. On this basis, we propose the formalisation of a sustainability management process group as a dedicated

**TABLE 4** | Combining sustainability into the principles and domains of PMBoK seventh edition. *Source: Authors.*

| N. | Principles | Combining *sustainability* into the principles of PMBoK seventh edition |
|---|---|---|
| 1 | **Stewardship** | The principle of **stewardship** aligns closely with sustainability, emphasising responsible and value-driven project management. Project managers are expected to act with accountability, transparency and legal integrity, treating projects with the same care as personal matters. Within a sustainability framework, Stewardship requires awareness of environmental and social consequences, encouraging decision-makers to minimise negative impacts. |
| 2 | **Team** | The **team** principle, when aligned with sustainability, calls on the project manager to foster a collaborative environment that unites diverse skills towards shared goals. Active participation, open dialogue and mutual trust naturally integrate sustainability into the project. This approach enhances ownership and commitment, supports diversity and strengthens emotional and problem-solving capacity, ensuring the Team's collective contribution exceeds individual efforts. |
| 3 | **Stakeholders** | The **stakeholders** principle, when integrated with sustainability, encourages active involvement of all relevant parties, customers, employees, suppliers and communities, throughout the project. This collaboration helps reduce risks, embrace opportunities and design flexible strategies that reflect diverse input. Engaging stakeholders meaningfully strengthens their understanding of environmental, social and governance issues; supports responsible practices; and builds trust through open communication, impact awareness and a culture of accountability. |
| 4 | **Value** | The **value** principle, applied through a sustainability lens, reframes project success in terms of long-term stakeholder value, rather than focusing solely on time, cost or quality metrics. By integrating sustainable solutions, projects can lower costs, enhance durability and operate more efficiently. This creates shared value and supports business objectives in a responsible and forward-looking manner. |
| 5 | **System thinking** | The **system thinking** principle, aligned with sustainability, encourages project managers to recognise their work as part of a wider network of systems. It enhances their ability to identify interdependencies and assess impacts across environmental, social and economic dimensions. This holistic perspective fosters more thoughtful planning, linking projects to broader sustainability outcomes through a systems-oriented mindset. |
| 6 | **Leadership** | The **leadership** principle, when paired with sustainability, highlights the importance of guiding teams with purpose, responsibility and vision. It ensures alignment between project execution and business strategy, while adapting to context and culture. Sustainable leadership actively fosters ethical behaviour, transparent decision-making and responsible resource use, driving meaningful change towards more sustainable organisational models. |
| 7 | **Tailoring** | The **tailoring** principle, integrated with sustainability, recognises that every project requires a unique setup to be truly effective by adapting practices to fit the project's context, whether organisational, cultural or sector specific. Teams can better align with sustainability goals. This tailored approach ensures that sustainability strategies are relevant, practical and impactful across all project dimensions. |
| 8 | **Quality** | The **quality** principle, combined with sustainability, emphasises the importance of integrating measurable quality into all aspects of a project. Sustainable practices enhance product and service quality by utilising efficient, low-impact processes. In contrast, robust quality management reinforces an organisation's commitment to sustainability, creating lasting value in both perception and outcome. |
| 9 | **Complexity** | The **complexity** principle, aligned with sustainability, calls for the development of capabilities to navigate the VUCA nature of today's projects. Since sustainability issues are inherently complex, spanning natural, social and economic dimensions, project managers must adopt a systems-thinking mindset to manage interconnected challenges and long-term impacts that extend beyond their direct control. |
| 10 | **Risk** | The **risk** principle, when viewed through a sustainability lens, emphasises proactive and context-specific risk management. Addressing environmental, social and governance risks is vital for long-term project success. It requires a comprehensive understanding of how these risks affect people, the planet and financial stability, ensuring resilience and responsibility are embedded in decision-making. |

(Continues)

**TABLE 4** | (Continued)

| N. | Principles | Combining *sustainability* into the principles of PMBoK seventh edition |
|---|---|---|
| 11 | **Adaptability and resilience** | The **adaptability and resilience** principle, aligned with sustainability, stresses the ability to remain flexible in volatile and uncertain conditions. Adaptability enables teams to refocus their efforts in response to sustainability challenges, while resilience ensures they can absorb shocks, whether environmental or social, and recover effectively. Together, they empower projects to embrace change and maintain long-term value. |
| 12 | **Change** | The **change** principle, when linked to sustainability, focuses on enabling transformation rather than resisting it. Project managers act as catalysts, guiding people through transitions, while embedding environmental and social considerations into project actions. Success relies on understanding the need for change, effective communication, cultural integration and supporting stakeholders throughout the journey. |
| **N.** | **Domains** | **Combining *Sustainability* into the Principles of PMBoK seventh edition** |
| 1 | **Stakeholders** | The **stakeholder domain**, when applied to sustainability, emphasises the importance of fostering relationships with individuals and groups that are affected by or have the potential to influence the project. In ESG-sensitive projects, this requires tailored engagement strategies that adapt to changing interests and concerns, especially when goals are contested. Long-term value stems from continuous, inclusive and responsive stakeholder management. |
| 2 | **Team** | The **team domain**, through a sustainability lens, focuses on building a culture of shared responsibility and emotional intelligence. It ensures clear role definition and fair task allocation, while promoting long-term motivation, team cohesion and inclusive collaboration. By integrating equity and minimising environmental burden, sustainable team practices support ethical, resilient project execution. |
| 3 | **Development approach and life cycle** | The **development approach and life cycle domain**, when integrated with sustainability, guides the selection of the most appropriate project model (predictive, iterative or hybrid) based on risk, innovation and available resources. This choice directly shapes environmental, social and economic outcomes through the use of recyclable materials, responsible technologies and scalable, adaptive methods. The domain enables strategic alignment between delivery methodology and sustainable impact. |
| 4 | **Planning** | The **planning domain** plays a critical role in embedding sustainability into project coordination from the outset. Closely linked with the development approach, planning defines how goals, estimates and budgets reflect environmental and social priorities. Integrating sustainability early establishes a foundation for long-term impact and consistent evaluation throughout the project life cycle. |
| 5 | **Project work** | The **project work domain** involves executing all planned activities (building deliverables, managing resources, contracts and change), while embedding sustainability into every action. Grounded in Tailoring and Change principles, this domain ensures environmental and social impacts are minimised, promoting long-term benefits and preventing disruptions to project goals. |
| 6 | **Delivery** | The **delivery domain** focuses on executing all project outputs while embedding sustainability in requirements gathering, quality control, change handling and stakeholder satisfaction. Aligned with the Value and Stakeholder principles, it ensures outcomes meet sustainability goals through eco-conscious practices and measurable impact, delivering value responsibly. |
| 7 | **Measurement** | The **measurement domain** in sustainability extends beyond data collection to include meaningful analysis of trends and outcomes. Closely aligned with the Quality principle, it involves setting measurable sustainability goals to define project success, such as improved resource efficiency or energy savings. Social impacts are also tracked through indicators of community well-being, ensuring a holistic view of performance. |
| 8 | **Uncertainty** | The **uncertainty domain** is essential in managing projects under VUCA conditions, especially when sustainability is a goal. It focuses on navigating both risks and opportunities through system-level insight. Setting clear, measurable sustainability objectives and incorporating flexibility into planning enables teams to anticipate regulatory, environmental and stakeholder-driven changes, thereby reducing uncertainty and supporting long-term success. |

knowledge area comprising four interdependent processes that are: planning, managing, checking and assessing, structured around the economic, social, environmental and governance dimensions of sustainability (Mutisya and Yarime 2014). This proposed structure operates as a 'bridging carrier' between the process-based logic of the PMBoK sixth edition and the principle/domain-based logic of the PMBoK seventh edition, translating sustainability from a dispersed normative orientation into a repeatable governance mechanism. In the PMBoK sixth edition, the mapping across all 49 processes reveals a recurrent pattern: sustainability-related content enters projects primarily through *external conditioning* and *stakeholder-driven requirements*. Specifically, ESG concerns are treated as enterprise environmental factors or as expectations to be managed within stakeholder management, particularly in *identify stakeholders* and *plan stakeholder engagement*. This configuration produces a predominantly reactive logic: sustainability becomes relevant when imposed by regulation, market pressures or stakeholder demands, rather than being established as a success criterion guiding the entire life cycle. A critical implication is that sustainability cannot be governed through the conventional PMI control system because it is not codified in baselines, requirements or acceptance criteria, thus quality verification tends to remain indirect and anchored to traditional project constraints. The core outcome of the PMBoK sixth edition analysis is therefore not merely that sustainability is 'missing', but that its integration is structurally fragile: It depends on interpretation, varies across projects and lacks repeatable mechanisms for decision-making and accountability. In governance terms, sustainability remains difficult to evidence, compare and audit across projects because it is not consistently anchored to standard artefacts and control routines. On the other hand, the PMBoK seventh edition presents a different pattern. Sustainability is no longer confined to contextual references but becomes structurally compatible with the framework's principles and value-delivery logic. The most explicit anchor is *stewardship*, which requires responsible management of resources and impacts across people, planet, profit and governance. Beyond this, sustainability is embedded through principles that reshape behavioural expectations of the project manager: *Value* extends success towards long-term benefits; *stakeholders* implies systematic engagement with social, ethical and environmental expectations; *systems thinking* requires awareness of socio-ecological interdependencies; and *tailoring* makes contextual ESG drivers integral to methodological choices. Similarly, performance domains broaden managerial attention from deliverables to impacts: *Measurement* legitimises the tracking of benefits and impacts, and *uncertainty* includes climate-related, regulatory and reputational risks. However, the PMBoK seventh edition analysis also identifies a critical limitation: sustainability remains distributed and partly implicit, which makes it conceptually consistent but operationally uneven, or in other words, interpretable as a guiding criterion yet not formalised as a process architecture with defined inputs, outputs and artefacts. As a result, accountability is legitimised in principle but not stabilised in routine, which limits repeatability across projects and organisational comparability.

Taking them together, these results indicate that PMBoK sixth and seventh editions express continuity in recognising sustainability, but discontinuity in *how* it can be governed. PMBoK sixth allows sustainability to enter decision-making yet does not provide a stable procedural locus through which it can be planned, controlled and verified. The PMBoK seventh edition legitimises sustainability as part of value delivery and stewardship but does not specify an operational grammar that ensures repeatability across projects and organisations. The recurring critical element across both editions is therefore the absence of a formalised 'carrier' that translates sustainability from external constraints and expectations (PMBoK sixth edition) and principle-based orientation (PMBoK seventh edition) into governance routines, measurable baselines and accountable responsibilities. The sustainability management process group is proposed precisely as that carrier, making sustainability an explicit object of planning, execution, governance, control and post-project assessment, supported by traceable artefacts and decision checkpoints. Therefore, Figure 1 synthesises our proposal to formalise a sustainability management process group as a new knowledge area that complements the existing PMBoK architecture. Unlike approaches that treat sustainability as a transversal aspiration, the proposed group consolidates it into four processes that mirror PMI's life cycle logic and translate sustainability into artefacts and decision checkpoints.

1. **Sustainability management planning** establishes the sustainability baseline at project initiation by defining sustainability objectives, constraints and measurable metrics. It operationally links the *project charter* and *business documents* to ESG value creation and embeds sustainability within the project management plan so that it becomes part of scope, risk, quality, procurement and stakeholder baselines rather than a parallel stream.
2. **Managing sustainability (executing)** converts commitments into practice through continuous measurement, trade-off management and governance of supply-chain and organisational alignment. Here sustainability entails managerial and behavioural implications: it requires explicit decision rules when performance tensions emerge (e.g., cost versus impact) and demands auditable routines that reduce the risk of symbolic compliance.
3. **Checking sustainability (monitoring and controlling)** formalises verification by treating sustainability metrics as control variables, not merely contextual considerations. This process introduces ESG-equivalent quality tools, inspections and evaluations to ensure that deliverables and project performance remain consistent with sustainability baselines and approved changes.
4. **Assessing project value (sustainability perspective)** extends the temporal boundary of accountability by evaluating long-term ESG value and benefits beyond closure. This process strengthens organisational learning via updates to OPAs and formal documentation, recognising that sustainability outcomes manifest over time and require traceability between planning assumptions and realised impacts.

The proposal is intentionally positioned as a differentiated response to the two frameworks. Relative to PMBoK sixth edition, it represents a necessary structural advance because it introduces what the sixth edition lacks: an explicit governance architecture that makes sustainability a managed, measurable and auditable

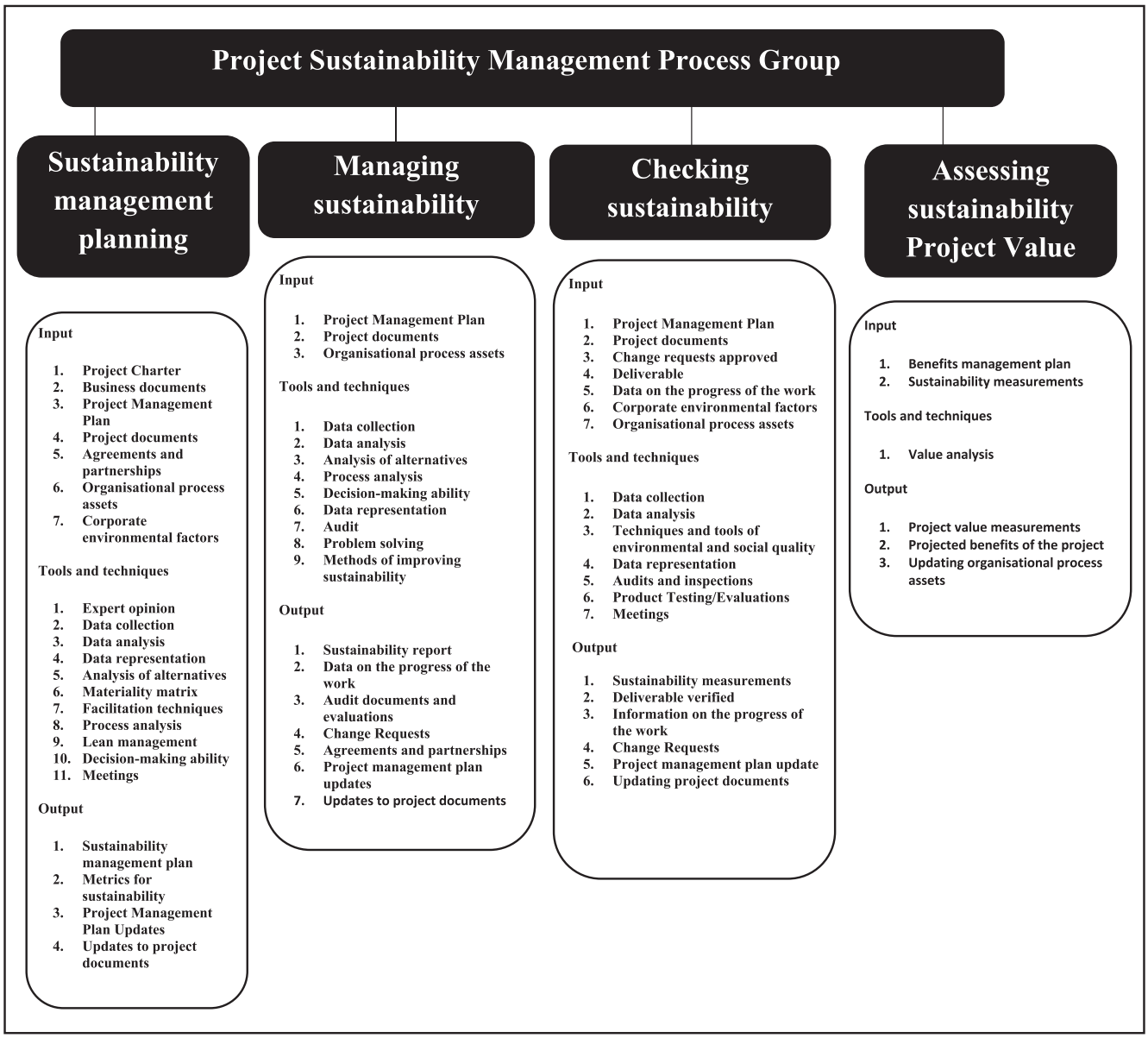


**FIGURE 1** | The project sustainability management process group, input, tools and techniques and output. *Source:* Authors.

dimension across the life cycle rather than a reactive constraint. Relative to the PMBoK seventh edition, it is less a conceptual disruption than an operational completion: It translates the sustainability orientation already presupposed by stewardship and value delivery into PMI's process language, or in other words, inputs, tools/techniques, outputs and governance responsibilities, thereby increasing traceability, repeatability and organisational implementability. This has implications for strategic accountability and organisational value creation. In fact, introducing a dedicated sustainability management process group reshapes accountability by clarifying where sustainability-related decisions are made, how trade-offs are justified and which artefacts provide evidence of compliance and performance. At organisational level, this enables stronger vertical alignment, where corporate sustainability objectives, materiality priorities and ESG governance expectations can be translated into project baselines, monitoring routines and benefits realisation practices. As a consequence, projects can contribute more explicitly to long-term value creation, not only through deliverables, but through auditable impacts, learning loops and governance routines that support portfolio comparability and oversight. To illustrate applicability across contexts, for example, in a construction megaproject, it can stabilise LCA, certified sourcing, emissions and waste control, and post-project benefits verification, while in a digital transformation project, it can prioritise data ethics, transparency, inclusion and governance controls. Across context, the contribution remains the same: sustainability becomes governable through standard artefacts and repeatable decision routines, aligned with the PMBoK control logic rather than left to discretionary interpretation.

Our proposal is in line with recent scholarship that has similarly highlighted the need for structured sustainability integration. For example, Gibbin et al. (2023) and Orieno et al. (2024) underline how fragmented approaches to sustainability in projects hinder strategic alignment, while Kehinde (2025) called for embedding eco-friendly practices

directly into project methodologies. Our findings contribute to this literature by offering a consolidated framework that links sustainability with the formal mechanisms of PMBoK, thus enhancing methodological rigour and practical applicability. The proposed integration of *sustainability management process group* into the PMBoK framework offers significant practical potential, yet it also raises important strategic and organisational considerations that underline the existence of trade-offs and implementation challenges. By adding governance layers, the architecture may increase procedural load, expand documentation requirements and introduce new coordination costs. It can also generate resistance from practitioners accustomed to iron triangle metrics, especially if sustainability indicators are perceived as ambiguous, costly to measure or misaligned with incentives. A further risk is symbolic compliance, where artefacts are produced without substantive behavioural change, particularly in the absence of training, leadership sponsorship and cultural reinforcement. These trade-offs suggest that implementation should be staged, capability supported and aligned with incentive systems and decision rights. Moreover, the adoption of a dedicated sustainability process group is not without challenges. One foreseeable difficulty lies in professional resistance, as project managers accustomed to traditional methodologies may perceive sustainability requirements as adding complexity or diluting the focus on time, cost and quality. Addressing this resistance requires targeted training and the development of sustainability-oriented competencies, alongside organisational incentives that reward sustainable project outcomes. Equally critical is the integration of sustainability into organisational culture. Without cultural alignment, formal frameworks risk remaining symbolic rather than transformative, echoing prior critiques of corporate social responsibility initiatives (Brammer and Millington 2008). From an organisational learning perspective, the framework encourages a shift from sustainability as an external add-on to a core dimension of project knowledge and practice. By embedding sustainability *by design* and *by default*, projects can generate feedback loops that support continuous improvement and institutional learning (Gibbin et al. 2023). This is particularly important in dynamic environments where sustainability standards evolve rapidly, and projects must adapt accordingly. In this sense, sustainability-oriented project management can act as a mechanism for organisational resilience, enabling firms to anticipate regulatory changes, manage reputational risks and respond proactively to stakeholder pressures. The findings also have implications for change management. Introducing sustainability as a process group entails reconfiguring established roles, responsibilities and success criteria. Project managers must navigate trade-offs between short-term efficiency and long-term sustainability outcomes, which may generate tensions both within project teams and at the governance level. Effective change management strategies, including stakeholder engagement, transparent communication and phased implementation, are essential to mitigate resistance and ensure buy-in from multiple stakeholders (Freeman and Dmytriyev 2017). Ultimately, incorporating sustainability into project management contributes to the broader debate on business strategy and performance. By offering a structured framework that connects project-level practices to organisational sustainability imperatives, the proposal demonstrates how operational tools can reinforce strategic priorities. This integration highlights the potential for project management to evolve from a predominantly execution-focused discipline into a driver of organisational transformation and sustainable value creation.

Figure 2 presents a visual framework for integrating sustainability into project management. It is structured around five key principles, arranged in a circular layout, all converging on the central theme of *integrating sustainability into the PMBoK*. Each principle serves as a practical anchor for embedding sustainability within project processes and decision-making. More in detail:

- **Monitoring and measurement.** This principle emphasises the ongoing evaluation of project performance against established sustainability goals, ensuring both accountability and transparency. Effective monitoring allows project managers to track progress, identify deviations early and adopt corrective actions. For instance, i*n a construction project, regularly measuring carbon emissions and energy consumption against established targets allows managers to assess whether sustainable building standards are being met and to implement corrective measures if necessary.*
- **Sustainability *by default*.** This principle emphasises the integration of sustainability as a non-negotiable foundation of project management, where sustainability considerations are embedded by default rather than treated as optional add-ons. It promotes a sustainability-first mindset from the project's inception. In line with this reasoning, we can imagine, for example, a *public procurement project that requires all suppliers to comply with minimum sustainability certifications, ensuring that sustainability is built into the supply chain from the outset.*
- **Sustainability *by design*.** This principle emphasises the importance of integrating sustainability into the planning and execution phases of the project. Rather than adjusting practices later, sustainability considerations are woven into the project life cycle from the design stage. In this case, for *example, we can draw on software development. The integration of energy-efficient coding practices and planning for hardware recycling at the design stage ensures that sustainability is considered throughout the product's life cycle.*
- **Shared value.** The goal of this principle is to maximise positive impacts for stakeholders while minimising negative consequences. It encourages balancing economic, social and environmental benefits to create outcomes that are valuable for both the organisation and society as a whole. For *example, a tourism project that supports local businesses and cultural heritage, while also implementing environmental protection measures, generates economic gains, strengthens community ties and safeguards natural resources.*
- **Stakeholder engagement.** This principle underlines the importance of actively involving stakeholders in decision-making processes, ensuring inclusivity and social legitimacy. Collaboration fosters trust, reduces conflicts and strengthens long-term project success. *This enables, for*

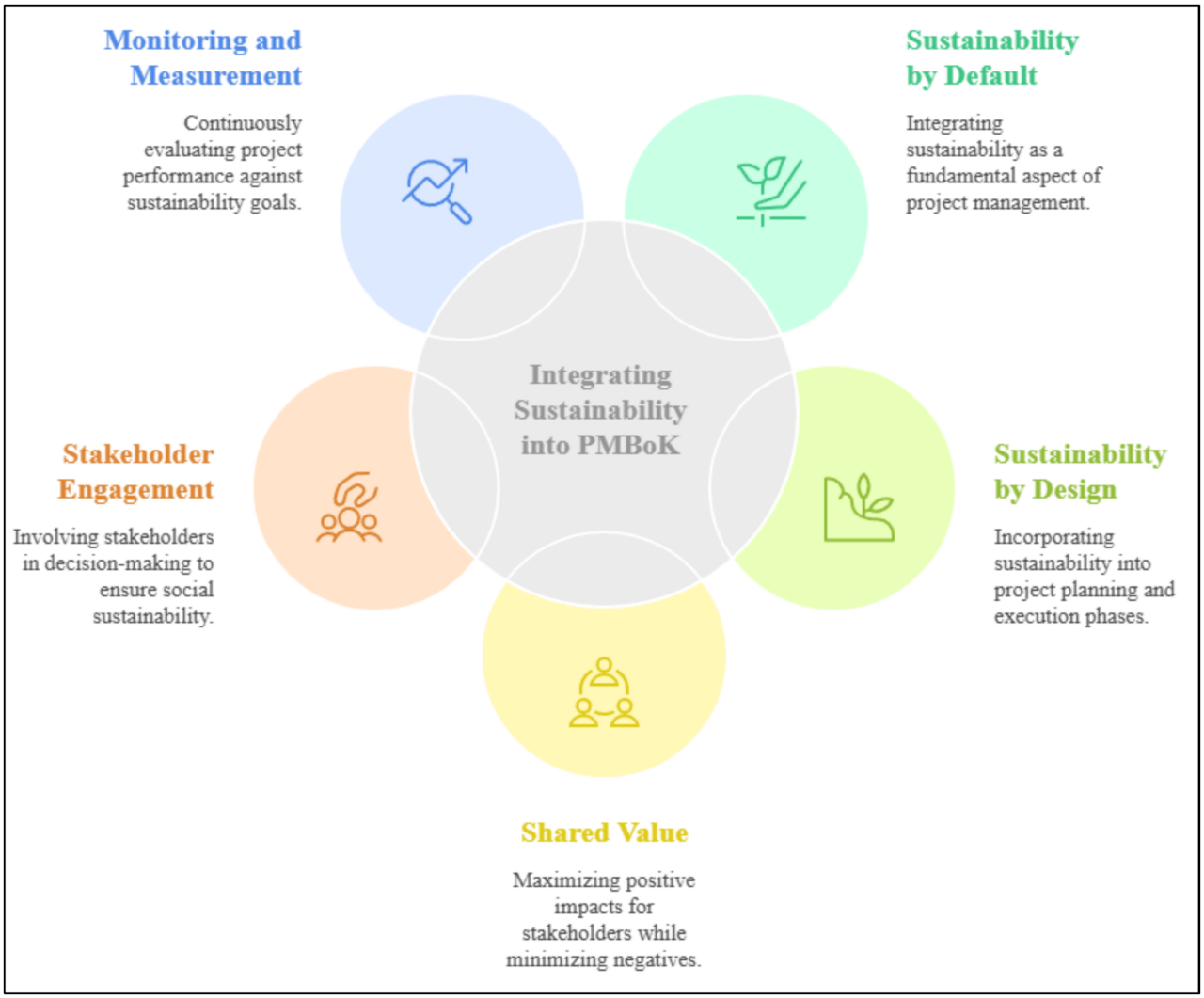


**FIGURE 2** | Embedding sustainability in project management. *Source: Authors.*

*example, the engagement of local communities in urban development projects through workshops and consultations, allowing residents to contribute ideas, voice concerns and co-create solutions, thereby enhancing social acceptance and sustainability outcomes.*

Each of these principles is represented with a distinct colour and icon, emphasising their role in sustainable project management. The central theme of Integrating Sustainability into PMBoK highlights the need for these elements to be embedded into standard project management methodologies. Finally, the proposed architecture is most likely to be effective under specific conditions. Its benefits increase where organisational ESG maturity supports reliable data, roles and governance routines, sectoral materiality makes sustainability impacts salient and measurable, the regulatory and reporting environment requires traceable evidence and assurance readiness, and project complexity and stakeholder plurality make discretionary sustainability management insufficient. Conversely, in low-maturity contexts or small, low-complexity projects, a lighter implementation may be appropriate, focusing on a limited set of high-materiality indicators and decision gates. The framework also requires tailoring to the delivery approach, especially regarding the timing and cadence of checkpoints and the granularity of artefacts. More broadly, implementation requires change management, including role clarification, stakeholder buy-in and a clear cadence for sustainability checkpoints that fits the delivery approach (predictive, agile, hybrid).

## 5 | Concluding Remark

This study's central contribution is the formalisation of sustainability management process group as a distinct process group and knowledge area within the PMBoK framework. Rather than replacing established project management logics, the proposal should be understood as a normative extension of the PMBoK that systematises what has so far remained fragmented, voluntary and context dependent. In doing so, it advances an ideal-type architecture through which ESG dimensions become governable or, using the language and mechanisms of PMI standards, that is planned, executed, controlled and evaluated. The originality of the findings lies in demonstrating that sustainability can be integrated *by design* and *by default*, meaning that ESG considerations are embedded from the outset into baselines, decision routines and control mechanisms, instead of being treated as an ex post add-on. The mapping of sustainability

across process groups, principles and performance domains confirms that such integration is feasible and compatible with existing PMI standards, while also revealing why sustainability remains operationally fragile when it is left implicitly or dispersed (PMI 2021; Silvius 2017). The proposed process group addresses this fragility by consolidating sustainability into a coherent structure of four interdependent processes: planning, managing, checking and assessing, each associated with explicit inputs, tools/techniques, outputs and governance responsibilities, thereby transforming sustainability from an external constraint into a structural feature of project governance (Mutisya and Yarime 2014). Conceptually, the framework bridges theory and practice. It builds on stakeholder theory and the NRBV to reinforce that project value cannot be reduced to financial performance alone but must incorporate social and environmental dimensions as part of legitimacy and long-term competitiveness. At the same time, it translates this premise into operational guidance for project managers, clarifying how sustainability can be embedded into everyday governance through artefacts, metrics and traceable decision-making. Illustrative scenarios underscore its adaptability across sectors: in infrastructure megaprojects, sustainability planning can legitimise early LCA and structured stakeholder consultation, while execution and control can be anchored in green procurement and monitored impact targets; in IT transformation projects, the same process logic can prioritise governance and social dimensions such as data ethics, transparency and diversity, monitored through sustainability KPIs. These examples illustrate how common architecture can remain methodologically coherent while being tailored to different sustainability materialities. This is in line with recent scholars that reinforce the need for such formalisation. Fragmented initiatives frequently fail to generate consistent outcomes (Orieno et al. 2024), while the growing demand for systematic ESG integration into project standards is increasingly evident in both research and practice (Gibbin et al. 2023). Relatedly, work on digital transformation highlights how sustainability-oriented governance mechanisms can strengthen organisational learning and resilience (Du et al. 2022). Against this backdrop, our results position sustainability management not as an ancillary aspiration, but as a repeatable process capability that can be embedded in the core of project management practice.

## 6 | Managerial Implications

Adopting the proposed sustainability management process group entails concrete organisational shifts in governance, delivery and assurance and requires the development of specific competencies at both managerial and executive levels. More specifically, from a governance perspective, organisations should institutionalise sustainability through formal 'sustainability gates' (e.g., charter approval, baseline approval, readiness reviews), supported by ESG checklists and explicit documentation of trade-offs. This strengthens transparency, reduces discretionary interpretation and anchors sustainability accountability within established governance routines (PMI 2021). Concerning delivery, sustainability must be embedded into the project baselines by incorporating P5/TBL-aligned KPIs into scope, schedule and budget planning; requiring suppliers to provide ESG performance evidence in procurement; and tailoring delivery approaches (predictive, iterative, hybrid) according to sustainability risk exposure and materiality (PMI-GPM Sustainability Joint Venture 2025; PMI 2021). In practical terms, this implies that sustainability becomes an organising logic for requirements, design choices and risk responses, rather than merely a reporting layer. Finally, in terms of assurance, organisations should strengthen oversight by extending the measurement domain with ESG dashboards, ensuring traceability from sustainability requirements to validated scope and integrating project-level sustainability reports into corporate ESG reporting cycles (PMI 2021). This closes the loop between project governance and organisational accountability, enabling benefits realisation and impact verification beyond closure. Accordingly, project managers are expected to expand their skill set—technical, managerial and relational—to effectively operationalise sustainability requirements and to support organisations in embedding ESG considerations throughout project processes. Moreover, our proposal of the sustainability management process group is designed to reduce adoption friction across PMBoK editions. Under PMBoK 6, it creates explicit sustainability inputs/outputs and subsidiary plans that can be mapped across the 49 processes. Under PMBoK 7, it provides an operational mechanism for tailoring the 12 principles and eight domains, especially stakeholders, planning, delivery, measurement and uncertainty, thereby clarifying continuity between editions and supporting consistent implementation (PMI 2021). Complementarily, ISO 21502:2020 offers practice-level guidance on governance frameworks, roles, competencies and integrated practices across delivery approaches, which can help organisations codify sustainability gates and KPIs within a recognised guidance standard (ISO 2020).

## 7 | Limitations

The study's principal limitation is its conceptual and interpretive character: The framework has not yet been empirically validated in real project settings (Orieno et al. 2024). Moreover, the analysis is grounded specifically in the sixth and seventh editions of the PMBoK, which may constrain generalisability to alternative methodologies such as PRINCE2, Agile approaches or ISO 21500 (Calero and Piattini 2015). A further limitation concerns the evolving nature of sustainability itself, which is shaped by changing regulations, technological innovations and shifting stakeholder expectations; as a result, any formalisation must remain adaptable and subject to refinement over time (Kehinde 2025).

## 8 | Future Research Trajectories

The framework proposed here establishes a clear agenda for empirical validation and methodological extension. To progress from normative architecture to evidence-based practice, future research should adopt robust designs that can assess feasibility, behavioural implications and outcomes over time. In line with Basile (2019), an appropriate strategy would be to employ multi-case studies across sectors characterised by different sustainability materialities such as construction projects, where environmental performance tends to be dominant, IT and

digital transformation initiatives, where governance and social dimensions are often more salient, and public procurement contexts, where policy and regulatory imperatives strongly shape sustainability priorities. Such a design would enable researchers to test both the transferability of the proposed sustainability management process group and the effectiveness of tailoring mechanisms across heterogeneous project environments (Silvius and Schipper 2015). Empirical testing should also rely on outcome-oriented measures capable of capturing sustainability value at, and beyond, project closure. This implies the use of ESG KPIs that reflect concrete impacts, such as energy intensity, waste diversion or incidents related to data ethics, alongside stakeholder satisfaction and benefits realisation over time, thereby assessing both immediate project performance and longer-term value creation (PMI-GPM Sustainability Joint Venture 2025; PMI 2021). Methodologically, these evaluations could combine pre–post comparisons of projects implementing the sustainability management process group with matched control projects, complemented by surveys exploring project management competencies, organisational readiness and potential sources of resistance. Replication in settings governed by ISO 21502 would further strengthen external validity and help determine whether the proposed process group remains portable across delivery approaches and organisational governance models (ISO 2020; PMI 2021). Beyond validation, several extensions are particularly promising. Comparative studies across methodologies (PRINCE2, Agile, ISO standards) could test whether the proposed process group functions as a transferable 'sustainability layer' or requires deeper methodological redesign (Calero and Piattini 2015). Sector-specific adaptations should also be explored: infrastructure may prioritise resilience and energy indicators, while supply chains may focus on ethical sourcing and circularity (Tan et al. 2024). Finally, the integration of digital technologies such as AI, blockchain and big data analytics can offer a fertile direction for enhancing monitoring, reporting and compliance, potentially strengthening transparency and accountability at the project level (Tan et al. 2024). In the longer term, research should examine whether institutionalising sustainability in project management yields measurable benefits in environmental outcomes, social equity and financial performance and should investigate governance and change-management challenges, including cultural resistance and capability development (Calero and Piattini 2015; Orieno et al. 2024).

## 9 | Conclusion

By formalising sustainability management as a dedicated process group and knowledge area, this paper addresses a persistent gap between sustainability discourse and project management standards. The proposed architecture strengthens the PMBoK by making sustainability explicit, auditable and repeatable, thereby extending success criteria beyond the iron triangle towards ESG outcomes and institutional legitimacy. While empirical validation remains necessary, the framework offers actionable guidance for project managers and a structured pathway for organisations and standard-setting bodies to align project governance with global sustainability imperatives. Institutionalising sustainability is not only a methodological innovation but a strategic necessity that equips organisations to deliver long-term value while contributing to societal and environmental resilience, and it lays the groundwork for a new generation of project managers capable of governing complexity with accountability.


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