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INTEGRATING LIFE CYCLE ASSESSMENT AND EMISSIONS TRADING SCHEME IN THE AUSTRALIAN CONSTRUCTION SECTOR: A PRELIMINARY STUDY

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ABSTRACT

Construction carbon mitigation is increasingly moving beyond operational energy, with growing attention directed towards embodied carbon in materials. Life cycle assessment (LCA) offers a means to quantify these emissions, yet its uptake is constrained by data limitations, varied organisational capability, and fragmented decision-making processes. Carbon pricing under an emissions trading scheme (ETS) faces similar adoption barriers. In the absence of a workable accounting interface, ETS-derived carbon costs rarely enter project-level engineering and procurement trade-offs. This exploratory study examines the feasibility of embedding ETS logic within an LCA framework, and clarifies the conditions under which such integration could operate in practice. Semi-structured interviews were conducted with five industry practitioners, and the data were analysed using thematic analysis. The results indicate that participants generally valued the LCA–ETS integration, particularly when concrete carbon information is available in time to inform procurement choices. Key implementation barriers include weak policy and verification credibility, immature early-stage information, and delivery-side workflow frictions. Key enabling conditions include stable policy signals, minimum data and verification standards, and an accounting interface that can be embedded into routine procurement decision-making. The study offers preliminary, project-grounded insights into the conditions under which LCA–ETS integration may become workable in construction project delivery.

Keywords: *Australia; Barriers; Construction Decarbonisation; Emissions Trading Scheme (ETS); Life Cycle Assessment (LCA).*

1. INTRODUCTION

The construction sector drives global energy use and carbon emissions across extraction, manufacturing, transport, construction and end-of-life treatment (Intergovernmental Panel on Climate Change [IPCC], 2023). A narrow focus on operational efficiency, such as heating, ventilation and air conditioning (HVAC) and lighting systems, often overlooks the embodied carbon committed during material production and construction, before

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buildings enter the operational phase. Early design decisions and material choices lock in embodied carbon, and embodied carbon is therefore too large to treat as secondary in building decarbonisation efforts (Ibn-Mohammed et al., 2013). Life cycle assessment (LCA) offers a promising approach to quantify whole-of-life carbon emissions and identify carbon hotspots (Abd Rashid & Yusoff, 2015). In theory, it converts low-carbon intent into comparable design options, yet in practice it is often framed as a compliance pathway and/or a means of earning rating points (Athena Sustainable Materials Institute, 2014). Data limitations, time and cost, and time pressure within procurement and planning phases constrain the applicability of LCA in practice (Scherz et al., 2022). Additionally, project stakeholders' responsibilities often blur within multi-actor project delivery systems, meaning LCA rarely enters the core decision loop (Ristimäki & Junnila, 2015). In practice, carbon results are rarely priced into project budgets or embedded in tender evaluation and contractual accountability, so they have limited leverage over procurement trade-offs (Subal et al., 2024). Thus, when LCA-based carbon results are given lower priority than other decision criteria, the gap between LCA calculation and project decision-making can widen (Subal et al., 2024). More fundamentally, the challenge is not just better datasets or faster calculation tools, but the legitimacy and governance of carbon metrics, including which calculations are treated as decision-relevant and under what boundaries, procedures and verification rules (Jordan & Bleischwitz, 2020). Market-based instruments such as emissions trading schemes (ETSs) offer a different lever. These schemes convert emissions into an explicit cost and attempt to reweight decisions through price signals (Zhang & Wei, 2010). However, applying ETS logic to the construction sector is more challenging because a substantial share of project-related emissions sits upstream in multi-tier material supply chains where carbon data is fragmented and difficult to trace consistently (Pittri et al., 2026). A price signal only changes choices when measurement, reporting and verification (MRV) is robust enough to sustain credible and comparable emissions accounting (European Commission, n.d.). Standard ETS design therefore assumes that emissions within the scope of the scheme can be monitored and verified, and that a clearly defined legal entity is accountable for compliance obligations such as emissions reporting and allowance surrender (World Bank & International Carbon Action Partnership [ICAP], 2021). In project-based delivery, this assumption weakens because traditional contracting and procurement fragment responsibilities between design and construction teams, limiting contractors' ability to influence design-stage choices (Nawi et al., 2014). Information asymmetry across project participants further constrains how carbon information travels into tender evaluation, contracting terms, and procurement decisions (Ivić & Cerić, 2023).

In the context of the Australian construction sector, these constraints are even stronger. Unlike jurisdictions with established compliance carbon markets such as the EU ETS, the Korea ETS, and California's Cap-and-Trade Program (Narassimhan et al., 2018), Australia lacks a national ETS covering the building value chain. Policy volatility has also made firms more sensitive to long-run certainty. This raises a practical question about whether the construction sector would accept an integrated framework that uses LCA as the accounting base for an ETS carbon-price obligation. The more difficult question is what minimum conditions would make such integration implementable. Although LCA and ETS are well developed in the literature, they are rarely examined as an integrated framework in construction project delivery. In this setting, carbon accounting outputs would need to be translated through agreed rules and systems into allocations of cost, risk and accountability across project stakeholders who do not share incentives. Feasibility of such integration is therefore not primarily about agreeing with decarbonisation in principle (Giesekam et al., 2016; World Bank & ICAP, 2021). Instead, it depends on whether this integration can survive routine procurement, programme pressure, and contested responsibility boundaries across the project life cycle. This challenge is further sharpened in Australia by the absence of a building-sector ETS and the reliance on facility-based constraints under the Safeguard Mechanism (covering facilities emitting >100,000 tCO_2-e/year), which do not map neatly onto project-level procurement decisions (Department of Climate Change, Energy, the Environment and Water [DCCEEW], 2025).

This study addresses this interface gap through an exploratory qualitative design. Using semi-structured interviews and thematic analysis, it identifies the key constraints and enabling conditions that shape whether LCA–ETS integration can operate in routine construction project delivery. The two research questions are:

Q1: How do construction practitioners perceive value and feasibility of LCA–ETS integration?

Q2: What barriers and enabling conditions shape the practical implementation of LCA–ETS integration?

This paper provides preliminary empirical evidence from the Australian construction sector, where a national ETS is absent. While prior research has examined LCA usability and ETS governance as separate domains, these two mechanisms have rarely been studied as an integrated framework within construction project delivery. The study contributes by linking LCA-derived carbon information with ETS compliance logic at the project level, and by identifying the specific conditions under which such integration is perceived as workable by practitioners. This project-level integration perspective, situated in a jurisdiction without a building-sector ETS, offers a distinct analytical contribution that extends beyond established findings on LCA adoption barriers or ETS design principles that were considered in isolation.

2. LITERATURE REVIEW

2.1 DECARBONISATION: STRATEGIC DRIVERS AND ADOPTION TRIGGERS

Research on construction decarbonisation often frames adoption drivers in terms of governance and decision usability (Jordan & Bleischwitz, 2020; Scherz et al., 2022; Schmidt et al., 2020; Subal et al., 2024). Carbon performance is more likely to shape routine project decisions when it can be presented in a legible form and compared across options within organisational decision processes. Operational energy has attracted sustained attention, largely because it is easier to measure and benchmark, and can be more readily incorporated into established disclosure and governance arrangements (DCCEEW, 2024). As operational efficiency improves and electricity grids decarbonise, several studies suggest that embodied emissions in materials and upstream supply chains become increasingly salient within whole life carbon footprints (Giesekam et al., 2016; IPCC, 2023). However, the literature indicates that embodied carbon management often lacks stable market incentives, and is therefore more commonly advanced through voluntary actions, client requirements, Environmental, Social, and Governance (ESG) reporting expectations, and rating-based incentives rather than direct price constraints (IPCC, 2023; Green Building Council of Australia [GBCA] & thinkstep-anz, 2021;

Infrastructure Australia [IA], 2024). This implies that adoption triggers may not be determined by technical feasibility alone (Kibert, 2016; United Nations Environment Programme [UNEP] & Global Alliance for Buildings and Construction [GlobalABC], 2023). They may also be shaped by institutional arrangements, including the indicators legitimised for disclosure and comparison and the practices that are rewarded and become embedded over time.

The Australian context reflects many of these dynamics, particularly through disclosure schemes and inconsistent approaches to embodied carbon (Clean Energy Regulator, 2026; DCCEEW, 2025; New South Wales Department of Planning and Environment [NSW DPE], 2026; IA, 2024). While the National Australian Built Environment Rating System (NABERS) and the Commercial Building Disclosure scheme have strengthened transparency around operational performance, requirements addressing embodied carbon remain comparatively limited and inconsistent (DCCEEW, 2024; GBCA & thinkstep-anz, 2021). In parallel, coverage under the Safeguard Mechanism is concentrated on large facilities, which means that many construction-related actors do not face a direct carbon price signal at the project level (DCCEEW, 2025; IPCC, 2023). For non-covered actors, uptake is often shaped by non-price drivers, particularly investors' expectations and the incentives embedded within voluntary rating systems (IA, 2024). Recent state level measures also suggest that regulatory triggers can emerge in more targeted forms, as illustrated by mandatory embodied emissions disclosure for selected projects in New South Wales (NSW DPE, 2026). At the same time, Fouché and Crawford (2015) noted continuing uncertainty in methods and data used for embodied carbon assessment, and suggested that uneven organisational capability may remain a practical constraint on consistent implementation (Marsh et al., 2023). Overall, decarbonisation adoption triggers in the Australian construction sector appear increasingly policy oriented, and whether these signals extend beyond disclosure and translate into routine project decisions is likely to depend on whether sector capability and implementation conditions can support uptake at scale (IPCC, 2023; IA, 2024).

2.2 LCA CAPABILITY, DECISION USABILITY AND BARRIERS IN PROJECT DELIVERY

Studies on LCA delivery in construction projects show that producing credible results depends on reliable information being available across design, procurement, and construction (Marsh et al., 2023; Scherz et al., 2022; Waldman et al., 2020; Pittri et al., 2026). Marsh et al. (2023) pointed out that when harmonised rules and structured protocols are limited, context such as system boundaries, data provenance and quality indicators may not be recorded in a consistent way. This can make verification and comparisons more difficult. At the product level, Waldman et al. (2020) noted that Environmental Product Declarations (EPDs) do not always report uncertainty and other key fields in a uniform manner. This can reduce alignment across projects and increase the labour required for interpretation and checking (Waldman et al., 2020). Evidence in the Australian context provides a concrete example. Crawford and Stephan (2022) reported substantial variations in cut-off rules for concrete EPDs. Such variations require additional calibration at the building scale and add to the interpretive load when results are compared. Taken together, the literature often characterises these issues as challenges of comparability and interpretability, which may limit the extent to which LCA outputs could inform routine project decisions (Waldman et al., 2020; Crawford & Stephan, 2022).

On workflow integration, building information modelling (BIM) is widely regarded as useful for quantity take-off, yet BIM and LCA linkage still often relies on manual mapping. Studies typically attribute this to limited machine-readable data and interoperability frictions across software tools, which can constrain automated integration in routine delivery settings (Parece et al., 2025; Pittri et al., 2026). International studies also report a high intent but low adoption pattern, suggesting a persistent gap between professional endorsement and everyday application (Moncaster et al., 2019). Additionally, the investment required for rigorous data management may be perceived as a cost burden if economic incentives are weak, which could dampen organisational willingness to adopt more advanced practices (IPCC, 2023). Policy measures such as mandatory disclosure in New South Wales aim to improve transparency, but they may also introduce adaptation costs as stakeholders adjust to new reporting requirements (NSW DPE, 2026). Across these studies, the practical issue is not simply about producing compliant figures; it is about producing outputs that are comparable, interpretable and workable within procurement and decision-making workflows (Waldman et al., 2020; Parece et al., 2025).

2.3 ETS Logic and Implementation Prerequisites in the Construction Sector

Many studies describe ETS as an institutional arrangement rather than a simple ‘price on emissions’ that reshapes how organisations weigh trade-offs and make decisions (Schmalensee & Stavins, 2017). Reviews also suggest that the influence of an ETS is not determined by price levels alone. It depends heavily on three institutional foundations. First, monitoring, reporting and verification (MRV) needs to support consistent boundary setting and verifiable data sources. Second, compliance responsibility needs to sit with actors who hold budget and decision authority. Third, the rules need to be credible and predictable enough to support medium- to long-term choices (World Bank & ICAP, 2021). From this perspective, the ‘re-weighting’ effect of an ETS can be seen as a process of institutionalisation, with outcomes closely shaped, and often constrained, by factors such as rule clarity, verification feasibility, and clear allocation of responsibility (Narassimhan et al., 2018; Schmalensee & Stavins, 2017; World Bank & ICAP, 2021).

Against this institutional framing, Narassimhan et al. (2018) noted that, in the construction sector, discussion tends to focus on practical implementation conditions and sources of friction, particularly around MRV, responsibility allocation and cost pass-through, which often become more complicated in this sector. On the one hand, construction-related emissions are distributed across multi-tier material supply chains and multiple project stages. This makes boundary definition and cross-actor data transfer more difficult, and increases challenges for verification and comparability. Studies suggest that LCA results become harder to trace and less robust to comparison across projects if key assumptions, dataset details, or process documentation are not recorded transparently (De Wolf et al., 2017; Marsh et al., 2023; Röck et al., 2020). On the other hand, project-based delivery and contract chains can fragment control and accountability. If compliance obligations are not assigned to entities with budget and decision authority, carbon costs are unlikely to be embedded consistently in procurement evaluation or contractual responsibilities. World Bank and ICAP (2021) describe this as a practical implementation challenge when ETS compliance logics are mapped onto construction project governance structures. In Australia, this is reinforced by the current policy architecture: regulatory information and industry analyses generally noted that there is currently no ETS framework at the national level that directly covers the construction value chain, and existing constraints remain largely facility oriented. This makes procurement-side exposure to carbon costs comparatively indirect (Clean Energy Regulator, 2026; KPMG, 2023). Relatedly, LCA research more often focuses on establishing clearer emissions boundaries and measurement bases for buildings, while also emphasising that cross-stage data transfer and transparent reporting of key methodological assumptions and traceability can materially affect whether results are verifiable and comparable (Röck et al., 2020; Marsh et al., 2023). At the sector discourse level, recent reviews suggest that ETS-related discussion and practice in the construction sector remains relatively limited and often leans towards operational emissions; incorporating embodied carbon into implementable institutional arrangements still faces challenges around measurement, allowance allocation and feasibility (Liu & Loo, 2026). While some studies have begun to monetise whole-life emissions using carbon prices and apply this in economic appraisal or procurement incentives (Schmidt et al., 2020; Scherz et al., 2023), work on building a replicable and verifiable LCA–ETS interface for the construction sector context remains fragmented. This study aims to address these gaps by investigating, in the Australian construction sector, the drivers and barriers shaping stakeholders' willingness to adopt an LCA-informed ETS approach, and by identifying the governance and delivery conditions under which carbon information can be embedded into routine procurement and decision-making processes.

Two constructs are central to this exploratory study. Value refers to the perceived benefits that practitioners associate with LCA–ETS integration, including improved carbon transparency, enhanced comparability of design alternatives, and alignment with regulatory and market expectations. This definition was informed by Subal et al. (2024) and Schmidt et al. (2020). Feasibility refers to the perceived practicality of implementing such integration at the project level, encompassing data availability, verification credibility, cost implications, institutional support, and compatibility with existing procurement and delivery processes (Narassimhan et al., 2018; World Bank & ICAP, 2021). These constructs are treated as practitioner-assessed judgements shaped by role, organisational context, and project conditions, rather than as objective or fixed properties of the integration itself.

At the project level, LCA–ETS integration could take the form of using life cycle carbon assessment outputs as a quantified basis for estimating project-related carbon liabilities, comparing design and material alternatives on a carbon-cost basis (Schmidt et al., 2020), identifying high-emission processes or supply chain segments (Röck et al., 2020), and informing whether carbon costs, allowances, or offset obligations should be incorporated into procurement evaluation and contractual terms (Liu & Loo, 2026; Scherz et al., 2023). Such integration would likely require an accounting interface capable of translating LCA outputs into units compatible with ETS compliance logic—such as verified tonnes of CO_2-equivalent linked to defined system boundaries—and embedding these within routine project decision points including tender evaluation, design review, and material procurement (World Bank & ICAP, 2021).

3. RESEARCH METHOD

This study adopted an exploratory qualitative design to address the research questions. The focus was on how feasibility judgements are formed in practice and what implementation conditions practitioners see as necessary, rather than on estimating the prevalence of views in the wider population. The study therefore aimed to surface the practical logics and condition sets that shape feasibility judgements, rather than to quantify attitudes. A qualitative approach was used to capture practitioners' decision logics and feasibility judgements under real project constraints. Data was collected through semi-structured interviews. Interviewees were recruited through purposive sampling to target decision-critical roles across the construction value chain. The final sample comprised five senior practitioners: a project manager, a sustainability consultant, a cost manager, and two developers from organisations of different scales. Recruitment was constrained by the time pressure faced by senior staff, the commercial sensitivity of procurement and carbon-related decision processes, and, in several cases, internal approval requirements and confidentiality obligations. Given these constraints, the study prioritised experienced practitioners who could provide role-specific and information-rich insights. Consistent with purposive sampling in exploratory qualitative research, participant selection prioritised information richness and relevance to the research questions over representativeness (Patton, 2015). The intent was not to achieve theoretical saturation or population-level generalisability, but to surface the practical logics and condition sets through which feasibility is assessed in role-specific project contexts.

The interview guide questions were developed relative to the research questions, covering decarbonisation drivers, LCA and ETS implementation conditions, policy trust, and practical requirements for integration. During the interviews, follow-up questions were tailored to role-specific examples and project contexts. The interviews lasted approximately 30 minutes each and were conducted online or in person. With informed consent, interviews were audio-recorded, transcribed verbatim, and de-identified prior to analysis. Ethics approval was obtained through the university human research ethics process, and confidentiality and informed consent procedures were followed throughout. The thematic analysis followed Braun and Clarke's (2006) six phases of familiarisation, initial coding, theme development, theme review, theme definition and reporting, and was performed using the NVivo software. Coding began with a small set of deductive categories aligned to the research questions and was iteratively refined as recurring ideas emerged. Themes were compared across participants and roles to identify recurring patterns and role-based contrasts, while retaining the context of each interview. Rigour was supported through an audit trail of coding decisions, iterative refinement of the codebook, checks for disconfirming evidence, and the use of exemplar quotations to support key interpretations.

4. RESULTS AND DISCUSSION

4.1 PROFILE OF INTERVIEWEES AND ROLE-BASED CONTEXT

Table 1 summarises the profiles of the five interviewees. They work in cost management, property development, project management, and sustainability consulting roles, covering decision and delivery points that are central to LCA–ETS integration across the construction value chain. All interviewees have had at least eight years of industry experience, and three of them have had over fifteen years of experience. Accordingly, the interviews reflect practitioners' practical judgements and trade-offs drawn from real project delivery contexts. This sample was assembled deliberately to address the research questions through different role lenses. For example, the developer participants focused on investment decisions and strategic trade-offs, while the cost manager emphasised how carbon performance information can be translated into cost planning, budgeting, and contractual language. These role-critical accounts help clarify how practitioners assess the perceived value and feasibility of LCA–ETS integration, and which barriers and enabling conditions shape its practical implementation.

Table 1: Profile of Interviewees

ID	Professional role	Organisation type	Years of experience	Key focus
I1	Cost Manager	Large quantity surveying consultancy firm	≥15	Carbon performance integration into cost planning and budgeting
I2	Developer Representative	A large-scale property development firm	≥15	Institutional logic, ESG strategy, and macro-level policy compliance
I3	Developer Representative	A small-to-medium sized property development firm	≥12	Economic sensitivity, incentives, and implementation constraints
I4	Project Manager	Major building contractor (Tier 1)	≥15	Delivery interface frictions and cross-stakeholder workflow coordination
I5	Sustainability Consultant	Specialist environmental/sustainability consultancy firm	≥8	LCA methodological rigour, data quality, and decision-support usability

4.2 PERCEIVED VALUE AND FEASIBILITY APPRAISAL OF LCA–ETS INTEGRATION

When the interviewees discussed the value of LCA–ETS integration, they focused less on broad environmental ideas and commented more on its applicability in project decision-making. Value was primarily framed in terms of early visibility of carbon information, support for option comparisons, and usefulness in budgeting and risk conversations. In these budgeting and risk conversations, carbon pricing was seen to matter mainly when it could be translated into established costing routines. Interviewee I2 rarely framed decisions in terms of a 'carbon price'; carbon-related costs were typically treated as secondary to programme certainty, procurement sequencing, and downside risk. Interviewee I3 stated a similar view explicitly: "If you don't force me to use it, I won't. Why would I use it? My margin is already tight." Overall, the interviewees point to a conditional view of the value of LCA–ETS integration: carbon information needs to be quantifiable, benchmarkable, and defensible, and able to appear as a clear line item within budget and contract language, before it is likely to shift project trade-offs. This aligns with research showing that LCA evidence influences decisions most strongly when it is decision-relevant within organisational routines, rather than existing only as reporting output (Subal et al., 2024). This routine-based view is consistent with LCA-based carbon quantification often being driven by regulation, client requirements, and ESG disclosure under weak incentives, rather than by stable project-level price constraints (IPCC, 2023; GBCA & thinkstep-anz, 2021; IA, 2024). In Australia, project actors' exposure to an explicit carbon cost signal is often indirect, because major compliance obligations are largely structured around facility-level coverage rather than project procurement (DCCEEW, 2025; Clean Energy Regulator, 2026). Against this backdrop, the interviewees specified that the value of integration in practice depends on whether carbon information can be expressed in cost and risk language, and can function as a priced, comparable basis for decisions.

Alongside recognising potential value, interviewees set a higher bar for feasibility. Feasibility was first framed around policy stability, consistency of implementation, and the credibility of verification. Interviewee I2 positioned compliance as the baseline driver and indicated that developers tend to wait for mandatory rules rather than pursue voluntary adoption. While prior research commonly emphasises technical and informational conditions, such as boundary definition, data comparability, and workflow integration (e.g., Waldman et al., 2020; Crawford & Stephan, 2022; Marsh et al., 2023), the interviewees suggest that a key prerequisite is whether carbon assessment outputs are trusted and reliable, rather than whether they can be calculated. The interviewees suggested that 'value' and 'feasibility' are assessed through usability in project decision-making. Integration was considered feasible in practice only when carbon information can be expressed in cost, risk, and contractual terms and relied upon as a defensible basis for choices.

4.3 Barriers and Enabling Conditions Shaping the Implementation of LCA–ETS Integration

Regulatory triggers and compliance deadlines were a shared starting point among the interviewees, framing carbon-related requirements as a baseline compliance task rather than an optional initiative. Beyond regulation, client requirements were described as a direct project-level instruction that legitimises allocating budget and adjusting scope; for example, I1 noted: "The main trigger was the client's internal targets" (I1, interview). Against this backdrop, the interview results indicate that implementation of LCA–ETS integration is constrained by three interrelated issues: unstable outputs driven by low information maturity in early stages, delivery-side workflow and resourcing frictions, and responsibility and risk concerns linked to weak verification credibility. On the information side, interviewees emphasised that underdeveloped early design and unclear material specifications force teams to rely on assumptions, undermining accuracy and defensibility. Interviewee I1 captured this clearly: "If the design doesn't show it, I have to make assumptions, and those assumptions can be incorrect." When carbon information is delayed, it often arrives too late to shape procurement and other key decisions where carbon impacts are largely fixed. Next, delivery-side barriers were commonly described as operational frictions rather than ideological resistance. An example given by Interviewee I5 is that reconciling inconsistent certificates and managing supplier documentation is labour-intensive under time pressure, yet their project teams are rarely resourced for this workload. Third, responsibility and risk concerns were amplified where verification credibility was perceived as weak. Interviewee I2 noted that when carbon assessment outputs cannot be independently verified, relying on them in procurement or contractual settings increases accountability and commercial exposure. As a result, participants were reluctant to treat such outputs as decision-binding, even when calculations could be produced.

The results suggest that institutional and risk-related barriers were more pronounced from the developers' perspectives. Policy settings were treated as parameters shaping investment logic, and shifts in rule stability were seen as changing strategic judgement. Interviewee I2 specifically distinguished mandatory and voluntary regimes, framing compliance as the primary driver for action. Where supply-chain carbon data are opaque or boundaries are unstable, risk was seen as concentrating on parties with final reputational and contractual exposure. Overall, the interviewees assessed implementability in terms of defensible accountability and credible verification, with less emphasis on whether carbon assessment outputs can be produced. This is consistent with prior findings that inconsistent boundaries and disclosure in supply chains reduce comparability and weaken decision usability (Waldman et al., 2020; Crawford & Stephan, 2022; Marsh et al., 2023). Limited workflow integration often means that data handling remains manual and feedback loops are slower (Parece et al., 2025). Uneven capability and resourcing constraints therefore remain practical barriers in Australia (Fouché & Crawford, 2015). Most interviewees added that a key prerequisite for integration is trust in verification and clarity of responsibility. Even if carbon assessment outputs can be produced, inconsistent verification and unstable rules can make them too risky to rely on (Schmalensee & Stavins, 2017; Narassimhan et al., 2018).

In terms of enabling conditions, interviewees converged on MRV and data standardisation as the minimum requirements for integration. They emphasised that consistent rules, clear baselines, and third-party verification are necessary for carbon assessment outputs to be comparable and defensible. Interviewee I5 noted that if LCA data is used for compliance, project teams would need "standardised baselines" and "approved datasets or verified EPDs", and that "third-party verification would also be important". Operationally, strengthening LCA influence was framed as front-end embedding: clarifying scope and targets early, and using cross-disciplinary workshops so LCA becomes a design input rather than being "added at the end" (Interviewee I5). It appears that developers placed greater weight on institutional supports and risk buffering. Interviewee I2 highlighted the need for financial support and more mature, validated tools to sustain early-stage integration. He further noted that longer defect liability periods increase the potential liability risks associated with adopting new solutions. As a result, developers tend to prefer proven, established systems unless low-carbon alternatives can demonstrate reliability and are cost-acceptable (Interviewee I2). These conditions align with the broader literature that ETS influence is dependent not only on price levels, but also on MRV that supports verifiable boundaries, clear responsibility assigned to actors with decision authority, and predictable rules (Schmalensee & Stavins, 2017; World Bank & ICAP, 2021). Overall, the interview findings suggest that implementation hinges on three conditions: (i) early-stage information being decision-ready; (ii) delivery teams having the capacity to absorb additional documentation and verification work; and (iii) MRV and responsibility arrangements being credible enough to reduce accountability risk.

5. CONCLUSIONS

This study draws on five semi-structured interviews with Australian construction practitioners to provide preliminary insights into how LCA–ETS integration is perceived and what conditions may shape its implementation in routine project delivery. Its contribution is not in identifying individual barriers, such as compliance-driven adoption or distrust of early-stage data, which are documented in prior LCA and ETS literature. Rather, it lies in examining how these factors interact at the project level when LCA and ETS are considered as an integrated framework, and in surfacing the specific institutional and delivery conditions under which such integration is perceived as workable in a jurisdiction without a building-sector ETS. Within this exploratory study, compliance-related requirements were described as a relatively stable and credible trigger for action. Carbon price signals, by contrast, appeared uneven and indirect, and tended to shape decisions only when they could be translated into established routines such as cost planning, material selection, and risk appraisal. Taken together, these findings indicate that feasibility judgements are shaped not only by attitudes, but also by whether integration can be executed within everyday project systems. Minimum MRV foundations, interoperable data and workflows, and clearer responsibility allocation need to be in place; otherwise, carbon evidence may struggle to be incorporated into routine procurement processes and approval points. From this perspective, LCA–ETS integration is better treated not as a simple add-on or pricing overlay, but as a socio-technical shift that is likely to require coordinated change across data governance and organisational processes. The implication for practice is that integration efforts need to focus on making requirements workable in projects. Priorities include establishing minimum data and verification standards, creating workflow interfaces that align with procurement governance, and clarifying roles and responsibilities across project teams. Such measures could reduce accountability risk and make implementation more repeatable. For research, the study offers an empirical foundation for subsequent construct operationalisation. It supports survey development that treats capability, trust, and responsibility allocation as testable mechanisms rather than background context.

This research is exploratory in nature and is intended to map how the feasibility of LCA–ETS integration is interpreted and reasoned through by practitioners in the Australian construction sector. The study is limited by its small sample size and exploratory design. The findings should therefore be interpreted as analytically indicative rather than statistically generalisable, and future research should extend the sample to test whether these patterns hold across a wider range of organisational types and project contexts. Despite this limitation, the study allows role-based interpretation and careful tracing of how feasibility is reasoned through in practice. Future work can extend this study through an exploratory sequential mixed-methods design. This is planned in the next stage of this study to quantify the impacts of the key factors identified in this exploratory study on practitioners' perceptions of feasibility and implementation likelihood. In parallel, project case studies can be used to assess the practicality and cost implications of embedding an LCA–ETS accounting interface into procurement decision-making.

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