Resilience in the last mile: a systematic literature review of sustainable logistics in South Africa

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ABSTRACT

The last mile of logistics, representing the final stage of product delivery to consumers, is critical for supply chain efficiency and sustainability. Infrastructure inadequacies, urbanisation, and environmental concerns pose challenges to this period in South Africa. This study conducts a systematic evaluation of the literature to investigate the ability of last-mile logistics in South Africa to withstand and maintain throughout time. The PRISMA method and Atlas-ti software are used for thematic analysis. The review highlights important topics such as the development of supply chain management, obstacles in last-mile distribution, the significance of technology, regulatory frameworks, infrastructure improvement, cooperative activities, and the economic and social effects. The findings emphasise the significance of incorporating resilience and sustainability into last-mile logistics in order to enhance operational efficiency, mitigate environmental consequences, and promote socio-economic advancement. The assessment highlights the necessity of joint endeavours, technical advancement, and supporting policies to tackle the distinct issues encountered by South Africa in this field. This study enhances the comprehension of sustainable logistics in South Africa and offers valuable insights for practitioners and policymakers to enhance last-mile logistics operations.

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Introduction

In the realm of logistics, the term "last mile" pertains to the final and often intricate stage of the supply chain, during which goods are transported from distribution centres to end users. The efficiency and sustainability of the last phase of logistics are crucial factors in enhancing the overall efficiency of the supply chain and reducing environmental impacts. South Africa, like other regions, faces challenges in optimising last-mile logistics to ensure economic viability and environmental sustainability. Conducting a thorough literature review is crucial for acquiring a thorough comprehension of the sustainable logistics domain, particularly within the context of South Africa.

By synthesising existing research, one can pinpoint areas of insufficient information and create frameworks for implementing sustainable logistics methods in the future. Multiple studies have investigated innovative strategies to enhance the final phase of logistics, particularly by minimising expenses related to external variables, assessing environmentally friendly alternatives, and optimising delivery effectiveness (Ranieri, Digiesi, Silvestri & Roccotelli, 2018; Agrawal & Singh, 2019; Mangiaracina, Perego, Seghezzi & Tumino, 2019; Krstić, Tadić, Kovač, Roso & Zecevic, 2021). Moreover, the importance of sustainability in the last phase of logistics is underscored by the need to address ecological factors and reduce environmental impacts (Olsson, Hellström & Pålsson, 2019; Trapp, Luttermann, Rippel, Kotzab & Freitag, 2021). Implementing sustainable methods not only helps protect the environment but also plays a significant role in ensuring the long-term viability of logistical operations. Resilience is a crucial concern, especially when managing interruptions like the COVID-19 pandemic. Amidst the current circumstances, the need of implementing lean supply...
chain strategies and digitization has been underscored as crucial factors in guaranteeing company sustainability (Trabucco & Giovanni, 2021). Utilising crowd-based delivery, optimising routes, and implementing shared micro-depot networks have emerged as innovative approaches to enhance the efficiency and eco-friendliness of last-mile logistics (Seghezzi, Mangiaracina, Tumino & Perego, 2020; Rosenberg, Balouka, Herer, Dani, Gasparin, Dobers, Rüdiger, Pättiniemi, Portheine & Uden, 2021). The purpose of these advancements is to address problems such as disorganised addresses, improve delivery efficiency, and reduce carbon emissions in urban areas (Allen, Bektas, Cherrett, Friday, McLeod, Piecyk, Piotrowska & Austwick, 2017; Rahman, Basheer, Khalid, Tahir & Uppal, 2022).

The logistics industry is undergoing significant changes as a result of new customer demands and heightened global competitiveness (Winkelhaus & Grosse, 2019). This is particularly evident in South Africa, where the emphasis on sustainable logistics is paramount. Scholarly interest in the topic of last-mile logistics, a crucial component of sustainable logistics, has significantly grown. These variables, such as the increase in omni-channel shopping, urbanisation, and the growing significance of sustainability, may contribute to this phenomenon (Olsson et al., 2019). Resilience plays a crucial role in ensuring the long-term viability of transport networks within sustainable logistics (Wan, Yang, Zhang, Yan & Fan, 2018). The growing impact of e-commerce on the last mile of delivery in metropolitan areas is emerging as a noteworthy concern, affecting economic, social, environmental, and technological aspects (Winkelhaus & Grosse, 2020).

The importance of decision support systems in sustainable logistics is also being acknowledged, particularly in addressing issues such as carbon footprinting (Qaiser, Ahmed, Sykora, Choudhary & Simpson, 2017). However, additional research is necessary to examine the specific challenges and possible benefits in South Africa, particularly with the procurement and administration of resources (Kauppi, Salmi & You, 2018).

The existing research on resilience in business and management, particularly in the field of sustainable logistics in South Africa, is marked by its wide range of topics and lack of cohesion (Linnenluecke, 2017). The problem is further complicated by the rapid growth of omni-channel retailing, urbanisation, and changing customer behaviour (Olsson et al., 2019). The concept of Logistics 4.0, which aims to incorporate many research approaches, provides a helpful basis for understanding and addressing these challenges (Winkelhus & Grosse, 2020). However, the specific execution of these concepts in the South African context, particularly in the last phase of eco-friendly transportation, has not been extensively examined. The existing gap is worsened by the need for increased theoretical depth and methodological rigour in research carried out in the African environment (Kauppi et al., 2018). Therefore, there is a clear need for more research that integrates these diverse perspectives and utilises them to tackle the specific challenges of sustainable logistics in South Africa.

The existing amount of research on last-mile delivery, resilience, and sustainable logistics in South Africa demonstrates the nation's increasing focus on addressing the challenges and opportunities in its logistics business. The research undertaken by Song, Ma, Zhao & Zhang (2022) and Nitsche et al. (2023) has investigated the importance of enhancing supply chain resilience and logistics techniques, particularly in the face of disruptions such as the COVID-19 pandemic. These studies have highlighted the importance of innovative strategies and adaptable skills to enhance the resilience of logistics networks.

Furthermore, Badenhorst (2016) did a study on the challenges faced in reverse logistics operations, while Havenga, Goedhals-Gerber, Bod, and Simpson (2015) investigated the costs associated with logistics at the provincial level in South Africa. These studies have offered valuable understanding of specific challenges in the logistics sector in South Africa, emphasising the importance of overcoming hurdles and refining logistical processes to reduce costs and enhance efficiency.

Despite the valuable insights provided by the current literature, there remains a research deficit in the comprehensive examination of sustainable logistics methods, specifically in the area of last-mile distribution in South Africa. While studies like Kazancoğlu et al. (2022) have explored some aspects of supply chain resilience and risk management, there is a need for a comprehensive analysis that assesses the current state of sustainable logistics practices in the final stage of delivery in the South African context.

The identified research need pertains to the lack of a thorough examination of resilience strategies, operational challenges, and sustainable logistics techniques that are specifically tailored to last-mile distribution in South Africa.

The objective of this study is to fill the research gap on sustainable logistics in the last stage of delivery in South Africa by conducting a comprehensive review of existing literature. The objective is to get a thorough comprehension of the present condition, difficulties, and possibilities for enhancing sustainability and resilience in last-mile logistics operations in South Africa. The primary research inquiry is: What is the impact of resilience and sustainable practices on the efficiency of last-mile distribution in South Africa's logistics industry?

Furthermore, the primary research goal is to conduct a comprehensive review and thematic analysis of the current literature on resilience, last-mile distribution, and sustainable logistics in South Africa. This will be achieved by utilising the PRISMA method and Atlas-ti software to synthesise the findings and identify both best practices and challenges.
Literature Review

Theoretical and Conceptual Background

Resilience, last-mile distribution, and sustainable logistics

A strong supply chain system must include resilience, last-mile delivery, and sustainable logistics. Resilience, as per the definition provided by Linnenluecke (2017), refers to the capacity to endure and bounce back from disturbances, which is a key element in the context of last-mile distribution. This is especially key in South Africa, where the logistics sector is confronted with several difficulties. Hosseini, Ivanov and Dolgui (2019) discusses the application of quantitative methods in analysing supply chain resilience. These methods can be useful in identifying vulnerabilities and devising ways to minimise their impact.

Winkelhaus and Grosse (2019) introduced the idea of Logistics 4.0, which may be utilised to improve the effectiveness and eco-friendliness of last-mile distribution. Gunasekaran, Subramanian and Papadopoulos (2017) emphasises that information technology is essential for gaining a competitive edge in logistics and supply chains, and may be utilised to improve last-mile distribution. The significance of resilience in the realm of transportation networks, as underscored by Wan et al. (2018) is equally applicable to last-mile distribution. Wang, Muddada, Wang, Ding, Lin, Liu and Zhang (2016) discusses the idea of a robust holistic supply chain network system, which may be used to improve the resilience of last-mile distribution. Olsson et al. (2019) presents a comprehensive framework for last-mile logistics research, which offers a thorough understanding of the different elements involved in last-mile distribution.

Modern supply chain management is not complete without resilience, last-mile distribution, and sustainable logistics. These elements are critical to maintaining operational effectiveness, environmental responsibility, and business continuity. Resilience in logistics pertains to the capacity of a system to endure and bounce back from disturbances, such as natural catastrophes or pandemics, emphasising the significance of sturdy and flexible supply chains. The studies conducted by Kazançoğlu, Özbiltekin-Pala, Sezer and Luthra (2022); (Michel, Gerbaix & Marc, 2023; Nitsche, Brands, Treiblmaier & Gebhardt, 2023) are relevant. The COVID-19 pandemic has highlighted the importance of resilience in sustaining supply chain operations and fulfilling customer requirements (Kazançoğlu et al., 2022).

Last-mile distribution, which refers to the final phase of the supply chain where products are transported to end consumers, is a key component that has a direct impact on customer satisfaction and operational expenses. Strategies such as crowdsourcing delivery and route optimisation have been developed to improve efficiency and minimise environmental impact in last-mile logistics. Implementing sustainable last-mile measures not only helps decrease carbon emissions but also significantly improves the economic sustainability of logistics operations.

In recent years, sustainable logistics, which involve implementing measures that reduce environmental impact and promote social responsibility, have become increasingly important. It is key to incorporate sustainability into logistics operations in order to minimise waste, optimise resources, and address negative externalities (Mageto, 2022b; Remondino & Zanin, 2022; Zondervan, Tolentino-Zondervan & Mocek, 2022a).

Organisations must prioritise sustainable supply chain management to comply with environmental requirements, cater to consumer demand for eco-friendly products, and improve overall business performance (Carter & Easton, 2011; Morgan, Tokman, Richey & Defee, 2018; Agrawal & Singh, 2019).

The implementation of sustainable practices in logistics is motivated not just by environmental considerations but also by economic necessities. Research has demonstrated that allocating resources towards sustainability can result in improved corporate performance and consumer loyalty, underscoring the interdependence between sustainability, resilience, and commercial prosperity (Eroglu, Kurt & Elwakil, 2016; Kovač, Tadić & Krstić, 2022; Justavino-Castillo, Saura, Blasco, Velázquez & Francés, 2023). In addition, the incorporation of technologies such as blockchain and artificial intelligence can significantly improve the sustainability and robustness of logistics networks (Tan, Wang, Liu, Kang & Costa, 2020; Kazançoğlu et al., 2022; Kovač et al., 2022).

Within the framework of South Africa, the concepts of resilience, last-mile distribution, and sustainable logistics are of notable importance because they offer a framework for comprehending and resolving the opportunities and problems in sustainable logistics, particularly in the context of South Africa. The logistics sector in South Africa is key for sustaining the economy since it facilitates the efficient transportation of commodities, which is vital for commerce, economic expansion, and the generation of employment opportunities. Nevertheless, the nation encounters numerous obstacles such as insufficient infrastructure, exorbitant transportation expenses, and intricate urban settings, all of which have a detrimental effect on the effectiveness and sustainability of logistical operations.

Implementing the principles of Logistics 4.0, as proposed by Winkelhaus and Grosse (2019), can assist South African businesses in adjusting to evolving client demands and international competition. The last mile logistics, as discussed by Olsson et al. (2019) plays a vital role in the context of South Africa’s urbanisation and the evolving consumer behaviour. The diverse and frequently demanding geographical and environmental conditions in South Africa make resilience in transport networks particularly key (Wan et al., 2018).

South Africa places significant importance on environmental sustainability in the transport and logistics service industry, since it is
committed to sustainable development, as highlighted by (Centobelli, Cerchione & Esposito, 2017). The relevance of the impact of last-mile logistics related to e-commerce on cities, as discussed in Viu-Roig and Alvarez-Palau (2020) study, is significant in the context of South Africa’s expanding e-commerce industry.

The significance of African culture and ethics in sourcing from Africa, as discussed by Kauppi et al. (2018) is particularly notable for South Africa, a prominent participant in the continent’s economy. Logistics flexibility, as discussed by Jafari (2015) plays a key role in enabling South Africa’s logistics business to effectively respond and adjust to evolving market conditions. Qaiser et al. (2017) proposes that decision support systems for sustainable logistics can assist South African organisations in making well-informed decisions that effectively balance economic, environmental, and social considerations.

The South African logistics sector must prioritise resilience due to the country’s susceptibility to interruptions such as strikes, natural catastrophes, and political instability. Developing the ability to withstand and recover from interruptions in last-mile distribution networks can assist reduce the negative effects of these disruptions, ensuring that supply chains continue to function and minimising financial losses. Given South Africa’s dedication to environmental protection and the imperative to mitigate climate change by reducing carbon emissions, sustainable logistics methods hold equal significance in the country.

The importance of these topics in the South African setting is further emphasised by the country’s socio-economic challenges, such as significant levels of inequality and unemployment. Implementing sustainable logistics practices can generate employment prospects, foster equitable economic expansion, and facilitate the growth of small and medium firms within the logistics industry. In addition, strengthening the durability of final-stage distribution networks can improve the availability of necessary products and services in marginalised groups, thereby promoting social progress and reducing poverty.

Furthermore, South Africa’s advantageous geographical position as a gateway to the African continent establishes the country as a pivotal participant in regional commerce and transportation. By placing a high importance on the ability to recover quickly and sustainably in the last stage of transportation, South Africa may improve its ability to compete, attract financial investments, and reinforce its position as a central hub for regional transportation. By adopting cutting-edge solutions like digital technologies and green logistics practices, the South African logistics sector can improve both efficiency and sustainability.

Research and Methodology

The PRISMA methodology is selected for the systematic literature review on “Resilience in the Last Mile: Sustainable Logistics in South Africa” for its thorough and transparent approach, guaranteeing the dependability and replicability of the review results. According to Rethlefsen, Kirtley, Waffenschmidt, Ayala, Moher, Page and Koffel (2021), PRISMA provides a structured framework for presenting systematic reviews. This framework involves the procedures of locating, selecting, synthesising, and evaluating pertinent studies. The selected strategy is ideal for the current investigation because it can systematically explore the complex connection between resilience and sustainability in last-mile logistics. This field is recognised for its diverse range of methodologies and various research designs. Adhering to the PRISMA guidelines decreases the likelihood of bias and ensures a comprehensive and unbiased selection of studies. This subject is key for sustainable logistics in South Africa due to its broad coverage across academic disciplines and geographic locations. Furthermore, using PRISMA improves the transparency of the review process, allowing readers to critically evaluate the methodology used and the robustness of the conclusions (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl & Brennan, 2021). The PRISMA approach emphasises a detailed search strategy and clear inclusion and exclusion criteria, aligning with the review’s goal of providing a comprehensive understanding of resilience in the last phase of supply chains in South Africa. The review can offer valuable insights on successful methods for enhancing sustainability and resilience in the critical area of logistics by systematically integrating the available evidence (Booth, Sutton, Clowes & Martyn-St James, 2021).

The PRISMA technique is a generally accepted guideline created to improve the reporting of systematic reviews and meta-analyses. The organised approach of this method improves transparency and repeatability, making it well-suited for systematic literature reviews, particularly in disciplines that demand thorough synthesis of study findings, such resilience and sustainability in last-mile distribution. The PRISMA technique consists of four essential stages: identification, screening, eligibility, and inclusion, which enable a thorough and impartial examination of pertinent studies.

Identification

The identification stage entails a comprehensive search of databases and registers to gather possibly relevant studies. The process is directed by a predetermined search strategy that incorporates particular keywords and criteria to guarantee a comprehensive yet targeted retrieval of pertinent literature. To explore resilience and sustainability in last-mile distribution, search for phrases like “resilience,” “sustainability,” “last-mile distribution,” and “logistics,” among others. The purpose of this stage is to gather a thorough list of records for future evaluation (Page et al., 2021).

Screening

Titles and abstracts of identified records are reviewed during the screening phase to determine their relevance to the review’s objectives. This stage usually includes eliminating duplicates and excluding research that do not satisfy the predetermined inclusion
criteria. The screening method is essential for narrowing down the search results to a manageable number of papers for further review (Rethlefsen et al., 2021).

**Eligibility**

During the eligibility step, a thorough examination of the complete texts of the screened articles is conducted. This thorough evaluation ensures that each study fully covers the research subject and meets the inclusion criteria, which may include study design, context, and emphasis on resilience and sustainability in last-mile distribution. Studies that do not match these criteria are not included. This phase involves selecting literature that offers the most pertinent and important insights on the topic (Shamseer, Moher, Clarke, Gherisi, Liberati, Petticrew, Shekelle & Stewart, 2015).

**Inclusion**

The inclusion phase involves selecting studies for analysis and synthesis in the review. Only studies that have successfully completed the eligibility phase are included. This methodological methodology guarantees that the review relies on pertinent and high-quality research, establishing a strong basis for making conclusions concerning resilience and sustainability strategies in last-mile distribution (Shamseer et al., 2015).

The PRISMA method was selected for its methodical and transparent approach, which is essential for reducing bias and guaranteeing the review findings’ trustworthiness. The strict technique enables the thorough integration of current research, aiding in pinpointing deficiencies and laying a strong groundwork for future study. The PRISMA technique offers a structured framework for methodically considering and evaluating all relevant literature in studies on resilience and sustainability in last-mile distribution, which are complex and multidisciplinary in nature (Rethlefsen et al., 2021).

Atlas-ti is a robust software programme specifically created for qualitative data analysis, extensively utilised in several research domains for thematic analysis. The programme assists in managing, examining, and combining extensive amounts of text data, allowing academics to identify patterns, themes, and insights in qualitative content. Atlas-ti is a powerful tool for discovering and analysing themes that arise from a comprehensive literature review on resilience and sustainability in last-mile distribution.

**Identifying Themes**

Thematic analysis in Atlas-ti starts with coding, where text segments linked to particular concepts, ideas, or phenomena are identified and grouped. Codes could be created for themes like “supply chain resilience,” “sustainable practices,” “technology in logistics,” and “collaborative models” in the context of resilience and sustainability in last-mile distribution. Atlas-ti enables the flexible organisation of codes into bigger themes that represent important elements of resilience and sustainability in the last-mile distribution sector (Friese, 2019).

**Analysing Themes**

After identifying themes, Atlas-ti enables researchers to conduct a thorough study to investigate linkages between themes, evaluate their frequency, and comprehend their significance in the context of last-mile distribution. The software’s query and visualisation capabilities allow for analysing linkages between many aspects of resilience and sustainability, providing insights into intricate relationships and dependencies. Researchers can study the impact of technological advancements on supply chain resilience and examine how collaborative practices might improve sustainable logistics operations (Paulus, Woods, Atkins & Macklin, 2017).

**Why Atlas-ti Was Chosen**

Atlas-ti was selected for multiple reasons. The extensive set of tools allows for a detailed examination of qualitative data, which is key for studying the intricate and multifaceted subject of resilience and sustainability in last-mile distribution. The software’s capacity to handle and analyse extensive datasets guarantees the inclusion of all pertinent literature in the study, leading to a comprehensive comprehension of the subject matter (Brennen, 2021).

Furthermore, the flexibility and adaptability of Atlas-ti make it appropriate for investigating developing topics and adjusting the analytical framework as new insights are acquired. In a fast-changing field such as logistics, improvements in technology and shifts in environmental and societal factors constantly impact the resilience and sustainability of the industry (Paulus et al., 2017). Atlas-ti’s visual representation features, such as network views and code-document tables, help in comprehending the thematic structure and theme relationships more effectively. This visual method helps to analyse intricate data, facilitating the communication of results and drawing conclusions pertinent to professionals, policymakers, and scholars focused on improving resilience and sustainability in final-stage distribution (Paulus et al., 2017; Friese, 2019).

**Analysis and Results**

Figure 1 below presents the PRISMA flow diagram, detailing the search results, screening process, and studies included in the review. ( “resilience” OR “last-mile” OR “last mile” OR “sustainable logistics” ) AND ( “South Africa” ) AND ( “supply chain” OR “distribution” OR “logistics” )
Figure 1: PRISMA framework; Source: Rethlefsen et al. (2021)

Figure 2 below of the pie chart offers a detailed visual depiction of the distribution of scholarly articles related to sustainable logistics in South Africa from 2018 to 2023.

The data presented in the chart indicates that a significant proportion of research output is focused within the fields of Business and Management, constituting a considerable 31.6% of the overall documentation. The substantial percentage highlights the key significance of business principles and managerial practices in the conversation surrounding resilience and sustainability within the field of logistics.

However, both Engineering and Social Sciences occupy an equitable portion of the scholarly domain, with each field accounting for 16.8% of the document distribution. The equivalence seen between the two domains suggests a harmonious inclination towards both the technical and societal aspects of sustainable logistics. The prevalence of Engineering is indicative of the indispensability of technological and infrastructural knowledge in the advancement of robust logistical systems, whereas the prevalence of Social Sciences signifies the significance of comprehending the human and societal elements that impact or are impacted by these systems.

Furthermore, it is worth noting that 11.6% of the documents pertaining to the field of Decision Sciences indicate a notable emphasis on the analytical and methodological strategies employed in decision-making within the realm of sustainability concerns. Environmental Science has a growth rate of 8.4%, indicating an increasing acknowledgement of the environmental consequences of logistics and the importance of incorporating ecological factors into the creation of sustainable methods.

According to the figure, Economics, Econometrics and Finance (5.3%), Energy (4.2%), and Computer Science (2.1%) have a smaller impact on the overall knowledge in sustainable logistics in South Africa. This indicates that although these fields are important, they...
are not the focus in this field. The limited presence of Agricultural and Biological Sciences and Psychology, each accounting for 1.1%, indicates a developing interest or specialised use of these fields in relation to the current topic.

Figure 2: Documents by subject area; Source: Authors

The data visualisation successfully conveys the diverse range of research conducted in the field of sustainable logistics. However, to gain a more detailed comprehension of the scholarly output, it would be advantageous to ascertain the precise quantity of documents that align with the provided percentages. This would offer a valuable understanding of the extent of research and enable a more accurate evaluation of the field’s progress. Furthermore, conducting a temporal analysis of the papers could uncover patterns in academic emphasis during the specified timeframe, determining if there is a change in concentration across different fields of study. An analysis of this nature could be key in identifying changing priorities and deficiencies in the existing literature. Finally, including details about the origins and references of these papers could improve the credibility of the research and promote a more comprehensive comprehension of the influence and scope of the work carried out in each field.

Figure 3 below, “Documents by year,” is a line graph that shows the development of scholarly publications on sustainable logistics in South Africa from 2018 to 2023. The chart displays a chronological order, where the x-axis represents the years, and the y-axis measures the quantity of documents created in each year.

Figure 3: Documents by year; Source: Authors

The chart begins in 2018, with a relatively stable number of documents, indicating a moderate level of academic output with around two documents. This trend continues into 2019. Nevertheless, a notable shift took place between the years 2019 and 2020, characterised by a noticeable increase in scholarly engagement, as seen by a substantial surge in the number of scholarly publications. The increasing trend persists in 2021, demonstrating a notable increase in research attention and productivity within the subject, ultimately reaching a peak of approximately nine papers. The year 2022 represents the pinnacle of this scholarly pursuit, followed by a marginal decline in the quantity of documents, as evidenced in the year 2023. This suggests that there may be a stabilisation or little decline in research production in the field of sustainable logistics in South Africa by the end of the observed period. Figure 3 adeptly depicts the progression of study interest and academic publications during the designated time. In addition, the inclusion of accurate numerical values for each year’s papers would be key in providing empirical evidence to support the visual depiction, so facilitating a more comprehensive and rigorous scholarly analysis.
The horizontal bar chart in Figure 4 below, labelled “Documents by country or territory,” presents the number of scholarly documents generated on the subject of sustainable logistics in South Africa. The documents are categorised based on their nation or territory of origin and cover the period from 2018 to 2023.

The provided chart serves as a tool for comparing the scholarly contributions made by different worldwide areas in relation to the topic of resilience within the last mile of the logistics industry in South Africa.

South Africa is the dominant country in the table since it is the main focus of the study. It has the biggest number of documents, indicating a significant local research interest and a sense of urgency in tackling the difficulties within its own logistical frameworks. The considerable body of research conducted in South Africa demonstrates a proactive approach towards addressing the sustainability challenges encountered by the country within the field of logistics. India has emerged as the second most prolific supplier, following South Africa. India’s significant research output indicates a global academic interest and potentially demonstrates the common experiences or similarities in logistical issues encountered by developing nations. Norway’s status as the third-largest contributor signifies a substantial commitment to the examination of sustainable logistics in South Africa, implying potential overseas partnerships or an acknowledgement of the worldwide ramifications of indigenous sustainability measures.

Both the United Kingdom and Finland exhibit a substantial quantity of documents, so highlighting the worldwide scope of this research domain. Italy, the United States, Australia, China, and Turkey are all included in the representation, but with relatively smaller contributions. This collective representation highlights the global scholarly involvement in the field of sustainable logistics in South Africa. The bar chart effectively illustrates the global distribution of scholarly work according to the topic issue. Nevertheless, the lack of precise numerical data regarding the quantity of papers from each country or region hinders the ability to accurately measure this output. By incorporating these numbers, a more comprehensive and statistically rigorous study would be possible. Furthermore, gaining a comprehensive understanding of the contextual factors surrounding the contributions made by each country, such as the presence of dedicated research centres or collaborative initiatives, would yield more profound insights into the characteristics and extent of the global research environment in sustainable logistics, particularly in relation to South Africa.

Thematic analysis

The provided word cloud in Figure 5 below is a graphical depiction that highlights the occurrence rate of significant terms associated with the concepts of resilience and sustainability in the last-mile distribution domain of South Africa’s logistics industry. Words that are larger and bolder in the source literature suggest a greater frequency or significance. Terms such as “Challenges,” “Logistics,” “SCM” (Supply Chain Management), “Infrastructure,” “Impact,” “Collaboration,” and “Sustainability” are integral to the concept of the cloud. The aforementioned concepts are encompassed by additional noteworthy terms, including “Resilience,” “Technological,” “Evolution,” “Economic,” “Regulatory,” “Historical,” “Digitalization,” and “Customer Perceptions.” The wide array of terminology indicates a thorough investigation into the aspects that influence the success of last-mile distribution.

The word cloud indicates that the terms “Challenges” and “Logistics” are commonly mentioned in the literature, highlighting the significant study attention given to the issues related to logistics, particularly in the last stage of transportation. The significance of “SCM” is indicative of its pivotal position within the field of logistics research. The term “Infrastructure” denotes the essential physical and organisational frameworks required for logistics, encompassing elements such as transportation networks, storage facilities, and technological systems. The term “impact” likely pertains to the influence of logistics operations on several facets of the industry.

The focus on “Collaboration” and “Sustainability” underscores the significance of cooperative methodologies and ecologically conscious practices in SCM. The concept of “resilience” refers to the ability of last-mile distribution systems to effectively recover
from and adjust to various disturbances or alterations. The inclusion of terms such as “Technological,” “Evolution,” and “Digitalisation” suggests that the study is relevant to the development of technology and the evolution of supply chain management methods. However, the inclusion of the terms “Economic,” “Regulatory,” and “Historical” implies that the study encompasses a comprehensive viewpoint that encompasses the economic ramifications, governmental strategies, and the evolution of SCM methodologies throughout history. The concept of “Customer Perceptions” encompasses the examination of customers’ perspectives regarding the efficacy of last-mile distribution systems.

Table 1 below presents a well-organised collection of themes and sub-themes, along with illustrative source quotes. These themes and sub-themes cover different aspects of SCM, with a specific emphasis on resilience and sustainability in the last-mile distribution in South Africa. This table presents a qualitative review of nine main topics that cover several aspects of SCM, including its historical development, the challenges and methods related to last-mile delivery, collaborative practices, and the economic and social consequences. The major theme is elaborated upon by sub-themes that outline particular issues or tactics, supported by direct quotations from the source material.

The research question encompasses several themes that are directly pertinent. These themes encompass an analysis of the difficulties linked to last-mile distribution, the incorporation of resilience in supply chain management (SCM), the advancement of sustainability practices in logistics, and the formation of collaborative practices and partnerships.

Table 1 below illustrates the findings of the study; the following observations have been identified. The concept of resilience in SCM is emphasised as a key factor in reducing inefficiencies and effectively adapting to disruptions within the specific context of South Africa. Technological advancements play a key role in promoting resilience, enhancing coordination, and improving real-time decision-making, which is vital for the efficiency of last-mile distribution. The difficulties associated with last-mile distribution are exacerbated by concerns regarding the efficiency of postal services and the growing influence of digitization, which significantly burdens the logistics of last-mile operations in South Africa. Customer perceptions are intimately linked to the effectiveness of last-mile distribution, highlighting the importance of reliable and high-quality services.

The adoption of sustainability practices in the field of logistics is increasingly evident through the emergence of green and sustainable logistics trends, as well as the implementation of reverse logistics strategies aimed at waste reduction. In addition to promoting environmental and social responsibility, these measures also serve to bolster the competitive advantage of last-mile delivery services. The significance of collaborative practices and public-private partnerships is emphasised, indicating that the pooling of resources and sharing of risks are strategic approaches that can improve resilience and improve the efficiency of last-mile distribution. The presented table illustrates a comprehensive approach to enhancing the efficiency of last-mile distribution by integrating resilience and sustainable practices. The transformative influences on the South African logistics sector are attributed to the historical evolution and present initiatives in SCM, as well as technical improvements and the growing emphasis on sustainability.
Table 1: Themes and sub-themes

<table>
<thead>
<tr>
<th>Main Themes</th>
<th>Sub-Themes</th>
<th>Source Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Chain Management</td>
<td>- Historical development of logistics and SCM in South Africa.</td>
<td>“SCM in South Africa has evolved significantly over the past decades, reflecting global trends and local socioeconomic dynamics.”</td>
</tr>
<tr>
<td>Evolution and Initiatives</td>
<td>- Key strategies and frameworks.</td>
<td>“Strategies such as the National Freight Logistics Strategy have been pivotal in shaping SCM practices in South Africa.”</td>
</tr>
<tr>
<td></td>
<td>- Role of academic and research institutions.</td>
<td>“Academic and research institutions in South Africa have contributed to SCM knowledge and practice through research and innovation.”</td>
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<tr>
<td></td>
<td>- Impact of digitalization and e-commerce.</td>
<td>“Digitalization and e-commerce growth have increased pressure on last-mile distribution systems in South Africa.”</td>
</tr>
<tr>
<td></td>
<td>- Last-mile delivery problems and customer perceptions.</td>
<td>“Customer perceptions are influenced by the effectiveness of last-mile distribution, highlighting the need for reliable services.”</td>
</tr>
<tr>
<td>Resilience in SCM</td>
<td>- Strategies for handling inefficiencies.</td>
<td>“Resilience in SCM involves strategies to address inefficiencies and adapt to disruptions in the supply chain.”</td>
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<td></td>
<td>- Role of technology in enhancing resilience.</td>
<td>“Technology plays a key role in enhancing SCM resilience, facilitating better coordination and real-time decision-making.”</td>
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<td>- Case studies on overcoming logistical challenges.</td>
<td>“Case studies from South Africa demonstrate how companies have successfully navigated logistical challenges through resilient SCM practices.”</td>
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<tr>
<td>Sustainability Practices in Logistics</td>
<td>- Green and sustainable logistics trends.</td>
<td>“Sustainable logistics practices, such as green transportation and waste reduction, are increasingly adopted by South African companies.”</td>
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<td></td>
<td>- Reverse logistics and waste reduction.</td>
<td>“Reverse logistics has become a key component in reducing waste and enhancing sustainability in SCM.”</td>
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<td>- Impact of sustainability on competitiveness.</td>
<td>“Sustainable practices in logistics not only reduce environmental impact but also improve SCM competitiveness in South Africa.”</td>
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<td>Infrastructure and Technology</td>
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<td>“Challenges in infrastructure, such as inadequate roads and ports, affect the efficiency of logistics and SCM in South Africa.”</td>
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<td>- Technological advancements and impact on SCM.</td>
<td>“Technological advancements, like IoT and AI, are significantly impacting SCM, offering opportunities for optimization and efficiency.”</td>
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<td>Regulatory and Policy Framework</td>
<td>- Government policies influencing SCM.</td>
<td>“Government policies and regulations play a critical role in shaping the logistics and SCM landscape in South Africa.”</td>
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<td>- Regulatory challenges and reforms in logistics.</td>
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<td>Collaborative Practices and</td>
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<td>Partnerships</td>
<td>- Public-private partnerships in supply chain efficiency.</td>
<td>“Public-private partnerships have been instrumental in improving supply chain efficiency through shared investments and innovations.”</td>
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<tr>
<td>Economic and Social Impacts</td>
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<td>“SCM is vital for the South African economy, supporting sectors from manufacturing to retail and impacting overall economic growth.”</td>
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<td></td>
<td>- Social consequences of postal service liberalization.</td>
<td>“The liberalization of postal services has had significant social impacts, affecting employment and access to services in remote areas.”</td>
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<tr>
<td>Case Studies and Real-world</td>
<td>- Success stories of resilient SCM practices.</td>
<td>“South African companies have demonstrated resilience in SCM through innovative practices and adaptive strategies.”</td>
</tr>
<tr>
<td>Examples</td>
<td>- Lessons from challenges faced by logistics entities.</td>
<td>“Lessons from the challenges faced by logistics entities in South Africa provide insights into improving SCM resilience and effectiveness.”</td>
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</tbody>
</table>

Source: Authors
Discussion

The themes identified provide a detailed insight into the resilience and sustainability of last-mile logistics in South Africa, covering topics such as the evolution of supply chain management, challenges in distribution, resilience, sustainability, infrastructure, technology, regulations, collaboration, and economic and social impacts. The themes highlight the intricate relationship between operational efficiency, environmental stewardship, and socio-economic inclusion. The emphasis on resilience underscores how organisations and supply chains have managed logistical issues, highlighting the key need of adaptability and response. This is especially important in South Africa, where limitations in infrastructure and socio-economic inequalities provide distinct obstacles. Highlighting technical innovation and collaborative methods indicates a direction towards stronger and more sustainable logistics systems. The systematic literature analysis revealed important topics related to resilience and sustainability in last-mile logistics in South Africa. The themes provide insight into the current status of sustainable logistics and also give perspective on the wider implications for the logistics industry in developing economies. We explore each of these issues in depth to gain a greater understanding of their importance and consequences.

Evolution of Supply Chain Management and Initiatives

SCM’s development in South Africa demonstrates a complex interaction between worldwide patterns and domestic socio-economic conditions. Implementing plans like the National Freight Logistics Strategy demonstrates a proactive effort to harmonise South Africa’s logistics industry with international standards, while also tackling specific local issues like infrastructure shortcomings and socio-economic inequalities. This evolution highlights the shift towards increasingly interconnected, adaptable, and environmentally friendly logistics systems, stressing the importance of innovation and strategic planning in improving logistics efficiency and sustainability.

Last-Mile Distribution Challenges

The challenges related to final-stage distribution in South Africa, specifically concerning postal service dependability and the influence of digitisation, underscore the significant deficiencies in current logistics infrastructure and services. The swift expansion of e-commerce has increased demands on last-mile delivery systems, providing the need for creative solutions to improve delivery effectiveness and dependability. This theme emphasises the need of achieving consumer expectations for punctual and dependable deliveries in e-commerce, which are key for the competitiveness of firms.

Resilience in SCM

Emphasising resilience in supply chain management strategies highlights the significance of constructing adaptable and flexible logistics systems that can endure interruptions. Technology has a significant role in improving resilience by enabling better coordination, real-time decision-making, and increased efficiency in distributing goods to remote areas. These observations indicate the importance of investing in technical solutions and infrastructure to create stronger supply chains.

Sustainability Practices in Logistics

The rising implementation of eco-friendly and sustainable logistics strategies demonstrates an increased awareness of the environmental consequences of logistical operations. The focus on reverse logistics and waste reduction demonstrates the industry’s commitment to reducing its environmental impact. Sustainability is increasingly seen as a competitive advantage in the logistics business, as it not only solves environmental issues but also meets customer demands for eco-friendly operations.

Infrastructure and Technology

The constraints in infrastructure and the transformative power of technology in supply chain management underscore the key role of physical and digital infrastructure in enabling efficient and sustainable logistics operations.

The recognised deficiencies in infrastructure, such as insufficient roads and ports, indicate the need for significant expenditures in logistical infrastructure. Simultaneously, technological breakthroughs like the IoT and AI indicate that using technology might greatly improve efficiency and sustainability in supply chain management.

Collaborative Practices and Partnerships

Collaborative practices and partnerships emphasise the importance of cooperation among various stakeholders to improve the resilience and efficiency of last-mile logistics. This highlights the possibility of public-private partnerships and collaborative efforts to combine resources, distribute risks, and create innovative solutions for shared concerns. Collaborative initiatives are key in addressing the challenges of last-mile logistics in South Africa.

Economic and Social Impacts

The economic and social effects of SCM and last-mile logistics methods highlight the wider significance of logistics operations for South Africa’s economy and society. SCM plays a key role in promoting socio-economic development by supporting economic growth, creating employment opportunities, and improving access to products and services. This issue also addresses the social
implications of postal service deregulation, highlighting the need for policies that harmonise efficiency improvements with social inclusion and accessibility.

The thorough analysis of these findings provides a full insight into the current status of resilience and sustainability in last-mile logistics in South Africa. The statement highlights the intricate relationships and dependencies in the logistics industry, emphasising the importance of unified strategies to tackle the difficulties and make use of the advantages arising from the changing logistics environment.

When comparing these results with previous research, similarities and differences are evident. Resilience in supply chain management is key to adapting to global trends and ensuring that supply chains can endure disturbances (Ivanov, 2020; Patel, 2023). The issues and solutions found in South Africa, such as the reliance on collaborative practices and the key role of infrastructure and technology, emphasise distinctive regional factors that are distinct from global perspectives. The focus on digitalisation and e-commerce is a global trend, but it is especially pronounced in South Africa because of its rapidly expanding digital economy and the distinct challenges of urban and rural logistics.

The emphasis on technology and innovation as factors that support resilience and sustainability in logistics aligns with research from other areas but is influenced by specific local obstacles and advantages. A literature vacuum has been detected in the systematic study of sustainable logistics methods in South Africa, particularly in last-mile distribution. This gap indicates a departure from worldwide research that frequently neglects the unique characteristics of the African logistics environment. This emphasises the need for research tailored to specific contexts that tackle the distinct logistical, socio-economic, and environmental obstacles encountered by African nations. The systematic literature review examines sustainable logistics in South Africa and places these findings in the global context of last-mile resilience and sustainability. This study’s comparison with previous literature emphasises its unique contributions while acknowledging the worldwide themes in the research area.

Global Themes and Local Specificities

Highlighting resilience as a key element of sustainable logistics is in line with current global research patterns. Pan, Yan, He and He (2021) emphasises the significance of resilience in transportation systems worldwide, indicating a widespread recognition of the need for supply networks to endure disturbances. South Africa emphasises technological innovation and collaborative practices to improve resilience and sustainability, aligning with the techniques (Jacobs & Pretorius, 2020; Smidt & Jokonya, 2022). The South African experience is distinct because of its particular obstacles, including infrastructural limits and socio-economic inequities, emphasising the need for solutions tailored to the specific situation.

Unique Challenges in South Africa

The study’s results on the difficulties of last-mile distribution in South Africa, namely the dependence on ineffective postal services and the growing influence of digitisation, contrast with literature that mostly concentrates on more advanced logistics systems. Krsić, Tadić, Kovač, Roso and Zečević (2021) examine recent advancements in last-mile logistics within a European setting, where infrastructure poses few limitations. South Africa’s use of creative, cooperative strategies to address infrastructure shortcomings provides a distinctive contribution to the worldwide logistics research.

Technological Advancements

Utilising technological advancements to achieve resilience and sustainability is a prevalent topic in logistics studies.

South Africa’s focus on digitalization aligns with worldwide patterns, exemplified by Subramanian, Chaudhuri and Kayıkcı (2020) research on the capabilities of blockchain and artificial intelligence in logistics. The South African context, characterised by rapid digital transformation and specific market dynamics, offers a unique setting for implementing these technologies, indicating a detailed understanding of their potential advantages and obstacles.

Environmental Sustainability

The worldwide discussion on sustainable logistics, focusing on minimising environmental effects and advocating social accountability, is evident in South Africa. Zondervan, Tolentino-Zondervan and Moeke (2022b) and Mageto (2022a) emphasise the significance of integrating sustainability into logistics operations on a worldwide scale. The reference to green and sustainable logistics developments in South Africa, such as reverse logistics for waste reduction, aligns with the worldwide emphasis on environmental responsibility in logistics, as discussed by Carter and Liane Easton (2011) and Negri, Cagno, Colicchia and Sarkis (2021). The implementation in South Africa provides useful insights into the practicability and implications of sustainable logistics in a developing nation context, considering its unique environmental, social, and economic factors.

Collaborative Practices

The study emphasises the importance of collaborative practices and public-private partnerships in improving last-mile distribution efficiency, which aligns with existing literature on supply chain collaboration. Jafari, Eslami and Paulraj (2022) examines logistical flexibility through collaboration in a broader setting. South Africa’s focus on collaboration to address logistical and infrastructural
issues demonstrates the potential of cooperative strategies in environments marked by substantial logistical limitations and social disparities.

The systematic literature review on sustainable logistics in South Africa makes unique additions to the worldwide understanding on last-mile resilience and sustainability, as highlighted by this thorough comparison with previous literature. The assessment places the South African experience in the global context, emphasising the significance of resilience and sustainability in logistics universally, while also showcasing the unique difficulties and potential in the South African environment. This combination of local experiences and global trends improves the academic discussion, providing vital viewpoints for researchers, professionals, and politicians involved in developing resilient and sustainable last-mile logistics solutions.

Implications

The results of this analysis have important consequences for both practical applications and governmental guidelines in South Africa. Highlighting collaborative methods emphasises the ability of public-private collaborations to improve last-mile logistics efficiency and resilience. This information could be used to develop policy initiatives that promote collaboration among government, industry, and academia to address logistical difficulties together. Furthermore, the key importance of technology and infrastructure in supporting sustainable logistics practices indicates that focusing on investments in digitalization, road infrastructure, and green technologies should be a priority in policy planning and resource distribution. Implementing policies that promote innovation in logistics and supply chain management, such as providing tax incentives for environmentally friendly logistics solutions or offering funding for businesses specialising in SCM technologies, could assist in overcoming the mentioned obstacles. The comprehensive literature review on sustainable logistics in South Africa combines themes to provide important insights for improving last-mile logistics operations. The observations have significant consequences for professionals and decision-makers, aiming to improve operational efficiency, environmental sustainability, and socio-economic development. We will explore specific solutions and policy suggestions based on the highlighted themes, focusing on incorporating resilience and sustainability into logistical operations.

Utilising technology breakthroughs like the Internet of Things (IoT), artificial intelligence (AI), and blockchain has the potential to transform last-mile delivery through improved tracking, efficiency, and transparency. Businesses should allocate resources to digital solutions to streamline route planning, improve client communication, and guarantee real-time monitoring of deliveries. Furthermore, implementing green technologies and vehicles can decrease carbon footprints and operational expenses over time. Governments should focus on building strong infrastructure to assist sustainable logistics, such as improving road networks and urban planning for efficient last-mile deliveries. Policy interventions may involve providing incentives to enterprises that implement green technologies and invest in renewable energy sources. Creating innovation centres and offering research funding for logistics and supply chain technology helps promote a culture of innovation and sustainability.

Businesses need to stay updated on regulatory changes and interact with lawmakers to promote logistical policies. Adhering to environmental standards reduces legal risks and can improve brand reputation and consumer loyalty. Policymakers should aim to establish a legal framework that promotes sustainable logistics practices, like simplifying customs procedures for eco-friendly products and lowering taxes on ecologically sustainable logistics equipment. Introducing uniform sustainability reporting for logistics firms may promote openness and responsibility. Policies that support circular economy techniques, such reverse logistics, are key in decreasing waste and encouraging recycling. Forging partnerships throughout the supply chain with suppliers, retailers, and logistics providers can result in mutual advantages including cost savings, increased productivity, and higher service standards. Public-private partnerships facilitate access to innovative ideas and technologies, enhancing resilience against shocks. Government entities should promote and support collaboration between the public and commercial sectors by providing forums for sharing expertise and engaging in joint ventures. Implementing policies that promote collaborative research initiatives, shared logistics hubs, and cooperative buying methods can improve sustainability and resilience in the logistics sector.

Integrating social responsibility into logistics operations can improve community connections and promote sustainable economic development. This involves investing in local communities, generating employment opportunities, and guaranteeing equitable labour practices across the supply chain. Policies should prioritise inclusion and equity to reap the socio-economic benefits of sustainable logistics by ensuring that the advantages of improved logistics infrastructure and practices are distributed evenly throughout society. Developing training programmes to provide employees with essential skills for the future logistics industry and assisting small and medium-sized firms in implementing sustainable practices will help improve economic diversification and social welfare. Integrating resilience and sustainability into last-mile logistics operations can lead to a more efficient, eco-friendly, and socially responsible logistics sector in South Africa. Utilising the findings of the comprehensive literature study, stakeholders may collectively address the specific difficulties encountered by the South African logistics sector, leading to a sustainable and successful future.

Conclusions

The systematic literature review conducted a comprehensive analysis of resilience and sustainability in last-mile logistics in South Africa. The examination identified significant themes that highlight the complex interplay between technological improvements, regulatory frameworks, infrastructure challenges, and collaborative practices. The findings emphasise the crucial requirement for resilience in ensuring the long-term sustainability of final-stage logistics operations, especially in a dynamic and challenging
environment like South Africa. The review focuses on important topics such as the advancement of supply chain management practices, difficulties in last-mile distribution, the influence of technological innovations, the necessity of regulatory and policy frameworks, the significance of infrastructure development, and the advantages of collaborative practices. The themes emphasise the necessity of adopting a comprehensive strategy to enhance the durability and long-term viability of last-mile logistics operations. These findings have substantial implications for both professionals and decision-makers. In order to effectively address the difficulties associated with last-mile distribution, practitioners should prioritise the utilisation of technology and collaboration among team members. This includes implementing innovative logistical solutions and establishing strategic relationships. Policymakers should prioritise the development of regulatory frameworks and infrastructure that facilitate the effective and sustainable functioning of logistical operations.

This report provides valuable insights into the challenges and opportunities for enhancing resilience and sustainability in last-mile logistics in South Africa, however it does have certain limitations. This review focuses exclusively on the most recent literature and may not provide a comprehensive analysis of the rapidly evolving logistics industry or the specific experiences of all parties involved in last-mile distribution. The review predominantly focuses on academic sources, potentially overlooking practical insights derived from industry reports and case studies. In order to surpass these limitations, future research endeavours should endeavour to incorporate a more extensive range of resources, including industry reports, case studies, and interviews with experts in the field of logistics. This research has the potential to provide a comprehensive understanding of the practical challenges and innovative solutions in the field. Examining the comparative studies on last-mile logistics in other emerging economies could offer valuable insights into the challenges and strategies that could be implemented in South Africa.

Exploring the impact of emerging technologies like drone deliveries and autonomous vehicles on the efficiency and eco-friendliness of final-stage logistics in South Africa has great potential for future research.

An examination of the societal and financial consequences of sustainable logistics practices could enhance our understanding of how logistics operations can contribute to inclusive economic growth and social development. This literature research offers a thorough examination of resilience and sustainability in last-mile logistics in South Africa, providing valuable insights for professionals and policymakers. Through surmounting obstacles and using the capacity for creativity and cooperation, South Africa has the opportunity to enhance the durability and viability of its logistics industry, resulting in economic expansion and ecological sustainability. Future research on this subject should prioritise broadening the range of investigation and investigating novel patterns to advance sustainable logistics.

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References


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