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Pathways to Circular Transformation: Rethinking Construction Industry Practices in Emerging Economies

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Abstract

The construction industry (CI) faces continuous pressure to transition from linear (take, make, dispose) models toward circular economy (CE) principles that prioritise sustainability, resource efficiency, and long-term resilience. However, this transition is hindered by entrenched profit-driven strategies, public-sector demands for rapid delivery, and limited stakeholder awareness of CE benefits. Moreover, challenges such as financial constraints, regulatory gaps, and the absence of structured markets for recycled materials further complicate adoption, leaving many firms reliant on traditional practices. To investigate these challenges, the study employed a qualitative mono-method, using semi-structured interviews with 10 professionals across the Gauteng, KwaZulu-Natal, Free State, and Northwest provinces. The research participants were identified through snowball sampling to ensure a diverse range of perspectives. The research sample included architects, engineers, project managers, and policy makers. The qualitative data were analysed using thematic analysis to capture insights into CE awareness, perceived opportunities, and the potential of CE practices in construction. The results of this study suggest that governmental support through targeted policies, tax incentives, and regulatory frameworks can accelerate CE integration. The study further emphasises the pivotal role of education and professional bodies in embedding CE principles into curricula and competency standards. The findings also suggested that collaboration across public and private sectors could offer a practical pathway to sustainable construction practices. Hence, these findings highlight that an integrated approach combining policy reform, economic measures, education, and stakeholder collaboration can reposition the CI as both profitable and pro-environmental. Therefore, this study recommends that future research should investigate sector-specific CE adoption models, explore financial mechanisms such as subsidies and green financing, and assess the role of digital technologies in enabling CE adoption. Thus, moving the construction industry beyond short-term gains to the delivery of resilient infrastructure that supports societal well-being and ecological regeneration.

Keywords
Construction industry, circular economy, emerging economies, sustainability, stakeholder collaboration

1. Introduction

The CI is a cornerstone of economic growth and infrastructure development, yet it remains one of the most resource-intensive industries worldwide. The linear models of construction, often described as “take, make, dispose”, have contributed significantly to environmental degradation, resource depletion, and waste generation (Geissdoerfer et al., 2017). In response, the CE has emerged as a transformative paradigm that seeks to close resource loops by promoting the reuse, recycling, and repurposing of materials to enhance sustainability and resilience (Bocken et al., 2016). CE principles are increasingly recognised as essential for rethinking construction practices, particularly in emerging economies where rapid urbanisation and industrialisation intensify environmental pressures. In South African CI, CE

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adoption remains limited and fragmented. While practices such as material reuse and recycling are not entirely new, they are often informal and concentrated in community-driven initiatives rather than mainstream construction operations (Godfrey et al., 2021). Some of the structural obstacles that hinder widespread CE adoption include financial constraints, regulatory gaps, and fragmented supply chains. Furthermore, limited awareness and technical capacity among construction professionals exacerbate the challenge, leaving many firms reliant on traditional linear practices (Hosseini et al., 2023). These challenges highlight the need for systemic transformation that integrates CE principles into policy, practice, and education.

Researchers in CE have also emphasised that CE adoption in construction requires not only technical innovation but also institutional and organisational change. For instance, Awuzie and Emuze (2017) and Awuzie (2022) argue that the construction industry must embrace CE as a strategic framework that redefines value creation, moving beyond short-term profit motives towards long-term sustainability and resilience. Their work underscores the importance of collaborative governance, stakeholder engagement, and capacity building in enabling CE transitions, particularly in contexts where regulatory and financial support is limited. Therefore, this study investigates the pathways to circular transformation in the South African construction industry. To achieve this aim, the study explores the extent of CE adoption and awareness, the perceived opportunities related to CE, and the potential of CE practices in construction processes.

2. Literature Review

The CE has emerged as a transformative paradigm for addressing sustainability challenges within the CI. Contrary to the traditional linear model of "take, make, dispose," CE emphasises closed-loop systems that maximise resource efficiency, minimise waste, and promote resilience (Geissdoerfer et al., 2017). Research accents the importance and relevance of CE principles in construction, given the sector's high consumption of raw materials and its significant contribution to global waste streams (Bocken et al., 2016). Despite its potential, CE adoption in construction remains uneven, particularly in emerging economies where structural and institutional barriers persist.

2.1. Global Perspectives on CE in Construction

CE adoption in construction has largely been driven by regulatory frameworks, technological innovation, and stakeholder pressure. In the Global North, CE practices such as design for disassembly, material reuse, and recycling have been integrated into mainstream construction processes, often supported by government incentives and certification schemes (Adams et al., 2017). These initiatives demonstrate CE's potential to reshape construction practices and the importance of systemic support mechanisms. Therefore, without enabling policies and infrastructure, CE adoption remains limited to niche projects rather than industry-wide transformation. While the literature celebrates progress in the Global North, it tends to overemphasise technological solutions and underexplores the socio-cultural realities of Global South countries, such as South Africa. This creates a gap in understanding of how CE principles can be adapted to diverse contexts in which regulatory and financial ecosystems differ significantly.

2.2. CE Adoption in Emerging Economies

In emerging economies, CE adoption faces unique challenges. Recent studies highlight that CE practices, such as recycling and material reuse, are often informal and concentrated in community-driven initiatives rather than institutionalised within the CI (Godfrey et al., 2021). Barriers, including financial constraints, regulatory gaps, and fragmented supply chains, further hinder adoption, leaving many firms reliant on linear models that prioritise cost efficiency and rapid project delivery (John et al., 2023). Hosseini et al. (2023) emphasise that limited technical capacity and awareness among construction professionals exacerbate these challenges, underscoring the need for education and training to build industry readiness. The literature on CE practices tends to frame emerging economies as lagging behind, but this overlooks innovative grassroots practices, such as informal recycling, that could inform formal CE strategies.

2.3. Institutional and Organisational Dimensions

Beyond technical barriers, research suggests that CE adoption requires institutional and organisational transformation. Awuzie and Emuze (2017) contend that CE must be embraced as a strategic framework that redefines value creation, moving beyond short-term profit motives towards long-term sustainability. Awuzie (2022) further highlights the importance of collaborative governance, stakeholder engagement, and capacity building in enabling CE transitions, particularly in contexts where regulatory and financial support are limited. These perspectives suggest that CE adoption in construction is not merely a technical challenge but a systemic one, requiring alignment across policy, practice, and education. Although these studies rightly emphasise governance and collaboration, they lack empirical evidence on how institutional reforms can be operationalised in practice. This raises a need for case-based research that demonstrates how organisational culture shifts can be achieved in resource-constrained environments.

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2.4. Supply Chain and Collaboration Challenges

Supply chain fragmentation has emerged as an obstacle to CE adoption. As such, Mhlanga et al. (2023) argue that effective CE implementation requires collaborative supply chains that enable the circulation of materials and resources. Hence, when coordination among suppliers, contractors, and clients is restricted, CE practices remain isolated within individual projects with limited systemic impact. This highlights the need for integrated approaches that foster communication and cooperation across stakeholders. Thus, ensuring that CE principles are embedded throughout the construction process. Nonetheless, the literary lens that identifies collaboration as essential often treats supply chains as static processes. In reality, supply chains are dynamic and shaped by power relations, market forces, and trust.

2.5. Research Gaps and Pathway Forward

The literature collectively underscores that while CE offers significant potential for transforming construction practices, its adoption is hindered by financial, regulatory, technical, and organisational barriers. In emerging economies such as South Africa, these challenges are compounded by limited awareness, fragmented supply chains, and the absence of enabling policies. Scholars emphasise that pathways to circular transformation must therefore combine policy reform, financial incentives, education, and stakeholder collaboration. The literature further provides a strong conceptual foundation but remains uneven in its empirical grounding. Global North perspectives dominate, while emerging economy contexts are often framed in deficit terms. A critical pathway forward would involve recognising informal practices as legitimate contributions, embedding CE within institutional reforms, and fostering supply chain collaboration that accounts for socio-economic realities. Therefore, addressing these barriers will help the CI move beyond incremental initiatives towards a comprehensive transformation that aligns profitability with sustainability.

3. Methodology

This study adopted a qualitative mono-method research design to explore the complex realities of CE adoption in the South African construction industry. A qualitative approach enabled the researchers to capture the lived experiences, perceptions, and contextual challenges of registered construction professionals, to identify opportunities for CE integration. Semi-structured interviews were selected as the primary data collection instrument because they provided both consistency in questioning and the flexibility to probe deeply into research participants' insights (Creswell and Poth, 2018).

The research participants were recruited through snowball sampling, a technique that facilitated access to professionals with relevant expertise in construction and CE-related practices (Etikan et al., 2016). The final sample comprised 10 registered professionals drawn from the Gauteng, KwaZulu-Natal, Free State, and North West provinces, as shown in Table 1. This geographical spread ensured diversity in perspectives and organisational contexts. The participants represented a range of roles, including architects, engineers, project managers, property developers, and policy makers, reflecting the multidisciplinary nature of the construction industry. Their professional experience ranged from six to twenty-eight years, thereby incorporating both emerging voices and seasoned expertise. The research data were collected through semi-structured interviews conducted both in person and virtually, given the spread of the research sample across South African regions. Each interview lasted approximately 45 minutes, providing sufficient depth in discussion while maintaining research participant engagement. The interview protocol was designed to elicit insights into three key areas: knowledge and awareness of CE principles, perceived opportunities, and the potential of CE practices in construction. This structure ensured alignment with the study's objectives while allowing participants to elaborate on their personal experiences and professional perspectives.

The interviews were transcribed and analysed using thematic analysis, a method well suited to identifying patterns and meanings when synthesising qualitative data (Braun and Clarke, 2019). The thematic codes were generated and subsequently clustered into themes and sub-themes for ease of analysis. This iterative process enabled the condensation of raw data into analytically meaningful categories. Thematic analysis revealed a substantial level of understanding of CE practices among participants, with many describing CE as a transformative framework shifting from the traditional "take-make-dispose" model to a "closed-loop" system (Bocken et al., 2016). The researchers also triangulated the results by incorporating perspectives from diverse professional roles and provinces to ensure the credibility and trustworthiness of the findings. This helped strengthen the study's reliability and ensured that the findings were firmly grounded in participants' authentic experiences.

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Table 1. Summary of Participants

Coded Name	Type of Organisation	Size of Company	Occupation	Area of Expertise	Year of Experience	Highest Qualification
C1	Architectural Consultancy	National	Architect	Heritage Art Deco, Designs and Review	24	Honours in Civil Engineering
C2	Architectural Consultancy	Regional	Architect	Building and Design Implementation	28	National Diploma in Architectural Technology
C3	Civil Structure Consultancy	Regional	Structural Engineer	Project Planning, Design, Engineering, Construction Monitoring	8	Bachelor's Degree in Civil Engineering
C4	Project Manager/Academic	Regional	Contracts Manager	Project Co-ordination, Construction Management	6	Masters
C5	Multi-Disciplinary Consultancy	National	Project Manager/ Quantity Surveyor	Contract Law	10	Masters
C6	Multi-Disciplinary Consultancy	National	Project Manager	Project Management Operations.	17	B-Tech in Quantity Surveying
C7	Property Developer	National	Property Developer	Project Management, Alternative Building Method and Sustainable Construction	9	Masters
C8	Multi-Disciplinary Consultancy	National	Quantity Surveyor	Quantity Surveying, Business Administration	13	Bachelors in Quantity Surveying
C9	Multi-Disciplinary Consultancy	National	Quantity Surveyor	Quantity Surveying, Business Administration	18	Masters
C10	Multi-Disciplinary Consultancy	National	Project Manager/ Quantity Surveyor	Project and Programme Management	17	PHD

4. Findings

The findings from the interviews reveal that the adoption of CE principles in the South African CI remains in its early stages. While participants demonstrated awareness of CE concepts, their application across companies remains fragmented, informal, and often limited to specific projects or community initiatives. Therefore, the results highlight both emerging pathways of transformation and persistent barriers that hinder the mainstreaming of CE practices. The following sub-themes, coded by their identifiers, illustrate research participants' perspectives and provide insight into the current state of CE adoption in South African CI.

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Theme 1: Informal and Limited Adoption
Participants consistently described CE practices as informal and peripheral to mainstream construction endeavours. For instance,

- **C1** explained that recycling and reuse are familiar but not embedded in company strategies, often occurring only when cost savings are evident.
- **C3** added that CE is not part of formal policy but is applied sporadically depending on project circumstances.
- Several professionals noted that CE practices are more visible in rural housing initiatives, where communities reuse materials out of necessity rather than as part of structured sustainability planning.

Theme 2: Hybrid Models and Emerging Practices
Some participants observed a gradual shift towards hybrid models that combine linear and circular approaches. For instance,

- **C7** highlighted that certain developers are experimenting with alternative building methods and sustainable construction, though these remain exceptions.
- **C2** reported that in Gauteng, green construction initiatives frequently include material reuse and recycling, contributing to reduced waste and improved resource efficiency.
- **C5** noted that CE practices are beginning to appear in projects seeking certification or recognition for sustainability, but they are not yet standard across the industry.

Theme 3: Financial and Regulatory Barriers
The research participants noted that the slow transition towards CE practices is hindered by several critical obstacles, with financial and regulatory challenges repeatedly emphasised. For instance,

- **C4** stated that the absence of clear government frameworks and incentives makes it difficult for companies to justify the additional costs of procuring sustainable materials.
- **C6** explained that even when companies are interested in CE, the lack of financial support forces them to revert to cheaper, linear practices.
- **C5** and **C6** added that small-scale construction companies face greater difficulties, as the financial burden of adopting CE practices is harder to rationalise without tangible benefits.
- **C7** observed that larger firms may absorb some costs, but smaller firms cannot compete under current conditions.

Theme 4: Awareness and Capacity Constraints
The research participants subsequently identified limited awareness and technical capacity as significant barriers to CE adoption. For instance,

- **C8** and **C9** pointed out that many industry stakeholders lack specialised knowledge of CE strategies such as design for disassembly or material repurposing.
- **C9** further remarked: *"…one needs to have a global approach in terms of issues around sustainability, because it's not just recycling, but the entire chain from the design to the choice of materials and all the way to the reuse of those materials when eventually the building is no longer serving its purpose well, where it needs to be demolished, or repurposed."*
- **C10** added that training opportunities are scarce, leaving many professionals without the skills needed to implement CE effectively.

Theme 5: Supply Chain Fragmentation
Supply chain fragmentation was also highlighted by research participants as another major barrier. For instance,

- **C10** observed that poor coordination among suppliers, contractors, and clients makes it difficult to establish circular practices involving material recycling and reuse.
- **C3** explained that even when companies attempt to reuse materials, the lack of collaboration across the supply chain results in inefficiencies and wasted effort.
- **C7** added that without clear communication channels, CE practices remain isolated within individual projects rather than spreading across the industry.

Theme 6: Industry Practitioners' Perceptions and Pathways Forward
There is an overarching consensus among professionals across different provinces that CE principles are gaining traction. However, their adoption is hindered by regulatory, financial, educational, and logistical barriers. For instance,

- **C2** and **C7** noted that CE practices are currently limited to companies prioritising sustainability within certified projects, while the wider industry continues to rely on entrenched linear models.

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- **C1** and **C4** emphasised that until systemic changes are introduced, CE will remain marginal rather than mainstream.
- Other research participants suggested that improvements in regulation, financial support, stakeholder collaboration, and professional training are essential to expand CE adoption and pave the way for a sustainable CI in South Africa.

5. Discussion

The findings of this study revealed that while awareness of CE principles in the South African CI is increasing, adoption remains fragmented and largely informal. This reflects broader patterns observed in emerging economies, where CE practices are often associated with community-driven initiatives rather than mainstream industry transformation (Godfrey et al., 2021). The persistence of informal practices highlights the gap between theoretical understanding and practical implementation, suggesting that CE is still perceived as peripheral to core construction operations. Consequently, empirical evidence from construction professionals indicated that hybrid models are emerging, in which companies combine linear and CE approaches. These practices are most visible in projects seeking green building certification, where material reuse and recycling are incorporated to meet sustainability standards. These developments are a testament to the fact that external factors, including regulatory compliance and stakeholder expectations, are influencing construction companies' behaviour (Aboginije et al., 2020). However, these initiatives remain isolated, and CE principles have not yet been embedded across the wider construction industry.

Furthermore, financial and regulatory barriers emerged as critical obstacles to CE practices. The findings elucidated that the absence of supportive government frameworks and incentives makes sustainable materials and waste management strategies financially unattractive. This notion resonates with the study by Durdyev et al. (2023), emphasising the importance of policy intervention in enabling CE adoption. The financial burden on small and medium-sized enterprises (SMEs) was also highlighted, since their limited access to financial resources restricts their ability to invest in sustainable practices (John et al., 2023). Therefore, without clear financial benefits, companies continue to prioritise cost efficiency and rapid project delivery, reinforcing reliance on linear models. The results of this study also suggested that awareness and capacity constraints further hinder CE adoption. For instance, most research participants highlighted the lack of specialised knowledge in strategies such as design for disassembly and material repurposing. This aligns with Hosseini et al.'s research that identifies knowledge and skills gaps as a major barrier to circularity in construction (Hosseini et al., 2023). As such, construction professionals may struggle to appreciate the long-term benefits of CE without adequate training and education, perpetuating short-term decision-making. Hence, it is essential to embed CE principles into professional curricula and competency standards to build capacity and foster industry-wide transformation.

The challenge relating to the fragmented supply chain was another recurring theme. In this theme, the research participants described poor coordination among suppliers, contractors, and clients, which undermines efforts to establish CE practices. Mhlanga et al. (2023) argue that effective CE adoption requires collaborative supply chains that enable the circulation of materials and resources. Therefore, when such collaboration is missing, CE initiatives remain isolated within individual projects with limited systemic impact. This reality underscores the need for integrated approaches that foster communication and cooperation across stakeholders. In addition, the literature highlights the importance of targeted policies, financial incentives, and collaborative frameworks to enabling CE adoption (Adams et al., 2017; Otasowie et al., 2024). There is also a need to foster education and professional training, as both play pivotal roles in building capacity and embedding CE principles in practice. These strides would enable the South African CI to move beyond incremental initiatives towards a comprehensive transformation that aligns profitability with sustainability.

6. Conclusion

This study concludes that while awareness of CE principles within the South African CI is steadily increasing, their adoption remains fragmented, informal, and largely confined to specific projects or community-driven initiatives. The persistence of linear models, driven by cost efficiency and rapid project delivery, continues to overshadow CE objectives, with financial constraints, regulatory gaps, limited technical capacity, and supply chain fragmentation acting as major barriers. However, the literature also reveals that current CE discourse often privileges Global North perspectives, where adoption is supported by robust regulatory frameworks and technological innovation, framing emerging economies in deficit terms. This risks overlooking the innovative grassroots practices and informal recycling networks that, although marginalised, could serve as an important pathway to CE transformation. Furthermore, while institutional and organisational reforms are frequently emphasised, empirical evidence on how to operationalise them in resource-constrained contexts remains limited. This reality highlights an urgent need for government intervention through targeted policies, subsidies, and tax incentives, as well as capacity building through professional education and training that embeds CE principles in industry practice. This would therefore strengthen collaboration across supply chains to ensure the systemic integration of CE strategies. Hence, future research must interrogate the relational dynamics of supply chains, including trust, power relations, and informal-formal linkages, that shape CE adoption in practice. There is also a

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need for comparative studies across emerging economies to explore transferable solutions, while recognising the socio-cultural and institutional diversity that influences CE pathways. Therefore, this consideration would yield a socio-cultural pathway to CE behaviour that would reposition the CI as both economically viable and environmentally responsible sector, paving the way for resilient infrastructure that supports societal well-being and ecological regeneration.

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