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Barriers to the Adoption of the Circular Economy in South Africa's Construction Industry

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Abstract

Purpose: The purpose of the study is to identify and analyze the key barriers hindering the adoption of circular economy principles in the construction industry. Research Methodology: The study adopted a qualitative research methodology, used a semi-structured interview design, and employed snowballing sampling. A total of 18 construction professionals participated in the interviews. The data gathered from the interviews were thematically analyzed. Findings: The study identifies several significant barriers to integrating circular economy principles in the construction industry. Firstly, there is a notable lack of awareness and understanding among industry stakeholders regarding circular practices and their long-term benefits. Secondly, existing regulatory and policy frameworks are often rigid and do not support innovative circular approaches such as material reuse and recycling. Thirdly, the availability of recyclable and reusable materials remains limited due to underdeveloped supply chains and a lack of standardization. Additionally, the study found that high initial costs and perceived financial risks discourage stakeholders from adopting circular methods. Lastly, the industry's fragmented structure and poor collaboration among stakeholders further impede the implementation of circular economy strategies. Practical implications: The study provides insights to guide policymakers, industry stakeholders, and educators in developing targeted strategies to overcome identified barriers and promote the effective adoption of circular economy principles in the construction industry. Originality: The study's originality lies in its focused examination of the specific barriers to adopting circular economy principles in the construction industry, offering context-specific insights often overlooked in broader sustainability research.

Keywords
Circular Economy, Construction Industry, Sustainability, Barriers

1. Introduction

The construction industry plays a fundamental role in South Africa's economic development through infrastructure provision, employment creation, and contributions to national gross domestic product (GDP). Despite its economic importance, the industry is one of the largest consumers of natural resources and a major contributor to construction and demolition (C&D) waste, greenhouse gas emissions, and environmental degradation (Benachio 2020; Rao et al., 2025). The continued reliance on the traditional linear economic model of take–make–dispose has intensified concerns regarding resource depletion, increasing landfill pressures, and climate change, highlighting the need for more sustainable approaches to resource management (Benachio et al., 2020).

The Circular Economy (CE) has emerged as a transformative framework that seeks to decouple economic growth from resource consumption by extending the lifecycle of materials through strategies such as reducing, reusing, repairing, remanufacturing, and recycling. Unlike the conventional linear model, the Circular Economy promotes closed-loop systems where materials remain in productive use for as long as possible, thereby reducing waste

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generation and environmental impacts while improving resource efficiency (Benachio et al., 2020; Rao et al., 2025). Globally, governments and construction industries have increasingly incorporated Circular Economy principles into project planning, procurement, building design, material selection, construction processes, and demolition activities to support sustainable development and achieve net-zero carbon objectives (Rao et al., 2025). In South Africa, the adoption of Circular Economy principles within the construction sector remains relatively limited despite growing national commitments towards sustainable development, climate resilience, and responsible waste management. While initiatives such as green building certification, sustainable procurement, adaptive reuse of buildings, and recycling of construction materials have gained increasing attention, the implementation of Circular Economy practices remains fragmented across the industry (Otasowie et al., 2023). Existing challenges include inadequate policy implementation, limited recycling infrastructure, insufficient financial incentives, low levels of awareness, fragmented supply chains, and shortages of technical expertise required to support circular construction practices (Aseni et al., 2025; Otasowie et al., 2023).

Furthermore, the successful implementation of Circular Economy principles requires collaboration among policymakers, designers, contractors, suppliers, clients, and waste management organisations throughout the construction project lifecycle. However, limited stakeholder collaboration and the absence of supportive regulatory frameworks continue to hinder the transition from conventional construction practices towards more circular and resource-efficient approaches (Aseni et al., 2025; Rao et al., 2025). Addressing these barriers is essential for reducing construction waste, improving material efficiency, lowering carbon emissions, and supporting South Africa's commitment to the United Nations Sustainable Development Goals (SDGs).

Although previous studies have investigated sustainable construction and resource efficiency within the built environment, relatively few empirical studies have specifically examined the barriers to Circular Economy adoption from the perspectives of South African construction professionals. Consequently, there remains a significant knowledge gap regarding the institutional, financial, technical, and behavioural factors that influence the implementation of Circular Economy principles within the local construction industry (Aseni et al., 2025). This study therefore seeks to identify and analyse the key barriers affecting the adoption of Circular Economy practices in South Africa's construction industry using qualitative evidence gathered from experienced construction professionals. The findings are expected to provide valuable insights for policymakers, industry practitioners, professional bodies, and researchers in developing targeted interventions that facilitate the transition towards a more sustainable and circular construction sector.

2. Literature review

2.1 Overview of the Circular Economy in the South Africa construction Sector

The Circular Economy (CE) is an economic model that aims to minimise waste, maximise resource efficiency, and keep materials in use for as long as possible through reuse, repair, recycling, and recovery. In contrast to the traditional linear model of "take-make-dispose," the CE promotes sustainable resource management throughout the entire lifecycle of buildings and infrastructure (Benachio et al., 2020). The South African construction sector is a major contributor to economic growth and employment; however, it is also one of the largest consumers of natural resources and generators of construction and demolition (C&D) waste. Consequently, there is increasing recognition that adopting Circular Economy principles can reduce environmental impacts, improve resource efficiency, and support sustainable infrastructure development (Rao et al., 2025). Although the implementation of the Circular Economy in South Africa is still in its early stages, several initiatives are promoting its adoption. These include increased recycling of construction materials, adaptive reuse of buildings, sustainable procurement, and green building practices. Furthermore, organisations such as the Green Building Council South Africa have encouraged resource-efficient construction through green building certification systems (Otasowie et al., 2023). Despite these developments, the sector continues to face challenges including limited awareness, inadequate recycling infrastructure, weak policy implementation, and insufficient financial incentives. Addressing these barriers through stronger regulations, stakeholder collaboration, and the adoption of digital technologies such as Building Information Modelling (BIM) is essential to accelerate the transition towards a circular construction industry (Aseni et al., 2025; Rao et al., 2025). Overall, the Circular Economy presents significant opportunities for South Africa's construction sector by reducing waste, conserving natural resources, lowering carbon emissions, and contributing to the country's sustainable development goals (Benachio et al., 2020).

2.2 Benefits of Circular Economy in the South African Construction Sector

The adoption of Circular Economy (CE) principles in the South African construction sector offers significant environmental, economic, and social benefits. Unlike the traditional linear model of take–make–dispose, the circular economy promotes efficient resource use by reducing material consumption, extending the lifespan of buildings, reusing construction materials, and recycling construction and demolition waste. This approach aligns with South Africa's sustainability objectives and contributes to a more resilient construction industry (Benachio

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et al., 2020; Otasowie et al., 2024). One of the major benefits of the circular economy is the reduction of construction and demolition waste, which remains one of the largest waste streams in South Africa. By encouraging material recovery, recycling, and reuse, circular practices reduce the volume of waste disposed of in landfills while lowering the demand for virgin construction materials. This contributes to environmental conservation and supports more sustainable waste management practices (Otasowie et al., 2024).

The circular economy also improves resource efficiency by keeping materials in productive use for as long as possible. Strategies such as designing buildings for adaptability and disassembly, using recycled aggregates, and extending the service life of construction materials reduce resource depletion and enhance material productivity. These practices are particularly important in South Africa, where rapid urbanisation continues to increase demand for construction materials (Benachio et al., 2020; Itanola et al., 2026). From an economic perspective, CE practices can generate cost savings through reduced material procurement costs, lower waste disposal expenses, and improved project efficiency. The use of reclaimed materials and efficient resource management can reduce overall project costs while improving profitability. Furthermore, circular business models stimulate innovation and create new market opportunities for material recovery, remanufacturing, and recycling enterprises (Otasowie et al., 2024).

The circular economy also contributes to reducing greenhouse gas emissions and improving environmental performance. By minimising the extraction of raw materials and promoting the reuse of existing resources, embodied carbon emissions associated with construction activities are significantly reduced. These outcomes support South Africa's transition towards low-carbon and climate-resilient infrastructure while contributing to national and global sustainability goals (Itanola et al., 2026).

In addition, the adoption of circular economy principles promotes job creation and skills development. Expanding activities such as recycling, material sorting, refurbishment, remanufacturing, and deconstruction creates new employment opportunities while supporting the growth of green industries. Circular practices also encourage greater collaboration among contractors, suppliers, designers, and waste management companies, strengthening the construction value chain (Otasowie et al., 2024).

Despite these benefits, achieving widespread implementation requires supportive government policies, investment in recycling infrastructure, industry awareness, and collaboration among stakeholders. Recent research indicates that although interest in circular construction is growing rapidly, implementation remains relatively limited, highlighting the need for stronger policy support, innovation, and industry commitment (Itanola et al., 2026).

3. Research methodology and method

The study adopted a qualitative mono-method research approach, selected for it's ability to provide a rich understanding of the barriers to adopting CE principles in South Africa's construction industry. A qualitative research approach was more suitable for capturing the rich experiences, perspectives, and contextual realities of professionals, which are not easily measurable using a quantitative approach (Creswell and Poth, 2018)**.** Semi-structured interviews were used as a primary instrument of data collection. This method provided scope for the utilisation of a set of standardized core questions while maintaining flexibility in asking for greater depth of questions (Kallio, et al., 2016). Interview questions were designed to explore three key areas: Knowledge and awareness of CE principles; Enablers and barriers to implementation perceived by CE implementation and Examples of existing or potential CE practices within the South African construction industry. The interviews were conducted virtually through Microsoft Teams, and in-person sessions were held depending on participant availability and location.

A The snowballing sampling technique was employed to identify participants with relevant industry experience and knowledge of CE-related practices (Etikan, et al., 2016). The sample consisted of professionals involved in design, planning, and management across various types of projects. Participants were selected from Gauteng, KwaZulu-Natal, Free State, and Northwest provinces to ensure diversity of geographical and organisational contexts. The sample consisted of architects, civil and structural engineers, construction/project managers, and policy and regulatory officials. The aim was to obtain a holistic overview from professionals in the construction industry. 18 professionals were interviewed, and they were deemed sufficient according to Creswell & Poth (2018) Data from the respondents was thematically analysed.

4. Research results

4.1. Identified Barriers to CE Adoption

The findings revealed that the most frequently reported barrier to the adoption of circular economy practices in the South African construction industry was the lack of regulatory frameworks, reported by 83.3% of respondents.

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This suggests that the absence of clear policies, standards and enforcement mechanisms continues to limit industry-wide circular economy implementation. One respondent stated: "Circular economy is still not clearly supported by construction regulations in South Africa; without proper policies and enforcement, companies are not pushed to adopt it" (Pr CM 1). Similarly, another participant noted that "the industry needs government direction because contractors will not fully commit to circular practices when there are no clear compliance requirements or incentives" (Pr QS 2).

High implementation costs were also identified as a major barrier, reported by 66.7% of respondents. This finding indicates that many construction firms perceive circular economy practices as financially demanding, especially where technologies, sustainable materials, recycling systems and training are required. One respondent explained: "The initial cost of implementing circular economy principles is very high, especially for small and medium contractors who are already struggling with project cash flow" (Pr PM 1). Another respondent added that "clients often focus on the lowest construction cost, so contractors find it difficult to justify circular solutions that may appear expensive at the beginning" (Pr QS 3).

Limited technical expertise was reported by 61.1% of respondents, showing that skills shortages remain a significant challenge in the transition towards circular construction. Respondents indicated that many professionals and contractors lack practical knowledge on circular design, material reuse, waste minimisation and lifecycle-based construction approaches. As one respondent observed: "Many people in the industry have heard about circular economy, but they do not know how to apply it practically on construction projects" (Pr ENG 1). Another participant stated that "there is still a shortage of professionals who understand how to design, specify and manage projects using circular economy principles" (Pr CM 2).

Cultural resistance to change was reported by 50.0% of respondents. This suggests that traditional construction practices remain deeply embedded in the South African construction industry, making it difficult for firms to adopt new approaches. One respondent explained: "The construction industry is used to conventional ways of doing things, and many stakeholders are not willing to change unless they are forced by policy or client requirements" (Pr PM 2). Another respondent remarked that "some contractors still believe that reusing materials or changing construction methods may compromise quality, which creates resistance to circular economy practices" (Pr QS 1).

Fragmented supply chains were reported by 44.4% of respondents, indicating that poor coordination among suppliers, contractors, designers and waste management stakeholders affects circular economy implementation. Respondents suggested that circular construction requires strong collaboration across the entire project lifecycle, which is often lacking in current practice. One respondent stated: "Circular economy cannot work when suppliers, contractors and waste handlers operate separately; the whole supply chain must be connected from design to demolition" (Pr ENG 2). Another respondent added that "the lack of reliable suppliers for recycled and reusable materials makes it difficult for contractors to implement circular practices consistently" (Pr CM 3). Based on the findings presented in Table 1, the barriers were quantitatively prioritised according to their frequency of occurrence. Lack of regulatory frameworks was the most significant barrier, reported by 83.3% (n = 15) of the reviewed studies, followed by high implementation costs (66.7%, n = 12), limited technical expertise (61.1%, n = 11), cultural resistance to change (50.0%, n = 9), and fragmented supply chains (44.4%, n = 8). The predominance of regulatory barriers indicates that shortcomings such as inadequate circular economy policies, weak enforcement mechanisms, the absence of procurement incentives for recycled materials, and limited technical standards remain the principal constraints to implementing circular economy practices in road construction. The second research question examined barriers hindering CE adoption. Thematic coding produced five main categories:

Table 1. Barriers to CE Adoption in the South African Construction Industry

Barrier Category	Frequency of Mentions (n=18)	% of Respondents Reporting
Lack of regulatory frameworks	15	83.3
High implementation costs	12	66.7
Limited technical expertise	11	61.1
Cultural resistance to change	9	50.0
Fragmented supply chains	8	44.4

4.3 Geographic Trends in Barrier Perceptions

The barriers were varied in relative significance across provinces. Gauteng respondents cited more policy gaps, while KwaZulu-Natal respondents cited infrastructure constraints. The findings in Figure 1reveal that policy gaps are the most significant barrier overall, particularly in Gauteng, where 85% of respondents identified this as a

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challenge, followed by KwaZulu-Natal (70%), Free State (75%), and North West (65%). This suggests that regulatory inconsistencies and a lack of clear policy direction are felt more acutely in urbanized and industrialized regions such as Gauteng. High costs are also widely reported, with Gauteng (70%) and KwaZulu-Natal (65%) again leading, reflecting higher operational and infrastructural expenses in these provinces. In terms of technical expertise, challenges are more prominent in Gauteng (60%) and KwaZulu-Natal (55%), possibly due to the higher demand for specialized skills in implementing innovative or sustainable projects. Cultural resistance appears more evenly distributed, but still higher in Gauteng (50%) compared to North West (35%), implying that attitudes toward change may be more entrenched in less urbanized areas. Finally, fragmented supply chains were most reported in Gauteng (45%) and least in North West (30%), highlighting disparities in infrastructure integration and logistical coordination across provinces.

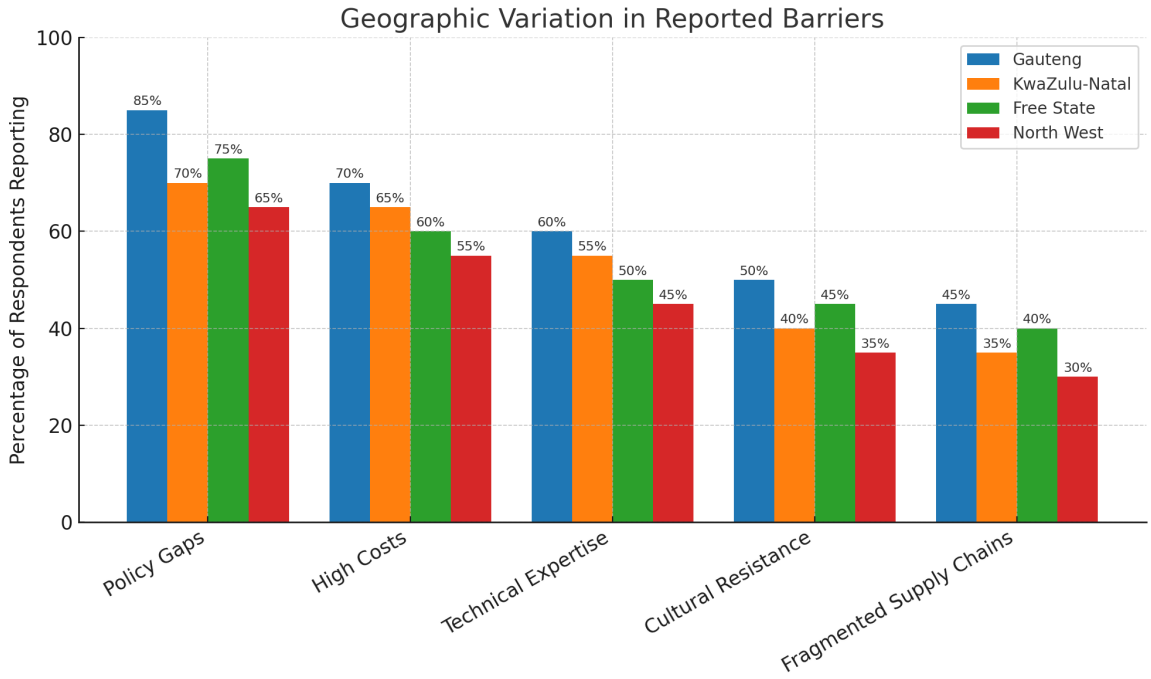


Figure 1. Geographic Variation in Reported Barriers

5. Discussion

The findings demonstrate that the adoption of Circular Economy principles within South Africa's construction industry is constrained by several interrelated institutional, economic, technical, and behavioural barriers. The most significant barrier identified was the lack of regulatory frameworks, reported by 83.3% of participants. This finding suggests that existing construction legislation and policy frameworks provide insufficient guidance, incentives, and enforcement mechanisms to encourage the implementation of circular practices. Participants consistently indicated that government leadership is essential to facilitate industry-wide adoption through mandatory regulations, standards, and procurement policies. This finding supports previous studies by Benachio et al. (2020) and Rao et al. (2025), who argue that effective policy instruments are fundamental drivers of Circular Economy implementation within the construction sector.

High implementation costs emerged as the second most significant barrier. Although Circular Economy practices generate long-term environmental and economic benefits, many participants perceived the initial investment required for recycling technologies, material recovery systems, specialised equipment, and workforce training as financially prohibitive. These findings are consistent with Otasowie et al. (2024), who reported that financial constraints remain one of the primary obstacles to sustainable construction adoption in developing economies. The findings further suggest that the absence of financial incentives, tax benefits, and government subsidies discourages contractors from investing in circular solutions.

The study also revealed that limited technical expertise continues to impede implementation. Participants highlighted that many construction professionals possess only a basic understanding of Circular Economy concepts and lack practical knowledge regarding circular design, material recovery, lifecycle assessment, and

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waste minimization techniques. This finding indicates a need for universities, professional councils, and industry organizations to strengthen education and continuous professional development programs focused on Circular Economy principles. Similar observations have been reported by Aseni et al. (2025), who identified knowledge gaps as a significant behavioral barrier to Circular Economy implementation.

Another important finding relates to cultural resistance to change. Many respondents indicated that stakeholders continue to favor conventional construction methods due to concerns about project risk, quality assurance, and uncertainty about recycled materials. Such resistance reflects organizational inertia and highlights the importance of change management, awareness campaigns, and demonstration projects to build confidence in circular construction practices. This finding aligns with international literature suggesting that organizational culture significantly influences the successful adoption of sustainability innovations.

Fragmented supply chains were also identified as an important challenge. Effective Circular Economy implementation requires collaboration among architects, engineers, contractors, suppliers, manufacturers, waste management companies, and government agencies throughout the project lifecycle. However, respondents indicated that poor coordination and limited availability of recycled construction materials restrict opportunities for reuse and material recovery. Strengthening collaboration and establishing integrated material recovery networks would therefore improve resource efficiency and facilitate greater adoption of circular practices.

The geographical analysis further revealed regional differences in perceived barriers. Respondents from Gauteng reported policy-related challenges more frequently than participants from other provinces, reflecting the complexity and scale of construction activities within South Africa's primary economic hub. In contrast, respondents from KwaZulu-Natal placed greater emphasis on infrastructure limitations and implementation challenges. These regional differences suggest that although national policy reforms are required, province-specific implementation strategies may be necessary to address local industry conditions effectively. Overall, the findings demonstrate that successful Circular Economy implementation requires coordinated efforts involving government, industry, academia, and professional institutions to overcome the institutional, technical, financial, and behavioral barriers currently limiting adoption.

6. Conclusion

This study investigated the barriers to the adoption of Circular Economy principles in South Africa's construction industry through qualitative interviews with construction professionals. The findings revealed that the absence of supportive regulatory frameworks, high implementation costs, limited technical expertise, cultural resistance to change, and fragmented supply chains are the primary challenges preventing the widespread implementation of the Circular Economy. Among these, inadequate regulatory support emerged as the most significant barrier, highlighting the critical role of government policy in driving sustainable transformation within the construction sector.

The study contributes to the growing body of knowledge on Circular Economy implementation by providing empirical evidence from South African construction professionals. The findings demonstrate that successful implementation requires a collaborative approach involving government departments, professional councils, higher education institutions, contractors, consultants, suppliers, and waste management organisations. Strengthening regulatory frameworks, investing in technical capacity development, promoting stakeholder collaboration, and introducing financial incentives would significantly accelerate the transition towards circular construction practices.

From a practical perspective, the study provides useful guidance for policymakers responsible for developing construction and environmental policies, while also assisting industry practitioners in identifying priority areas for improving resource efficiency and sustainable construction practices. Future research should expand the study to include quantitative investigations involving a larger sample across all South African provinces and examine sector-specific Circular Economy implementation strategies. Comparative studies between South Africa and other developing economies would also provide valuable insights into effective policy interventions and best practices to accelerate Circular Economy adoption in the construction industry.

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