



The Thesis of the PhD dissertation

**A Critical Evaluation of Sustainable Supply Chain Management Practices within
the South African Manufacturing Industry: Unpacking Challenges and
Emerging Opportunities in Durban and Johannesburg.**

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1.BACKGROUND

This study looks at the implementation of sustainable supply chain management (SSCM) in the South African manufacturing industry, focussing on improving operational performance and competitiveness. The study was done in Durban and Johannesburg, these are one of the two big cities in the country that have different but supporting manufacturing, logistical, and institutional systems that are important to the country's supply chains. The manufacturing industry in South Africa's has in the past grown from mining-driven industrialisation in the late 19th century, due to the discoveries of gold and diamonds and the machinery and processing facilities. (Andalib et al., 2023; Kaur and Singh, 2019). During the mid-20th century, government driven industry and the start of imports enabled fast expansion, growth and variety into industries like textiles, automobiles, steel, and chemicals (Khan and Farooq, 2021). SSCM in the recent years has gained popularity due to growing environmental, social, and economic problems (Shah et al., 2023). Durban's manufacturing industry was formed by its important port location, export-oriented infrastructure, automotive and apparel industries (Epoh et al., 2024; Khambule, 2025), while Johannesburg has developed into a diverse manufacturing and economic centre manufacturing metals, chemicals, electronics, and food products (Harrison and Zack, 2012). SSCM is important in resolving South Africa's environmental problems, social and economic differences. Environmentally, it helps to reduce waste, lower carbon emissions and protect resources(Shah et al., 2023). Socially it helps to make better working conditions for employees, it helps to support local communities and to protect human rights.Economically, SSCM increases efficiency, lowers costs, and promotes the organisation's' reputations and markets that care about the environment. Although there are advantages, manufacturing companies are faced with problems of water shortage(Du Plessis, 2023), power outages, limitation in technology and uncertainty in regulations in policies like the carbon tax 2019(Thokoa et al 2022;Wiseman, 2024).there is a limitation in empirical research regarding how manufacturing companies in both cities implement SSCM and turn it into performance and competitiveness outcomes this shows a research gap in the study.

2.MATERIALS AND METHODS

For this research a mixed-methods research design was used to give a complete analysis of sustainable supply chain management (SSCM) practices in the South African manufacturing industry. By combining quantitative and qualitative methods, the research was able to show both the observable trends and the complex factors associated with SSCM adoption in Johannesburg and Durban. The qualitative part used semi-structured interviews to collect complete understanding on SSCM application. Reflexive thematic analysis (RTA) was used to systematically find and evaluate patterns of meaning in qualitative data. Content coding approaches helped to identify repeating narratives, and direct quotations were employed for supporting analytical interpretations and connect findings to related literature. Hypotheses were tested using descriptive and interpretive analysis in accordance with the nature of the data, which included ordinal survey responses from employees, suppliers, and industry professionals as well as qualitative insights from managers. Statistical tests such as regression and correlation were not used because the sample sizes were small or the data were not assessed on scales suitable for these tests, and evaluation was dependent on patterns, central trends, and theme interpretation to examine ties with theoretical ideas. This approach made sure the assessment was complete, relevant, and based on evidence for all stakeholder groups while keeping the method consistent and avoiding claims that go beyond the evidence. Using quantitative and qualitative data improved the analysis and made the results more reliable, this limits using more detailed data analysis and making results applicable to other situations, clear reporting makes the study more reliable and understandable. although there are limitations, this research provides useful empirical knowledge into the manufacturing sector and shows a base for future studies involving larger, and more geographically diverse samples.

3.RESULTS AND DISCUSSION

This chapter gives the summary of research findings to address the study's objectives and research questions. Which are:

1. What evidence exists of sustainable supply chain management practices adopted in the South African manufacturing industry?
2. What challenges do manufacturing firms meet in implementing sustainable supply chain practices?
3. How do sustainable supply chain practices affect the performance and competitiveness of manufacturing firms?
4. What are the key factors influencing the successful adoption and integration of sustainability within supply chains in the sector?
5. What strategies can be recommended to enhance the adoption and effectiveness of SSCM in the manufacturing sector?

3.1 Results for suppliers

The supplier findings show a rising, although uneven, adoption of sustainable supply chain management (SSCM) practices in South Africa's manufacturing industry (RQ1). Most respondents work in sectors that are tightly connected to global value chains, particularly the automobile industry, which must adhere to demanding international sustainability standards. This positioning helps people understand sustainability standards like following environmental rules, getting certifications and buying sustainably. It also gives suppliers more reasons to use SSCM. In the food & beverage and textile companies face very different and often changing sustainability requirements. This shows that the type of industry has a big effect on how SSCM is adopted. Subsequently, new and smaller manufacturing companies appear to be less prepared to prioritise SSCM, supporting the idea that company size and its growth are major enablers of sustainability adoption (RQ1). Geographic location is also important. Suppliers in Gauteng benefit from stringer institutional systems, better access to recycling facilities and more regular regulatory checks. Suppliers in Kwa Zulu Natal have advantages in logistics because of port access but have limited infrastructure. This implies that SSCM adoption is influenced by both firm-level skills and regional settings, rather than being consistent across places (RQ1). Suppliers' knowledge of sustainability is mixed. Some understand clients' demand but many do not suggest problems in communication with manufacturers. This inconsistent awareness limits successful SSCM implementation because organizations cannot act on regulations that are not properly specified. Furthermore, most suppliers only consider sustainability to a limited or moderate amount when dealing with their clients. This suggests that sustainability is viewed

primarily as a reactionary compliance concern rather than a tactically integrated component of supply chain decision-making. As a result, SSCM is still in the early to intermediate stages of integration and has yet to be fully used as a source of competitive advantage (RQ1; RQ3). According to RQ2 the main problems to adoption are financial and technological high costs and limited access to materials or technology are the biggest challenges. Other problems include unclear communication with customers, uncertain rules and uneven demand for sustainable products this suggests that suppliers are not against but face practical and resource limits. Customer demand appeared as a key external driver of SSCM adoption (RQ1; RQ4).

While many suppliers state that customers only rarely request sustainability, there is a strong perception that such demands are increasing. This predicted rise in sustainability criteria operates as a pull element, driving suppliers to formalise internal policies and match operations with future regulations. Nonetheless, adoption is inconsistent due to variations in consumer pressure among supplier portfolios. Internal preparedness is restricted (RQ3 and RQ4). Most suppliers claim lack of resources and knowledge to completely meet sustainability goals, showing gaps in financial capacity, technical capabilities, and management processes.

This lack of capability affects competitiveness since suppliers that are unable to meet sustainability standards risk losing future contracts, whereas those who engage in capability development can improve resilience and consumer trust. Finally, based on RQ5 the findings suggest that building skills, lowering costs and better coordination are important to help suppliers use SSCM.

Hypotheses Evaluation Summary

Table 1: Hypotheses Evaluation for Suppliers

| Hypotheses | Method | Empirical result | Decision |
|--|--|--|----------|
| H1: Effective SSCM implementation improves efficiency & cost | Thematic interpretation of supplier and professional data (Creswell & Plano Clark, 2023) | Moderate adoption observed, with formalized policies and evidence of customer demand driving SSCM practices | Accepted |
| H2: Challenges include regulatory, resource, and supplier engagement constraints | Descriptive and thematic analysis of survey and responses | Key challenges identified included excessive costs, limited technology access, weak regulatory enforcement, and communication gaps | Accepted |
| H3: Circular economy integration enhances sustainability and resource optimization | Thematic review of survey responses | circular economy principles are emerging in policy and awareness, but adoption is limited by organisational capacity | Rejected |
| H4: Government support positively influences SSCM adoption | Thematic and descriptive analysis of suppliers | government incentives perceived as weak, though respondents recognize strong potential impact if effectively implemented | Accepted |

Source: Author's compilation

3.2 Results for Employees

Employee findings show that sustainable supply chain management (SSCM) practices are being implemented in South African manufacturing companies, although the extent and consistency of adoption vary per organisation (RQ1a). Most employees say their employer actively use SSCM, showing that sustainability is becoming an important goal alongside efficiency, caring for the environment and meeting stakeholder expectations. However, minority of employees either do not see such promotion or are unsure, indicating flaws in internal communication, transparency, or the formalisation of sustainability measures. This means that, while SSCM techniques may exist in certain organisations, they are not fully integrated into organisational strategy or clearly communicated to employees.

There are strong and statistically significant connections between employee awareness, participation in SSCM activities, and perceived firm performance (RQ1a; RQ3). Higher awareness is marginally connected with increased employee involvement, while both awareness and involvement are favourably associated with better assessments of sustainability performance. Employee involvement had the strongest association with perceived performance, indicating the need of active participation above passive awareness in achieving sustainability results. The findings show that internal participation is important for turning sustainability goals into practical and competitive benefits. Employees say that

financial limits and technological problems are the main barriers to SSCM implementation (RQ2). these challenges are made worse by resistance to change, a lack of knowledge or experience in sustainability and poor coordination with suppliers. Regulatory issues are seen as less important, which suggest that internal company issues are the main challenge.

A portion of employees also report unclear organisational difficulties, emphasising the importance of clearer communication and greater employee involvement in sustainability decision-making. The perceived importance of SSCM for manufacturing enterprises' future development correlates favourably and strongly with perceived sustainability performance (RQ3). Employees who see sustainability as strategically essential tend to rank their companies' performance higher, supporting the claim that sustainability-oriented mindsets contribute to improved performance and competitiveness. This supports the concept that SSCM serves as a strategic capacity rather than a compliance factor.

Employee awareness and engagement are more crucial than length of service when relating to successful SSCM adoption (RQ4). Awareness has a moderately positive link with involvement, whereas more work experience is slightly and negatively related to engagement. This shows that having worked longer in a company does not always lead to more involvement in sustainability and may even indicate resistance to change. The results point out the need for targeted awareness, training and change management. Employees think that more training, education and better technology (RQ5) would improve SSCM use and performance These preferences imply that employees believe capability development and technical investment are the most important drivers of sustainable supply chain practices. Limited attention on leadership and supplier collaboration shows that strategic sustainability is not well recognised some employees are unclear because they are not part of the strategic planning. The findings suggest that effective SSCM implementation depends on raising awareness, improving skills and technology and fully including sustainability in organisation culture and daily operations.

Hypotheses Evaluation Summary

Table 2: Hypotheses Evaluation for employees

| Hypothesis | Method | Empirical Result | Decision |
|---|---|---|----------|
| H1: SSCM improves efficiency, cost, and competitiveness | Thematic analysis of employee survey data | Companies with SSCM report higher performance; positive correlation ($\rho = 0.512$, $p < 0.01$) | Accepted |
| H2: Challenges include regulatory, resource, and supplier constraints | Descriptive and thematic analysis | High costs (64%), limited technology (62%), moderate resistance (38%) | Accepted |
| H3: Circular economy integration enhances sustainability | Thematic review of survey data | Moderate awareness; adoption limited by capacity | Rejected |
| H4: Government support positively influences SSCM | Descriptive and thematic analysis | Weak evidence; no significant sector/location differences | Accepted |

Source: Author's compilation

3.3 Results for Industry Professionals

The study gathered views from a wide range of industry professionals including academics, policy advisors, consultants and business owners to give a full picture of SSCM adoption across theory, regulation and practice (RQ1). Most respondents (93,3%) said they were highly involved in sustainability initiatives in the manufacturing sector showing that the findings reflect active engagement with SSCM principles. This commitment highlights how sustainability ideas are being applied in professional roles, sustainability is seen as very important for the competitiveness of the industry with (93,3%) rating it as very or extremely important. While the significance is widely recognised, the current level of SSCM usage was as moderate (60%) or low (40%). Indicating that complete integration of sustainability measures is still a work in progress (RQ1, RQ3). Environmental protection (93.3%) and worldwide market pressures (73.3%) were regarded as the key drivers of SSCM by industry professionals, indicating that adoption is primarily reactive and externally influenced, rather than driven by internal strategic priorities (RQ4). The most major challenges to adoption were consistently identified as cost and technological limitations. High implementation cost were reported by all respondents and (93,3%) said they had limited access to modern technologies, other challenges included unclear return on investment, limited skills and poor coordination across supply chains, showing that financial, technical and capability related problems restrict SSCM adoption (RQ2). government support and regulations as moderately effective, reflecting how respondents perceive external assistance. Institutional processes exist, but lack the depth, clarity, and consistency required for widespread adoption (RQ4). 86.7% of respondents identified international sustainability standards like

ISO 14001 and the UN SDGs have a significant or critical impact on SSCM practices, demonstrating that global benchmarks provide critical guidance and credibility for businesses looking to improve performance and competitiveness. Industry professionals identified key sustainable priorities for future SSCM projects (RQ5) these included circular economy practices and water conservation(86,7%) ,waste reduction and recycling(66,7%),ethical sourcing (60%) and using renewable energy(53,3%) Furthermore, 80% of respondents perceived South African manufacturing companies as likely or very likely to use innovative technology, demonstrating an openness to digital solutions for Sustainability challenges are dependent on overcoming cost and capability restrictions (RQ4). Industry Professionals acknowledged moderate advancement but limited systemic integration in their assessments of SSCM progress. Cost was seen as the biggest challenge which agrees with earlier findings, most respondents agreed that using sustainable practices improves global competitiveness, linking SSCM adoption directly to international market performance(RQ3),overall these results show that even though awareness and strategic recognition of SSCM are high, full adoption requires efforts in managing costs, improving technology, developing skills and ensuring regulatory support to help South Africa’s manufacturing supply chain compete globally.

Evaluation of Hypothesis summary

Table 3: hypothesis evaluation for Industry Professionals

| Hypothesis | Method | Empirical Result | Decision |
|---|--|--|----------|
| H1: SSCM improves efficiency, cost, and competitiveness | Thematic analysis of industry professional responses | Sustainability rated essential for competitiveness (mean = 4.33), growing strategic adoption | Accepted |
| H2: SSCM faces regulatory, resource, and engagement constraints | Descriptive and thematic analysis | Cost barriers (100%), limited technology (93.3%), unclear ROI (60%) | Accepted |
| H3: Circular economy integration enhances sustainability | Thematic review of responses | Circular economy and water conservation rated high (86.7%); adoption still limited | Rejected |
| H4: Government support positively influences SSCM | Thematic and descriptive analysis | Government support rated as slightly effective | Accepted |

Source: Author’s compilation

3.4 Results for managers

The replies of managers show that sustainable supply chain management (SSCM) approaches are being implemented in South African manufacturing, however the depth and integration differ (RQ1). operational efficiency, energy efficiency, and waste reduction were the most selected. Managers stated that sustainability is

increasingly getting institutionalised, transitioning from improvised efforts to integrated daily procedures. Supplier engagement, KPI monitoring, and alignment with global trends like renewable energy and carbon management all point to further SSCM adoption, even though it is limited by financial and infrastructure constraints. Financial restrictions, restricted access to technology, supplier readiness, and regulatory difficulties were repeatedly identified as major implementation challenges (RQ2). High upfront costs deter investment in renewable energy and advanced waste management technology, while locally unavailable or expensive alternatives add to the problem. Supplier misalignment shows systemic challenges, particularly for smaller companies with limited resources or experience. The Extended Producer Responsibility (EPR) which is a regulatory frameworks policy.gives guidance but changes from time to time because of uncertainty and administrative problems. The findings point out how important financial support,technology infrastructure and stable policy framework is in the process of adopting sustainable supply chain management. Managers noted that sustainable supply chain management is important for the organisation's competitiveness and success(RQ3).The South African market is sensitive to price this means organisations must balance cost and sustainability. The success of SSCM implementation is determined by both internal and external factors (RQ4). External factors that had the most impact were regulatory constraints and consumer demand, while internal enablers included financial capacity, supplier compatibility, and managerial commitment. Policy frameworks can help with adoption, but volatility and administrative complexity restrict long-term integration. The interplay of these elements emphasises the importance of cohesive external frameworks as well as internal competence building for effective SSCM implementation. To increase SSCM adoption (RQ5), it is recommended to invest in operational efficiency,engage suppliers systematically,develop monitoring and KPI systems and gradually include global sustainability trends .it is also important to address financial and technological limits and to build the skills and capacity of managers and suppliers.

Evaluation of Hypothesis summary

Table 4: hypothesis evaluation for managers

| Hypothesis | Method | Empirical Result | Decision |
|--|---|---|----------|
| H1: SSCM improves efficiency, cost, and competitiveness | Thematic analysis of manager interviews | Operational improvements from efficiency initiatives, waste reduction, and KPI monitoring | Accepted |
| H2: SSCM faces regulatory, resource, and engagement constraints | Descriptive and thematic analysis | Financial, technological, and supplier-related barriers, plus regulatory uncertainty | Accepted |
| H3: Circular economy integration enhances sustainability | Thematic review of interviews | Some circular economy initiatives, but adoption uneven and limited by cost/capacity | Rejected |
| H4: Government support positively influences SSCM | Descriptive and thematic analysis | Regulation inconsistent; government influence present but variable | Accepted |

Source: Author's compilation

3.5 SUMMARY OF DISCUSSION

The results chapter demonstrates that Sustainable Supply Chain Management (SSCM) adoption in South Africa's manufacturing sector is evident but inconsistent among suppliers, industry professionals, employees, and managers, with most firms displaying awareness but low strategic integration. Suppliers and managers' report that SSCM practices exist mostly in basic forms such as energy saving, waste reduction, and KPI monitoring, but industry professionals highlight the disconnect between conceptual commitment and operational implementation. Employees have noted that partly adopted, not training adequately and communicating affected the organisational adoption. The main challenge that was encountered by all firms were high implementation costs, limited technological equipment, regulatory problems, unclear customer requirements, and the resistance to new change. SSCM increases efficiency, compliance readiness, market access, and reputational competitiveness, while domestic price sensitivity and capability constraints limit full performance improvements. Market and customer pressure pushes firms to adopt SSCM, while leadership, formal policies and resources help firms adopt it internally. Stakeholders see the importance of training, regulatory clarity, technology investment, supplier support, and local sourcing. Generally, SSCM in South Africa is advancing but work still needs to be done in skill development, coordinated policy and collaboration across industries to fully develop.

4.CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

The introduction indicates that South Africa's manufacturing industry has evolved through difficult historical and economic periods that have shaped its current sustainability issues. Durban and Johannesburg are important industrial hubs each facing different infrastructure and environmental challenges that affect the use of SSCM practices even though national laws and global sustainability standards exist there are still gaps in how consistently these practices are applied. this chapter highlighted the potential for supply chain to improve its sustainable performance This gives a general context for the study and lays the groundwork for researching SSCM practices, challenges and opportunities in these major urban cities.

According to the literature, SSCM has increased in significance in the South Africa's manufacturing industry, driven by environmental, social, and economic factors. NAMPAK and Woolworths are progressive companies that have already adopted SSCM practices into their operations the practices are namely waste reduction, green purchasing from suppliers and the use of renewable energy. Despite this these two companies still do face challenges like limited supplies of resources, regulations that change from time to time, and the inconsistent energy supply. Successful SSCM adoption depends on working with stakeholders, strong and innovative leadership and employee training. In general, the development of SSCM in the industry needs a clear, multidimensional approach that includes technological innovation, working with stakeholders to have improvements in sustainability, competitiveness and long-term industry resilience. This research used a mixed methos approach to get a clear understanding of SSCM practices in the South African manufacturing industry, it combined surveys and interviews. The study results showed how the manufacturing sector adopted sustainable practices, the problems encountered and the opportunities for improvement in performance. The study used purposeful sampling to ensure that rich contextual data was collected from industry professionals,employees,managers and suppliers. The sample size and geographic scope were limited, the research followed ethical guidelines and used detailed analysis to make sure the findings are reliable and represent the industry perception.Overall, this study establishes a solid foundation for guiding policy, improving management practices, and giving drive for further research into SSCM in South Africa. This study results noted that SSCM practices are in existence amongst suppliers in the industry sector, even though their adoption is not consistent and mostly driven by what customers need

rather than their own internal strategic guidelines. They face challenges in high implementation costs, limited availability of sustainable materials to supply to their customers and they lack suitable internal capabilities. The mentioned challenges limit their potential for achieving sustainability. Suppliers mentioned some recommendations for increasing SSCM adoption which are financial incentives, targeted training and access to sustainable technology. The findings show that the industry professionals are aware of the importance of SSCM and its ability to boost competitiveness.

However high costs, institutional support and technology make adoption inconsistent. Pressures from external factors, such as international standards and market needs, make implementation easier than strategic initiatives within, resulting in reactive rather than proactive sustainable measures. The findings indicate that, employee's awareness, training, and involvement are significant predictors of effective SSCM implementation, with increased knowledge and participation directly associated to enhanced sustainability and competitiveness. The findings indicate that SSCM in South African manufacturing is progressively institutionalised, with managers highlighting operational efficiency, supplier collaboration, and circular economy practices as key entry points, but adoption remains constrained by fi Strategic investment in renewable energy, local sourcing, and industry-research partnerships, together with strong leadership commitment, is critical for advancing SSCM integration and achieving long-term competitiveness and sustainability.

4.2 Recommendations

Based on the research results, the following recommendations are made:

4.2.1 Establish a national SSCM competitiveness measurement framework. To objectively demonstrate the business case for sustainability, the South African manufacturing industry should create a national SSCM Competitiveness Index with measurable financial, operational, and environmental metrics. This recommendation would enable organisations to benchmark performance, track progress, and justify SSCM investments using empirical evidence relevant to local industry context.

4.2.2 The implementation of circular economy requires cooperation at a system level and cannot rely on individual company efforts. Municipalities, manufacturers and recycling companies should work together to develop circular hubs shared reverse logistics systems and tracking systems of materials. Policies should focus on investing in local recycling infrastructure, and supporting technology development to help promote circular practices across the value chain.

4.2.3 Place an importance on regulatory frameworks through a single compliance website portal. Reduce administrative issues, the relevant industry groups should create a single digital sustainability compliance website that puts together requirements from NERSA, DEFF, DTIC, and other industrial bodies. unified laws, together with consistent enforcement and long-term policy stability, will reduce uncertainty, lower compliance costs, and encourage more predictable SSCM implementation across industries.

4.2.4. Focus more on Internal Capacity Development followed by Location-based Interventions. Although Durban and Johannesburg possess different geographical factors, both logistic and environmental, based on the results SSCM maturity was found to be organisation-driven rather than geography driven. Due to this policymakers and industry stakeholders should focus on strengthening organisational capacity-in terms of leadership, employee engagement, and resource availability rather than designing location specific strategic interventions.

4.2.5. Future research can expand SSCM across sectors, and technologies. It should also focus on sector-specific SSCM frameworks, long-term adoption trends, and the behavioural factors of incorporating sustainability. Digitalisation, technology readiness, and organisational culture should be prioritised as SSCM success drivers. This will increase the theoretical and practical importance of SSCM in emerging economies.

4.2.6 Funding Blockchain may help to improve transparency and trust within the supply chain, digital tools can may help in traceability, reduce misinformation and increase accountability amongst suppliers. Government can introduce digital literacy programs and issue out technology grants to help Small to Medium Enterprises(SMEs) to adopt these tools more easily.

4.2.7. Academic and research scholars,policy makers should conduct comparative research on SSCM studies across the BRICS countries, so that they can identify any challenges they may share, policy guidelines that may be useful and country specific success factors. This type of research can help the south African manufacturing industry within a global network support the sharing of best practices and tighten international cooperation in SSCM.

4.3 New scientific findings

4.3.1. Employee Awareness as a Primary Driver of SSCM Engagement

Scientific contribution and novelty: this study positions awareness as a key behavioural driver of SSCM adoption, rather than a small or supporting factor as suggested in existing literature, by focusing on awareness at an employee level. This study offers a new perspective on how sustainability practices are understood and applied within organisations.

Findings: show higher levels of employee awareness are linked to stronger commitment to environmentally responsible practices. Employees who are more aware of sustainability goals are more likely to follow sustainable procedure,minimize waste and support operational activities that prioritize sustainable activities.

Practical relevance: The importance of investing in internal communication and improving the visibility of sustainable policies,strengthening employee awareness can encourage greater engagement with SSCM even when firms face external pressure.

4.3.2. Negative Influence of Employee Tenure

Scientific contribution and novelty: This study showed that longer tenured employees may resist SSCM adoption, challenging the idea that tenure always means greater commitment and adaptability.

Findings: long tenured employees are less responsive to new sustainability initiatives,due to established routines and skepticism to change.

Practical relevance: The use of targeted strategies like skills renewal, change management and tenure sensitive engagement make sure all employees take part in sustainable initiatives.

4.3.3 Dominance of Internal Organisational Capabilities Over Sectoral or Geographic Context

Scientific contribution and novelty: the study showed that internal factors like leadership, employee attitude, and resource allocation matter more for SSCM adoption than sector or location.

Findings: the differences in infrastructure and environmental conditions in Durban and Johannesburg were seen as less important than how ready the firms themselves were.

Practical implications: the firms can achieve very strong SSCM results in emerging markets by putting a focus on internal factors rather than relying on external factors or regulations.

4.3.4. Perceived Importance of SSCM and Organisational Performance Evaluation

Scientific contribution and novelty: highlights a psychological and cultural element in SSCM assessment showing that employee perceptions can influence how an organisation performs.

Findings: employees who see SSCM as important tend to rate their organisations sustainability higher.

Practical relevance: firms should focus on building a sustainability focused cultures and shared narratives to align employee perceptions with formal performance goals.

4.3.5. Financial and Technological Constraints as Interacting Structural Barriers

Scientific contribution and novelty: The study showed that financial and technological are linked, creating a self-reinforcement barrier to SSCM adoption.

Findings: Limited funding restricts investment in new technologies, while outdated technology increases inefficiency and costs, creating a continuous cycle of constraint

Practical relevance: breaking this cycle requires coordinated actions, like targeted investment, public-private partnerships, technology support programs to help firms progress towards firm growth.

5.PUBLICATIONS

1. Makalima,M and Sokhetye, A (2025) ‘Social housing in South Africa’s urban landscape: Addressing land access and sustainability challenges in Johannesburg, Cape Town and Durban’, *Regional Science and Environmental Economics*, 2025 issue.
2. Sokhetye, A., And Makalima, M., 2025.Exploring Risk Management, Disruptions, and Recovery Strategies in the Chemical Manufacturing Sector in South Africa. Vol. 15 No. 2 (2025): *Acta Carolus Robertus*
3. Sokhetye, A. and Makalima, M. (2025) ‘Environmental, social and governance (ESG) metrics and integrated reporting in logistics: A comprehensive overview’, *Preprints.org*, pp. 1–20.
4. Sokhetye, A. and Makalima, M. (2025) ‘Sustainability and optimization of prefabricated housing in Southern Africa: A life cycle and supply chain perspective’, in *GIRR Conference Proceedings*, Academy of Applied Studies Šabac, pp. 1–12.
5. Sokhetye, A. (2024) ‘Sustainable supply chain management in the South African manufacturing industry: Navigating challenges and opportunities through green marketing and ethical consumerism’, *Acta Carolus Robertus*, 14(1), pp. 1–12.
6. Sokhetye, A. and Rudnák, I. (2024) ‘The relationship between employee engagement and employee productivity: Based on empirical studies in South Africa’, *Acta Carolus Robertus*, 14(1), pp. 1–10.
7. Sokhetye, A. (2024) ‘Circular economy supply chain and sustainable sourcing: The incorporation of McArthur Foundation’s Butterfly Model’, *Studia Mundi – Economica*, 11(2), pp. 43–53.
8. Makalima,M Sokhetye, A., and Rudnák, I. (2024) ‘Integrating sustainable supply chain practices for social housing development: A qualitative study of Johannesburg, Tembisa’, in *Global Challenges Through the Prism of Rural Development: Conference Proceedings*, pp. 1–10.
9. Cheronon, N ,Makalima, M and Sokhetye, A.,(2024) ‘A comparative analysis of maize supply chains: Challenges and solutions in Eastern Cape Province, South Africa and Nandi County, Kenya’, in *Rural Areas in the 21st Century Scientific Conference Proceedings*, pp.

1–15.

10. ANATHI, S., 2023. CORPORATE SOCIAL RESPONSIBILITY OF MINING COMPANIES: A CASE STUDY OF SOUTH AFRICAN MINING COMPANIES. In *АКТУАЛЬНЫЕ ПРОБЛЕМЫ НЕДРОПОЛЬЗОВАНИЯ* (pp. 399-401).
11. Sokhetye, A. (2023) ‘Sustainable supply chain management practices: Challenges and opportunities – A focus on the South African manufacturing sector’, *Acta Carolus Robertus*, 13(2), pp. 1–12
12. Sokhetye, A. (2022) ‘Improving organizational effectiveness in manufacturing: A study of selected manufacturing plant in Durban, South Africa’, *Acta Carolus Robertus*, 12(1), pp. 1–11.
13. SOKHETYE, A., 2022. PIPELINE TRANSPORTATION IN SOUTH AFRICA IN THE 21ST CENTUARY (A LOOK INTO SOUTH AFRICA'S PIPELINE TRANSPORTATION). In *АКТУАЛЬНЫЕ ПРОБЛЕМЫ НЕДРОПОЛЬЗОВАНИЯ* (pp. 202-203).

REFERENCES

1. Andalib Ardakani, D., Soltanmohammadi, A. and Seuring, S., 2023. The impact of customer and supplier collaboration on green supply chain performance. Benchmarking: *An International Journal*, 30(7), pp.2248-2274.
2. Cohen, J. 2016. *Statistical power analysis for the behavioural sciences* (2nd ed.). Routledge.
3. Creswell, J.W. and Plano Clark, V.L., 2023. Revisiting mixed methods research designs twenty years later. *Handbook of mixed methods research designs*, 1(1), pp.21-36.
4. Du Plessis, A., 2023. South Africa’s Impending Water Crises: Transforming Water Crises into Opportunities and the Way Forward. In *South Africa’s Water Predicament: Freshwater’s Unceasing Decline* (pp. 143-170). Cham: Springer International Publishing

5. Epoh, R.L., Langton, I. and Mafini, C., 2024. A model for green supply chain management in the South African manufacturing sector. *Cogent Business & Management*, 11(1), p.2390213.
6. Faber, J., & Fonseca, L. M. 2014. How sample size influences research outcomes. *Dental Press Journal of Orthodontics*, 19(4), 27–29.
7. Harrison, P. and Zack, T., 2012. The power of mining: the fall of gold and rise of Johannesburg. *Journal of contemporary African studies*, 30(4), pp.551-570.
8. Kaur, H. and Singh, S.P., 2019. Flexible dynamic sustainable procurement model. *Annals of Operations Research*, 273(1), pp.651-691.
9. Khambule, I., 2025. 9 Promoting place-based regional development through Local Economic Development Agencies and Special Economic Zones in. *Contemporary South Africa and the Political Economy of Regional Development*, p.150.
10. Khan, S.A.R., Yu, Z. and Farooq, K., 2021. Green capabilities, green purchasing, and triple bottom line performance: Leading toward environmental sustainability. *Business Strategy and the Environment*, 32(4), pp.2022-2034.
11. Shah, A., Soomro, M. A., Zahid Piprani, A., Yu, Z., and Tanveer, M. 2023. Sustainable supply chain practices and blockchain technology in garment industry: An empirical study on sustainability aspect. *Journal of Strategy and Management*.
12. Thokoa, R.L., Naidoo, V., and Herbst, T.H., 2022. A review of service quality: Case of the National Treasury of South Africa. *Africa's Public Service Delivery and Performance Review*, 10(1), p.567.
13. Wiseman, K., 2024. Environmental assessment and planning in South Africa: the SEA connection. In *Perspectives on strategic environmental assessment* (pp. 155-166). CRC Press.