
THE COSTS AND PRACTICAL IMPLICATIONS ASSOCIATED WITH ACHIEVING NET ZERO IN THE CONSTRUCTION INDUSTRY. A MAIN CONTRACTORS PERSPECTIVE...

ACBA 6015 – Independent Project - Dissertation

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Author's Declaration

I attest that this dissertation complied with the University of Wales, Trinity Saint David regulations and is entirely original except for any references cited in the text. Additionally, no portion of this dissertation has been submitted for any other degree program. The views expressed in this dissertation are solely those of the author and do not represent those of the University of Wales, Trinity Saint David. This dissertation has not been presented for examination at any other university, either in the UK or overseas.

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List of Abbreviations

1. CIOB – Chartered Institute of Building
2. ECI – Early Contractor Involvement
3. ESG – Environmental, Social & Governance
4. GGBS – Ground Granulated Blast Furnace Slag
5. ICE – Institution of Civil Engineers

6. RIBA – Royal Institute of British Architects

7. RICS – Royal Institute of Chartered Surveyors

1.0 - Chapter 1 – Introduction

1.1 - Scope of Chapter

The purpose of this chapter is to provide an outlook as to what this dissertation will entail. Initially, the rationale and context of the study will be explored, which will allow for clear definition of the research aim and objective of this dissertation. Furthermore, a review of the overall structure of the dissertation has been completed in order to provide an indication as to what the dissertation includes overall.

1.2 - Context of the study

The construction industry occupies a critical position within the United Kingdom's transition towards a low-carbon economy, particularly following the Government's legally binding commitment to achieve net zero greenhouse gas emissions by 2050 (CIOB, 2024). The built environment remains one of the most significant contributors to carbon emissions through both operational and embodied carbon, with emissions arising from material extraction, transportation, plant usage, on-site activities and supply chain logistics (UKGBC, 2021; CIOB, 2024). Research by the World Green Building Council further identifies that the global building and construction sector is responsible for approximately 39% of carbon emissions, reinforcing the strategic importance of decarbonisation within the industry (WorldGBC, 2019).

Within this context, UK main contractors are facing increasing pressure from government policy, clients and procurement frameworks to demonstrate clear and measurable carbon reduction strategies. This includes the adoption of electric plant and vehicles, low-carbon construction methods, sustainable material procurement and improved collaboration across the supply chain (UKGBC, 2021). Despite this strategic direction, embodied carbon measurement and mitigation remain inconsistently embedded across industry practice and, in many cases, are still treated as voluntary rather than regulated requirements (UKGBC, 2026).

The study is therefore situated within the wider transformation of construction management and commercial practices, where sustainability objectives are increasingly influencing project delivery, cost planning and procurement decision-making. Traditional quantity surveying functions, historically centred on cost certainty and value for money, are evolving to incorporate whole-life value, embodied carbon assessment and environmental performance criteria (CIOB, 2024). This is particularly relevant within tendering processes, where contractors are increasingly required to evidence their ability to achieve sustainability targets as part of bid submissions and framework pre-qualification requirements.

Furthermore, the role of collaboration between main contractors, subcontractors and suppliers is becoming increasingly significant. Achieving net zero objectives cannot be

delivered solely through internal contractor policies; rather, it depends on the capability, maturity and responsiveness of the wider supply chain to provide compliant low-carbon materials, technologies and processes. This places procurement and tendering at the centre of sustainability implementation, making this an important area for academic and professional investigation.

1.3 - Rationale of the study

The rationale for this study is founded upon the increasing significance of net zero as both an operational challenge and a source of commercial differentiation within the UK construction industry. While the strategic importance of carbon reduction is widely recognised, there remains a notable gap between policy ambition and practical implementation at project level. Existing literature and industry guidance largely focus on strategic targets and policy pathways; however, less attention has been given to the practical barriers experienced by main contractors in delivering these targets through plant, procurement and tendering processes (UKGBC, 2021).

This research is therefore justified by the need to critically investigate the operational limitations associated with implementing net zero initiatives, particularly those relating to electric plant, vehicles, machinery and supply chain constraints. These factors represent significant commercial and logistical barriers that may directly influence project feasibility, programme certainty and cost management. As Naoum (2019) suggests, research objectives should be broken down into sub-objectives to investigate specific issues that collectively address the wider research aim. In this case, the objectives allow for a focused exploration of how sustainability aspirations translate into real-world industry practice.

A further rationale lies in the evolving role of quantity surveying and procurement functions. As clients increasingly incorporate sustainability requirements into tender documentation, contractors are required to demonstrate carbon-conscious methodologies, lifecycle costing and environmentally responsible supply chain strategies as part of their bids. This represents a fundamental shift in the commercial function of tendering, moving beyond lowest-cost procurement towards value-based and sustainability-led bid evaluation (CIOB, 2024).

In addition, the study seeks to explore whether demonstrable commitment to net zero provides main contractors with a competitive advantage during the tender process. This is particularly relevant in public sector procurement and major framework agreements, where environmental performance increasingly forms part of the award criteria. Understanding whether investment in sustainability generates measurable commercial benefits will provide valuable insight for both academic research and professional practice.

Ultimately, the rationale for this dissertation is to contribute to the growing body of knowledge surrounding sustainable construction management by examining the relationship between operational barriers, procurement evolution and competitive advantage within the context of net zero delivery.

1.4 - Research Goals

1.4.1 – Research Aim

The main aim of this dissertation is to critically examine the impact of net zero implementation on the operational and commercial practices of main contractors within the UK construction industry, with particular focus on how sustainability commitments influence project delivery, procurement processes and tender competitiveness.

The construction industry is under increasing pressure to align with the UK Government's legally binding target of achieving net zero carbon emissions by 2050, creating significant changes in the way construction projects are planned, procured and delivered (UK Green Building Council, 2021). As sustainability requirements continue to grow in importance, main contractors are being required to adapt both operationally and commercially to meet carbon reduction expectations set by clients, regulators and wider industry frameworks.

This research aims to explore the broader implications of this transition by investigating how net zero policies and initiatives are shaping business practices across the construction sector. The study focuses on understanding whether the industry's sustainability ambitions are realistically achievable within current operational and commercial constraints, and whether these changes are influencing contractor competitiveness within tendering environments.

As Naoum (2019) identifies, establishing a clear research aim provides the foundation for developing focused research objectives that investigate specific issues contributing to the wider purpose of the study. Therefore, the following objectives have been developed to explore the practical limitations, procurement changes and competitive implications associated with net zero implementation, collectively addressing the overall aim of the research.

1.4.2 – Research Objectives

Naoum (2019) states that it is important to detail my aim into sub aims and/or objectives, in order to establish certain issues whilst achieving the overall aim of the study. These sub aims and objectives will subsequently provide a number of questions to be researched throughout the course of the primary research element of the dissertation.

Objective 1: To investigate and evaluate the practical and operational limitations associated with implementing net zero initiatives, including electric plant, vehicles, machinery and supply chain constraints.

The purpose of this aim is to determine whether decarbonising construction equipment and supply chain collaboration are key operational barriers to achieving net zero for UK construction companies and projects.

Objective 2: To examine how quantity surveying and tendering practices are evolving to integrate net zero requirements within procurement and bid evaluation processes

The purpose is to establish whether net zero targets are being integrated into bid evaluation, procurement processes and practices in the industry.

Objective 3: To assess whether demonstrating a commitment to net zero provides main contractors with a competitive advantage during the tender process.

This aim will involve establishing whether the cost of implementing net zero in Main Contractors company policies provide commercial benefits over their competitors.

2.0 – Chapter 2 – Literature Review

2.1 - Scope of Chapter

This chapter will explain what net zero is, as well as, analysing the current drive for net zero within the construction industry. It will also provide an insight into how using electric is aimed at achieving net zero in comparison to fossil fuels that have more commonly been used throughout the industry to date.

2.2 - Practical and Operational Barriers to achieving Net Zero

The construction industry is positioned as a key contributor to national and global decarbonisation targets (due to the energy it uses and the waste that it generates), with the UK government committing to achieving net zero greenhouse gas emissions by 2020 (HM government, 2022). Despite this direction from the government literature consistently highlights a significant gap between policy ambition and practical implementation at project delivery (UKGBC, 2021; RICS, 2024). This is largely attributed to operational constraints within construction sites across the UK where traditional delivery models remain heavily embedded in frameworks, namely cost, time and programme (Pomponi and Moncaster, 2017). A key argument in the literature is that whilst decarbonisation strategies are increasingly well defined within policy documents, the construction sites remain the most challenging environment to implement due to its temporary and highly variable state (ICE, 2023). This results in the

inability to implement low carbon technologies despite increasing pressure from regulatory bodies and client demands.

2.2.1 – Limitations of Electric Plant, Vehicles and Machinery

One of the most widely regarded operational barriers to achieving net zero in construction is the limitations of electric construction plant and machinery. Electrification has advanced significantly in the automotive industry, although, heavy construction plant remains largely dependent on diesel-powered systems due to energy density, torque requirements and operational reliability (ICE, 2023). Diesel plant continues to dominate site operations due to its high continuous power output, rapid refuelling capability, suitability for heavy-duty operations and established supply chain infrastructure (McKinsey & Company, 2023).

In contrast, electric construction equipment is constrained by limited battery energy density, reduced operating durations and prolonged charging times, all of which introduce operational inefficiencies and programme risk (Carbon Trust, 2022). Research published in *Automation in Construction* highlights that whilst electrification is technically feasible it is not yet economical across the whole of the construction activities on a project, particularly in regard to earthworks and heavy civils operations (Nasir et al, 2021). Moreover, the Institution of Chartered Engineers (2023) notes that supply constraints from original manufacturers (OEM's) significantly limit market availability which means that contractors often lack realistic alternatives even where sustainability targets are mandated. This reinforces continued reliance on diesel-based plant and creates a structural barrier to decarbonisation at site level.

2.2.2 – Site Infrastructure and Charging Constraints

In addition to equipment limitations, the literature identifies inadequate site infrastructure as a major limitation to the electrification of plant and machinery. Construction sites are typically temporary and therefore not designed with long term energy infrastructure in mind (UKGBC, 2021). Most sites operate on restricted grid connections that are insufficient to support simultaneous charging of multiple electric plant items, welfare facilities, site offices and electric company vehicles for site/visiting staff members.

This challenge is more prevalent within urban environments because the grid reinforcement is costly, time consuming and subject to regulatory constraints (National Grid ESO, 2023). In most cases, Main Contractors resort to diesel generators to supplement energy demand which undermines decarbonisation objectives and introduces inefficiencies in site energy management (Carbon Trust, 2022).

RICS (2024) emphasises that early-stage energy planning is essential for enabling low-carbon construction methods, although, such considerations are often absent at tender

stage due to cost sensitivity and lack of client specification. This highlights a disconnect between strategic carbon targets and operational delivery constraints on site.

2.2.3 – Programme and Productivity Implications

Programme certainty and productivity remain fundamental drivers in all construction project deliverables that can often outweigh the sustainability considerations in decision-making processes (HM Government, 2022). Literature consistently identifies perceived productivity risk as a critical barrier to adoption of low-carbon technologies (ICE 2023).

Electric Plant introduces potential downtime due to charging requirements, which can disrupt sequencing and reduce utilisation rates (Nasir et al., 2021). Also, low-carbon concrete alternatives such as GGBS or fly ash blends could require extended curing periods, affecting critical path activities to a Main Contractors contract programme (Soutsos et al., 2011).

Offsite manufacturing and modular construction are frequently promoted as carbon reduction strategies however they introduce increased reliance on supply chain coordination and longer lead-in times, which can shift rather than eliminate environmental impact. Pomponi and Moncaster (2017) argue that without system-wide integration, sustainability interventions risk transferring carbon impacts across lifecycle stages rather than reducing them.

This creates tension between traditional project success criteria such as time, cost and quality and emerging sustainability requirements, reinforcing conservative decision-making behaviours within contracting organisations.

2.2.4 – Cost Implications of Low-Carbon Technologies

Cost remains one of the most significant barriers to low-carbon technologies in construction (RICS, 2024, World Green Building Council, 2019). Many sustainable materials and technologies carry higher upfront capital costs due to immature markets, limited supply chain scaling and increased production complexity. Some examples include:

- Low-carbon cement
- Recycled structural steel
- Electrified plant and machinery
- Renewable site energy systems

However, literature strongly critiques capital cost weighting in procurement decision-making. ISO 15686-5 (2017) and RICS (2024) emphasise that whole-life costing provides a more accurate representation of value by integrating operational costs, maintenance and end of life considerations alongside environmental performance.

Despite this, adoption remains limited due to client preference for lowest capital cost tendering and short-term financial constraints. This reinforces systemic barriers to sustainable procurement practices.

2.3 - Supply Chain Influence on Net Zero Delivery

The construction supply chain plays a crucial role in determining project-level carbon outcomes. Decarbonisation cannot be achieved in isolation by Main Contractors at site level but requires coordinated transformation across materials manufacturing, logistics and subcontractor networks (UKGBC, 2021; BRE, 2022).

2.3.1 – Material Procurement and Embodied Carbon

Embodied carbon represents a significant proportion of total lifecycle emissions in construction, often accounting for 40-70% of whole-life carbon in new buildings (RICS, 2024). Key contributors include concrete, steel, aluminium, and façade systems such as metal cladding.

Standards such as PAS 2080 (BSI, 2016), EN 15804 (CEN, 2012) and RICS Whole Life Carbon Assessment (2024) provide frameworks for carbon measurement and reporting. Although, BRE (2022) highlights the inconsistencies in Environmental Product Declarations (EPDs) limiting comparability and reducing procurement transparency, particularly for the end user following the inclusion of EPDs in the O&M Manuals at the point of handover by a Main Contractor.

Therefore, procurement decisions continue to be influenced primarily by cost, availability and programme constraints for the materials required to construct the products in lieu of the evaluation the carbon performance. This clearly limits the effectiveness of embodied carbon reduction strategies.

2.3.2 – Supplier Capability and Availability

Supply chain capability is an important constraint on net zero delivery. Whilst demand for low-carbon materials is increasing throughout the years, production capacity has not followed suit (UKGBC, 2021). This creates supply-demand imbalance across key material categories. Some of the constraints include:

- Limited green cement production capacity (IEA, 2023)
- Regional variation in recycled steel availability (World Steel Association, 2022)
- Inconsistent certification systems
- Extended lead times for low-carbon materials (McKinsey & Company, 2023)

McKinsey describes these limitations as a “green premium bottleneck” where demand is greater than that being supplied by manufacturers which can greatly restrict the main contractor’s flexibility to choose the product, not to mention the potential cost volatility.

2.3.3 – Collaboration between Main Contractors and Subcontractors

It is clear that collaboration is recognised in the industry as essential for carrying out successful construction projects. This is no exception to the drive for achieving net zero either and is supported by a statement from Bilsborrow (2019). Early Contractor Involvement and Integrated procurement models enable sustainability considerations to be embedded at design stage (HM Government, 2022).

However, traditional procurement approaches remain adversarial in nature, limiting early subcontractor engagement and reducing opportunities for innovation (Latham, 1994; Egan, 1998). This restricts value engineering opportunities and limits carbon reduction potential offerings at the most influential stages of the project lifecycle.

Smyth and Pryke (2008) argue that collaborative procurement models such as alliancing and design and build are more effective in achieving integrated project outcomes, particularly in sustainability-focused projects.

2.3.4 – The role of procurement & tendering

Traditional single stage tendering routes are frequently criticised for creating an adversarial procurement environment where contractors are appointed on the basis of lowest cost with limited opportunity for early engagement in design development, buildability reviews or carbon reduction strategies (Latham, 1994; Egan, 1998). This can restrict innovation and reduce the ability for the project team to embed sustainable objectives.

In contrast, two stage tendering has increasingly emerged as a collaborative procurement route that supports ECI and is widely regarded as beneficial for sustainability and carbon reduction outcomes (HM Government, 2022). Under a two-stage procurement process, a preferred contractor is appointed during the first stage based on outline design information, preliminaries, overheads, programme capability and qualitative criteria, rather than a fully fixed lump sum contract. This allows the main contractor to enter into a Pre-Construction Services Agreement (PCSA) and work collaboratively with the client, consultants and specialist subcontractors prior to the final contract sum being agreed at stage 2 (RICS, 2024).

The significance of this procurement route for sustainability lies in the fact that the majority of meaningful opportunities to reduce carbon emissions occur during the early stages of the RIBA Plan of works at design and pre-construction phases. PAS 2080 explicitly states that carbon should be managed across the whole value chain and that early collaboration is essential to reduce both carbon and cost (British Standards Institution, 2016). ICE (2023) guidance further reinforces that early-stage decisions set the carbon trajectory of a project and that collaboration across design, contractor and the supply chain is essential to optimise whole-life carbon outcomes.

Recent academic literature on integrated project delivery and sustainable contractor selection suggests that early-stage decisions may influence more than 70% of the eventual environmental performance of a building or infrastructure asset. Two stage tendering therefore allows sustainability measures to be embedded at the point where they are most effective, rather than attempting to retrofit carbon reductions after design freeze.

Moreover, during the first stage of procurement, the contractor and key subcontractors can collaboratively contribute to a range of carbon reduction measures including:

- Buildability reviews to reduce material waste
- Programme sequencing to minimise plant emissions
- Selection of low-carbon material alternatives
- Logistics planning to reduce transport emissions
- Modern methods of construction and off-site modular manufacture
- Value engineering focused on embodied carbon reductions

All of the above are able to significantly reduce embodied carbon (RICS, 2024; UKGBC, 2021).

A greater advantage of two-stage tendering is the level of commercial transparency and open-book costing it can provide. Unlike Single stage tendering where pricing is often fixed early and value engineering occurs later under commercial pressures, two stage tendering enables the quantity surveyor and commercial team for the Main Contractor to compare costs against whole-life carbon benefits during the PCSA period and share these with their client (Ashworth and Perera, 2018).

This is relevant where sustainable design solutions carry higher upfront capital costs but provide long term operational and carbon benefits. For instance, a low carbon façade system may increase the increase capital cost but reduces the operational energy demand and lifecycle replacement costs due to the U-values that it offers. Two stage tendering provides the Main Contractor with the commercial flexibility to assess these different cost options as you typically share your cost report with a minimum of three quotations prior to entering into the main contract of works.

From a risk management perspective, two stage tendering also reduces the likelihood of aggressive value engineering once in contract which could result in inferior products being installed if an inadequate set of Employers Requirements is provided. In single stage competitive tendering, main contractors are often incentivised by the weighting of the tender to submit low bids and if successful recover profit margin through variations or alternative products which could undermine the initial sustainability objectives of the scheme which is supported by Latham (1994) and Egan (1998). Alternatively, the

collaborative nature of the two-stage tendering process helps to protect the client's design intent for the scheme and the overall carbon reduction targets via continuous cost reporting and weekly meetings, value engineering workshops and specialist supply chain input, particularly from Mechanical & Electrical specialists.

Literature also supports this view of Early Contractor Involvement highlighting that two stage tendering improves buildability, reduces Disputes and allows more accurate cost and carbon forecasting throughout the lifecycle of the building.

However, it is clear that the literature also recognises limitations with a common issue with two stage tendering being that it can reduce competitive tendering following the Stage 1 appointment and entering of the PCSA agreement with a Main Contractor. This could lead to an increase in costs at the 2nd stage if the Professional Quantity Surveyor working on behalf of the client is weak (Ashworth and Perera, 2018). This means that it is essential for the client team to ensure they're robust with cost control and benchmark against previous contracts to ensure that prices don't rise significantly and reduce the perceived value the client was forecasting following stage 1.

Being critical, from a sustainability perspective, the key benefit of two stage tendering is that it shifts carbon decision making into pre-construction where the opportunity to influence whole life emissions is at its greatest due to this being where the design of the building is occurring and wouldn't incur the client additional costs for making a change during RIBA stage 5 at the construction phase. This aligns with PAS 2080 principles promoting an integrated procurement strategy and net zero construction frameworks.

2.4 – Evolution of Quantity Surveying and Tendering Practices

The drive towards net zero construction has fundamentally changed the role of the Quantity Surveyor and the structure of tendering practices across the UK construction industry. Traditionally, the role would be centred around cost planning, procurement, valuations, CVR's and contract administration (Ashworth and Perera, 2018). However, literature now supports that the profession is undergoing transformation as sustainability, embodied carbon and whole-life cycles become more valuable and are integrated into pre-construction decision making (RICS, 2024).

This also reflects a broader movement away from capital cost driven procurement towards more value based tendering frameworks where carbon performance, operational efficiency and lifecycle implications on building materials are considering in conjunction with the costs of the aforementioned (HM Government, 2022). The Quantity Surveyor is therefore evolving with these times from a traditional cost manager into a commercial and carbon advisor, playing a key role in whether a project is able to achieve their sustainability outcomes across the lifecycle of the scheme.

2.4.1 – Changes in Pre-Construction Cost Planning

Pre-construction cost planning has traditionally been focused on capital cost forecasting, benchmarking and cost certainty at early RIBA stages. Although, literature increasingly highlights that this approach isn't suitable in the context of net zero targets, where early stage decisions significantly influence both financial and environmental outcomes (Kelly, Male and Graham, 2014).

Recent guidance from RICS (2024) strongly advocated the integration of whole-life carbon assessment (WLCA) alongside cost planning, allowing design alternatives to be assessed not only on the costs but also on the embodied and operational carbon implications. This is a major shift in QS practice as professionals are now expected to evaluate alternative materials, building system and construction methodologies based on their carbon performance as well as commercial value. For example, at RIBA Stages 1-3, a QS may traditionally compare steel and reinforced concrete frame options for a building based on capital cost and programme implications for the buildability of each. However, due to the new frameworks they must also consider:

- Embodied carbon
- Lifecycle replacement costs
- Maintenance requirements
- Operational energy impacts
- Circular economy potential

This further supports the evolution from cost planning to integrated cost and carbon planning (Ibbotson, 2020).

In summary, literature argues that the Quantity Surveying and Commercial profession is uniquely positioned to lead this transition for net zero by 2050 because of its existing competency in quantification, benchmarking, cost modelling and material comparison. RICS (2023) notes that the skills used in cost estimation are directly transferable to carbon costing.

2.4.2 – Net Zero Requirements within Tender Documentation

Tender documentation has evolved significantly in response to client net zero commitments, ESG reporting obligations and public sector procurement reforms. Historically, tender packages focused primarily on cost, technical compliance, programme and quality but literature highlights growing emphasis on sustainability requirements within tender documentation (UKGBC, 2021), These requirements typically include:

- Carbon reduction strategies
- Whole life carbon assessments
- PAS 2080 compliance strategies

- Waste management plans
- Social value and ESG
- Evidence of previous sustainable project delivery such as Passivhaus

The UK Construction Playbook specifically promotes the integration of sustainability and social value criteria into procurement documentation, reinforcing the principle that public sector procurement should drive long term environmental outcomes rather than lowest cost selection alone (HM Government, 2022).

This has significant implications for contractors and commercial teams as tender submissions now require evidence of both technical capability and carbon management competence. From a Quantity Surveying perspective this increases the complexity of pre-construction commercial submissions, requiring integration of carbon risk allowances, sustainable material strategies and lifecycle cost justifications within pricing documents which increases the costs to a Main Contractor when preparing these submissions.

2.4.3 – Carbon Costing and Lifecycle Cost Considerations

The integration of whole life costing and life cycle assessments is now widely regarded as essential for net zero construction decision making as stated within ISO 15686-5 (2017). As RICS notes, cost and carbon must now be estimated as part of the same decision making process rather than as separate disciplines. This is particularly relevant where sustainable options carry higher upfront capital costs but lower operational or replacement costs over its lifecycle. For example, higher specification insulation systems, low carbon façade systems, heat pump systems and photovoltaics may increase the initial costs during the second stage tendering process but can significantly reduce lifecycle costs and carbon emissions. This shift supports the principle of whole life value which is increasingly replacing capital cost only tender evaluation (Kelly, Male, Graham, 2014).

2.4.4 – Bid Evaluation Criteria and Sustainability Weighting

Bid evaluation frameworks have increasingly moved toward multi-criteria assessment models particularly in public sector and framework procurement. In the past, tender evaluation has been dominated by cost driven scoring models. However, current literature suggests that this is changing in response to sustainability policies and client ESG commitments (HM Government, 2022). Modern weighting models for tender evaluations can look similar to this:

- Price – 50-60%
- Quality – 20-30%
- Sustainability/Carbon – 10-20%
- Social Value – 10%

Whilst the introduction of sustainability to the weighting offers a competitive advantage for main contractors with strong credentials in this field, robust carbon management frameworks and proven low carbon delivery capability (UKGBC, 2021) it still demonstrates that cost is still heavily weighted.

2.4.5 – Impact on Tender Success Rates

A key area of literature concerns whether sustainability credentials directly improve tender success rates. Evidence increasingly suggests that main contractors with robust carbon strategies, transparent ESG reporting and proven low carbon delivery capabilities experience improved success within framework and public sector procurement as supported by HM Government (2022) and UKGBC (2021).

Market surveys across UK construction show that whilst tender remain highly price sensitive, quality and other differentiators such as sustainability are increasingly decisive where margins between main contractors bids are extremely competitive (CCBP, 2025).

Where a Main contractor is demonstrating within their bid: lower whole life carbon, strong social value outcomes, the use of modern methods of construction, lower waste projections and verified ESG credentials they are more likely to achieve higher scores as part of their quality submission. From a Quantity Surveyors perspective this directly affects historical bid strategy because price alone may no longer secure commercial success. Instead, tender teams for Main Contractors must now work closely and collaboratively to strengthen qualitative responses.

2.4.6 – Commercial Value against additional cost

There is seen to be a tension between whether sustainability investment creates a genuine commercial value or rather increases tender cost burdens in what is becoming an increasingly difficult construction industry. The RICS (2024) acknowledge that low carbon technologies, ESG reporting systems and carbon consultants accompanied with a general increase in resource for a Main Contractor to carry out a tender submission create additional upfront commercial costs. This can initially reduce margin competitiveness particularly in private sector single stage tender that remain price led. To counter this, some argue that the costs should be viewed as strategic commercial investment rather than an overhead for a Main Contractors business. Long term commercial value could include:

- Increased framework access
- Improved tender win rates
- Enhanced reputation and brand positioning
- Reduced operational risk
- Lifecycle cost savings

- Improved client retention

This aligns with whole life value theory where short-term cost increases are justified by long term economic and reputational return (Kelly, Male and Graham, 2014).

3.0 – Chapter 3 – Research Methodology

3.1 – Scope of Chapter

This chapter will provide an explanation of the methodology behind the collection of data to address the research question. Throughout this, I will evaluate the benefits and be critical to the specific research evidence.

3.2 – Secondary Research

To gain a greater understanding of the subject area, secondary research on existing data such as Government publications, Articles and reports by organisations such the UK Green Building Council and the Royal Institute of Chartered Surveyors (RICS) has been conducted via a Literature review. Conducting research in this manner allows for an analytical and critical review which can result in recognition of similarities between statements between writers, common issues between writers as well as conflicting statements between writers (Naoum, 2019). Gathering of secondary information is usually preferred as it's a quicker way of obtaining information.

3.3 – Primary Research

Primary Research is when a specific type of research is conducted, typically interviews or questionnaires to provide the researcher with the opportunity to gather qualitative information. This allows the researcher to prove or disprove their hypothesis as well as addressing the research question, aims and objectives (Naoum, 2019).

3.3.1 – Qualitative data

Qualitative data is used as a means of understanding an individual's perception of the research topic (Bell and Waters, 2018). This is further supported by Naoum (2019), who suggests that qualitative data typically draws upon personal experience and is both attitudinal and exploratory in nature. Attitudinal research focuses on evaluating an individual's views or opinions, whereas exploratory research involves the "need for a clear and precise statement" (Naoum, 2019, p.58). Furthermore, both Bell and Waters (2018) and Neuman (2014) suggest that qualitative research is not concerned with statistical or numerical data, but instead focuses on words, meanings, and interpretations.

3.3.2 – Quantitative Data

Quantitative research, by contrast, is based on testing a hypothesis or theory using measured and numerical data, which is then analysed through statistical procedures to either prove or disprove the hypothesis (Creswell and Creswell, 2018). This type of data is structured and predetermined, enabling the study of relationships between different sets of facts and allowing findings to be generalised (Bell and Waters, 2018).

3.4 – Research Strategy and Methodology

This study adopts a qualitative research strategy underpinned by an interpretivist philosophical position, as the research seeks to explore the perceptions, experiences, and professional judgements of construction practitioners in relation to the identified research problem. Qualitative research is particularly appropriate where the objective is to gain an in-depth understanding of how individuals interpret issues, experiences, and organisational processes within their professional environment (Bell and Waters, 2018; Creswell and Creswell, 2018).

Within construction management research, many of the challenges associated with project delivery, collaboration, procurement, and sustainability are shaped by professional judgement and contextual decision-making rather than purely measurable variables. As such, a quantitative approach was considered less appropriate because the study does not seek to test a hypothesis through numerical analysis or statistical relationships. Instead, the research aims to develop a rich understanding of practitioner perspectives and the reasoning that underpins managerial decisions in practice.

Interview-based research is widely recognised as a common and effective data collection method within construction management studies. Hansen (2021) found that interview techniques have become increasingly prominent within construction management research due to their ability to capture detailed practitioner opinions, attitudes, and best practice insights. The study's review of 223 construction management papers further identified interviews as a key method for investigating complex professional and project-based phenomena.

This supports the methodological choice adopted within this research, as the topic requires insight into the lived experiences and decision-making processes of industry professionals rather than the collection of generalised statistical trends.

3.4.1 – Structured Interviews

Farrell (2017) and Naoum (2019) suggest that a structured interview format generally achieves a higher response rate than the other two interview types, as it aligns more closely with a quantitative research approach. Naoum (2019) further explains that questions are likely to progress from an open-question format to a closed-question

format, which supports Farrell's (2017) view that responses are often limited and tend to generate closed answers.

Additionally, Farrell (2017) implies that structured interviews are the least flexible approach, offering little opportunity for probing or follow-up questions to obtain further detail. As this research seeks to draw upon the experiences of interviewees, flexibility and the ability to gather detailed insights are of significant importance.

3.4.1.1 – Closed Questions

"Closed questions often require a short response in the form of Yes or No, Agree or Disagree, Important or Not important, and so on. Closed-ended questions are easy to ask and quick to answer, they require no writing by either respondent or interviewer, and their analysis is straightforward (Naoum, 2019)".

Naoum (2019) also suggests that questionnaires are the most suitable method for the use of closed-ended questions that require a specific response.

3.4.1.2 – Open Questions

"Open questions seek to encourage the respondent to provide free responses (Naoum, 2019)".

Naoum (2019) further implies that open questions provide respondents with the opportunity to express detailed opinions, which also allows for further probing during the course of an interview. This is particularly beneficial when gathering professional opinions, as it enables more in-depth information to be obtained in relation to each question. However, open-ended questions are generally more difficult to analyse than closed questions.

3.4.2 – Unstructured Interviews

Naoum (2019) and Farrell (2017) emphasise that an unstructured interview consists primarily of open-ended questions, with the sequence of questioning determined by the nature of the responses received. Naoum (2019) states that this form of interview is not intended to obtain "the same information from each person", which helps explain why Bell and Waters (2018) suggest that a flexible approach is necessary when conducting unstructured interviews.

Although this is an effective method for collecting qualitative data, Bell and Waters (2018) suggest that the information gathered can be highly time-consuming to analyse.

3.4.3 – Semi Structured Interviews

The semi-structured interview approach consists of questions focused on a number of specific issues related to the topic area and may include both open- and closed-ended questions (Naoum, 2019). Farrell (2017) and Naoum (2019) both suggest that the semi-

structured interview format allows sufficient flexibility to probe further and request additional detail when responses are unclear or incomplete.

This suggests that there is considerable freedom within the interview process to explore relevant areas as they arise, provided they remain aligned with the research topic. Although Bell and Waters (2018) do not explicitly refer to semi-structured interviews, they do state that “most interviews carried out in the main data collection stage of the research will come somewhere between the completely structured and completely unstructured point”.

3.4.4 – Interview Method Summary

The semi-structured interview approach has been selected as the most appropriate primary data collection method for this study. This choice is based on both methodological justification and its established use within construction management research.

Semi-structured interviews provide a balance between consistency and flexibility. While a predetermined interview schedule ensures that all participants are asked questions aligned to the research objectives, the format also enables the researcher to probe further where responses are unclear, incomplete, or particularly insightful (Naoum, 2019; Farrell, 2017). This flexibility is essential in construction management research, where responses are often shaped by project type, procurement route, company structure, and individual professional experience.

Hansen’s (2021) empirical review of construction management literature found that semi-structured interviews were the most frequently used interview format, accounting for 65.8% of the studies reviewed, significantly exceeding structured and unstructured approaches. This demonstrates that the semi-structured method is widely accepted as best practice within the discipline for exploring practitioner insights and achieving sufficient data richness.

The suitability of this method is particularly relevant to construction project management because managerial decisions are rarely made in isolation and are often influenced by commercial pressures, programme constraints, stakeholder relationships, and sustainability objectives. Such complex and context-dependent factors cannot always be fully captured through rigid questioning structures.

For example, project managers working under traditional procurement routes may provide different perspectives from those operating within design-and-build or two-stage tendering environments. A semi-structured format allows these differences to be explored in greater depth while still maintaining alignment with the core themes of the study.

Furthermore, Reissner and Whittle (2021) emphasise that interview-based research in management studies benefits from methodological flexibility where professional judgement and lived experiences are central to the research aims. This strengthens the justification for using semi-structured interviews in a construction management context.

3.5 – Sampling

“The term ‘sample’ means a specimen or part of a whole (population) which is drawn to show what the rest is like” (Naoum, 2019).

Naoum (2019) explains that the sampling process is a critical stage of the research design and must therefore be approached with considerable care. There are two main types of sampling techniques: ‘random’ sampling and ‘selected’ sampling (Naoum, 2019). Random sampling techniques do not require individuals to possess any specific background, characteristics, company size, or work type (Naoum, 2019). For example, participants may be selected at random by choosing every fifth individual from an initial population of 250 people.

By contrast, the ‘selective’ sampling approach is commonly used when conducting interviews and requires participants who possess specific characteristics relevant to the study (Naoum, 2019).

Considering the time and resources available, the sample size for this study will consist of five participants, intended to represent wider industry views through a semi-structured interview approach. Furthermore, a selective sampling strategy will be implemented, focusing on participants who are currently, or have previously been, project managers. This ensures that interviewees share similar professional characteristics and experiences, allowing the questions to be interpreted in a broadly consistent manner.

Project managers have been selected as part sample group for this research because they are responsible for making critical decisions on a daily basis within the construction site environment (Project Management Institute, 2013). Furthermore, participants will be drawn from different companies and age groups in order to capture a wider range of experiences, perspectives, and decision-making approaches.

3.6 – Critical Evaluation of alternative methods

Although structured interviews and questionnaires may offer greater efficiency and ease of analysis, they were considered less appropriate for this study. Their reliance on predetermined and often closed questions risks oversimplifying complex professional experiences and may fail to capture the reasoning behind managerial decisions.

For example, understanding why project managers may prioritise cost certainty over sustainability objectives, or why collaboration barriers emerge between main contractors and subcontractors, requires deeper exploration than fixed-response methods can provide.

Conversely, fully unstructured interviews were also considered but ultimately rejected. While they provide maximum flexibility, they may reduce reliability and consistency across the sample, making cross-case comparison more difficult. In research involving multiple participants from different organisations, excessive flexibility can weaken the robustness of thematic analysis and make it harder to identify recurring patterns.

Therefore, the semi-structured interview method provides the most appropriate methodological balance, supporting both depth of insight and analytical comparability, which is essential for research within this industry.

4.0 - Chapter 4 – Analysis & Results

4.1 – Scope of Chapter

This chapter presents and analyses the data obtained from the semi-structured interviews. It provides a synthesis of the qualitative findings, identifying key patterns, trends, and variations across participants' responses (Naoum, 2019). In addition, themes are developed through the integration of the interview data and insights from the literature review, forming the basis for subsequent conclusions.

A thematic analysis approach has been adopted, consistent with qualitative research principles outlined by Naoum (2019), allowing recurring themes across interviewees responses to be identified and critically compared with the literature.

A key strength of the interview sample is the diversity of commercial, operational and sustainability roles represented. This improves triangulation across disciplines, although the small sample size of 5 limits generalisation which is consistent with Bell and Waters (2018) who acknowledge that qualitative studies prioritise depth over breadth.

4.2 – Practical and Operational Limitations in achieving net zero

4.2.1 – Practical and Operational Barriers to achieving net zero

Interviewee 1:	I'd say it's become significantly more embedded over the past few years, but I wouldn't go as far as saying it's fully integrated. At tender stage, sustainability is definitely a key consideration—particularly when clients set specific carbon targets or require embodied carbon assessments. However, once a project moves into delivery, there is often a tension between maintaining those ambitions and managing
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	cost certainty. In practice, commercial pressures can result in sustainable options being challenged or, in some cases, value engineered out if they're not considered financially viable.
Interviewee 2:	It's definitely becoming more prominent, but I'd say it's still somewhat secondary to programme and delivery pressures. A lot of the sustainability agenda is driven by client requirements rather than internal drivers. On-site, the priority is still getting the job built safely, on time, and within budget, and sometimes sustainability can feel like an additional constraint rather than something fully embedded in decision-making.
Interviewee 4:	It's definitely a key consideration at tender stage, but the reality is that cost competitiveness still drives most decisions. If a sustainable option is significantly more expensive, it's unlikely to be adopted unless the client specifically requires it.
Interviewee 5:	On-site, it's not really the main focus. The priorities are still safety, programme, and productivity. Sustainability is there, but it's not always practical.

Figure 4.2.1 – Comments on Extent of net zero in current roles

A significant theme emerging from the interviews was the disconnect between strategic sustainability ambitions and operational delivery realities. Figure 4.2.1 demonstrates that Interviewees 1,2,4 and 5 all recognised sustainability as increasingly important, yet none viewed it as fully embedded in day-to-day project decision-making. This is significant because it demonstrates that net zero is still positioned alongside rather than within traditional project success metrics. Interviewee 2 stated “the priority is still getting the job built safely, on time and within budget.” This strongly supports the literature of Pomponi and Moncaster (2017), who argue that construction remains fundamentally driven by time, cost and quality frameworks with sustainability being a secondary target. Interviewee 5 reinforced the operational reality stating, “sustainability is there, but it's not always practical.” This aligns with the ICE (2023), which identifies construction sites as inherently difficult environments for implementing low-carbon strategies due to their temporary and variable nature. Critically, whilst policy frameworks suggest sustainability integration is progressing (HM Government, 2022), the interview findings suggest implementation maturity remains inconsistent. This creates a significant implementation gap between strategic intent and practical delivery. This supports the argument by UKGBC (2021) that net zero remains heavily policy led rather than operationally embedded in the processes of Main Contractors.

However, Interviewee 3 presented a contrasting perspective describing net zero as “central to everything I do.” This divergence is important as it suggests net zero integration could be role dependent rather than company wide across a Main Contractor. This could create internal fragmentation though whereby sustainability specialists may drive carbon strategy, but operational teams continue to prioritise traditional project KPIs. This contradicts RICS (2024), which suggests that sustainability

is becoming fully integrated into project management functions. The findings therefore suggest that sustainability integration remains siloed rather than holistic.

4.2.2 – Limitations of Electric Plant, Vehicles and Machinery

All interviewees were asked whether they've experienced limitations when implementing electric plant, vehicles or machinery on site and there were three themes that emerged from the responses in figure 4.2.2.1, being availability, cost and charging infrastructure.

Interviewee 1:	The main limitation from a commercial perspective is availability and cost. Electric plant is still relatively limited in the UK market, which reduces competition and drives up hire rates. There are also uncertainties around residual value and long-term performance, which makes procurement riskier compared to conventional diesel plant.
Interviewee 2:	From a delivery point of view, the biggest issue is operational practicality. Charging infrastructure is not always readily available on sites, especially in early enabling works. This creates dependency on site setup and can limit flexibility in how plant is deployed across different areas of the project.
Interviewee 3:	We tend to see limitations around scalability and supply chain readiness. While electric solutions exist, they are not yet available across all plant categories at the scale required for major projects. This makes full substitution difficult, particularly on large infrastructure schemes.
Interviewee 4:	The key limitation is cost certainty. When pricing tenders, electric plant rates are often higher and less predictable due to limited market data. This makes it difficult to benchmark against traditional plant and increases estimating risk allowances.
Interviewee 5:	In practice, the main issue is reliability and downtime. If equipment runs out of charge or charging points are not efficiently managed, it can cause delays and disrupt sequencing of works.

Figure 4.2.2.1 – Comments on limitations implementing electric plant, vehicles and machinery

Interviewee 1 highlighted the limited market maturity in the industry stating that “Electric plant is still relatively limited in the UK market.” This supports ICE (2023) when reviewing literature as they identified OEM supply limitations as a major barrier. From a commercial perspective Interviewee 4 reinforced this commenting “electric plant rates are often higher and less predictable.” This also supports RICS (2024) which identifies immature market pricing as a major commercial barrier. Interviewee 2 highlighted the infrastructure limitations in the construction industry “charging infrastructure is not always readily available.” This directly supports National Grid ESO (2023), which identifies grid constraints as a major barrier to electrification.

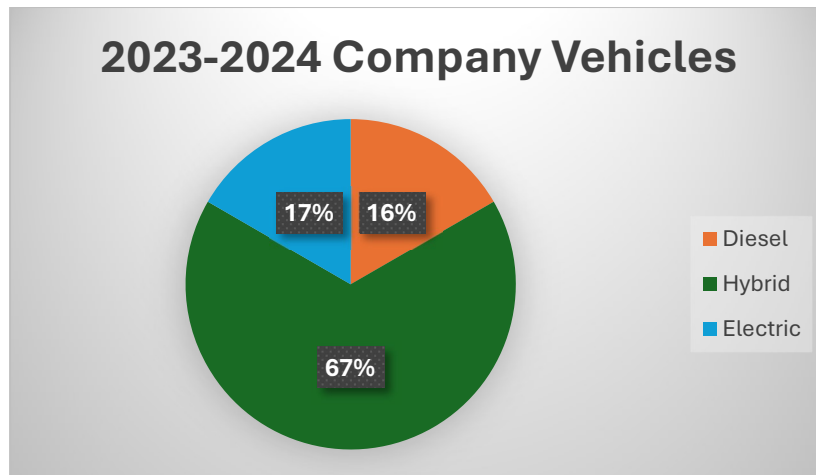


Figure 4.2.2.2 – 2023-2024 Company Vehicles (Fleet Data)

This is further evidenced through internal fleet electrification data, which identified a significant increase in electric company cars from 3 vehicles in 2023–2024 (Figure 4.2.2.2) to 12 vehicles in 2024–2025 (Figure 4.2.2.3), resulting in average emissions reducing from 110.5g/km to 49.9g/km. However, during the same period, electric van adoption remained minimal, increasing from zero to only one vehicle whilst diesel vans remained the dominant operational vehicle type. This demonstrates that whilst electrification is achievable for light-duty management vehicles with predictable routes and lower payload requirements, the transition becomes considerably more challenging for operational fleet vehicles due to increased mileage, payload demands and operational dependency. This directly reinforces Interviewee 3’s concerns regarding scalability and supply chain readiness, evidencing that electrification progress remains uneven across different vehicle and plant categories.

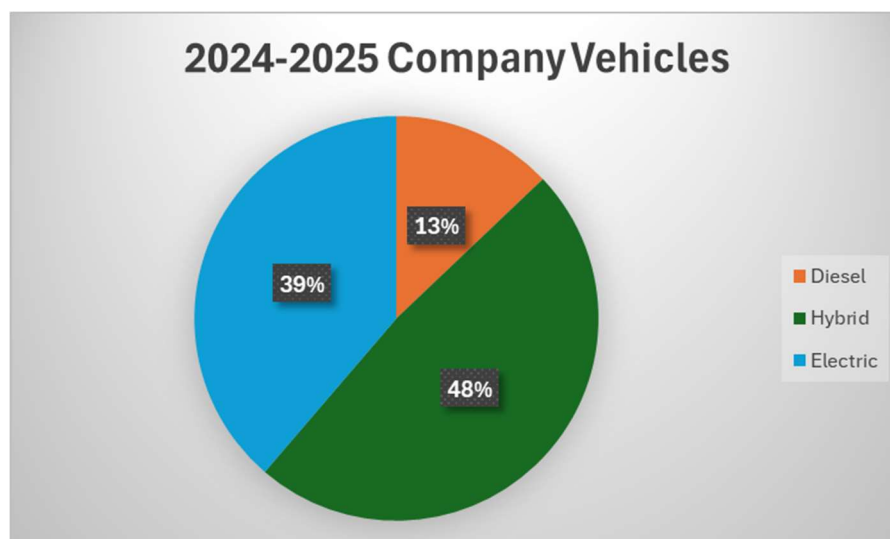


Figure 4.2.2.3 – 2024-2025 Company Vehicles (Fleet Data)

There is a strong consistency between the literature and primary data that has been gathered within this field. All interviewees acknowledged the operational difficulties

associated with charging and all would have significant costs associated to decrease these difficulties. This validates Carbon Trust (2022), who identified charging downtime as a productivity risk to main contractors. The internal fleet data further supports this by evidencing that adoption has been concentrated within vehicle categories where charging downtime can be more easily managed operationally, whereas higher utilisation fleet categories continue to rely on diesel-powered alternatives.

Critically however, the literature tends to suggest that whilst there are shortfalls, there is equally an inevitable progression in the electrification of the construction industry. It is clear from the primary data though that within the industry people are not yet fully familiar with these operational changes and continue to have reliability concerns, as Interviewee 5 noted, “if equipment runs out of charge, it can cause delays.” This suggests the literature may underestimate site-level operational dependency on plant uptime and overestimate the short-term feasibility of full electrification across construction operations. Whilst progress is evident in light fleet electrification, the practical limitations surrounding infrastructure, cost certainty, equipment availability and operational reliability remain significant barriers to wider adoption of electric plant and machinery within the sector.

4.2.3 – Cost Implications of Low-Carbon Technologies

All interviewees were asked what they considered to be the main practical challenges in achieving net zero on construction projects.

Interviewee 1:	From a commercial perspective, the biggest challenge is the lack of reliable cost data. Traditional materials and methods have well-established benchmarks, whereas low-carbon alternatives don’t always have that same level of maturity. That introduces a level of risk in pricing. There’s also a lack of standardisation in how embodied carbon is measured, which makes it difficult to compare like-for-like options. Ultimately, it creates uncertainty, and the industry isn’t particularly comfortable operating in that space.
Interviewee 4:	The biggest issue is the competitive nature of tendering. There’s very little incentive to include higher-cost sustainable solutions if it risks losing the job.

Figure 4.2.3.1 – Comments on Practical Challenges in achieving net zero

Cost emerged as the strongest and most consistent obstacle across all interviewees. Interviewee 1 described a lack of reliable cost benchmarking stating “low carbon alternatives don’t always have that same level of maturity.” This strongly supports RICS (2024), which identify pricing immaturity as a key barrier. Interviewee 4 reinforced competitive tendering pressure stating “there’s very little incentive to include higher cost sustainable solutions.” This statement heavily supports Latham (1994), whose critique of lowest cost procurement remains highly relevant, this finding is significant because it suggests that despite modern procurement methods, commercial

behaviours remain fundamentally cost driven. This contradicts HM Government (2022) which advocate value-based procurement. In reality, interviewees suggest price competitiveness remains dominant which reveals a gap between procurement policies and procurement practices.

In addition, interviewees were asked whether the transition to lower carbon equipment significantly increases project costs.

Interviewee 3:	I think there's a misconception that sustainability always increases cost. If you take a lifecycle approach, that's not necessarily the case. The issue is that the industry is still heavily focused on capital cost rather than whole-life value.
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Figure 4.2.3.2 – Comments on lower carbon equipment and the costs associated

Interviewee 3 provides an important counterpoint stating, “if you take a lifecycle approach, that’s not necessarily the case.” This supports ISO 15686-5 (2017), which promotes whole-life value. However, Interviewee 3 was the only respondent strongly advocating lifecycle thinking. This suggests whole life costing remains conceptually accepted but practically underutilised. This supports Kelly, Male and Graham (2014).

4.3 – Supply Chain Influence on Net Zero Delivery

4.3.1 – Supplier Capability and Availability

Supply chain capability emerged as a key dependency in Main Contractors achieving the drive for net zero. Interviewees were asked how the supply chain influences your organisation’s ability to meet net zero targets. Initially Interviewee 1 stated that “the supply chain is a critical dependency” which supports the UKGBC (2021) that argues that contractors are inherently constrained by upstream material producers and downstream logistics providers which limit their ability to unilaterally reduce carbon emissions. However, critically the interview data suggest this dependency is not merely influential but potentially determinative, meaning that contractor-led sustainability strategies may be structurally capped by supply chain maturity rather than enhanced by it. UKGBC (2021) frames the supply chain as an enabler of decarbonisation but can also function as a constraint to the Main Contractor limiting the extent to which carbon reductions can realistically be achieved on live projects. Interviewee 3 reinforced this dependency on the supply chain stating “if the supply chain isn’t engaged, it becomes very difficult” which aligns with BRE (2022) highlighting the lack of consistent Environmental Product Declarations and variability in supplier carbon reporting. Although, the interview data extends this argument by suggesting that difficulty is not simply an administrative inconvenience but a decision making impairment, in practice uncertainty in supplier carbon data reduces the ability of Quantity Surveyors and estimators to confidently evaluate alternatives on a like-for-like basis. A critical theme emerging across Interviewees 1 and 3 was the lack of standardisation in embodied

carbon data, particularly at procurement stage. This strongly reinforces BRE (2022), which critiques the inconsistency and incomparability of EPDs across material suppliers. However, the interviews highlight a deeper commercial consequence not fully articulated in existing literature: data inconsistency directly undermines cost planning reliability.

From a Quantity Surveying perspective, this creates a level of uncertainty as it provides cost uncertainty with price volatility in low carbon alternatives and also carbon uncertainty with the lack of comparable embodied carbon benchmarks. This weakens decision making and increases reliance on conservative risk allowances within tenders submitted by Main Contractors. This directly challenges PAS 2080 (BSI, 2016) which assumes that value chain integration will enable structured carbon management. Although, in practice the findings suggest that this is conceptually promoted but operationally incomplete. The absence of consistent data standards means that integration exists more as an aspirational framework than a functional commercial tool.

As a result, even where main contractors are willing to adopt low carbon solutions, the lack of supplier data restricts meaningful comparison which effectively force decisions back towards conventional materials with established benchmarks. This reinforces a structural inertia within procurement systems that favours traditional carbon materials due to their predictability rather than their sustainability performance.

4.3.2 – Collaboration between construction professionals

All interviewees were asked whether there's anything else they believe is important regarding the costs and practical implications of achieving net zero from a main contractor's perspective.

Interviewee 2:	There needs to be better collaboration between designers, contractors, and suppliers. A lot of inefficiencies come from late-stage changes driven by sustainability requirements.
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Figure 4.3.2 – Comments on other important points surrounding net zero emissions

Collaboration between designers, contractors, and suppliers was consistently identified as insufficiently developed, despite being widely promoted in both academic and policy literature as essential for net zero delivery. Interviewee 2 stated “There needs to be better collaboration between designers, contractors, and suppliers” which aligns strongly with Smyth and Pryke (2008), who advocate integrated procurement models such as alliancing and Early Contractor Involvement (ECI) as mechanisms for improving coordination and sustainability outcomes. However, the interview findings suggest that despite widespread theoretical support, collaborative procurement remains inconsistently applied in practice. This creates a clear divergence between procurement theory and procurement reality. This gap indicates that procurement reform has been largely procedural rather than structural. While frameworks such as

two-stage tendering (HM Government, 2022) formally encourage early engagement, the interviews suggest that commercial behaviours continue to reflect traditional adversarial procurement cultures, particularly in competitive tender environments. The persistence of late-stage design changes and fragmented decision-making reinforces inefficiencies in carbon reduction strategies. This is significant because late stage sustainability interventions are inherently less effective, as the majority of embodied carbon is locked in during early design decisions (HM Government, 2022). Therefore, failure to embed collaboration early does not merely reduce efficiency but it fundamentally limits carbon reduction potential.

In summary, the findings suggest that procurement structures alone are insufficient to drive collaboration unless accompanied by cultural and behavioural change within the construction industry. This challenges the implicit assumption within literature that procurement model selection alone such as two-stage tendering guarantees improved sustainability outcomes. Instead, the evidence suggests that collaboration is structurally enabled but behaviourally constrained, meaning that even collaborative procurement routes can reproduce fragmented working practices if organisational incentives remain cost and programme driven.

4.4 – Evolution of Quantity Surveyors and Tendering Practices

4.4.1 – Bid Evaluation Criteria and Sustainability Weighting

All interviewees were asked whether they believe that strong net zero commitments improve a main contractors likelihood of winning work.

Interviewee 1:	Yes, particularly with clients who have clear sustainability targets. It can be a differentiator, but it is rarely the sole deciding factor.
Interviewee 2:	It helps, but only when combined with competitive pricing and a strong delivery track record.

Figure 4.4.1 – Comments on net zero commitments link to tender success

A consistent theme across all interviews is that sustainability increasingly enhances competitiveness but does not independently determine tender outcomes. Interviewee 1 stated that “it can be a differentiator, but it is rarely the sole deciding factor.” This aligns with CCBP (2025), which suggests sustainability acts as a differentiating factor primarily in highly competitive bids where cost differences are marginal.

Interviewee 2 reinforced this commenting that “only when combined with competitive pricing.” This strongly supports HM Government (2022), which emphasises multi-criteria evaluation frameworks rather than single-factor selection. The findings challenge more optimistic interpretations in the literature that suggest net zero

commitments significantly improve tender success rates. Instead, the evidence indicates that sustainability functions as a secondary differentiator rather than a primary award determinant. This is particularly evident in private sector procurement, where cost certainty and programme reliability continue to dominate decision-making frameworks. In contrast, sustainability appears to have greater influence only in contexts where procurement frameworks explicitly weight environmental performance, typically within public sector or institutional clients.

This suggests that the commercial value of sustainability is context-dependent rather than universal and therefore cannot yet be considered a standalone competitive advantage in most tendering environments.

4.4.2 – Procurement success

All interviewees were asked if they’ve seen examples of where sustainability performance has been a deciding factor in a tender outcome.

Interviewee 1:	Yes, particularly on public sector frameworks where carbon reduction targets are heavily weighted in the scoring model.
Interviewee 2:	Yes, but these are still relatively limited compared to traditional cost-led decisions.
Interviewee 3:	Yes, especially where clients have strong ESG frameworks embedded into procurement decisions.

Figure 4.4.2 - Comments on procurement success

Interview data consistently highlighted public sector frameworks as the most advanced in integrating sustainability criteria into procurement decision-making. Interviewee 1 stated “where carbon reduction targets are heavily weighted.” This directly supports UKGBC (2021), which identifies public sector procurement as a key driver of market transformation due to its ability to embed ESG requirements into formal scoring frameworks. HM Government (2022) further reinforces this through the Construction Playbook, which mandates value-based procurement approaches and increased consideration of whole-life outcomes. Although, the interviews also suggest that this advancement is not mirrored in the private sector. Instead, private procurement remains predominantly cost-led and risk-averse, with sustainability acting as a secondary consideration unless explicitly mandated by clients. This divergence is a significant finding because it suggests that net zero adoption is not uniform across the construction industry but instead varies according to procurement governance structures.

5.0 - Chapter 5 – Conclusion

5.1 – Scope of Chapter

This chapter concludes the dissertation by drawing together the key findings from the literature review and primary research in relation to the research aim and objectives. It critically evaluates the extent to which the objectives have been achieved and reflects on the wider implications for main contractors operating within the UK construction industry. The chapter also consolidates the relationship between operational constraints, procurement practices and commercial competitiveness in the context of net zero delivery, providing a final conclusion on the practical and cost implications of achieving net zero from a main contractor's perspective.

5.2 – Conclusion of Objectives

5.2.1 - Objective 1: To investigate and evaluate the practical and operational limitations associated with implementing net zero initiatives, including electric plant, vehicles, machinery and supply chain constraints.

The findings confirm that substantial practical and operational barriers continue to restrict the implementation of net zero initiatives at project delivery level. Whilst both the literature and interview findings demonstrate increasing strategic commitment towards decarbonisation, the research identifies a significant implementation gap between policy ambition and operational reality. The adoption of electric plant and machinery remains constrained by three principal barriers: limited market availability, inadequate charging infrastructure, and increased commercial risk. Interviewees consistently identified concerns surrounding reliability, operational downtime, and higher hire costs, reinforcing literature which argues that electric plant technology remains immature in comparison to diesel alternatives.

Furthermore, the research demonstrates that supply chain capability remains a critical dependency in achieving carbon reduction targets. Main contractors remain heavily reliant on supplier maturity, product availability, and consistent embodied carbon data to make informed procurement decisions. However, inconsistencies in Environmental Product Declarations (EPDs), volatile material pricing, and limited low-carbon product benchmarking create both cost uncertainty and decision-making inefficiencies. Critically, the findings suggest that supply chain immaturity does not merely slow progress towards net zero but structurally limits the ability of main contractors to deliver it in practice.

This objective has therefore been fully achieved, establishing that operational practicality remains one of the greatest barriers to achieving net zero and that the

transition to lower-carbon construction methods remains constrained by both technological and supply chain limitations.

5.2.2 - Objective 2: To examine how quantity surveying and tendering practices are evolving to integrate net zero requirements within procurement and bid evaluation processes

The research confirms that quantity surveying and tendering practices are evolving in response to increasing net zero obligations, although this evolution remains inconsistent across the industry. The literature identified a clear shift away from traditional capital-cost focused procurement towards broader whole-life value considerations, integrating embodied carbon assessments and sustainability criteria into tender documentation. Primary findings supported this shift, particularly in relation to public sector procurement and framework agreements where carbon reduction targets are becoming increasingly embedded within evaluation criteria.

However, despite this structural evolution, the findings demonstrate that cost remains the dominant commercial driver within procurement decision-making. Interviewees consistently identified that sustainable alternatives remain vulnerable to value engineering where capital costs are significantly higher. This highlights a key contradiction between procurement theory and procurement practice. Whilst government guidance and industry frameworks advocate value-based procurement, practical decision-making remains heavily influenced by cost certainty and programme risk.

The role of the Quantity Surveyor has clearly expanded beyond traditional cost management functions into a more integrated cost and carbon advisory role. However, the research suggests that this transition is still developing and is constrained by a lack of standardised carbon measurement frameworks and limited commercial confidence in low-carbon alternatives. This objective has therefore been achieved, demonstrating that procurement practices are evolving, but not yet fully aligned with net zero ambitions.

5.2.3 - Objective 3: To assess whether demonstrating a commitment to net zero provides main contractors with a competitive advantage during the tender process.

The findings suggest that demonstrating strong net zero commitments can provide a competitive advantage, although this advantage remains conditional rather than absolute. The primary data revealed that sustainability credentials increasingly act as a differentiating factor within tender submissions, particularly where procurement frameworks formally allocate weighting to carbon reduction, ESG performance and social value. This was particularly evident within public sector frameworks, where

sustainability requirements are now more embedded within formal bid evaluation criteria.

However, the findings also demonstrate that sustainability alone is rarely sufficient to secure work. Competitive pricing, programme certainty, and delivery capability remain the dominant determinants of tender success. This suggests that net zero commitment currently functions as a secondary competitive differentiator rather than a primary award determinant. In private sector procurement, where cost-led decision-making remains more prevalent, the commercial return on sustainability investment appears less immediate and less measurable.

Critically, the research establishes that sustainability investment should be viewed as a long-term strategic commercial investment rather than an immediate financial advantage. Whilst upfront investment in carbon reporting systems, sustainable materials and low-carbon methodologies may increase tender costs, longer-term benefits such as improved framework access, stronger client relationships and enhanced market positioning may justify this expenditure. This objective has therefore been achieved, concluding that net zero commitment can improve competitiveness, but only where procurement environments are structured to recognise and reward it.

5.3 – Summary

Overall, this dissertation concludes that achieving net zero within the UK construction industry remains a complex challenge for main contractors due to the interconnected relationship between operational practicality, supply chain maturity and procurement structures. Whilst the strategic direction towards decarbonisation is clear and increasingly unavoidable, practical implementation remains constrained by technological limitations, cost pressures and fragmented supply chain capability.

The research highlights that the construction industry remains fundamentally rooted in traditional project success criteria of cost, time and quality, with sustainability often positioned as an additional objective rather than a core operational principle. Although procurement reform and evolving quantity surveying practices are beginning to embed carbon considerations into decision-making, commercial behaviours remain heavily cost-driven.

The study ultimately concludes that the transition towards net zero will require more than policy frameworks and procurement reform alone. It will require market maturity, supply chain standardisation, earlier collaboration between project stakeholders, and a wider cultural shift within the construction industry towards whole-life value thinking. Until these structural and behavioural changes occur, the achievement of net zero will remain commercially and operationally challenging for main contractors.

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8.0 – Appendices

8.1 – Appendix A – Semi Structured Interview Questions

1. What is your current role within the construction industry?

2. How long have you worked within main contracting?
3. To what extent is sustainability or net zero considered within your current role?
4. What do you consider to be the main practical challenges in achieving net zero on construction projects?
5. What limitations have you experienced when implementing electric plant, vehicles, or machinery on site?
6. How do these limitations affect project cost, programme, and site logistics?
7. In your opinion, does the transition to lower-carbon equipment significantly increase project costs? If so, in what areas?
8. How does the supply chain influence your organisation's ability to meet net zero targets?
9. How has the tendering process changed in recent years in relation to net zero and sustainability requirements?
10. Are carbon reduction targets, sustainability statements, or embodied carbon assessments now included within tender submissions?
11. From a QS or estimating perspective, how are net zero requirements reflected in pricing and cost planning?
12. Have clients begun to place greater weighting on sustainability credentials during bid evaluation?

13. Do you believe that strong net zero commitments improve a main contractor's likelihood of winning work?

14. Have you seen examples where sustainability performance has been a deciding factor in a tender outcome?

15. In your opinion, does the commercial benefit of pursuing net zero outweigh the associated costs?

16. Is there anything else you believe is important regarding the costs and practical implications of achieving net zero from a main contractor's perspective?