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UNIVERSITY OF THE
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JOHANNESBURG

Assessing perceptions of environmental management in the construction industry: a case study of construction companies in the Gauteng Province

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A DISSERTATION SUBMITED TO THE FACULTY OF SCIENCE, UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG, IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES

School of Geography, Archaeology and Environmental Studies

Supervisor:

Dr Nzalalemba Serge Kubanza

DECLARATION

I, Rhulani Hlungwane (2755769), affirm that the work contained in this dissertation is my own work. I acknowledge that Artificial Intelligence (AI) tools were employed for formatting assistance, grammar refinement and improving the clarity of academic writing. I also attest that all sources of material used have been duly acknowledged. This dissertation, which is being submitted for the Master of Science in Environmental Science degree requirements, has not been submitted for a different qualification at a different institution.



Rhulani Hlulani Hlungwane

18 October 2025

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ABSTRACT

This study looks into the perceptions of construction industry professionals working for grade 9 CIDB registered companies within the Gauteng Province of South Africa. Given that construction is not only of high economic value but also of high environmental impact, understanding the perceptions of construction professionals regarding their obligation towards the environment is crucial for ensuring sustainability in the construction industry. Informed by Stakeholder Theory, Institutional Theory and the Theory of Planned Behavior, the investigation used a quantitative cross-sectional design entailing structured questionnaires among Environmental Officers (EOs) and Project Managers (PMs). There were 66 valid responses (35 EOs and 31 PMs) which were analyzed with descriptive and inferential statistics.

Respondents showed a very high sense of consciousness and positive attitudes towards environmental regulations, with a 90% of them rating compliance at "extremely important." Yet environmental practice application remains reactive and inconsistent, with prevalence of the obsessions of audits rather than inherent commitment. Key inhibitions reported were lack of funds, insufficiency of commitment by management, lack of coordination and ambiguity of regulations. Notably, cost perception was a key inhibition reported and environmental compliance was viewed as an added cost burden.

The study concludes that while environmental stewardship commitment at the theoretical level does exist, application is limited by structural, institutional and perceptual problems. Its recommendation for greater policy conformity, capacity building initiatives and organizational leadership acts to promote mainstreaming of sustainable construction practice. Such a result seeks to bring environmental policy closer to on-site practice for South Africa's construction industry.

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ACRONYMS AND ABBREVIATIONS

BS	British Standard
CIDB	Construction Industry Development Board
EM	Environmental Management
EMP	Environmental Management Plan
EMS	Environmental Management System
GDP	Gross Domestic Product
ISO	International Organization for Standardization
SACPCMP	South African Council for the Project and Construction Management Professions
SMEs	Small and Medium-sized Enterprises
TPB	Theory of Planned Behavior

CHAPTER 1:

INTRODUCTION

1.1 Introduction

South Africa became a democratic country in 1994, which brought a new and inclusive constitution (South African Parliament, 1996). Its constitution gives citizens their rights, including section 24 which mandates that everyone should be in an environment that does not endanger their health and well-being. It represents environmental protection for the benefit of present and future generations through avoiding pollution as well as degradation of the ecosystem (South African Parliament, 1996).

Due to the numerous materials needed and the unique aspects of its operations, the construction industry has a substantial negative impact on the environment (Campos et al., 2016). Kein et al., (1999) argue that although environmental preservation is crucial for construction companies, it is not a top issue. Working procedures in the construction sector typically place higher importance on immediate profits than on long-term benefits like environmental management (Abdul Khalim & Lee, 2020). Over the past two decades, there have been enormous advances in environmental management. (Campos et al. 2016). Companies today employ different stances towards environmental issues: some take reactive measures, concentrating on pollution management and seeking to follow the law and nothing more, while others invest in new goods and technology and take a proactive approach. (Campos et al. 2016). In the developing world, integrating environmental concerns in construction is not very common because most construction companies are motivated by immediate cost-benefit analyses (Onkangi et al., 2018). This could be attributed to the perceptions that management of construction companies have towards environmental management as demonstrated in the literature review where others view it as making good business sense (Ololade & Rametse, 2018) while others are hesitant to adopt sustainability (Gehlot & Shrivastava, 2022). This study sets out to assess these perceptions towards environmental management in the construction

industry, particularly construction companies found in the Gauteng Province of South Africa.

1.2 Problem Statement

The construction industry is widely recognized as a major driver of economic development (Tafesse et al., 2022). The South African construction industry contributed about R109.5 billion in the fourth quarter of 2023 (Giel, 2024), however, the construction industry is also consistently identified as one of the largest contributors to environmental degradation (Farouq et al., 2017; Zhang et al., 2022). Construction activities generate multiple impacts, including land disturbance, air and noise pollution, excessive waste generation, and biodiversity loss, all of which pose significant threats to sustainable development (Ametepey & Ansah, 2014; Zolfagharian et al., 2012). While international standards such as British Standard (BS) 7750 and International Organization for Standardization (ISO) 14001 have promoted environmental management systems (EMS) since the 1990s (Chen & Li, 2006), studies show that many construction companies, particularly in developing contexts, adopt these practices superficially, focusing on compliance audits rather than proactive integration of sustainability into operations (Campos et al., 2016; Ololade & Rametse, 2018). This highlights a persistent gap between awareness of environmental issues and their consistent implementation on project sites.

In South Africa, the Construction Industry Development Board (CIDB) has registered over 5,000 companies throughout the country, with a significant proportion operating in Gauteng Province (CIDB, 2025). Although some large companies have adopted EMSs and publish sustainability reports, smaller and medium-sized companies frequently struggle with limited resources, weak enforcement, and competing economic pressures (Maubane et al., 2014; Green, 2023; Smallwood, 2023). As a result, environmental management is often perceived as an added financial burden rather than a long-term investment in reducing risks and improving efficiency (Ifije & Aigbavboa, 2020). This perception of cost as a barrier is critical, because it directly influences decision-making

on whether environmental measures are implemented consistently across the construction project lifecycle.

Despite these challenges, construction professionals, particularly project managers and environmental officers, play a central role in shaping compliance with environmental regulations, evaluating project impacts, and balancing cost considerations. Yet existing studies have paid limited attention to their perceptions, especially in South Africa, where empirical evidence on how these professionals view regulatory frameworks, life-cycle environmental impacts, and cost implications remains scarce (Mbala et al., 2019; Ncube & Cloete, 2015). Without such insights, environmental governance risks remaining detached from practice, and opportunities for mainstreaming sustainability in construction projects may be lost. Against the background of the problem statement above, the current work shall be informed by the following questions of investigation:

I. How do construction professionals in Gauteng perceive and interpret environmental regulations, and how do these perceptions influence compliance behaviour?

II. What are construction professionals' perceptions of environmental impacts across the different stages of the construction project lifecycle (planning, execution, and decommissioning)?

III. How do construction professionals perceive the cost implications of implementing environmental management measures, and in what ways do these perceptions shape decision-making in construction projects?

1.3 Aim and Objectives

The aim of the study is to assess the perceptions of environmental management of the construction companies based in Gauteng Province. The overall objectives are:

I. To examine construction professionals' familiarity with and attitudes toward environmental regulations.

II. To assess how these regulatory perceptions influence compliance behaviour and decision-making in construction projects.

III. To examine construction professionals' perceptions on environmental impacts during the whole lifecycle of construction activities, emphasizing on their level of awareness, comprehension, and evaluation of prospective environmental impacts.

IV. To assess construction professionals' cost perceptions of integrating environmental considerations in construction projects including their evaluation of initial costs, future returns, and potential costs of adopting environmentally sustainable measures.

1.4 Justification and Significance of the study

The construction industry contributes significantly to South Africa's economic development, contributing about R109.5 billion in the fourth quarter of 2023 (Giel, 2024) but remains one of the largest sectors contributing to environmental degradation through pollution, waste generation, and resource consumption (Farouq et al., 2017; Zhang et al., 2022). Although regulatory frameworks such as ISO 14001 and national environmental legislation have been introduced to encourage sustainable practices, implementation often remains inconsistent, with compliance treated as an administrative obligation rather than an integrated management approach (Campos et al., 2016; Green, 2023). This gap between regulatory intention and on-site practice underscores the importance of understanding how professionals themselves perceive environmental management.

Previous research in Sub-Saharan Africa has highlighted that while construction professionals are aware of environmental impacts, adoption of sustainable practices is constrained by perceptions of high costs, weak enforcement, and insufficient institutional support (Ametepey & Ansah, 2014; Ifije & Aigbavboa, 2020; Mbala et al., 2019). In South Africa, Ncube and Cloete (2015) observed that non-compliance remains a persistent issue despite the country's strong environmental legislation, suggesting that perceptions and attitudes of practitioners may play a critical role in shaping outcomes. Yet, few empirical studies have systematically examined how environmental officers and project managers in South African construction companies view regulations, project lifecycle impacts, and cost implications, dimensions that directly influence compliance and sustainability integration.

By focusing on Gauteng Province, the country's economic hub and home to the largest number of CIDB-registered Grade 9 construction companies (CIDB, 2025), this study provides timely insights into professional perceptions within a context of high construction intensity. Understanding these perceptions is significant for two reasons. First, it

contributes to academic literature by addressing a clear gap in empirical research on environmental management perceptions in South Africa's construction sector, thereby complementing broader studies conducted in other developing economies (Gehlot & Shrivastava, 2022; Lima et al., 2021). Second, the findings carry practical value for policymakers, regulators, and industry leaders by identifying the perceptual barriers, such as cost concerns and limited awareness, that hinder effective environmental management. Addressing these barriers can help align national sustainability policies with industry practice, promote capacity-building initiatives, and foster stronger compliance cultures. In sum, the study is justified by the limited empirical evidence on professional perceptions in South Africa's construction industry and is significant in offering both theoretical contributions to the literature on environmental management perceptions and practical recommendations for bridging the policy-practice gap in the construction sector.

1.5 Structure of the Research

Chapter 1: Introduction - introduces the study, outlining the background, problem statement, research aim, objectives, research questions, justification, and significance. It also presents the researcher's positionality and the structure of the dissertation.

Chapter 2: Conceptual Framework and Literature Review - reviews relevant literature, tracing global, regional, and local perspectives on environmental management in the construction industry. It defines core concepts, explores theoretical frameworks, and highlights the research gap.

Chapter 3: Methodology - describes the research methodology, including the research design, study area, population and sampling, data collection instruments, analytical procedures, and ethical considerations.

Chapter 4: Results and Discussion - presents and discusses the results of the study. Quantitative and qualitative findings are analyzed and interpreted in relation to the research questions and theoretical frameworks.

Chapter 5: Conclusion - concludes the study by summarising the key findings, drawing conclusions in relation to the objectives, and offering recommendations for policy, practice, and further research.

CHAPTER 2:

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

Construction both as utilitarian pursuits and expressions of culture trace back over 12,000 years to Neolithic times when early humans first built fixed shelters (Scarre, 2013). Ancient societies like Egypt, Mesopotamia, Greece and Rome advanced construction processes considerably exemplified through the building of Pyramids of Giza (~2600 BCE), ziggurats at Mesopotamia and Roman aqueducts illustrate the evolution of mega scale engineering, employing standard components and planned labor systems (Childe, 1950).

Construction today has been transformed by digital technology, automation, and more attention paid to sustainability and green design, which shows an integrated and environmentally conscious approach (Kibert, 2016).This chapter will look at what other researchers have discovered on environmental management among construction professionals in developing countries, Sub-Saharan Africa and as well as South Africa and will seek to explore and review environmental management perceptions among construction professionals across these varied nations. Due to numerous materials needed and unique aspects of its operations, the construction industry tends to cause extensive environmental harm (Campos et al., 2016) and understanding sector perceptions assists in identifying current challenges, knowledge gaps, and where there are opportunities for improving environmental care throughout the sector.

2.2 Definition of concepts

2.2.1 Environment

The environment comprises all external biotic and abiotic factors surrounding and affecting an organism, activity, or system (Brundtland, 1987). For this study, only natural and built ecosystems affected by construction activities in Gauteng are included. These are air quality, water sources, biodiversity, land use and waste management systems (Brundtland, 1987; Glasson et al., 2012; UN Environment, 2019). The study acknowledges that construction work is an interactive environmental interface where environmental quality relies on on-site decisions among contractors and project managers.

2.2.2 Environmental Management

Environmental management (EM) is conceived here as an integrated procedure of designing, applying, monitoring and perfecting techniques and practices for reducing environmental impact of human activity while promoting sustainability (Barrow, 2005; Mikkelsen, 2005; Petts, 1999). It is an integration of policy instruments, planning tools and operational mechanisms. Effective environmental management in the construction industry involves integration into core business processes and alignment across regulatory frameworks, stakeholder expectations and organizational culture (Barrow, 2005). Environmental management here refers to tools, policies, practices and mindsets that construction organizations develop for reducing their environmental impact. These vary from site-specific activities like dust control and waste management to broader strategies like embracing EMS or compliance with ISO 14001.

2.2.3 Construction Industry

The construction industry is one of the biggest sectors within the global economy, responsible for built infrastructure such as bridges, roads and utilities (Hillebrandt, 2000; H. C. Lingard et al., 2005; Ofori, 2015). Even though it has a crucial input towards employment and economic development, the construction industry is a major contributor to environmental destruction by way of habitat loss, high energy use and pollution. This study is located in Gauteng where there is a lot of construction activity taking place and therefore knowing about environmental awareness, motivations and environmental pressures among construction professionals is important. The nature of the fragmented and multi-stakeholder (with contractors, subcontractors and regulating stakeholders) industry creates further layers on how environmental management is understood and conducted.

2.2.4 Perception

Perception has to do with the psychological process of how one interprets and gives meaning to information, experiences and stimuli from the world around them (Baron & Branscombe, 2012; Robbins & Judge, 2017; Sekaran & Bougie, 2016). As far as organizational behavior and environmental management is concerned, perception has a crucial influence on decision making, attitudes and behavior, especially on the understanding and prioritization of environmental issues (Robbins & Judge, 2017). Due to individual, cultural and contextual conditioning, perception can generate differential meanings for an equal occasion or policy (Baron & Branscombe, 2012). In this study, perception encompasses how professionals interpret, value and respond to environmental management duties and chances. Perception determines whether environmental behavior is viewed as an ethical duty, regulation requirement, or business opportunity. By exploring perception, the research can identify gaps between policy and practice, identify determinants of environmental accountability and identify where awareness building or capacity building is needed.

2.3 Assessing perceptions of Environmental Management in the Construction Industry in Developing countries

The construction industry in developing countries faces a paradox: professionals increasingly recognize the importance of sustainability, yet the translation of this awareness into consistent practice is fragmented and uneven (Zeule et al., 2019). This pattern is visible across Brazil, India, Malaysia, and China, where barriers such as cost perceptions, institutional weaknesses, and skills shortages continue to undermine adoption despite a broad consensus on the need for change.

In Brazil, empirical evidence suggests that environmental certification schemes serve as critical catalysts for sustainability uptake. Zeule et al. (2019) demonstrated that certified social housing projects displayed higher sustainability adoption than uncertified ones, while Lima et al., (2021) found that 75% of companies surveyed had integrated at least one sustainability practice, ranging from waste management to energy efficiency. Yet, Lima et al., (2021) also reported that a disconnect persisted between stated values and operational practices, with company size, training, and awareness shaping the depth of adoption. This mirrors findings in other Latin American contexts where certifications enhance legitimacy but do not guarantee transformative practices (Viana et al., 2013). The Brazilian case therefore illustrates how institutional frameworks can generate external legitimacy without necessarily embedding sustainability in organizational culture.

In India, the obstacles are framed more sharply through economic viability and resource constraints. Gehlot & Shrivastava, (2022) observed that small and medium-sized enterprises (SMEs) were particularly reluctant to adopt sustainable practices, perceiving them as costly, time-consuming, and client-driven rather than strategically valuable. Their respondents cited a lack of skilled human resources, misconceptions about green technologies, and concerns about project delays. This aligns with earlier studies in South Asia which also highlighted the client's unwillingness to pay for "invisible" environmental benefits as a persistent barrier (Chang & Kumar, 2021). Collectively, these studies suggest that in India, perceptions of environmental management are tightly bound to short-term profitability and client expectations, an outlook that relegates sustainability to

the margins of project decision-making. Malaysia provides a contrasting case where external and organizational drivers outweigh individual reluctance. Yusof et al., (2016) found that regulatory requirements, customer pressure, and organizational support were the strongest predictors of environmental practice adoption, while government aid and internal compatibility played a minimal role. More recent research in the region reinforces the notion that coercive and normative pressures rather than voluntary commitments are decisive in shaping practice (Onuoha et al., 2018). This suggests that, unlike India, where sustainability is filtered through cost logics, Malaysian construction professionals often respond to institutionalized pressures and market expectations, confirming the critical role of regulatory enforcement and stakeholder alignment in shifting professional perceptions.

China illustrates the dilemma of balancing rapid economic growth with environmental responsibility. As the world's largest construction market, generating nearly half of its total solid waste through construction debris (Chang et al., 2018), the sector faces acute environmental pressures. Chang et al. (2018) revealed that companies consistently prioritized economic over social and environmental dimensions, with larger companies demonstrating higher sustainability performance than SMEs. Similar findings by Yue, (2018) and Bai et al., (2018) emphasized the contradiction between economic expansion and sustainability, noting that short-term economic imperatives frequently overshadow long-term environmental goals. More recent studies suggest a gradual shift: large state-owned enterprises have begun embedding sustainability as a strategic priority, while private companies remain constrained by cost and competitive pressures (Zhang et al., 2022). This highlights the role of firm size and ownership structures in shaping perceptions and practices.

Critical synthesis: The comparative evidence points to a common pattern: awareness of sustainability is increasingly widespread across developing countries, but implementation is constrained by context-specific barriers. Brazil demonstrates how certification can drive uptake without necessarily embedding deeper cultural change; India shows how financial constraints and client resistance limit adoption; Malaysia highlights the role of external

pressures and organizational support as decisive factors; and China underscores the ongoing tension between rapid economic growth and sustainable practices. Across these cases, the dominance of economic considerations emerges as a consistent theme, often displacing environmental concerns to secondary importance. At the same time, the evidence suggests that where strong external signals exist, whether through regulation, certification, or client demand, companies are more likely to align with sustainability objectives (Ametepey & Ansah, 2014; Campos et al., 2016; Ifije & Aigbavboa, 2020).

These findings demonstrate that in developing countries, professional perceptions of environmental management are not shaped by awareness alone but by a complex interplay of economic pressures, institutional frameworks, and organizational capacity. This underscores the importance of studying not only whether professionals recognize sustainability but also how they interpret its costs, relevance, and feasibility within their own contexts. For South Africa, particularly in Gauteng, where construction intensity is high, this comparative evidence suggests that examining professional perceptions can provide critical insights into whether environmental management is seen as a regulatory burden, an economic liability, or a strategic opportunity for long-term competitiveness.

2.4 Assessing perceptions of Environmental Management in the Construction Industry in Sub-Saharan Africa

Research from Sub-Saharan Africa highlights a persistent tension between economic development and environmental protection in the construction industry. While professionals across the region demonstrate an awareness of environmental impacts, this awareness is often undermined by systemic barriers that prevent its translation into consistent sustainable practice. In the Democratic Republic of Congo (DRC), for example, construction professionals surveyed by Mbala et al., (2019) were able to identify a wide spectrum of environmental consequences associated with construction activities, including dust and air pollution, biodiversity loss, soil erosion, and water contamination.

This ability to recognize and rank impacts demonstrates a significant level of environmental literacy. Yet, as in many other developing contexts, such knowledge has not been sufficient to embed sustainability into industry operations, suggesting that professional awareness alone is insufficient without institutional and policy support.

The Ghanaian construction industry reflects similar dynamics, where economic growth is prioritized over environmental sustainability. Ametepey & Ansah, (2014) found that professionals could readily acknowledge resource consumption, biodiversity impacts, and noise pollution as the most significant outcomes of construction activities. Their findings were reinforced by Djokoto et al., (2014), who identified unsustainable construction processes and environmental degradation as prevalent across the sector. Importantly, these scholars noted that the persistence of such practices is closely tied to barriers such as the lack of government support, limited client demand, inadequate public awareness, and the absence of effective strategies for promoting sustainability. This indicates that, in Ghana, as in the DRC, awareness of environmental consequences exists but is not matched by systemic conditions that would enable consistent environmental management.

An additional layer of complexity is evident in Ghana when considering the perspectives of different stakeholders. Ayarkwa et al., (2014) compared the views of construction professionals and local residents and found notable divergences in how environmental impacts were prioritized. Whereas professionals considered waste generation and toxic emissions to be the most critical issues, residents placed greater emphasis on dust and noise pollution, which more directly affected their daily lives. The fact that these localized nuisances were consistently underplayed by industry professionals highlights an important disjuncture: professionals may focus on broader systemic issues, while communities experience the immediate and tangible consequences of construction activities. Moreover, given the Ghana Standards Authority's explicit dust emission thresholds (GS 1236:2019) of 70 µg/m3 and 35 µg/m3 for PM10 and PM2.5 respectively is the maximum allowable dust limits, the persistence of dust related complaints could

suggest non-compliance with regulatory frameworks, underscoring the limited enforcement capacity within the sector.

Nigeria provides a further illustration of the gap between formal institutions and actual practice. Despite the establishment of the Federal Environmental Protection Agency in 1988, ecological decline continues to erode a significant share of the country's gross domestic product (GDP) (Jegede, 2020). Although construction professionals recognize the importance of environmental management, barriers such as lack of customer awareness, additional costs, and insufficient appreciation of sustainability's benefits persist (Ifije & Aigbavboa, 2020). These findings reinforce the idea that regulation alone is inadequate if it is not backed by effective enforcement, financial incentives, and a shift in client expectations. In this respect, Nigeria's case echoes patterns observed in Ghana and the DRC, where professional awareness is constrained by weak institutional frameworks and economic disincentives.

Zambia, however, provides a somewhat different perspective. (Aghimien et al., 2018) reported that while the country's construction sector had expanded at an impressive rate of 17.5% annually, it was plagued by escalating costs, policy deficits, and the absence of green certification systems. Yet unlike in Nigeria, Zambian professionals ranked lack of financial incentives and regulatory support above knowledge gaps as barriers, suggesting that they were already relatively well informed about sustainability issues (Aghimien et al., 2018). This indicates that in Zambia, the principal challenge lies not in raising awareness, but in creating enabling institutional conditions, through certification schemes, policy frameworks, and financial mechanisms, that would allow professionals to act on their knowledge.

Across these Sub-Saharan African contexts, several patterns emerge. Professionals are generally capable of identifying the environmental consequences of construction, but the adoption of sustainable practices is systematically undermined by a combination of weak government support, cost concerns, and limited institutional infrastructure. At the same

time, differences across countries highlight the importance of context. In Ghana and the DRC, the gap between awareness and adoption is pronounced, while in Nigeria institutional fragility and cost perceptions dominate. In Zambia, by contrast, professionals appear more aware of sustainability imperatives, but the absence of systemic support inhibits progress. What unites these cases is the consistent subordination of environmental considerations to economic imperatives, reflecting a broader regional pattern in which rapid development goals overshadow ecological responsibilities.

Taken together, the literature suggests that awareness of sustainability is a necessary but insufficient condition for environmental management in Sub-Saharan Africa. Without stronger government support, stricter regulatory enforcement, and the introduction of financial incentives and certification systems, professional knowledge is unlikely to translate into sustainable practice. Furthermore, greater attention needs to be paid to the perspectives of local communities, whose lived experiences of construction-related nuisances highlight gaps in compliance and enforcement that professionals often overlook. The Sub-Saharan evidence therefore underscores the need for an integrated approach that combines professional awareness with structural reforms, economic incentives, and stakeholder engagement to address the persistent awareness practice gap in the region's construction industries.

2.5 Assessing perceptions of Environmental Management in the Construction Industry in South Africa

South Africa's construction industry is distinctive within the Sub-Saharan African context due to its comparatively well-developed environmental regulatory framework (Lumby, 2005). Environmental authorizations are mandatory for most projects, and these approvals are accompanied by strict conditions designed to mitigate potential ecological impacts (Ncube & Cloete, 2015). Despite this, enforcement gaps remain. Ncube and Cloete (2015), in their compliance study of 100 building developments in Gauteng, identified recurrent violations, particularly in failing to comply with stipulated conditions in

the environmental authorization and neglect of environmental management during construction phases. These findings suggest that while the legal framework is strong on paper, implementation remains inconsistent, reflecting a broader trend in which regulation is necessary but insufficient without robust monitoring and contractor buy-in (Ncube & Cloete, 2015). Audit reports from large-scale projects provide a more nuanced perspective on industry compliance and perceptions of environmental responsibility. Projects such as the Golden Valley wind energy facility, the Leeufontein sub-station, and the King Shaka International Airport taxiway extension all demonstrated high levels of compliance with environmental authorizations (CES, 2019; Green Gold Group, 2018; PB Consult, 2021; Thembeka Environmental Consulting, 2020; MuTingati Environmental Consulting, 2017). These cases suggest that where oversight is strict and reputational stakes are high, companies demonstrate strong commitment to compliance. This contrasts with smaller housing projects, where Ncube and Cloete (2015) observed neglect and non-compliance. The divergence highlights a common theme in South Africa: larger, higher profile companies or projects often perceive environmental compliance as part of their social licence to operate, while smaller contractors may view it as a secondary concern (Green, 2023). At the corporate level, there is evidence of a gradual cultural shift towards embedding sustainability into organizational governance. Ololade & Rametse, (2018) found that managers in a Johannesburg-based construction company recognized their companies' environmental impacts, particularly in relation to resource consumption and emissions. They also perceived EMS as valuable not only for compliance, but for enhancing corporate image, raising internal awareness, and institutionalizing sustainability principles. Interestingly, their study revealed generational differences, with older managers expressing greater openness to environmental management, suggesting that perceptions of sustainability are mediated by experience and exposure. These findings resonate with Banerjee et al., (2003), who argued that managerial perceptions of environmental threats and opportunities strongly shape organizational responses. The integration of EMSs into governance structures also reflects alignment with the King IV Code of Corporate Governance, which emphasizes sustainable value creation across social, environmental, and economic domains (Kitsikopoulos et al., 2018).

Recent research further demonstrates that South African companies increasingly view sustainability as a strategic necessity. Green (2023), study of major construction companies, noted that while most companies acknowledged the imperative of sustainable development and pursued ISO 14001 certification, many of their initiatives remained short-term and targeted, rather than long term and integrated. This could suggest that although compliance and awareness are strong, full institutionalization of environmental sustainability has yet to occur. Similarly, Smallwood, (2023), surveying 104 general contractors registered with the CIDB, concluded that contractors widely recognized environmental management as a critical project parameter. The authors findings indicated a positive perception of environmental issues and growing efforts to embed EMS at project level, but also noted that practices varied depending on company size, with larger companies generally exhibiting stronger maturity. This aligns with international evidence that larger companies tend to integrate sustainability more thoroughly due to higher visibility, reputational risks, and greater technical capacity (Abdullah, 2005).

Another recurring theme is the perception of sustainability not as a financial burden, but as an investment in long-term competitiveness. Bansal & Hunter, (2003) and Abdullah (2005) highlighted the long-term financial benefits of EMS implementation, including reduced liability, efficiency gains, and reputational enhancement. More recent South African scholars confirm this shift. Sibanda, (2017) argues that companies increasingly regard environmental management as a driver of risk reduction and resilience, while Moodley et al., (2021) note that sustainability is being mainstreamed into corporate strategy as a response to both regulatory pressure and investor expectations. This trend marks a sharp departure from patterns observed in countries such as Nigeria and Ghana, where cost is consistently cited as the primary barrier to sustainability adoption (Ifije & Aigbavboa, 2020; Djokoto et al., 2014). In South Africa, sustainability is increasingly framed as financially prudent and reputationally advantageous, particularly among companies with access to global markets and international financing, where ESG performance is a growing requirement (PwC, 2022).

Nevertheless, challenges remain. Studies consistently highlight that compliance is often driven by external enforcement rather than intrinsic commitment (Green, 2023). Smaller companies continue to struggle with the resource intensity of environmental compliance, often perceiving it as an administrative burden rather than a strategic asset (Chelliah et al., 2020; Smallwood, 2023). Moreover, while corporate governance frameworks such as King IV have catalyzed sustainability discourse, their translation into everyday site practices remains uneven.

In conclusion, the South African construction industry reflects a hybrid picture. On one hand, it is significantly ahead of many of its Sub-Saharan peers in terms of regulatory frameworks, corporate governance integration, and the reframing of sustainability as financially prudent. On the other, persistent non-compliance, resource constraints among smaller contractors, and a reliance on short-term strategies suggest that environmental management is not yet fully embedded as a long-term strategic norm. The South African case therefore illustrates both the potential of strong regulatory and governance frameworks to shift perceptions and the limits of compliance-driven approaches, highlighting the need for deeper cultural and institutional embedding of sustainability in the construction sector.

2.6 Theoretical Lens

This study is underpinned by three complementary theoretical frameworks, Stakeholder Theory, Institutional Theory, and the Theory of Planned Behaviour (TPB), which together provide a robust foundation for examining the perceptions of construction professionals toward environmental management (EM) in South Africa. Each framework offers unique explanatory value: Stakeholder Theory foregrounds the role of external actors, Institutional Theory highlights structural and normative pressures, and TPB clarifies individual level attitudes and behaviours. By integrating these lenses, the research is able

to capture the multi-layered determinants that influence environmental practice in the construction industry.

2.6.1 Stakeholder Theory

Stakeholder Theory, originally advanced by Freeman, (1984), argues that companies must recognize and balance the expectations of multiple stakeholders, not just shareholders. In the construction sector, these stakeholders include regulators, clients, employees, communities, investors, and advocacy groups, all of whom increasingly demand greater environmental accountability (Ayarkwa et al., 2014). The theory suggests that corporate environmental behaviour is shaped not only by internal strategies but also by the need to maintain legitimacy and respond to external pressures (Freeman, 1984).

In South Africa, construction companies face significant pressure from regulators through environmental authorizations and audits (Ncube & Cloete, 2015), from clients seeking sustainable credentials such as ISO 14001 certification (Green, 2023), and from communities affected by nuisances such as dust, noise, and waste (Ayarkwa et al., 2014). Stakeholder Theory therefore frames EM as both a compliance mechanism and a strategic necessity for companies wishing to maintain reputational capital and social license to operate. For this study, the theory is useful in assessing how professionals interpret and prioritise stakeholder demands, and how these interpretations shape their perceptions of EM.

2.6.2 Institutional Theory

Institutional Theory explains how organizations adopt practices in response to external pressures, professional norms, and sectoral expectations. P. DiMaggio & Powell, (2010) identify three mechanisms of institutional isomorphism: coercive, normative, and mimetic. Coercive pressures arise from regulatory requirements, normative pressures from

professional standards and ethical codes, and mimetic pressures when companies imitate perceived leaders in their sector.

Within the South African construction industry, coercive pressures are reflected in the environmental legal framework, which requires approvals and compliance monitoring for most projects (CES, 2019). Normative pressures are exerted by professional bodies such as the CIDB and The South African Council for the Project and Construction Management Professions (SACPCMP), which set guidelines for environmental practice. Mimetic pressures can be seen when smaller companies emulate the sustainability practices of larger companies, particularly regarding certification and reporting (Smallwood, 2023; Green, 2023). However, the literature also warns of the problem of decoupling, where companies symbolically comply with regulations (for instance, producing compliance reports) while failing to substantively embed sustainability in operations (Ncube & Cloete, 2015). For this study, Institutional Theory is valuable in examining whether construction professionals' perceptions of EM reflect genuine internalization or simply compliance driven responses.

2.6.3 Theory of Planed Behaviour (TPB)

At the individual level, the Theory of Planned Behaviour (Ajzen, 1991) provides a framework for understanding how attitudes, subjective norms and perceived behavioural control, shape behavioural intentions and actual behaviour. Attitudes refer to individuals' positive or negative evaluations of environmental practices, subjective norms relate to perceived expectations from important others, and perceived behavioural control reflects individuals' confidence in their ability to act, given resources and constraints.

In the construction industry, TPB is particularly useful for explaining why professionals who recognize the importance of sustainability may nevertheless fail to act. For example,

contractors may hold positive attitudes towards EM but perceive limited control due to financial constraints, lack of training, or client resistance (Ololade & Rametse, 2018; Gehlot & Shrivastava, 2022). Similarly, subjective norms exerted by managers, regulators, or clients may either encourage adoption or discourage it if sustainability is not prioritized in contracts. Applying TPB allows this study to interrogate how individual level perceptions and constraints influence the broader adoption of EM practices within construction companies.

2.6.4 Integrating the frameworks

Taken together, these three frameworks provide a comprehensive multi-level lens for analysing the awareness practice gap identified in the literature. Stakeholder Theory highlights the external demands shaping organizational priorities; Institutional Theory situates these within broader regulatory, normative and competitive environments; and TPB focuses on the cognitive and behavioural processes of professionals who make day-to-day decisions about EM implementation. The integration of these perspectives allows the research to trace how structural pressures and stakeholder demands interact with personal attitudes and perceived constraints to influence environmental outcomes.

For this study, the combined application of these theories is critical. It enables the identification of whether professionals adopt sustainability practices as a result of genuine commitment, compliance with regulations, or pressure from stakeholders. It also clarifies the extent to which perceptions of cost, regulatory burden, or stakeholder influence mediate the decision to implement EM. Following recent scholars that calls for multi-theoretical approaches to sustainability research in construction, this framework ensures that both micro-level and macro-level determinants of professional perceptions are captured.

2.7 Concluding remarks

Environmental compliance was not a consensus for all the companies under study in the literature reviewed, and in the author's personal experience of working on construction projects, construction professionals have had mixed views on environmental management on construction projects.

The literature on the construction industry's perceptions of environmental management in developing countries, Sub-Saharan Africa and South Africa in particular, illustrates mixed sentiments dependent on several aspects (Ametepey et al., 2020; Ifije & Aigbavboa, 2020; Zeule et al., 2019). Even though awareness of overall environmental impacts exists, a sense of commitment to sustainability is not always present (Lima et al., 2021; Mbala et al., 2019; Ololade & Rametse, 2018). Large companies, particularly public companies, are more participative due to regulations, access to expertise, and demands by stakeholders (Ololade & Rametse, 2018), whereas smaller companies are subject to cost constraints, lack of incentives, and minimal encouragement by governments. In addition, ownership of the company and demographics of the employee population add their part, with more experienced professionals demonstrating more passion for sustainability. Despite the limitations, increasing awareness of environmental responsibility appears based on policies of corporate governance, regulatory needs, and long-lasting economic returns (Ololade & Rametse, 2018). Better policy encouragement, economic incentives and awareness drives can increase the adoption of sustainability activities in the construction industry.

Chapter 3:

Methodology

3.1 Introduction

This chapter outlines the methodological process employed in this study. It describes the research approach and design, study area, population and sample size, selection criteria, data collection instruments, data analysis procedures, and ethical considerations. Unlike the literature review, which discussed previous scholars, this section focuses on what was practically undertaken to accomplish the research goals.

3.2 Research Approach and Design

The study adopted a mixed-methods research design, combining quantitative and qualitative strategies. Quantitative data were generated through structured, closed-ended survey questions, while qualitative insights were captured from open-ended items in the questionnaire and analyzed thematically. This integration provided both breadth, through descriptive and inferential statistical analysis, and depth, by enabling the exploration of professionals' subjective perceptions and lived experiences (Creswell & Plano Clark, 2018).

A mixed-methods approach was justified for three reasons. First, it aligns with the exploratory nature of the study, where measurable patterns (e.g., compliance attitudes, cost perceptions) must be examined alongside the meanings participants attach to those patterns. Second, combining methods strengthens validity through triangulation, ensuring that results are not artefacts of a single method. Third, the use of open-ended responses allowed themes to emerge inductively, complementing the more structured quantitative data

3.3 Description of Study Area

3.3.1 Geographic, Climatic and Socio-Economic Context of Gauteng

This study was conducted in Gauteng Province, South Africa, the smallest of the country's nine provinces by land area but it is a leading economic powerhouse. Despite occupying only 1.5% of South Africa's total landmass, Gauteng contributes over a third of national GDP, reflecting its high level of industrialization, service concentration, and construction activity (South African Government, 2025; Stats SA, 2022). The province is also the most urbanized, with a population of approximately 15.1 million, concentrated primarily in three metropolitan municipalities: Johannesburg, Tshwane and Ekurhuleni (Stats SA, 2022; World Bank, 2025). These urban centres host the country's largest infrastructure projects, including transport networks, housing developments, and commercial complexes, making Gauteng a strategic and representative site for examining environmental management practices within the construction industry.

Geographically, Gauteng lies on the Highveld plateau at an altitude of roughly 1,500 metres above sea level. Its physical landscape is dominated by grasslands interspersed with ridges and koppies (low hills), with limited natural forests (Norman & Whitfield, 2006). The province experiences a subtropical highland climate, characterized by warm, wet summers and cool, dry winters. Average annual rainfall ranges from 650 mm to 750 mm, concentrated between October and March, while winter months are marked by low humidity and occasional frost (South African Weather Service, 2025). These climatic patterns strongly influence construction activities: heavy summer rains can disrupt earthworks, heighten risks of soil erosion, and increase pollutant runoff into nearby rivers, while winter conditions favour uninterrupted building schedules but pose challenges for water-dependent construction processes.

Hydrologically, Gauteng is not rich in water resources, relying heavily on inter-basin water transfers such as the Lesotho Highlands Water Project to supplement local supplies

(Water Research Commission, 2022). Construction projects in the province therefore contribute to intense competition for scarce water resources, making compliance with environmental authorizations regarding wastewater discharge, stormwater management, and conservation especially critical.

Gauteng provides an ideal research site where rapid economic development, urbanization, and environmental governance intersect. Its construction-intensive context makes it possible to capture the perceptions of industry professionals working at the forefront of South Africa's sustainability challenges, while ensuring that findings resonate with broader debates on environmental management in developing economies.

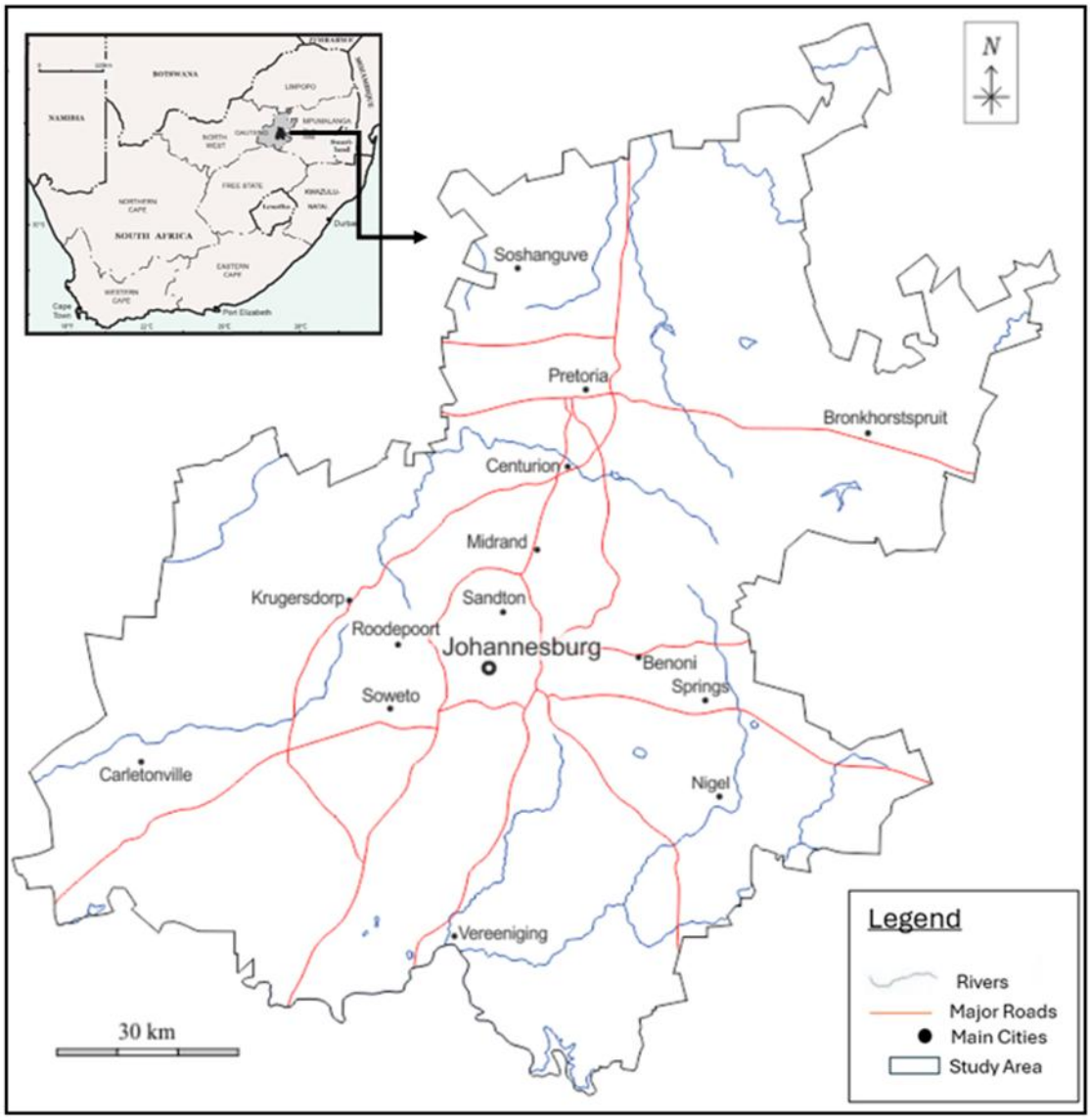


Figure 1 Map of study area - Gauteng, South Africa

Figure 1 illustrates the geographical location of Gauteng Province within South Africa, highlighting the major towns where the construction companies are located. These areas were chosen because they account for most of the province's large scale construction projects and house the highest density of construction companies registered with the CIDB.

3.3.2 Human Geography

Population

Gauteng is the country's least by land area but most populous province, Gauteng had a population of almost 16 million by 2022 and most of the population is of Black African descent (Stats SA, 2022) as can be seen in table 1. This population is highly urbanized, 97% of them live in urban parts of Johannesburg, Pretoria, and Ekurhuleni (World Bank, 2025). IsiZulu is the most spoken language in the province at 23,1%, then 13,1% of the people speaking Sesotho, 12,6% speaking Sepedi, 10,4% speaking Setswana and 9,2% speaking English (Stats SA, 2022). High population density brings much construction work and environmental control work in urban areas.

Table 1. Population group in Gauteng (Stats SA, 2022)

Race	Population size	Percentage
Black African	12764799	84.6
Coloured	443855	2.9
Indian / Asian	329736	2.2
White	1509800	10
Other	35890	0.2

Educational Profile

Gauteng has several leading tertiary institutions, including the University of Johannesburg, the University of the Witwatersrand and the University of Pretoria. As seen in Table 2 below, most Gauteng residents over the age of 20 have completed matric (Stats SA, 2022).

Table 2. Highest Level of education (20+ years) (Stats SA, 2022)

Education	Frequency	Percentage
No Schooling	384 007	3.9
Some Schooling	429 101	4.3
Completed Primary	245 695	2.5
Some Secondary	2 893 113	29.2
Grade 12	4 248 386	42.9
Higher Education	1 606 149	16.2
Other	92 130	0.9

Economic Activities

South Africa's economic hub is the Gauteng province, contributing 2,2 trillion rand (33,1%) to GDP (Stats SA, 2022). Its industries include construction, manufacturing, mining and logistics and finance. Its construction industry is a primary economic motivator owing to urban upgrading and infrastructural projects (Stats SA, 2022). Nevertheless, construction activities contribute greenhouse gases to the environment, which needs environmental management strategies (van Weele et al., 2020).

Cultural Aspects

Gauteng is a culturally rich and multilingual province with urban, peri-urban, and traditional communities. Its cultural heritage sites range from the UNESCO World Heritage Site, the Cradle of Humankind, emphasizing the province's rich history (Norman & Whitfield, 2006). Construction activities must be sensitive to a country's cultures, especially where archaeologically significant or indigenous sites exist, and environmental

impact studies must be done to be congruent with policies for cultural preservation (GDARD, 2014).

3.4 Study Population and Sampling size

The target population comprised construction professionals working in Gauteng who are directly involved in environmental management decision-making. This included project managers (PM) and environmental officers (EO) of 40 Grade 9 construction companies registered with the CIDB as outlined in Table 3, these are companies that qualify to execute large projects valued at more than R200 million (CIDB, 2025). The chosen companies are located throughout all the municipalities of Gauteng, namely, City of Tshwane, City of Johannesburg, City of Ekurhuleni, West Tand District and Sedibeng District. Companies were selected purposively to ensure they had active medium- to large-scale projects in Gauteng between 2022 and 2025. The criteria for inclusion were: (1) CIDB registration; (2) engagement in projects requiring environmental authorization. Within these companies, respondents were purposively recruited based on their roles in planning, managing, or implementing environmental compliance. A total of 66 usable responses were collected, these were 35 EOs and 31 PMs. From a quantitative standpoint, this number is sufficient for detecting medium effect sizes in correlation and chi-square analyses at conventional levels of statistical power (Cohen, 1992). From a qualitative standpoint, thematic saturation was achieved: after approximately 55 responses, no substantially new codes emerged, and subsequent responses reinforced existing themes (Guest et al., 2006). Thus, the final sample was adequate for both descriptive statistical reliability and thematic richness.

Table 3. Construction companies engaged for this study

AXTON MATRIX CONSTRUCTION	MURRAY AND DICKSON CONSTRUCTION
BASE MAJOR CONSTRUCTION	MVUSULUDZO PROJECTS
BOPHELONG CONSTRUCTION	LONEROCK CONSTRUCTION
CERIMELE CONSTRUCTION COMPANY	LUBOCON CIVILS
CLEAR CHOICE BUILDERS	MAKHADO PROJECT MANAGEMENT
COENG CONSULTING AND CONSTRUCTION ENGINEERS	MAPITSI CIVIL WORKS & SUPPLIERS
CONCOR CONSTRUCTION	MAZIYA GENERAL SERVICES
CTM CONSTRUCTION CC	QINISA CONSTRUCTION GAUTENG
DALMAR KONSTRUKSIE	QUENCH MANAGEMENT SERVICES
DANOHER CONTRACTING	REMAKO GROUP HOLDINGS
EDWIN CONSTRUCTION (PTY) LTD	RIGAMANI CONSTRUCTION
FIKILE CONSTRUCTION (PTY) LTD	SEDTRADE
GAP INFRASTRUCTURE CORPORATION (PTY) LTD	SHONISANI RAMBAU CONSTRUCTION
GRINAKER LTA	SOARING SUMMITS GROUP (PTY) LTD
GVK-SIYA ZAMA BUILDING CONTRACTORS	STEFANUTTI STOCKS
JODAN KONSTRUKSIE	TEMI CONSTRUCTION
KHATO CIVILS	THENGA HOLDINGS
KONTINENTAL ENGINEERING	TRENCON CONSTRUCTION
MBALI INDUSTRIAL SOLUTIONS	UHAMBISO CONSTRUCTION
MOTHEO CONSTRUCTION GROUP	UNIK CIVIL ENGINEERING

3.5 Data Collection and Research Instruments

3.5.1 Questionnaire Development

The primary research instrument used in this study was a structured questionnaire designed to capture both quantitative and qualitative data on construction professionals' perceptions of environmental management. The questionnaire comprised three sections: (1) demographic and professional background (e.g., role, years of experience), (2) closed-ended Likert-scale items measuring perceptions of environmental regulations, compliance behavior, perceived costs and environmental impacts, and (3) open-ended questions inviting participants to elaborate on challenges, regulatory experiences, and practical barriers to sustainability adoption.

The questionnaire was developed through a careful review of prior empirical studies on environmental management in the construction industry, including works by Ametepey and Ansah (2014) on Ghana, Ololade and Rametse (2018) on South Africa, and Smallwood (2023) on contractors' environmental practices. Drawing on these validated instruments ensured both content relevance and comparability with existing literature. In addition, questions were adapted to reflect the South African regulatory framework (e.g., National Environmental Management Act and environmental authorization requirements) to ensure contextual alignment. This hybrid approach, borrowing from established scales while tailoring items to local realities, enhanced the construct validity of the instrument (Creswell & Creswell, 2018).

The decision to include both closed-ended and open-ended items was deliberate. Closed-ended Likert-scale questions allowed for the quantification of attitudes and perceptions, enabling statistical analysis and cross-group comparison, while open-ended responses provided richer insights into nuanced experiences and challenges that may not have been captured in the fixed-response options. This mixed design is consistent with recommendations in survey research that advocate integrating structured measurement

with opportunities for participants to provide explanatory depth (Bryman, 2016; Saunders et al., 2023).

3.5.2 Validity and Reliability Testing

To ensure robustness, a pilot study was conducted with five professionals drawn from the target population. The aim of the pilot was to test clarity, item interpretation, and content coverage. Feedback indicated that some technical terms were ambiguous to respondents outside of environmental departments; consequently, wording was simplified for accessibility without compromising precision. Additionally, redundant items were consolidated to reduce response fatigue, thereby improving response quality. For the closed-ended Likert-scale items, internal consistency reliability was assessed using Cronbach's alpha. Constructs such as regulatory perceptions, cost perceptions, and environmental attitudes all produced alpha values above the widely accepted threshold of 0.70, confirming acceptable reliability (Heale & Twycross, 2015). In addition, content validity was strengthened by aligning questionnaire items with the research objectives and theoretical frameworks (Stakeholder Theory, Institutional Theory, and Theory of Planned Behavior), ensuring that the instrument effectively captured multi-level determinants of environmental management perceptions. This systematic approach to instrument validation enhanced both the credibility and transferability of the findings, aligning with established standards of methodological rigor in social science research (Nowell et al., 2017).

3.5.3 Administration

The questionnaire was electronically administered; copies of the questionnaire were distributed using Google Forms to ensure anonymity of the replies. To enhance credibility, participants were assured of anonymity, this approach encouraged frank responses, especially on sensitive issues such as non-compliance or regulatory criticism. Overall, the

administration strategy sought to balance methodological rigor with practical feasibility, ensuring that the final dataset was both representative and trustworthy.

3.6 Data Analysis

Before statistical and thematic analysis could be performed, the raw questionnaire responses underwent a systematic process of data coding and preparation. This stage was crucial to ensure that both the quantitative and qualitative data were accurately represented and suitable for subsequent analysis. For the closed-ended Likert-scale questions, responses were coded numerically (e.g., “Strongly Disagree” = 1 through to “Strongly Agree” = 5) to facilitate descriptive and inferential statistical testing. Data entry and coding were performed using Microsoft Excel and exported into SPSS (version 28) for analysis. To reduce error, double-entry verification was employed, and random checks of 10% of responses were conducted. Missing values were minimal; where encountered, they were handled using pairwise deletion to preserve the maximum dataset while avoiding distortion of means and variances (Tabachnick & Fidell, 2019).

For the open-ended responses, a thematic coding protocol was applied. Each response was first read in full to gain a holistic understanding, after which initial codes were generated to capture recurring ideas (Braun & Clarke, 2019). Codes were then grouped into broader categories such as “regulatory barriers,” “cost perceptions,” “capacity and skills,” and “practical compliance challenges.” This process allowed the qualitative data to be structured in a way that supported meaningful interpretation while retaining participants’ original voices. To enhance rigor and credibility, an audit trail of coding decisions was maintained, documenting how initial codes evolved into themes and subthemes (Koch, 1994). This ensured transparency and allowed the analysis to be replicated or scrutinized by independent reviewers. Coding reliability was further strengthened through peer debriefing, whereby a second researcher independently

reviewed a subset of coded data to check for consistency (Nowell et al., 2017). Discrepancies were discussed until consensus was reached, thereby enhancing intercoder reliability.

Quotations from participants were handled carefully to protect confidentiality. Only non-identifying excerpts were included in the dissertation, and these were presented with participant codes (e.g., “PM1” for Project Manager 1, “EO5” for Environmental Officer 5) rather than names or company details. This approach aligns with best practice in qualitative research, ensuring both ethical sensitivity and analytical depth (L. Lingard, 2019).

The integration of coded qualitative themes with quantitative results reflects the study’s mixed-methods design. Quantitative data provided measurable insights into trends and associations, while qualitative themes enriched the findings with context and explanation. This approach not only strengthened the validity of the results but also aligned with the research aim of exploring both the breadth and depth of construction professionals’ perceptions of environmental management.

3.7 Limitations of the Research

This study was prone to a few limitations. Firstly, the research was confined to Gauteng and relied on Gauteng based Grade 9 companies which potentially limited the generalizability of lower graded companies and those from the other eight provinces of the country. In the second place, the investigation relied on self-reported data, which could have been prone to social desirability bias, particularly in parts relating to compliance and environmental ethics. Lastly, non-responsiveness on the part of some companies and delayed submission of filled questionnaires was an issue that could have constrained the

dataset, even though a limited number of potential participants (14) did not respond, the resulting response exceeded 75% which was considered adequate.

3.8 Ethical Considerations

This project was provided with ethical clearance by the Human Research Ethics Committee (Non-Medical), University of the Witwatersrand. Its protocol number is H23/08/08 and the research was deemed to entail minimal risk for participants. Clearance was granted on 19 December 2023, and clearance remains valid until 18 December 2026.

As required by the university's ethics and legislated by the Protection of Personal Information Act (POPIA) (Protection of Personal Information Act, 2013), the study was guided by the ethics of confidentiality, anonymity and voluntary participation. The respondents were informed of the scope and purpose of the study before they could complete the questionnaire. An electronic consent form was also made available at the commencement of the questionnaire, which allowed the respondents to choose whether to participate based on informed consent.

No identifying information was collected, and all responses were de-identified. Data was stored safely and was only accessible by the researcher. Collected data was for educational purpose only and reported at the aggregate level for maintaining the anonymity of participants. Secondary analysis of data in the future and its reuse remains under the same ethical safeguards.

Chapter 4:

Results and Discussion

4.1 Introduction

This chapter presents the observations provided in questionnaires by Environmental Officers (EO) and Project Managers (PM) of grade 9 construction companies operating in Gauteng Province with the aim of delivering answers to the research questions designed in chapter 1, which were: (i) How construction professionals perceive environmental regulations? (ii) How construction professionals perceive environmental impact throughout the entirety of a construction project's life cycle? (iii) How construction professionals perceive the cost implications of environmental considerations in construction projects? Both quantitative and qualitative results are presented, organized by themes, and discussed with insights from Stakeholder Theory, Institutional Theory, and the Theory of Planned Behavior. This integration is important for understanding professionals' perceptions and how different systemic, organizational, and behavioral factors come together to impact environmental management practices. Results are categorized by the research questions and a discussion linking findings with the literature review.

4.1.2 Response Rate

Sampling design for the case study set out to select forty (40) grade 9 construction companies working in Gauteng Province from a list of companies that were on CIDB's registry of companies, and distribute questionnaires to 40 Environmental Officers and 40 Project Managers. 35 of the EOs and 31 of the PMs, however, participated in the case study, which amounted to an 87.5% response rate for the EO group and 77.5% for the PM group. Table 4 represents the cumulative response rate for the two groups of research participants.

Table 4: Response Rate

Sample Groups	Response	Non-Response	Target	Response Rate	Non-Response Rate
Environmental Officers	35	5	40	87.5%	12.5%
Project Managers	31	9	40	77.5%	22.5%
Total	**66**	**14**	**80**	**82.5%**	**17.5%**
Response Rate	**82.5%**	**17.5%**	**100%**		

4.2 Perceptions of Environmental regulations

4.2.1 Quantitative insights

Descriptive statistics show that EOs reported an average score of 4.7 for familiarity with environmental regulations, while PMs had an average of 4.5. For the importance of compliance, EOs scored an average of 4.9, and PMs scored 4.7. These findings suggest that EOs sampled may have a slightly greater awareness of regulations, likely due to their specific responsibilities related to environmental compliance. However, independent sample t-tests did not find any significant difference between the two groups ($p > 0.05$).

A cross-tabulation of regulatory familiarity and perceived importance of compliance showed a significant link ($\chi^2 = 4.67$, $p = 0.031$). Respondents who rated their familiarity as "high" or "expert" were more likely to consider compliance as "extremely important." This suggests a positive connection between knowledge and commitment, underscoring the vital role of environmental understanding in ensuring regulatory compliance.

4.2.2 Qualitative insights

Open-ended responses reinforced these findings. EOs expressed stronger environmental convictions, but PMs also acknowledged regulatory importance, albeit with a stronger inclination toward production priorities.

EO: "Unless there is an audit, project managers rarely consider environmental requirements."

PM: "Compliance is important but not always integrated into early planning."

These statements illustrate the gap between awareness and practical application, with compliance often triggered by external pressures such as audits rather than internalized norms.

4.2.3 Discussion

The findings show that both EOs and PMs acknowledge the importance of regulatory compliance. This supports the ideas of Stakeholder Theory, which highlights how external stakeholders, such as regulators, auditors, and the public, influence organizational behavior (Freeman, 1984). Institutional Theory further explains that audit-driven compliance reflects coercive isomorphism. In this case, companies adopt practices to meet legal requirements without fully integrating them into their daily operations (P. J. DiMaggio & Powell, 1983). These results are consistent with studies like Campos et al. (2016), which suggest that in many developing countries, including South Africa, construction companies often display a strong theoretical commitment but struggle with actual enforcement due to institutional constraints.

4.3 Perceptions of Environmental impacts across the project lifecycle

4.3.1 Quantitative insights

The survey indicated that 85% of EOs and 77% of PMs indicated that environmental impacts were "always" or "often" considered during the construction lifecycle. These percentages could indicate a generally positive awareness of environmental impacts. However, they also indicate possible differences in how this awareness is applied, particularly when projects are under pressure.

4.3.2 Qualitative insights

Open-ended responses provided depth to these findings. Respondents commonly indicated that while environmental considerations are part of formal project planning documentation, they are not always operationalized throughout the project lifecycle.

EO: "We are often consulted only during audits, not at the planning stage."

PM: "Environmental management takes a back seat when deadlines loom."

This disconnect between planning and practice reflects a reactive compliance culture rather than a proactive sustainability ethos.

4.3.3 Discussion

These findings echo concerns raised in the literature (Ololade & Rametse, 2018; Lima et al., 2021) regarding the superficial integration of Environmental Management Plans (EMPs) into daily practice. While these plans are often present, their role is more symbolic than functional. The Theory of Planned Behavior (Ajzen, 1991) helps explain the gap between attitudes and actions: while environmental attitudes are favourable, perceived behavioural control such as limited time, resource scarcity, and top-down pressure to

meet production targets hinders consistent implementation. This reveals an environment where short-term objectives are prioritized over long-term sustainability.

4.4 Perceptions of cost implications

4.4.1 Quantitative insights

EOs reported a mean score of 3.8 regarding the cost implications of environmental management, while PMs reported 3.6. Again, the differences were not statistically significant ($p = 0.320$). This suggests that while both groups view environmental practices as incurring additional costs, this perception is not uniquely held by one professional group over the other.

4.4.2 Qualitative insights

Cost concerns were among the most frequently cited barriers in qualitative responses:

EO: "Environmental management is seen as an extra cost."

PM: "Budget constraints delay or limit implementation."

These comments suggest that the perceived financial burden of compliance can outweigh its long-term benefits, especially in cost-sensitive project environments.

4.4.3 Discussion

These findings are consistent with research from developing countries, including studies by Mbala et al., (2019) and Zeule et al., (2019), where cost is cited as a principal barrier to adopting sustainable practices. Institutional Theory’s emphasis on resource constraints and organizational norms helps explain why environmental practices remain marginal without client or market incentives. Additionally, the categorization of environmental

management as a "non-revenue generating activity" contributes to its deprioritisation. Without external drivers or contractual mandates, companies lack sufficient incentive to invest in robust environmental safeguards.

4.5 Cross cutting themes

4.5.1 Management support and organizational culture

Lack of executive and managerial support was repeatedly identified as a structural barrier to environmental management. While a minority (10%) of respondents reported strong managerial backing, the overwhelming majority indicated that environmental considerations were deprioritized in favour of meeting production deadlines.

EO: "Environmental issues are only raised when we are close to a compliance inspection."

This aligns with findings by Banerjee et al., (2003), who argue that managerial perceptions of environmental risks heavily influence corporate environmental strategy.

4.5.2 Communication and collaboration

Poor collaboration between EOs and PMs was reported by 41% of participants, indicating a lack of integrative decision-making. The siloed nature of operations often results in EOs being brought in too late to influence key planning decisions.

PM: "Environmental concerns are usually discussed post-facto, not during initial planning stages."

This disconnection undermines the potential for interdisciplinary engagement and weakens the role of environmental officers in shaping project outcomes.

4.5.3 Regulatory complexity

Approximately 37% of respondents identified regulatory complexity as a barrier. The difficulty in interpreting environmental laws, compounded by bureaucratic delays in obtaining environmental authorizations, contributes to non-compliance and operational delays.

EO: "Project planning is disrupted by waiting for client-issued environmental permits."

This aligns with prior studies (e.g., Chileshe & Kikwasi, (2014), which found that unclear and burdensome regulatory processes can deter compliance in time-sensitive project environments.

4.6 Integration of theory

The findings affirm that individual level factors (as per the Theory of Planned Behavior), organizational dynamics (Institutional Theory) and stakeholder expectations (Stakeholder Theory) intersect to shape environmental management perceptions. Stakeholder Theory helps explain why compliance efforts are strongest when there is perceived pressure from regulators or clients. Institutional Theory accounts for the mimicry and normative practices observed, whereby organizations adopt compliance superficially to meet external expectations. Meanwhile, the Theory of Planned Behavior illuminates how attitudes alone are insufficient in the absence of behavioural control exemplified in budget constraints, training gaps, and leadership inertia. These interrelated factors present a multifaceted understanding of environmental behaviour in the construction sector.

4.7 Conclusion

This chapter provided a detailed analysis of construction professionals' perceptions of environmental management in Gauteng. The results highlight that while there is high awareness and theoretical commitment to compliance, implementation remains inconsistent and reactive. Structural and institutional constraints including financial limitations, insufficient managerial support, weak intra-organizational communication and complex regulatory environments continue to inhibit sustainable construction practices. The chapter also revealed that individual motivation alone is insufficient to drive change without systemic support, reinforcing the need for holistic reform strategies. The following chapter will synthesise these findings in the broader context of sustainable construction policy and propose targeted interventions that can address these embedded challenges at both institutional and operational levels.

Chapter 5:

Conclusion

5.1 Conclusion

The research set out to investigate perceptions of environmental management among Grade 9 construction professionals in Gauteng Province, South Africa. By employing mixed methods, the research provided an in depth understanding of how Project Managers and Environmental Officers conceptualise, implement, and experience environmental management within the construction industry.

The study found that while knowledge of environmental management practices and legislation is generally high, its application remains erratic and mostly compliance driven. This highlights that knowledge on its own does not result into behaviour, affirming the relevance of the Theory of Planned Behaviour attitudes and perceived control have a bearing on actual practice. The influence of Institutional Theory was also evident, as coercive and normative pressures (e.g., audits, regulations, client requirements) resulted in reactive rather than proactive attention. From a Stakeholder Theory point of view, the findings demonstrate the increasing relevance of external stakeholders especially clients and local communities in shaping environmental priorities within construction projects.

In critically concluding, this research deepens understanding by moving beyond describing barriers to explaining why they continue within a framework of structural and organisational limitations. It adds empirical evidence that the disconnect between awareness and practice is not just behavioural but systemic, embedded in cost perceptions, limited leadership commitment and weak institutional enforcement. The study therefore extends theoretical application to the South African construction context and provides a foundation for stakeholder collaboration, targeted policy interventions and capacity development.

Overall, the study makes three key contributions:

1. It demonstrates how institutional and stakeholder pressures interact to shape compliance behaviour economy context;
2. It empirically validates the awareness practice gap in a developing; and
3. It highlights the need for organisational leadership to integrate environmental management as a core business function rather than a peripheral compliance issue.

This critical synthesis underlines that effective environmental management in construction requires a multi-level approach one that aligns professional attitudes, organisational systems, and institutional incentives to achieve sustainable industry transformation.

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5.2 Implication for Policy and Practice

The research findings have important implications for project implementers, environmental regulators and construction industry policy makers.

Policy Implementation: While legal requirements such as NEMA are recognized, there is inconsistent enforcement from authorities. Authorities should improve monitoring of construction projects to ensure enforcement of environmental authorization conditions.

Capacity Development: To improve proactive environmental compliance, training programs on environmental requirements should be rolled out to all members of a project site.

Management Commitment: For successful incorporation of sustainability measures in construction companies, leadership buy-in is crucial.

Resource Allocation: Sufficient financial allocations should be provided for environmental measures. Project costing models should integrate environmental expenditure.

Integrated Communication channels: to ensure environmental inputs are considered from project inception, there should be institutionalized communication channels between all departments of construction companies.

Simplification of Regulatory Processes: One of the hindrances to compliance reported was regulatory procedures which are time consuming and complex. Regulators should simplify environmental authorization processes and provide clearer guidance to reduce procedural uncertainty

5.3 Recommendations for future studies

The recommendations of this study are directly informed by the empirical findings presented in Chapter 4. These aim to address the key barriers and opportunities identified in the perceptions of environmental management among construction professionals in Gauteng Province.

1. **Bridging the Awareness Practice Gap**
   It was noted that construction professionals were aware of their legal obligation, however, implementation remains inconsistent. It is there for recommended that construction companies institutionalise mandatory environmental training and on-site mentorship programmes to translate knowledge into action.
2. **Addressing Cost Perceptions and Rewarding Compliance**
   Seeing that cost was regarded as a significant barrier, industry bodies such as the CIDB and government should introduce financial and non-financial incentives such as recognition schemes or preferential tender scoring to reward companies demonstrating sustainable practices.
3. **Strengthening Institutional and Regulatory Support**
   The study found that compliance was undermined by weak enforcement. Clients

should embed environmental performance clauses in contracts. While Regulatory bodies should enhance monitoring frequency and transparency

4. **Enhancing Stakeholder Engagement**
   Stakeholders including developers, consultants and communities should be involved early in project planning to promote shared ownership of environmental goals.

5. **Promoting Organisational Commitment and Leadership**
   Support from top management of a company was shown to be a determinant of practice adoption. Companies should factor in environmental performance into leadership appraisal systems and corporate reporting frameworks.

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7. Annexures

7.1 Annexure A: Ethics clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Hlungwane

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: H23/08/08**

PROJECT TITLE Assessing Perceptions of Environmental Management in the Construction Industry: A Case Study of Construction Companies in the Gauteng Province

INVESTIGATOR(S) Mr R Hlungwane

SCHOOL/DEPARTMENT Geography, Archaeology and Environmental Studies/

DATE CONSIDERED 18 August 2023

DECISION OF THE COMMITTEE Approved
Risk Level: Minimal

EXPIRY DATE 18 December 2026

DATE 19 December 2023 **CHAIRPERSON** _____
(Professor J Watermeyer)

cc: Supervisor : Dr N Kubanza

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **A SIGNED COPY** returned to the Secretary electronically. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved I/we undertake to submit an amendment of the protocol to the Committee. **I/we agree to completion of a regular progress report. For Minimal and Low Risk studies, this is due annually on 31 December. For Medium and High Risk studies, this is due twice annually on 30 June and 31 December.**

_____ _____/_____/_____
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

7.2 Annexure B: Questionnaire for Environmental Officers

Questionnaire for Environmental Officers:

Section 1: General Information

1. Please provide your demographic information (e.g., age, gender, years of experience as an environmental officer).

Section 2: Support and Resources

2. On a scale of 1 to 5 (1 being no support and 5 being very supportive), how would you rate the level of support you receive from management for implementing environmental management practices in construction projects?

1 - Very Low Support: Management provides minimal or no support for environmental management practices.

2 - Low Support: Management's support for environmental management practices is limited and insufficient.

3 - Moderate Support: Management provides moderate support for environmental management practices.

4 - High Support: Management actively supports and encourages environmental management practices.

5 - Very High Support: Management provides exceptional support and is fully committed to environmental management practices.

---

3. To what extent do you have decision-making authority specifically related to environmental management within construction projects?

None - I have no decision-making authority related to environmental management within construction projects.

Limited - I have some input, but the final decisions are made by higher-ups or project managers.

Moderate - I have a reasonable level of decision-making authority and can influence environmental management decisions.

Significant - I have substantial decision-making authority and can actively shape environmental management strategies in construction projects.

Full - I have complete decision-making authority and am solely responsible for environmental management within construction projects.

---

4. Are there any financial resources allocated specifically for environmental initiatives within your projects?

No - There are no financial resources allocated for environmental initiatives within my projects.

Minimal - Limited financial resources are allocated for environmental initiatives, and funding is scarce.

Moderate - Some financial resources are allocated for environmental initiatives, but the budget is moderate.

Substantial - Significant financial resources are allocated for environmental initiatives within my projects.

Comprehensive - A substantial budget is allocated, and there are comprehensive financial resources dedicated to environmental initiatives within my projects.

Section 3: Collaboration and Communication

5. How often do you collaborate with project managers in decision-making processes related to environmental compliance?

Never - I do not collaborate with project managers on environmental compliance decisions.

Rarely - Collaboration with project managers on environmental compliance decisions is infrequent.

Occasionally - I sometimes collaborate with project managers on environmental compliance decisions.

Often - I frequently collaborate with project managers on environmental compliance decisions.

Always - I always collaborate with project managers on environmental compliance decisions.

---

6. How effectively do you communicate with project managers and other stakeholders regarding environmental management matters?

Ineffective - Communication regarding environmental management matters is often unclear or lacking.

Somewhat Ineffective - Communication is occasionally effective but could be improved.

Moderately Effective - Communication with project managers and stakeholders about environmental management is generally effective.

Very Effective - I communicate effectively with project managers and stakeholders about environmental management matters.

Extremely Effective - Communication about environmental management matters with project managers and stakeholders is exceptionally effective and well-received.

---

7. Are there any challenges or barriers to effective collaboration and communication with project managers?

_____
_____

Section 4: Awareness of National Environmental Regulations

8. How familiar are you with the national environmental regulations applicable to construction projects?

Not at all - I have no familiarity with national environmental regulations for construction projects.

Limited - I have basic knowledge but am not well-versed in national environmental regulations.

Moderate - I have a reasonable understanding of national environmental regulations for construction projects.

High - I am quite familiar with and knowledgeable about national environmental regulations for construction projects.

Expert - I have an in-depth understanding and expertise in national environmental regulations applicable to construction projects.

_____

9. To what extent do you believe that compliance with national environmental regulations is important for the success of construction projects?

Not important at all - I do not believe that compliance with national environmental regulations significantly impacts the success of construction projects.

Slightly important - I think compliance with national environmental regulations has a minor influence on the success of construction projects.

Moderately important - I believe that compliance with national environmental regulations is somewhat important for the success of construction projects.

Very important - I consider compliance with national environmental regulations to be a crucial factor for the success of construction projects.

Extremely important - I believe that strict compliance with national environmental regulations is absolutely essential for the success of construction projects.

_____

Section 5: Open-Ended Questions

10. In your opinion, what improvements could be made to enhance environmental management practices in construction projects?

_____
_____

11. Are there any additional insights or comments you would like to provide regarding environmental management in construction projects?

_____

7.3 Annexure C: Questionnaire for Project Managers

Questionnaire for Project Managers:

Section 1: General Information

1. Please provide your demographic information (e.g., age, gender, years of experience as a project manager).

_____

Section 2: Attitudes and Priorities

2. On a scale of 1 to 5, rate the importance you assign to environmental management in construction projects.

_____

3. What are the main factors that influence your decision-making process regarding environmental management in construction projects?

_____
_____
_____

4. How often do you consider environmental Impacts when making project-related decisions?

_____
_____
_____

5. Are there any specific challenges you face in incorporating environmental considerations into your decision-making process?

_____
_____
_____

Section 3: Decision-Making Powers

6. To what extent do you have decision-making authority related to environmental management in construction projects?

_____
_____
_____

7. How much influence do you have in allocating resources specifically for environmental initiatives within your projects?

_____
_____
_____

8. Are there any limitations or constraints on your decision-making powers regarding environmental management?

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Section 4: Awareness of National Environmental Regulations

9. How familiar are you with the national environmental regulations applicable to construction projects?

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10. To what extent do you believe that compliance with national environmental regulations is important for the success of construction projects?

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Section 5: Open-Ended Questions

11. In your opinion, what improvements could be made to enhance environmental management practices in construction projects?

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12. Are there any additional insights or comments you would like to provide regarding environmental management in construction projects?

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