

# Sustainable Supply Chain Strategies and Performance of World Food Programme in South Sudan

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## Abstract

Sustainable supply chain strategies are of paramount importance among humanitarian organizations for several reasons. The World Food Programme in South Sudan has adopted four key supply chain strategies, namely supplier relationship management, green procurement, reverse logistics, and transportation optimization. These strategies are employed not only to uphold World Food Program's mission of saving lives and changing lives for the better in South Sudan but also to enhance its operational efficiency, achieve cost reduction, and improve the overall effectiveness of its aid delivery. It however remains scantily explored in the South Sudanese body of knowledge, how these sustainable supply chain strategies have influence performance therefore, warranting the present study. Against this backdrop, this study set out to assess the effect of sustainable supply chain strategies on performance of World Food Program in South Sudan. More specifically, the study sought to establish the effect of supplier relationship management on performance of World Food Program in South Sudan; determine the effect of green procurement on performance of World Food Program in South Sudan; examine the effect of reverse logistics on performance of World Food Program in South Sudan; and assess the effect of transportation optimization on performance of World Food Program in South Sudan. The study adopted the descriptive design as it sought to collect data by survey tools, from which to give an accurate account of the effect of sustainable supply chain strategies on performance of World Food Program in South Sudan. The study relied on a mixed-method approach, whereby both quantitative and qualitative primary data were sought. While quantitative data were sourced from local suppliers that provide goods and services to World Food Program in South Sudan and members of the beneficiary communities through a structured questionnaire, in-depth key informant interviews were used to collect qualitative data from senior World Food Program staff involved in supply chain management, logistics, and procurement in South Sudan. The study furtherer employed a mixed-methods approach in data analysis, whereby both quantitative and qualitative data analysis techniques were used. Thematic analysis was used to analyse the qualitative data obtained from the in-depth key informant interviews. Both descriptive and inferential analysis were on the other hand be used to analyse the quantitative data obtained from structured questionnaires. The regression analysis results indicate that transportation optimization has the highest standardized coefficient ( $\beta = 0.523$ ,  $p < 0.001$ ), followed by green procurement ( $\beta = 0.159$ ,  $p = 0.011$ ) and reverse logistics ( $\beta = 0.167$ ,  $p = 0.026$ ), while supplier relationship management shows a non-significant effect ( $\beta = 0.008$ ,  $p = 0.890$ ). These results suggest that transportation optimization, green procurement, and reverse logistics significantly contribute to enhancing the performance of WFP in South Sudan, emphasizing the importance of these factors in humanitarian supply chain management.

***Key Words: Sustainable Supply Chain Strategies, Supplier Relationship Management, Green Procurement Strategy, Reverse Logistics Strategy, World Food Programme in South Sudan***

## **Introduction**

Humanitarian organizations are instrumental entities dedicated to addressing and alleviating human suffering in times of crisis, conflict, natural disasters, and other emergencies (Talib, Muhoho & Makali, 2020). Their importance is multi-faceted, as they play a critical role in saving lives, offering immediate relief, and providing essential services such as healthcare, food, and shelter to vulnerable populations. Beyond the immediate response, these organizations contribute to long-term recovery and resilience-building efforts (Van Wassenhove, 2022). They also uphold and advocate for the fundamental principles of humanity, neutrality, impartiality, and independence, ensuring that aid is delivered without discrimination, regardless of nationality, race, religion, or political affiliation (Kovač & Wallace, 2019). By providing assistance, protection, and support, humanitarian organizations help prevent further escalation of crises, support sustainable development, and promote social cohesion, making them indispensable in the global effort to address and mitigate the impact of emergencies and conflicts while upholding human rights and dignity (Bahadori, Bolinger, Alimohammadlou & Göransson, 2021).

Globally, humanitarian organizations have been particularly instrumental in delivering food aid to vulnerable populations in times of crisis and emergency. In Asia, organizations like the United Nations World Food Programme (WFP) have responded to complex humanitarian situations, such as the Rohingya refugee crisis in Bangladesh (WFP, 2021). WFP, in partnership with various Non-Government Organizations (NGOs) and government agencies, provides food assistance to hundreds of thousands of displaced individuals, ensuring their nutritional needs are met (Kovač & Wallace, 2019). In Yemen, a nation affected by a protracted conflict, humanitarian organizations like the International Committee of the Red Cross (ICRC) and Médecins Sans Frontières (MSF) have been involved in food aid distribution, saving lives by addressing severe malnutrition. In Syria, the WFP operates in challenging conditions to provide emergency food relief to conflict-affected populations, contributing to the stability and resilience of affected communities (Tatham & Spens, 2021).

In the Middle East, the United Nations High Commissioner for Refugees (UNHCR) and various NGOs have been actively engaged in delivering food aid to vulnerable populations affected by conflicts and displacement (Van Wassenhove & Martinez, 2022). The Syrian crisis, for instance, has witnessed substantial efforts to address food insecurity through the provision of food packages and nutrition support to internally displaced people and refugees in neighboring countries like Jordan, Turkey, and Lebanon (Tatham & Kovács, 2020).

Regionally, Sub-Saharan Africa has also seen significant humanitarian food aid efforts, particularly in countries facing drought, famine, and displacement. In the Horn of Africa, organizations like Save the Children have been involved in combating malnutrition and hunger in countries like Ethiopia and Somalia. These efforts are a testament to the dedicated work of humanitarian organizations in ensuring that food aid reaches those who need it most in some of the most challenging and volatile environments (WFP, 2021).

Locally, South Sudan has over the years, been a focal point for numerous humanitarian efforts aimed at alleviating the multifaceted challenges faced by its population. Humanitarian organizations, including the United Nations agencies, international NGOs, and local partners, have engaged in a range of interventions to address food insecurity, conflict-driven displacement, and health crises (Akol, 2021). These efforts have involved the provision of emergency food aid, nutrition support, and healthcare services, particularly in response to recurrent conflicts and natural disasters. Organizations like WFP have implemented food distribution programs, employing innovative approaches such as cash transfers and nutrition-sensitive interventions to combat malnutrition. Additionally, initiatives have been undertaken to enhance water, sanitation, and hygiene (WASH) infrastructure, offering essential resources to communities grappling with waterborne diseases (Government of South Sudan & WFP, 2019).

South Sudan, a young and war-torn nation in East Africa, has been grappling with a complex humanitarian crisis characterized by ongoing conflict, severe food insecurity, and displacement of its population (Akol, 2021). In this challenging context, the WFP, as one of the largest and most critical humanitarian organizations globally, plays a pivotal role in providing vital food assistance to millions of South Sudanese who are affected by the conflict and food shortages (Government of South Sudan & WFP, 2019). WFP's operations in South Sudan encompass a range of activities, including food distribution, nutrition programs, school feeding initiatives, and support for internally displaced persons and refugees.

Central to the foregoing humanitarian efforts is the sustainable distribution of aid to far-flung vulnerable populations who are often affected by conflict, displacement, and food insecurity, through various supply chains (Fawcett, Magnan & McCarter, 2021). As such, sustainable supply chain strategies enable humanitarian organizations to optimize the sourcing, transportation, and distribution of aid, minimizing costs, reducing environmental impact, and ensuring the efficient delivery of life-saving resources to vulnerable populations (Crainic & Kim, 2019). Sustainable practices also contribute to the long-term resilience of communities, promoting self-reliance and reducing dependence on aid (Christopher, Peck & Towill, 2022). With frequent disruptions to infrastructure and supply chain operations, WFP has over the years resorted to a range of sustainable supply chain strategies aimed at addressing these unique challenges in delivering aid efficiently and sustainably in South Sudan. These include the adoption of supplier relationship management, green procurement, reverse logistics and transportation optimization (Maxwell, Gordan, Moro, Santschi & Dau, 2018).

Supplier relationship management (SRM) is a sustainable supply chain strategy that humanitarian organizations employ to foster long-term and mutually beneficial partnerships with suppliers. By building strong and sustainable relationships with suppliers, humanitarian organizations can enhance the reliability and efficiency of their supply chains (Beamon, 2019). This involves not only ensuring a consistent supply of goods but also promoting ethical and environmentally responsible sourcing practices. SRM helps in the selection of suppliers who align with sustainability principles, reducing the environmental impact of procurement and ensuring that products meet quality and ethical standards (Cousins & Spekman, 2020). Through SRM, humanitarian organizations can make informed decisions regarding suppliers, supporting sustainability in their supply chains, and contributing to responsible and transparent sourcing, which is essential for the long-term resilience and effectiveness of humanitarian operations (Kannan, Sasikumar, Devika & Haq, 2020).

Green procurement is a sustainable supply chain strategy that involves the selection and sourcing of goods and services with a focus on environmental responsibility and minimal impact on the planet (Kosut & Moran, 2019). In the context of humanitarian organizations, green procurement means making environmentally conscious choices in the sourcing of materials and supplies, such as selecting energy-efficient vehicles, reducing single-use plastics, and favoring eco-friendly packaging (Li, Wang & Huang, 2019). This strategy is employed to minimize the carbon footprint of procurement activities, conserve natural resources, and reduce waste. Green procurement aligns with humanitarian organizations' commitments to sustainability by ensuring that their operations are not only effective but also environmentally responsible, contributing to a more resilient and sustainable future for the communities they serve and the planet as a whole (Quayson & Jiao, 2019).

Reverse logistics is a sustainable supply chain strategy that involves the management of the return, recycling, or responsible disposal of products and materials, focusing on reducing waste and environmental impact (Russo & Comi, 2022). In the context of humanitarian organizations, reverse logistics plays a critical role in ensuring the responsible disposal of aid materials, including medical supplies, relief items, and equipment (Talib, Muhoho & Makali, 2020). Humanitarian organizations employ this strategy by efficiently handling the return and recycling of unused or expired items, reducing the environmental footprint of their operations, and adhering to ethical disposal practices. This not only minimizes waste but also promotes environmental responsibility, contributing to the broader sustainability goals of humanitarian efforts and fostering a culture of responsible resource management and environmental stewardship (Srivastava, 2017).

Transportation optimization is a sustainable supply chain strategy that involves maximizing the efficiency of transportation processes, reducing costs, and minimizing the environmental impact of moving goods and resources (Li et al., 2019). In the context of humanitarian organizations, transportation optimization is crucial for ensuring the timely and cost-effective delivery of aid to vulnerable populations, especially in challenging and resource-constrained environments. Humanitarian organizations employ this strategy by implementing route optimization, load consolidation, and the use of energy-efficient vehicles to minimize fuel consumption and carbon emissions (Kannan, Sasikumar, Devika & Haq, 2020). By streamlining transportation operations, these organizations reduce costs and environmental impact, ensuring that more resources can be directed towards delivering aid and supporting the long-term sustainability of their operations, while also contributing to environmentally responsible humanitarian efforts (He & Bai, 2019).

In such conflict-affected and resource-constrained environment as South Sudan, such strategies are not only instrumental in ensuring the efficient and responsible delivery of food aid but also in minimizing the environmental footprint of operations and fostering the long-term resilience of communities (Ibreck & Pendle, 2017). WFP's commitment to sustainability in its supply chain operations goes beyond immediate relief, aiming to empower vulnerable populations, reduce dependence on aid, and contribute to the overall well-being of the environment and society (WFP, 2021). By integrating sustainable practices, WFP not only aims at uphold its mission of saving lives and changing lives for the better in South Sudan, but also enhance its operational efficiency, achieve cost reduction and overall effectiveness of its aid delivery (Maxwell et al., 2018).

### **Specific Objectives of the Study**

- i. To establish the effect of supplier relationship management on performance of World Food Program in South Sudan
- ii. To determine the effect of green procurement on performance of World Food Program in South Sudan
- iii. To examine the effect of reverse logistics on performance of World Food Program in South Sudan
- iv. To assess the effect of transportation optimization on performance of World Food Program in South Sudan

### **2.0 Literature Review**

The study was grounded on three theories, including The Resource-Based View (RBV), Institutional Theory and Transaction Cost Economics (TCE).

### **3.0 Conceptual Frame work**

The conceptual framework presented encompasses four distinct independent variables, each representing a critical aspect of sustainable supply chain management, and a dependent variable, namely Performance, assessed through timeliness and cost-efficiency. The first independent variable is supplier relationship management, assessed through communication and coordination and contract management. Effective communication and coordination between the humanitarian organization and its suppliers are integral to successful SRM. Clear communication ensures that expectations are well-defined, potential challenges are proactively addressed, and collaborative decision-making is facilitated. The structured administration of contracts is vital for fostering strong relationships with suppliers. Clear contractual terms, performance metrics, and obligations contribute to transparency, trust, and accountability, ultimately influencing overall supply chain performance.

The second independent variable is green procurement, indicated by eco-friendly sourcing and adherence to sustainable standards. Eco-friendly Sourcing pertains to the organization's efforts to procure products and services with minimal environmental impact. It involves sourcing from suppliers who adhere to environmentally friendly practices, use sustainable materials, and minimize their carbon footprint. Green procurement also involves ensuring that suppliers align with recognized sustainable standards, certifications, or industry best practices, promoting environmentally responsible sourcing throughout the supply chain.

The third independent variable is reverse logistics, indicated by returns management and recycling and disposal. Efficient handling of product returns is crucial for minimizing waste and maximizing the reuse of materials. Effective returns management within the reverse logistics framework involves processes for product recall, evaluation, and redistribution. The responsible disposal or recycling of products at the end of their life cycle is a key aspect of reverse logistics. Sustainable disposal practices contribute to minimizing environmental impact and aligning with broader sustainability goals.

The four independent variable is transportation optimization, as indicated by route planning and mode selection. Optimizing transportation routes involves strategically planning the most efficient paths for delivering goods. This reduces transit times, fuel consumption, and carbon emissions, contributing to both environmental sustainability and cost-efficiency. Choosing the most appropriate transportation mode, whether by road, rail, sea, or air, is essential for minimizing costs and environmental impact. Mode selection optimization ensures resources are utilized efficiently while meeting delivery requirements.

The dependent variable that is performance is assessed through timeliness and cost-efficiency. Timely deliveries are crucial in humanitarian operations, ensuring that assistance reaches vulnerable populations when needed most, enhancing the overall impact of the organization's efforts. Cost-efficiency measures the economic effectiveness of the supply chain strategies. Achieving cost-efficiency ensures that resources are utilized judiciously, maximizing the humanitarian organization's ability to provide aid sustainably and respond to dynamic operational challenges. The conceptual framework is provided in Figure 1

## **Independent Variables**

## **Dependent Variable**

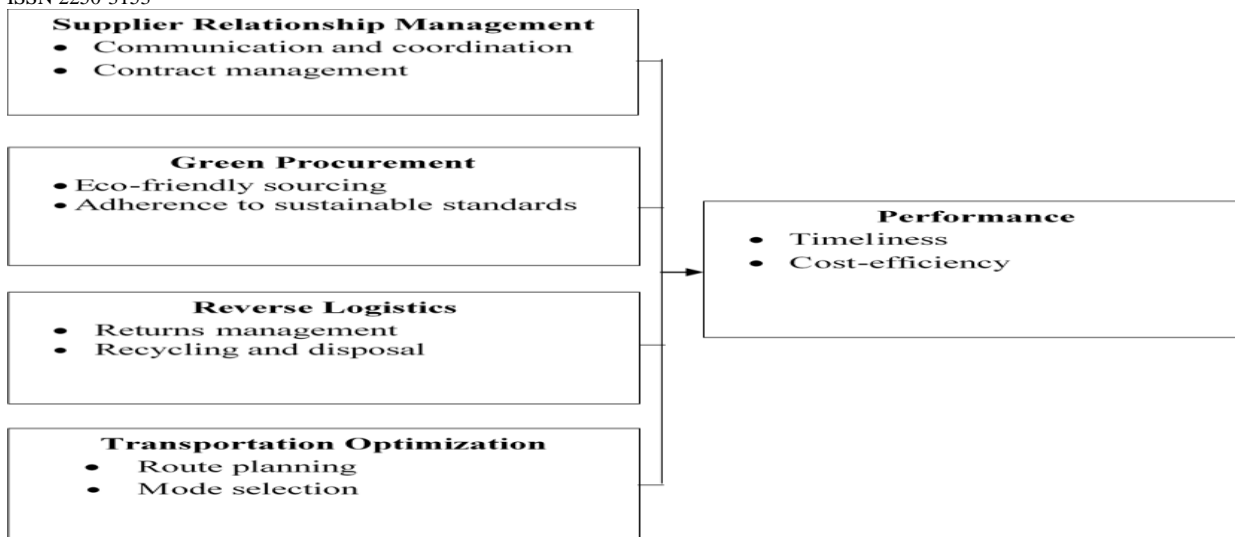


Figure 1: Conceptual Framework  
Source: Researcher (2024)

### Supplier Relationship Management and Performance of World Food Program in South Sudan

Supplier Relationship Management is a vital component of modern supply chain management that focuses on fostering mutually beneficial relationships with suppliers (Kosut & Moran, 2019). By working closely with suppliers, companies can foster environmentally responsible practices, ethical labor standards, and efficient processes. According to Cousins and Spekman (2020), SRM goes beyond transactional supplier-buyer interactions and forms a foundation for long-term, strategic partnerships that can drive innovation, reduce costs, and enhance competitiveness. It involves a shift from a transaction-based perspective to a more holistic and strategic approach.

While Kosut and Moran (2019) highlight the potential of SRM in fostering environmentally responsible and ethical practices, the discussion lacks depth regarding the specific challenges and strategies in conflict-affected areas like South Sudan. The literature could benefit from a more nuanced analysis of how SRM practices need to be adapted in such contexts to address unique operational challenges. The conceptualization of SRM by Cousins and Spekman (2020) as a foundation for long-term strategic partnerships is compelling. However, the study lacks empirical evidence or case studies, especially from humanitarian organizations like the World Food Program, to illustrate the real-world impact of SRM on supply chain excellence and sustainability within such unique environments.

Effective SRM necessitates collaboration and communication with suppliers. Lamming (2018) notes that strong communication and collaborative efforts enable organizations to align their goals with those of their suppliers, share information, and jointly address challenges. This collaborative approach can lead to joint product development and innovation, as stated by Luzzini et al. (2020), contributing to value creation. Supplier Relationship Management is crucial for risk mitigation in the supply chain. Wagner and Bode (2018) emphasize the role of SRM in identifying and managing risks associated with suppliers, including financial, operational, and environmental risks. Effective SRM enables organizations to develop resilience and preparedness to address potential supply chain disruptions, as highlighted in the study by Van der Vorst et al. (2019).

Lamming's (2018) emphasis on collaboration and communication is well-founded, but lacks practicality of achieving high levels of collaboration in the volatile context of South Sudan. It also fails to explore the specific barriers to effective communication and collaboration in humanitarian supply chains and suggest strategies to overcome these challenges. The role of SRM in risk mitigation is crucial, yet Wagner and Bode's (2018) discussion does not adequately address the complexity of risk in conflict zones. Literature could benefit from a more detailed examination of how SRM can be effectively utilized to manage not just financial and operational risks, but also the acute security risks prevalent in areas like South Sudan.

Sustainability is a recurring theme in SRM literature. Carter and Rogers (2018) argue that SRM is instrumental in aligning supply chain practices with sustainability goals. Organizations engage with suppliers who share their commitment to environmental and social responsibility, promoting sustainability initiatives in the supply chain. This alignment is essential for achieving corporate social responsibility (CSR) objectives. SRM involves the continuous evaluation of supplier performance. Key Performance Indicators (KPIs) are used to assess various aspects of supplier performance, as discussed in Handfield and Cousins' (2020) work. These evaluations help organizations identify areas for improvement, facilitate fact-based decision-making, and ensure suppliers meet or exceed expectations.



While the importance of aligning SRM with sustainability goals is well-articulated, Carter and Rogers' (2018) analysis may be critiqued for its lack of specificity regarding the implementation of sustainability initiatives within SRM in humanitarian contexts. The literature review could provide examples of successful sustainability initiatives within SRM in similar contexts, highlighting lessons learned and best practices. The discussion on using KPIs for evaluating supplier performance by Handfield and Cousins (2020) is insightful. However, it could be critiqued for not discussing the adaptability of these KPIs to the rapidly changing environments of humanitarian missions. The review might explore how performance evaluation methods can be adjusted to remain relevant and effective in the face of such variability and uncertainty.

Modern SRM often leverages technology and software solutions. Literature acknowledges the role of digital tools in enhancing SRM effectiveness. Monczka et al. (2020) note that technology, such as supplier portals and relationship management software, streamlines communication, automates processes, and facilitates data management, allowing for more efficient SRM practices. The study emphasizes the role of relationship management in driving innovation, risk mitigation, sustainability, and performance evaluation, while acknowledging the influence of technology in modern SRM practices. The acknowledgment of technology's role in enhancing SRM is necessary; however, the discussion by Monczka et al. (2020) could be expanded to critique the accessibility and applicability of these digital tools in regions with limited infrastructure, like South Sudan. The literature review could benefit from an analysis of the challenges and opportunities in implementing SRM technology solutions in less developed or conflict-affected regions.

### **Green Procurement and Performance of World Food Program in South Sudan**

Carter and Rogers (2018) argue that green procurement involves sourcing products and services from suppliers who prioritize eco-friendly practices, which contributes to reduced environmental harm. Organizations are encouraged to select suppliers who align with their sustainability objectives, as discussed in their work. A core element of green procurement is sustainable sourcing. Organizations are advised to consider the entire lifecycle of products, including raw material extraction, production, transportation, and end-of-life disposal. This approach helps in reducing the carbon footprint and environmental impact of products.

Carter and Rogers (2018) provide a foundational perspective on the importance of green procurement practices in enhancing environmental sustainability. Their argument emphasizes the strategic selection of suppliers based on environmental considerations, aligning with broader sustainability objectives. However, the critique of the study lies in the lack of detailed discussion on the practical challenges and complexities involved in implementing green procurement. The authors could have expanded on the operational hurdles, such as assessing the true environmental footprint of suppliers or the premium costs associated with eco-friendly products and services. Additionally, exploring the dynamics of supplier engagement and the potential for capacity building among suppliers to meet green procurement standards would enrich the discussion.

The study by He and Bai (2019) discusses the role of environmental regulations in shaping green procurement practices and supplier selection. Green procurement offers cost-saving opportunities. According to the study, selecting environmentally preferable products can lead to operational efficiencies, reduced waste, and lower energy consumption, resulting in long-term cost savings. Additionally, green procurement can enhance an organization's reputation and market advantage, as more consumers seek eco-friendly products and responsible companies.

The study by He and Bai (2019) highlights the significant role of environmental regulations in shaping green procurement practices. While this perspective is crucial, the critique here revolves around the narrow focus on regulatory compliance as a driver for green procurement. Expanding the discussion to include intrinsic motivations for companies to pursue green procurement, such as corporate social responsibility, brand image, and consumer demand, would provide a more comprehensive understanding of the multifaceted motivations behind green procurement practices.

Engaging with suppliers is a critical aspect of green procurement. Organizations should work closely with their suppliers to promote sustainability practices throughout the supply chain. By collaborating with suppliers who share their environmental commitment, companies can create a collective approach to sustainability, as discussed in the research by Luzzini et al. (2020). This study emphasizes the importance of engaging with suppliers to promote sustainability practices throughout the supply chain. While the collaborative approach is commendable, the critique lies in the underestimation of the effort and resources required to foster such collaborations effectively. The paper could benefit from a deeper exploration of the mechanisms for successful supplier engagement, including the challenges of aligning diverse organizational cultures and priorities, as well as practical strategies for overcoming these obstacles.

Green procurement is not without challenges. Bals et al. (2019) highlight that organizations may face barriers such as higher initial costs for environmentally preferable products, lack of supplier transparency, and limited availability of green alternatives. Overcoming these challenges requires a dedicated commitment to sustainability and collaboration with suppliers. The study provides a realistic overview of the challenges faced by organizations in implementing green procurement. While their acknowledgment of barriers such as higher costs and lack of transparency is important, the study did not make a strong emphasis on potential solutions and innovative practices that companies can adopt to overcome these hurdles. For instance, detailing case studies of organizations that have successfully

navigated these challenges, or discussing emerging technologies and platforms that facilitate more transparent and efficient green procurement processes, would significantly enhance the practical value of their insights.

### **Reverse Logistics and Performance of World Food Program in South Sudan**

Reverse logistics, a vital aspect of supply chain management, encompasses the processes involved in handling returned or end-of-life products (Guide & Van Wassenhove, 2019). This multidimensional concept plays a crucial role in environmental sustainability, economic efficiency, and value creation, and it has garnered substantial attention in academic literature and industry practice. Reverse logistics addresses the management of product returns and the recycling or disposal of waste products.

Guide & Van Wassenhove (2019) offer a comprehensive overview of reverse logistics, emphasizing its role in sustainability and value recapture. Their work effectively outlines the processes involved and the benefits thereof. However, their study fails to conduct a deeper exploration of the specific strategies and technologies that facilitate effective reverse logistics operations. Additionally, while the importance of reverse logistics in environmental sustainability is well-argued, the paper could further benefit from real-world examples or case studies that illustrate successful implementations of reverse logistics, particularly in challenging environments like South Sudan.

Reverse logistics is pivotal in managing product returns, recycling, remanufacturing, and disposal. As organizations increasingly recognize the value of resource conservation and waste reduction, the importance of reverse logistics has grown. Guide et al. (2020) emphasize its significance in the context of closed-loop supply chains, where products and materials are reclaimed and reintegrated, thereby reducing environmental impact. The efficient management of product returns is a central focus of reverse logistics. The literature highlights that a well-structured reverse logistics process can lead to significant cost savings and customer satisfaction. Furthermore, it enables the recycling and reuse of materials, contributing to environmental responsibility.

The study by Guide et al. (2020) underlines the significance of reverse logistics within closed-loop supply chains, presenting a strong argument for its environmental and economic benefits. The emphasis on closed-loop supply chains is particularly valuable. However, the study fails to delve deeper into the specific strategies for integrating reverse logistics into existing supply chains, particularly in sectors or regions where this practice is not yet widespread. The exploration of barriers to integration and strategies to overcome these would make the findings more actionable for practitioners.

Remanufacturing, an integral part of reverse logistics, involves restoring used products to their original or better condition. This aligns with the concept of a circular economy, which advocates for waste reduction and the extension of product lifecycles. Srivastava (2017) discusses how remanufacturing can contribute to both economic and environmental sustainability by decreasing the demand for new raw materials. Reverse logistics practices are shaped by environmental regulations and standards. Organizations are obligated to adhere to legal requirements related to product disposal, recycling, and hazardous materials management. These regulations often drive companies to adopt more environmentally responsible reverse logistics practices. Russo and Comi (2022) delve into the role of regulations in influencing the practices of reverse logistics.

Srivastava's (2017) discussion on remanufacturing as part of reverse logistics is insightful, highlighting its economic and environmental benefits. The connection between remanufacturing and sustainability is well-established, yet the analysis could be enriched by addressing the market demand for remanufactured products and the consumer perception challenges that might arise. Understanding consumer acceptance and the marketing of remanufactured products are critical for the success of such initiatives, especially in diverse markets.

The literature acknowledges that reverse logistics can be complex and present challenges, including the management of returns, efficient transportation, recycling infrastructure, and managing customer perceptions. Kannan et al. (2020) discuss the various challenges faced by organizations when implementing reverse logistics, emphasizing the importance of efficient planning and technology integration. The environmental benefits of reverse logistics are evident in waste reduction and resource conservation. However, it also has economic advantages. Fleischmann et al. (2017) outline how effective reverse logistics can lead to cost savings, as the remanufacturing and recycling of products can create value and generate additional revenue streams.

Kannan et al. (2020) provide a detailed examination of reverse logistics, focusing on the environmental impacts and the concept of a circular economy. Their work is crucial in highlighting the strategic importance of minimizing the environmental footprint. Nonetheless, the critique lies in the limited discussion on the operational challenges and the logistical specifics of implementing reverse logistics in conflict-affected areas or in regions with underdeveloped infrastructure. A more nuanced discussion on overcoming these practical challenges would enhance the relevance of their findings, especially for organizations operating in such contexts.

The analysis by Fleischmann et al. (2017) on the economic benefits of reverse logistics through cost savings and revenue generation is a valuable contribution to the literature. However, the focus on economic advantages might overshadow the practical challenges and



initial investments required to establish effective reverse logistics processes. A balanced discussion that also considers the upfront costs, the need for specialized knowledge, and the potential for long-term ROI would offer a more nuanced understanding of the economic dimensions of reverse logistics.

### **Transportation Optimization and performance of World Food Program in South Sudan**

Advanced technology solutions and data analytics play a pivotal role in helping companies make informed decisions regarding transportation optimization (Crainic & Kim, 2019). It is a topic widely covered in the literature, offering insights into various strategies, techniques, and tools to enhance transportation efficiency. Transportation represents a significant cost component within the supply chain, making its optimization vital. Literature underscores the importance of optimizing transportation for cost reduction and operational efficiency.

Crainic and Kim (2019) offer valuable insights into the role of advanced technology solutions and data analytics in transportation optimization. Their work underscores the importance of such technologies in enhancing operational efficiency and reducing costs. However, their study fails to give a more detailed exploration of the specific challenges and barriers to implementing these technologies, especially in complex environments like South Sudan where infrastructure and technological capabilities may be limited. Including case studies or examples of successful implementations in similar contexts could also enhance the applicability of their findings.

According to Chopra and Meindl (2019), transportation optimization enhances an organization's competitive advantage by reducing logistics costs and ensuring timely delivery. Route optimization and vehicle selection are critical aspects of transportation optimization. Researchers have highlighted the role of advanced algorithms and software solutions in finding the most efficient routes and selecting the appropriate vehicles for transport. Chopra and Meindl (2019) highlight the strategic advantage gained through transportation optimization, emphasizing cost reduction and timely delivery. While their analysis is comprehensive in discussing the benefits of optimization, it may overlook the practical difficulties organizations face in conflict-affected areas. The unique challenges of operating in South Sudan, such as security issues and infrastructure deficits, could have been addressed to provide a more rounded perspective on how transportation optimization strategies can be adapted or modified in such settings.

Zografos and Androustopoulos (2021) discuss the utilization of vehicle routing and scheduling systems to improve transportation operations and reduce fuel consumption. Literature recognizes the advantages of intermodal transportation, which involves using multiple modes of transportation (e.g., road, rail, sea, air) in a single journey. Intermodal transportation can lead to significant cost savings and environmental benefits. The discussion on route optimization and vehicle selection by Zografos and Androustopoulos (2021) is insightful, showcasing the potential of advanced algorithms and software solutions. Nonetheless, the study fails to delve deeper into the feasibility and implementation challenges of these technological solutions in regions with less developed technological infrastructure. Furthermore, considering the context of humanitarian supply chains, an exploration of how these solutions cater to the unpredictability and urgency of humanitarian logistics would add value.

According to Crainic and Kim (2019), intermodal transportation strategies enhance overall supply chain efficiency by combining the strengths of different transportation modes. This work provides an important analysis of intermodal transportation's benefits for supply chain efficiency and environmental sustainability. However, the feasibility of implementing intermodal transportation strategies in South Sudan could be further examined, considering the limited transportation infrastructure and logistical challenges unique to such regions. A discussion on potential strategies to overcome these limitations would make the findings more relevant to practitioners in the field.

Transportation optimization also addresses environmental concerns. Researchers have explored the environmental impact of transportation, emphasizing the reduction of carbon emissions and energy consumption. Attia et al. (2020) discuss the integration of environmental considerations into transportation optimization models and tools, highlighting the importance of sustainability in supply chain management. Technology plays a pivotal role in transportation optimization. Literature discusses the utilization of data analytics, real-time monitoring, and Internet of Things (IoT) technologies to track and optimize transportation processes.

Attia et al. (2020) address the critical aspect of incorporating environmental considerations into transportation optimization. While their focus on sustainability is commendable, the application of these models and tools in contexts with significant logistical and infrastructural challenges, such as South Sudan, remains underexplored. Insights into adapting these environmental considerations to local conditions and constraints would enhance the practical applicability of their research.

Lai et al. (2017) emphasize the significance of real-time data for route planning, load optimization, and performance monitoring. Collaboration among different organizations and stakeholders in the supply chain is another key aspect of transportation optimization. Collaborative transportation strategies aim to reduce empty miles, improve load consolidation, and minimize transportation costs. The emphasis on technology, particularly real-time data and IoT, by Lai et al. (2017), is crucial for transportation optimization. However, the study fails to give a more nuanced consideration of the technological readiness and infrastructure availability in various operational

contexts, especially in developing countries or conflict-affected regions. The paper could explore alternative or complementary strategies for contexts where the deployment of such advanced technologies is not feasible.

Tokar et al. (2020) discuss the benefits of collaborative transportation efforts and provide insights into successful collaborative practices. Tokar et al. (2020) present an important discussion on the benefits of collaborative transportation strategies. Their insights into reducing transportation costs and improving efficiency through collaboration are valuable. Yet, the study fails to explore the challenges and dynamics of establishing and maintaining such collaborations in complex humanitarian contexts, where organizations often have to navigate a myriad of logistical, political, and security challenges. A deeper dive into strategies for fostering effective collaboration in such environments would provide a more comprehensive understanding of transportation optimization in challenging contexts.

### 3.0 Research Methodology

#### 3.1. Research Design

The study adopted the descriptive design, defined by Saunders et al. (2019) as a type of research methodology that aims to describe and present an accurate representation of the characteristics, behaviours, opinions, or conditions of a particular subject or phenomenon. It involves gathering data from a sample or population and analysing it to provide a comprehensive and detailed description of the research topic. Similarly, Kothari (2019) further opines that descriptive research depicts a detailed sketch of circumstances, events, and people, and it includes data collected from the population through such survey instruments as questionnaires and interviews. The present study thus adopted the descriptive research design as it seeks to collect data by survey tools, from which to give an accurate account of the effect of sustainable supply chain strategies on performance of World Food Program in South Sudan.

#### 3.2. Target Population

The target population in this study comprised individuals, organizations, or entities directly involved or affected by WFP's supply chain operations in South Sudan. These include 265 staff members directly involved in supply chain management, logistics, procurement, and sustainability initiatives within the World Food Program in South Sudan; and 125 suppliers and vendors providing goods and services to the World Food Program in South Sudan. While the units of observation included WFP staff and individual suppliers and vendors, the unit of analysis was WFP. The total target population is thus 390. The target population is described in Table 1.

**Table 1: Target Population**

Category	Population	% Proportion
WFP Staff	265	67.9
Suppliers and vendors	125	32.1
<b>Total</b>	<b>390</b>	<b>100</b>

Source: World Food Programme (2024)

#### 3.3. Sample and Sampling Procedure

In the present, the stratified sampling technique was employed through grouping the accessible population into strata, formed by the stakeholder category. The Yamane formula (Yamane, 1967) is going to be applied in this investigation to determine an acceptable sample size, as shown below:

$$n = \frac{N}{1 + N(e)^2}$$

Where:  $n$  = required sample

$N$ =total population=375

$e$  = margin of error=0.01

Therefore;

$$n = \frac{390}{1+390(0.01)^2}$$

The determined sample size was therefore 375, comprising 265 WFP staff and 125 suppliers and vendors who for the units of observation, while the unit of analysis is WFP. The sample was proportionately sampled across the two strata as shown in Table 2.

**Table 2. Sample Distribution**

Category	Population	Sample	% Proportion
WFP Staff	265	255	67.9
Suppliers and vendors	125	120	32.1
<b>Total</b>	<b>390</b>	<b>375</b>	<b>100</b>

The allocated samples were then reached by the simple random sampling, defined by Bryman and Bell (2007) as a kind of survey research where the researcher chooses individuals at randomness from a demographic.

### 3.4. Data Collection Method

The present study relied on a mixed-method approach, whereby both quantitative and qualitative primary data was sought. While quantitative data was sourced from local suppliers that provide goods and services to WFP in South Sudan and members of the beneficiary communities through a structured questionnaire. In-depth key informant interviews were used to collect qualitative data from senior WFP staff involved in supply chain management, logistics, and procurement in South Sudan. A structured questionnaire was utilized for the reason that it confines response to a set of predetermined questions aimed at directly addressing the study objectives. A structured questionnaire also has the ability to reach a large number of participants in a short period of time; and that it provides a sense of confidentiality to the participant. It is also an ideal methodology with no bias associated with personal character traits (Kumar, 2018). Cooper and Schindler (2018) recommend the use of structured questionnaires because they are advantaged in being easy to administer, analyze and inexpensive in terms of time.

In-depth key informant interviews were on the other hand be utilized for the reason that key informants, typically individuals who are closely involved with the organization and its operations, possess in-depth insider knowledge. They can provide nuanced, context-specific insights that might not be available through other data collection methods. Their experience and expertise can offer a comprehensive understanding of the practical aspects of supply chain strategies and their impact on humanitarian operations (Kothari, 2019).

### 3.5. Validity and Reliability of Research Instrument

In order to determine the validity and reliability and objectivity of the questionnaire, a pre-test will be carried. This was done through reliability and validity tests (Kothari, 2004). Collis and Hussey (2009) observe that a research participant that were below 10,000 respondents as an illustration, a size of around 10% to 30% of respondents not included for the research study is an adequate population representation (Kumar, 2011) and hence 10% is adequate for a pilot test. So, 38 participants from the sample will be chosen at random by the investigator for the pilot testing. These were not a part of the primary investigation.

The validity of facial tests along with content consistency assessments was combined in a complimentary manner. To ascertain validity of both content and face, the researcher pursued expert counsel so as to firm up both validity of content and appearance in the survey. To this end, the project supervisor’s input on the questionnaire was sought, feedback from whom was used to make improvements on the questionnaire.

The reliability analysis assesses the internal consistency or reliability of the measurement scales used in the questionnaire. It presents the Cronbach’s alpha coefficient for each variable, along with the number of items comprising each variable. This analysis is crucial for ensuring the reliability of the data collected and the validity of subsequent analyses and interpretations. A tool is considered dependable by Collis and Hussey (2009) if it accurately assesses what it ought to and generates results that are constant after the same thing is measured repeatedly. The Cronbach Alpha criterion with an index of 0.7 (Nunnally, 1978) was applied to determine the dependability of the questionnaires.

**Table 3: Reliability Analysis**

Variable	Cronbach Alpha	Items	Decision
Supplier relationship management	0.798	8	Reliable
Green procurement	0.830	8	Reliable
Reverse logistics	0.850	8	Reliable
Transportation optimization	0.838	8	Reliable
Performance	0.814	8	Reliable

Overall	0.950	40	Reliable
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The table presents the results of a reliability analysis conducted on several variables used in the study. Each variable, including Supplier Relationship Management, Green Procurement, Reverse Logistics, Transportation Optimization, and Performance, was evaluated for internal consistency using Cronbach's alpha coefficient. The Cronbach's alpha coefficients for all variables are above the generally accepted threshold of 0.70, indicating strong internal consistency among the items within each variable. Specifically, Supplier Relationship Management has a Cronbach's alpha of 0.798, Green Procurement has a Cronbach's alpha of 0.830, Reverse Logistics has a Cronbach's alpha of 0.850, Transportation Optimization has a Cronbach's alpha of 0.838, and Performance has a Cronbach's alpha of 0.814. The overall Cronbach's alpha for all variables combined is 0.950, indicating a high level of internal consistency across the entire measurement instrument. Based on these results, it can be concluded that all variables are reliable measures, providing confidence in the validity and consistency of the data collected for the study.

#### 4.0 Data Analysis and Discussion

##### Supplier Relationship Management and Performance of World Food Program in South Sudan

The study sought to establish the effect of supplier relationship management on performance of World Food Program in South Sudan. To achieve this, participants were asked to rate their respective levels of agreement with the following items with regard to supplier relationship management as applies in their organization's arrangement with WFP. A 5-Point Likert scale was used, with denoting strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree:

**Table 4: Supplier Relationship Management**

Statement	Mean	Std. Dev
The World Food Program maintains clear and open lines of communication with our organization regarding procurement and delivery schedules	4.531	.781
WFP actively seeks feedback from our organization on its procurement processes and performance, and we feel our input is valued	4.081	.997
We have a mutually beneficial and collaborative working relationship with WFP, which contributes to the success of our partnership	4.342	.795
WFP provides clear and transparent information about their supply chain requirements, standards, and expectations	4.488	.701
We find that WFP's procurement practices are consistent and reliable, which helps us plan and allocate resources effectively	4.354	.759
WFP's payment terms and procedures are fair and reasonable, making it easier for our organization to do business with them	4.200	.885
The World Food Program considers our organization's needs and constraints when making procurement decisions	4.248	.842
We believe that our relationship with WFP positively impacts our organization's ability to provide goods and services efficiently and effectively to support humanitarian efforts in South Sudan	4.409	.769

Based on the means and standard deviations provided, the findings suggest that respondents generally perceive the supplier relationship management practices of WFP in South Sudan favorably. The high mean scores, ranging from 4.081 to 4.531 out of 5, indicate a strong level of agreement among respondents across various aspects of supplier relationship management, including communication, feedback mechanisms, collaboration, transparency, consistency in procurement practices, fairness in payment terms, and consideration of organizational needs. The relatively low standard deviations suggest a degree of consensus among respondents regarding these perceptions, indicating that the responses are relatively consistent. Overall, the findings suggest that WFP's efforts in supplier relationship management are perceived positively by its partners, contributing to a mutually beneficial and effective partnership in supporting humanitarian efforts in South Sudan.

Responses from the key informant interviews with senior management revealed that WFP in South Sudan maintains clear and open lines of communication with local suppliers to ensure smooth procurement and delivery processes. This approach fosters transparency and collaboration, contributing to a strong and mutually beneficial working relationship between WFP and its suppliers.

A respondent observed that:

*“.....Regular meetings and consultations are held to discuss procurement schedules, requirements, and any challenges faced by both parties.....”*

Effective communication and collaboration between WFP and local suppliers are crucial for ensuring the timely delivery of goods and services in humanitarian operations. Through maintaining clear lines of communication and actively engaging with suppliers, WFP can address potential supply chain disruptions proactively, ultimately enhancing the performance of its operations in South Sudan. This aligns with the findings of previous studies highlighting the importance of supplier relationship management in improving supply chain performance and resilience (Pagell & Wu, 2019).

It was also established from the interviews, that WFP encourages feedback from local suppliers on its procurement processes and performance, valuing their input as essential for continuous improvement:

*“.....Supplier feedback mechanisms, such as surveys, meetings, and regular evaluations, allow WFP to identify areas for enhancement and address any concerns raised by suppliers promptly.....”*

The proactive solicitation of feedback from local suppliers reflects WFP's commitment to fostering a collaborative and responsive procurement environment. By actively seeking input from suppliers, WFP can identify inefficiencies or bottlenecks in its procurement processes and implement targeted improvements to enhance overall performance. This approach is consistent with best practices in supply chain management, which emphasize the importance of incorporating supplier perspectives to drive continuous improvement and innovation (Cousins et al., 2019).

### Green Procurement and Performance of World Food Program in South Sudan

The study sought to determine the effect of green procurement on performance of World Food Program in South Sudan. To this end, respondents were asked to rate their respective levels of agreement with the following items with regard to green procurement as applies in their organization's arrangement with WFP. A 5-Point Likert scale was used, with denoting strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree:

**Table 5: Green Procurement**

Statement	Mean	Std. Dev
The World Food Program considers environmentally responsible sourcing practices when procuring goods and services from our organization	3.961	.943
We are encouraged by WFP to provide environmentally sustainable products and materials in our supply chain	3.851	1.002
WFP actively seeks to reduce its carbon footprint through its procurement decisions and practices	3.911	.966
Our organization incorporates environmentally responsible practices in the production and sourcing of goods and services for WFP	4.331	.789
WFP's procurement processes support the reduction of single-use plastics and other environmentally harmful materials	4.200	.887
We believe that our partnership with WFP positively impacts our organization's environmental sustainability efforts	3.907	1.019
WFP provides clear guidelines on environmentally friendly packaging and labeling of relief items	3.712	1.110
We feel that WFP's commitment to green procurement enhances our organization's ability to provide environmentally responsible products and services in support of humanitarian efforts in South Sudan	4.153	.898

The findings, based on the means and standard deviations, indicate that respondents generally perceive WFP in South Sudan as actively engaging in green procurement practices. With mean scores ranging from 3.712 to 4.331 out of 5, respondents express moderate to high levels of agreement across various aspects of green procurement, including the consideration of environmentally responsible sourcing practices, encouragement to provide sustainable products, and efforts to reduce the carbon footprint through procurement decisions. The relatively low standard deviations suggest a degree of consensus among respondents regarding these perceptions, indicating that the responses are relatively consistent. Overall, the findings suggest a positive perception of WFP's commitment to green procurement among its suppliers in South Sudan, highlighting the importance of sustainability in humanitarian supply chains.

Results from the key informant interviews indicate that WFP in South Sudan has implemented various initiatives to promote environmentally sustainable procurement practices. These include sourcing products from eco-friendly suppliers, reducing packaging waste through efficient packaging designs, and prioritizing the use of renewable and energy-efficient materials in relief items. The adoption of green procurement practices by WFP aligns with its commitment to environmental sustainability and responsible resource management. Through integrating eco-friendly criteria into its procurement decisions, WFP not only reduces its environmental footprint but also sets a positive example for other humanitarian organizations. The emphasis on green procurement reflects a growing awareness of the environmental impacts of supply chain operations and underscores the importance of sustainable procurement practices in mitigating these effects (Carter & Rogers, 2008).



It was also revealed from the interviews that WFP measures the impact of green procurement strategies on its operations in South Sudan through various key performance indicators, including carbon footprint reduction, waste minimization, and resource conservation:

*“.....Regular monitoring and evaluation of these KPIs allow WFP to assess the effectiveness of its green procurement initiatives and make data-driven decisions to optimize environmental performance.....”*

The use of KPIs to measure the impact of green procurement strategies demonstrates WFP's commitment to accountability and transparency in sustainability efforts. Through tracking and analyzing relevant metrics, WFP can identify areas of success and areas needing improvement in its green procurement practices, facilitating continuous refinement and optimization of environmental performance. This approach aligns with recommendations from the literature emphasizing the importance of performance measurement in evaluating the effectiveness of sustainable procurement initiatives (Seuring & Müller, 2008).

**Reverse Logistics and Performance of World Food Program in South Sudan**

The study further set out to examine the effect of reverse logistics on performance of World Food Program in South Sudan. To realize this, responders were required to rate their respective levels of agreement with the following items with regard to reverse logistics as applies in their organization's arrangement with WFP. A 5-Point Likert scale was used, with denoting strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree:

**Table 6: Reverse Logistics**

Statement	Mean	Std. Dev
The World Food Program effectively communicates its procedures and requirements for the return and recycling of unused or expired relief items	4.208	.959
Our organization has found the reverse logistics process with WFP to be efficient and well-organized	3.953	.951
We believe that WFP's commitment to responsible disposal and recycling of relief items positively impacts the environment and local communities	3.985	1.070
WFP actively seeks to minimize waste in its supply chain operations and encourages the recycling and repurposing of materials	4.190	.848
Our organization has received clear guidance from WFP on the return and responsible disposal of unused relief items	4.226	.822
We consider our involvement in WFP's reverse logistics efforts to be mutually beneficial and sustainable	4.161	.807
WFP's reverse logistics practices contribute to our organization's commitment to environmental responsibility	4.038	.879
We believe that our relationship with WFP positively impacts our organization's ability to engage in ethical and sustainable reverse logistics practices in support of humanitarian efforts in South Sudan	4.084	.855

Based on the means and standard deviations provided, the findings suggest that respondents generally perceive the reverse logistics practices of WFP in South Sudan positively. The mean scores, ranging from 3.953 to 4.226 out of 5, indicate a strong level of agreement among respondents across various aspects of reverse logistics, including communication of procedures, efficiency of the process, commitment to responsible disposal and recycling, minimization of waste, provision of clear guidance, and mutual benefit of involvement. The relatively low standard deviations suggest a degree of consensus among respondents regarding these perceptions, indicating that the responses are relatively consistent. Overall, the findings suggest that WFP's efforts in reverse logistics are perceived favorably by its partners, contributing to their commitment to environmental responsibility and their ability to engage in ethical and sustainable practices in support of humanitarian efforts in South Sudan.

Responses from the key informant interviews reveal that WFP effectively communicates its procedures and requirements for the return and recycling of unused or expired relief items to local suppliers. This ensures that reverse logistics operations are conducted in a systematic and environmentally responsible manner:

*“.....Clear guidelines and instructions are provided to suppliers regarding the process for returning items, including packaging requirements, labeling protocols, and disposal instructions.....”*

Clear communication and guidance on reverse logistics processes are essential for facilitating the efficient and responsible return of relief items in humanitarian supply chains. Through providing detailed instructions to suppliers, WFP minimizes the risk of miscommunication or errors during the return process, thereby enhancing operational efficiency and compliance with environmental regulations. This approach is consistent with best practices in reverse logistics management, which emphasize the importance of effective communication and coordination among stakeholders (Rogers & Tibben-Lembke, 2001).

It was also established that WFP actively seeks to minimize waste in its supply chain operations and encourages the recycling and repurposing of materials wherever possible. Through partnerships with local recycling facilities and community organizations, WFP facilitates the collection and processing of recyclable materials, including packaging materials, containers, and expired relief items. The integration of recycling and waste minimization initiatives into reverse logistics operations reflects WFP's commitment to sustainable supply chain management practices. Through diverting waste from landfills and promoting recycling, WFP not only reduces its environmental footprint but also contributes to the socioeconomic development of local communities through job creation and resource conservation. This approach aligns with the principles of circular economy, which emphasize the importance of closing the loop on material flows and maximizing resource efficiency (Ellen MacArthur Foundation, 2015).

### Transportation Optimization and Performance of World Food Program in South Sudan

The study also sought to assess the effect of transportation optimization on performance of World Food Program in South Sudan. To this end, respondents were asked to rate their respective levels of agreement with the following items with regard to transportation optimization as applies in their organization's arrangement with WFP. A 5-Point Likert scale was used, with denoting strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree.

**Table 7: Transportation Optimization**

	Mean	Std. Dev
The World Food Program's transportation optimization practices enhance the efficiency and timeliness of goods delivery to our organization	3.824	.996
WFP actively seeks to minimize transportation costs and reduce the environmental impact of its logistics and distribution operations	4.023	.934
We find that WFP's transportation planning and route optimization contribute to reliable and on-time deliveries of goods	4.076	.956
WFP's commitment to using energy-efficient vehicles aligns with our organization's sustainability goals	4.034	.999
Our organization receives clear information from WFP regarding transportation schedules and requirements	4.229	.914
WFP's transportation optimization efforts have a positive impact on our ability to plan and allocate resources effectively	4.218	.883
We believe that our partnership with WFP positively influences our organization's transportation efficiency and cost-effectiveness	4.212	.963
WFP's transportation optimization practices contribute to our organization's commitment to sustainable and environmentally responsible supply chain operations	4.322	.723

Based on the means and standard deviations provided, the findings suggest that respondents generally perceive the transportation optimization practices of WFP in South Sudan positively. The mean scores, ranging from 3.824 to 4.322 out of 5, indicate a strong level of agreement among respondents across various aspects of transportation optimization, including efficiency of goods delivery, minimization of transportation costs, reliability of deliveries, use of energy-efficient vehicles, provision of clear information on transportation schedules, and positive impact on resource planning and allocation. The relatively low standard deviations suggest a degree of consensus among respondents regarding these perceptions, indicating that the responses are relatively consistent. Overall, the findings suggest that WFP's efforts in transportation optimization are perceived favorably by its partners, contributing to their transportation efficiency, cost-effectiveness, and commitment to sustainable and environmentally responsible supply chain operations.

Responses from key informant interviews reveal that WFP's transportation optimization efforts have a positive impact on the ability of its partners to plan and allocate resources effectively. Through optimizing transportation routes, consolidating shipments, and leveraging technology such as GPS tracking and real-time monitoring systems, WFP enhances the efficiency and reliability of its transportation operations in South Sudan:

*“.....This allows for better coordination of deliveries, reduced transit times, and improved visibility throughout the supply chain.....”*

Transportation optimization plays a critical role in improving the performance of humanitarian supply chains by enhancing the speed, reliability, and cost-effectiveness of deliveries. WFP's adoption of transportation optimization strategies reflects a proactive approach to addressing logistical challenges and maximizing the impact of its humanitarian operations in South Sudan. Through leveraging technology and data-driven decision-making, WFP can achieve greater efficiency and responsiveness in its transportation processes, ultimately enabling more effective delivery of aid to vulnerable populations. This aligns with recommendations from the literature

emphasizing the importance of transportation optimization in enhancing the agility and resilience of humanitarian supply chains (Tomasini & Van Wassenhove, 2009).

**Performance of World Food Program in South Sudan**

The study also sought to assess the performance of World Food Program in South Sudan. To this end, respondents were asked to rate their respective levels of agreement with statements posed in regard to WFP’s performance. A 5-Point Likert scale was used, with denoting strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree:

**Table 8: Performance of World Food Program in South Sudan**

	Mean	Std. Dev
WFP effectively collaborates with local suppliers to ensure the timely delivery of goods and services for humanitarian operations in South Sudan	3.797	1.106
WFP's procurement processes are transparent and accountable, fostering trust and integrity in its partnerships with suppliers	3.973	.980
We actively seek feedback from local suppliers to continuously improve our procurement practices and operations	4.000	.969
WFP is committed to promoting environmentally sustainable procurement practices, such as green procurement and waste reduction initiatives	4.119	.929
We believe that WFP's procurement strategies positively impact the efficiency and effectiveness of humanitarian operations in South Sudan	4.154	.839
WFP maintains open and clear communication channels with local suppliers to facilitate smooth coordination and collaboration	4.027	.879
WFP's performance in meeting the procurement needs and expectations of local suppliers has improved over time	4.008	.973
Overall, local suppliers perceive WFP as a reliable and trustworthy partner in procurement and supply chain activities for humanitarian efforts in South Sudan	4.135	.897

Based on the means and standard deviations provided, the findings suggest that respondents generally perceive the performance of WFP in South Sudan positively. The mean scores, ranging from 3.797 to 4.154 out of 5, indicate a moderate to high level of agreement among respondents across various aspects of WFP's performance, including collaboration with local suppliers, transparency in procurement processes, commitment to environmentally sustainable practices, efficiency of procurement strategies, communication channels with suppliers, and overall reliability and trustworthiness as a partner. The relatively low standard deviations suggest a degree of consensus among respondents regarding these perceptions, indicating that the responses are relatively consistent. Overall, the findings suggest that WFP's performance in meeting the procurement needs and expectations of local suppliers is perceived favorably, contributing to its reputation as a reliable and trustworthy partner in humanitarian supply chain activities in South Sudan.

**Correlation Analysis of Sustainable Supply Chain Strategies and Performance of World Food Program in South Sudan**

In addition to the foregoing descriptive analyses, the study also conducted a correlation analysis to explore the relationships between various factors related to WFP's procurement and supply chain operations. This analysis thus aims to investigate the potential associations between different aspects of WFP's performance and key factors such as supplier relationship management, green procurement, reverse logistics, and transportation optimization. This will provide deeper insights into the factors that may influence WFP's performance in humanitarian operations in South Sudan.

**Table 9: Correlation Analysis of Sustainable Supply Chain Strategies**

		Performance of World Food Program in South Sudan	Supplier Relationship Management	Green procurement	Reverse Logistics	Transportation Optimization
Performance of World Food Program in South Sudan	Pearson Correlation	1	.554**	.641**	.686**	.755**
	Sig. (2-tailed)		.000	.000	.000	.000
Supplier Relationship Management	Pearson Correlation	.554**	1	.627**	.703**	.657**
	Sig. (2-tailed)	.000		.000	.000	.000

Green Procurement	Pearson Correlation	.641**	.627**	1	.723**	.666**
	Sig. (2-tailed)	.000	.000		.000	.000
Reverse Logistics	Pearson Correlation	.686**	.703**	.723**	1	.778**
	Sig. (2-tailed)	.000	.000	.000		.000
Transportation Optimization	Pearson Correlation	.755**	.657**	.666**	.778**	1
	Sig. (2-tailed)	.000	.000	.000	.000	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix reveals significant positive correlations between various factors related to the performance of WFP in South Sudan and key aspects of its supply chain management. Specifically, there are strong correlations between performance and each of the factors assessed: supplier relationship management ( $r=.554$ ;  $\text{Sig}=.000$ ;  $p<0.01$ ), green procurement ( $r=.641$ ;  $\text{Sig}=.000$ ;  $p<0.01$ ), reverse logistics ( $r=.686$ ;  $\text{Sig}=.000$ ;  $p<0.01$ ), and transportation optimization ( $r=.755$ ;  $\text{Sig}=.000$ ;  $p<0.01$ ). These correlations suggest that as one aspect of supply chain management improves, the overall performance of WFP also tends to improve. For example, there is a strong positive correlation between performance and transportation optimization, indicating that effective transportation optimization practices are closely associated with higher levels of performance in meeting procurement needs and expectations. Similarly, significant positive correlations are observed between performance and other factors such as supplier relationship management, green procurement, and reverse logistics, highlighting the interconnectedness of these components in driving overall effectiveness and efficiency in WFP's humanitarian operations in South Sudan.

### Regression Analysis of Sustainable Supply Chain Strategies

In addition to the correlation analysis, the study conducted a multiple regression analysis to further explore the relationship between various factors related to the performance of WFP in South Sudan. This analysis aims to identify the significant predictors of WFP's performance in humanitarian operations based on factors such as supplier relationship management, green procurement, reverse logistics, and transportation optimization. Through utilizing multiple regression, the study seeks to determine the extent to which these factors collectively contribute to explaining the variation in WFP's performance and to identify the specific impact of each predictor variable on performance outcomes. The analysis comprises three key outputs: Model Summary, Analysis of Variance (ANOVA), and coefficients, which collectively provide insights into the overall predictive power of the regression model and the significance of individual predictor variables in explaining variations in WFP's performance.

**Table 10: Model Summary of Sustainable Supply Chain Strategies**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.790 <sup>a</sup>	.623	.617	3.07077

a. Predictors: (Constant), Supplier Relationship Management, Green procurement, Reverse Logistics, Transportation Optimization

The model summary indicates that the regression model has a coefficient of determination (R-squared) of 0.623, suggesting that approximately 62.3% of the variance in the performance of WFP in South Sudan can be explained by the predictor variables included in the model, namely supplier relationship management, green procurement, reverse logistics, and transportation optimization. The adjusted R-squared value, which accounts for the number of predictors in the model, is 0.617, indicating that the model's explanatory power remains robust even after considering the number of variables included. The standard error of the estimate is 3.07077, representing the average deviation of observed values from the predicted values by the model. The model summary suggests that the combination of supplier relationship management, green procurement, reverse logistics, and transportation optimization significantly contributes to explaining variations in WFP's performance in humanitarian operations in South Sudan.

**Table 11: ANOVA of Sustainable Supply Chain Strategies**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3481.567	4	870.392	92.304	.000 <sup>b</sup>
	Residual	2102.801	223	9.430		
	Total	5584.368	227			

a. Dependent Variable: Performance of World Food Program in South Sudan

b. Predictors: (Constant), Supplier Relationship Management, Green procurement, Reverse Logistics, Transportation Optimization

The ANOVA table presents the results of the analysis of variance for the regression model predicting the performance of WFP in South Sudan based on supplier relationship management, green procurement, reverse logistics, and transportation optimization. The table indicates that the regression model is statistically significant, as evidenced by the F-statistic of 92.304, with a corresponding p-value (Sig.) of less than 0.001. This suggests that the variation in WFP's performance is not due to random chance alone, but rather, it can be

attributed to the combination of predictor variables included in the model. Additionally, the significant F-statistic indicates that at least one of the predictor variables has a significant effect on WFP's performance. Therefore, the overall model provides a good fit to the data and offers valuable insights into the relationship between supplier management practices, procurement strategies, logistics operations, and WFP's performance in humanitarian operations in South Sudan.

**Table 12: Coefficients of Sustainable Supply Chain Strategies**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	4.345	1.757		2.473	.014
Supplier Relationship Management	.010	.073	.008	.138	.890
Green procurement	.152	.060	.159	2.551	.011
Reverse Logistics	.168	.075	.167	2.247	.026
Transportation Optimization	.524	.070	.523	7.503	.000

a. Dependent Variable: Performance of World Food Program in South Sudan

From the regression equation employed in this regard:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon$$

Whereby:

Y is performance ;  $\beta_0$  is model's intercept ;  $\beta_1$  to  $\beta_4$  are regression coefficients ;  $X_1$  = Supplier relationship management

$X_2$  = Green procurement;  $X_3$  = Reverse logistics;  $X_4$  = Transportation optimization and  $\epsilon$  is model error term

The coefficients table presents the unstandardized coefficients, standardized coefficients (Beta), t-values, and significance levels for each predictor variable included in the regression model predicting the performance of WFP in South Sudan. Firstly, the constant term represents the intercept of the regression equation, indicating the expected value of WFP's performance when all predictor variables are zero. In this case, the constant term is 4.345, with a standard error of 1.757 and a significant t-value of 2.473 ( $p = 0.014$ ), suggesting that it is significantly different from zero. Moving on to the predictor variables, the standardized coefficients (Beta) provide insights into the relative importance of each predictor variable in predicting WFP's performance while accounting for differences in scale. The standardized coefficients range from 0.008 to 0.523.

$$Y = 4.345 + 0.010X_1 + 0.152X_2 + 0.168X_3 + 0.524X_4 + \epsilon$$

Among the predictor variables, transportation optimization has the highest standardized coefficient (Beta = 0.523), indicating that it has the strongest impact on WFP's performance compared to other predictors. Furthermore, the t-values and associated significance levels indicate whether each predictor variable makes a significant contribution to the model. In this case, green procurement, reverse logistics, and transportation optimization are statistically significant predictors of WFP's performance, with p-values of 0.011, 0.026, and <0.001, respectively. Conversely, supplier relationship management does not significantly predict WFP's performance, as its p-value is greater than 0.05. Overall, the coefficients table provides valuable insights into the individual contributions of each predictor variable to WFP's performance in humanitarian operations in South Sudan.

## 5.0 Summary of the findings.

### Supplier Relationship Management and Performance of World Food Program in South Sudan

The study first sought to establish the effect of supplier relationship management on performance of WFP in South Sudan. The study reveals that respondents generally perceive the supplier relationship management practices of WFP in South Sudan favorably. The high mean scores, ranging from 4.081 to 4.531 out of 5, indicate strong agreement among respondents across various aspects of supplier relationship management, including communication, feedback mechanisms, collaboration, transparency, consistency in procurement practices, fairness in payment terms, and consideration of organizational needs. The relatively low standard deviations suggest a consensus among respondents regarding these perceptions, indicating consistency in their responses. Overall, the findings suggest that WFP's efforts in supplier relationship management are positively perceived by its partners, contributing to a mutually beneficial and effective partnership in supporting humanitarian efforts in South Sudan. The high levels of agreement regarding clear communication, collaborative working relationships, and transparency in procurement practices suggest that WFP is effectively fostering strong partnerships with its suppliers. This aligns with the literature, which emphasizes the importance of collaborative relationships and transparent communication in supplier management for enhancing supply chain performance (Cousins & Spekman, 2020). Through



maintaining open lines of communication, seeking feedback, and considering the needs and constraints of its partners, WFP can facilitate a more efficient and responsive supply chain, ultimately contributing to the success of humanitarian operations in the region.

The findings also underscore the importance of fairness and reliability in procurement practices for building trust and confidence among suppliers. The high mean scores for statements related to consistency in procurement practices, fairness in payment terms, and consideration of organizational needs suggest that WFP's efforts in these areas are positively perceived by its partners. This resonates with the literature, which highlights the role of fair and equitable treatment of suppliers in fostering long-term relationships and enhancing supply chain performance (Kosut & Moran, 2019). Through ensuring fairness and reliability in its procurement processes, WFP can strengthen its partnerships with suppliers, mitigate risks, and promote sustainability in its humanitarian supply chain operations in South Sudan and beyond.

While supplier relationship management did not emerge as a significant predictor of WFP's performance in the regression analysis ( $\beta=.008$ ; Sig.= .890;  $p>.05$ ), it remains a critical aspect of humanitarian supply chain management. Literature suggests that effective supplier relationship management enhances collaboration, trust, and reliability in supply chain partnerships, thereby improving operational efficiency and responsiveness (Luzzini et al., 2020). Although not statistically significant in this study, maintaining strong relationships with suppliers is essential for WFP to ensure timely and reliable delivery of goods and services, minimize disruptions, and uphold its mission of supporting vulnerable populations in South Sudan.

### **Green Procurement and Performance of World Food Program in South Sudan**

The study also sought to determine the effect of green procurement on performance of WFP in South Sudan. The study reveals that respondents generally perceive of WFP in South Sudan as actively engaging in green procurement practices. Mean scores ranging from 3.712 to 4.331 out of 5 indicate moderate to high levels of agreement among respondents regarding various aspects of green procurement, including the consideration of environmentally responsible sourcing practices, encouragement to provide sustainable products, and efforts to reduce the carbon footprint through procurement decisions. The relatively low standard deviations suggest a consensus among respondents regarding these perceptions, indicating consistency in their responses.

The findings of the study on green procurement practices within WFP in South Sudan have significant implications for humanitarian supply chain management and sustainability efforts. The positive perceptions of respondents regarding WFP's green procurement initiatives underscore the organization's commitment to environmental responsibility and its efforts to integrate sustainability principles into its operations. This aligns with the literature, which emphasizes the importance of sustainable supply chain practices in reducing environmental impact and promoting long-term resilience in humanitarian operations (Carter & Rogers, 2018). Through considering environmentally responsible sourcing practices, WFP not only contributes to environmental conservation but also enhances its reputation as a socially responsible organization, potentially attracting more support and funding for its humanitarian endeavors.

The findings highlight the potential for green procurement practices to drive positive outcomes for both humanitarian organizations and their suppliers. The respondents' perceptions of the positive impact of WFP's green procurement on their organization's ability to provide environmentally responsible products and services underscore the mutual benefits of sustainability initiatives in supply chains (Seuring & Müller, 2021). This suggests that by fostering collaborative partnerships with suppliers and promoting sustainability throughout the supply chain, organizations like WFP can enhance operational efficiency, reduce costs, and contribute to broader sustainability goals. Overall, the findings underscore the importance of integrating green procurement practices into humanitarian supply chains to promote environmental stewardship and enhance the effectiveness of humanitarian efforts in regions like South Sudan.

The significant positive relationship between green procurement practices and WFP's performance ( $\beta=.159$ ; Sig.= .011;  $p<.05$ ) underscores the importance of environmental sustainability in humanitarian supply chain operations. Green procurement initiatives, such as sourcing environmentally responsible products and reducing waste, align with WFP's commitment to sustainability and can enhance operational efficiency and cost-effectiveness (He & Bai, 2019). The findings suggest that integrating green procurement practices into supply chain operations positively impacts WFP's performance, reflecting broader trends in sustainable supply chain management literature emphasizing the value of environmental responsibility for improving organizational performance and stakeholder satisfaction.

### **Reverse Logistics and Performance of World Food Program in South Sudan**

The study further sought to examine the effect of reverse logistics on performance of WFP in South Sudan. The study indicates that respondents generally perceive the reverse logistics practices of WFP in South Sudan positively. Mean scores ranging from 3.953 to 4.226 out of 5 suggest a strong level of agreement among respondents across various aspects of reverse logistics, including communication of procedures, efficiency of the process, commitment to responsible disposal and recycling, minimization of waste, provision of clear guidance, and mutual benefit of involvement. The relatively low standard deviations suggest a consensus among respondents regarding these perceptions, indicating consistency in their responses.

The positive perceptions of respondents regarding the reverse logistics practices of WFP in South Sudan carry significant implications for humanitarian supply chain management and environmental sustainability. The high level of agreement on the effectiveness and organization of the reverse logistics process, as well as the clear communication of procedures, suggests that WFP is successfully managing the return and recycling of unused or expired relief items. This aligns with empirical literature that emphasizes the importance of effective reverse logistics processes in reducing waste, minimizing environmental impact, and maximizing resource utilization (Guide & Van Wassenhove, 2019). Through actively seeking to minimize waste and encouraging recycling and repurposing of materials, WFP demonstrates a commitment to environmental responsibility in its supply chain operations, contributing to broader sustainability goals in humanitarian relief efforts.

The findings also indicate that respondents perceive their involvement in WFP's reverse logistics efforts as mutually beneficial and sustainable, with positive impacts on both their organization's commitment to environmental responsibility and their ability to engage in ethical practices. This underscores the importance of collaborative partnerships and shared responsibility in addressing environmental challenges within humanitarian supply chains (Ji et al., 2022). Through fostering mutually beneficial relationships with its partners, WFP can enhance the effectiveness of its reverse logistics practices and promote a culture of sustainability throughout its supply chain. Moreover, the positive perception of WFP's reverse logistics practices by its partners can enhance the organization's reputation and credibility in the humanitarian sector, potentially attracting more support and resources for its relief efforts in South Sudan and beyond.

The significant relationship between reverse logistics and WFP's performance ( $\beta=.167$ ; Sig.= .026;  $p<.05$ ) highlights the importance of effective waste management and recycling practices in humanitarian supply chains. Reverse logistics processes, including the return and responsible disposal of unused relief items, contribute to environmental sustainability and operational efficiency (Guide et al., 2020). Through minimizing waste and promoting recycling, WFP can reduce environmental impact, optimize resource utilization, and enhance its overall performance in delivering aid to vulnerable populations in South Sudan. This finding aligns with literature emphasizing the role of reverse logistics in mitigating environmental risks and improving supply chain sustainability.

### **Transportation Optimization and Performance of World Food Program in South Sudan**

The study further sought to assess the effect of transportation optimization on performance of World Food Program in South Sudan. The study indicates that respondents generally perceive the transportation optimization practices of WFP in South Sudan positively. Mean scores ranging from 3.824 to 4.322 out of 5 suggest a strong level of agreement among respondents across various aspects of transportation optimization, including efficiency of goods delivery, minimization of transportation costs, reliability of deliveries, use of energy-efficient vehicles, provision of clear information on transportation schedules, and positive impact on resource planning and allocation. The relatively low standard deviations suggest a consensus among respondents regarding these perceptions, indicating consistency in their responses.

The positive perceptions of respondents regarding the transportation optimization practices of WFP in South Sudan have significant implications for humanitarian supply chain management and sustainability. The findings suggest that WFP's efforts in transportation optimization contribute to the efficiency and timeliness of goods delivery, as well as the reliability of deliveries. This aligns with empirical literature emphasizing the importance of transportation optimization in enhancing supply chain performance and responsiveness (Christopher, 2019). Through actively seeking to minimize transportation costs, using energy-efficient vehicles, and optimizing transportation planning and route optimization, WFP not only improves its operational efficiency but also reduces its environmental footprint. These practices are consistent with the literature on sustainable supply chain management, which emphasizes the need for organizations to integrate environmental considerations into their logistics and distribution operations (Seuring & Müller, 2021).

The findings suggest that WFP's transportation optimization efforts positively influence its partners' transportation efficiency, cost-effectiveness, and commitment to sustainable supply chain operations. This underscores the importance of collaborative partnerships and shared responsibility in driving sustainability initiatives within humanitarian supply chains (Carter & Easton, 2021). Through fostering mutually beneficial relationships with its partners and promoting sustainable transportation practices, WFP can enhance the overall effectiveness and resilience of its supply chain. Moreover, the positive perception of WFP's transportation optimization practices by its partners can strengthen the organization's reputation and credibility in the humanitarian sector, potentially attracting more support and resources for its relief efforts in South Sudan and other regions.

The strong positive relationship between transportation optimization and WFP's performance ( $\beta=.523$ ; Sig.= .000;  $p<.05$ ) emphasizes the critical role of efficient transportation management in humanitarian operations. Optimizing transportation processes, such as route planning and vehicle utilization, reduces costs, improves delivery times, and enhances overall supply chain performance (Srivastava, 2017). The significant impact of transportation optimization on WFP's performance aligns with empirical evidence highlighting the importance of transportation efficiency for achieving operational excellence and ensuring timely delivery of humanitarian aid (Kannan et al., 2020). Through prioritizing transportation optimization initiatives, WFP can enhance its operational effectiveness, strengthen its supply chain resilience, and ultimately, better serve the needs of vulnerable populations in South Sudan.

## Performance of World Food Program in South Sudan

The regression analysis results indicate that the predictors, including supplier relationship management, green procurement, reverse logistics, and transportation optimization, collectively have a significant effect on the performance of WFP in South Sudan. The model summary reveals a moderately strong relationship ( $R=0.790$ ) between the predictors and performance, explaining approximately 62.3% of the variance in WFP performance. The ANOVA table further confirms the significance of the regression model, with a significant F-statistic ( $F = 92.304, p < 0.001$ ). Additionally, the coefficients table shows that transportation optimization has the highest standardized coefficient ( $\beta = 0.523, p < 0.001$ ), followed by green procurement ( $\beta = 0.159, p = 0.011$ ) and reverse logistics ( $\beta = 0.167, p = 0.026$ ), while supplier relationship management shows a non-significant effect ( $\beta = 0.008, p = 0.890$ ). These results suggest that transportation optimization, green procurement, and reverse logistics significantly contribute to enhancing the performance of WFP in South Sudan, emphasizing the importance of these factors in humanitarian supply chain management.

## 6.0 Conclusion

The positive perceptions of supplier relationship management highlight the importance of transparent communication, collaborative partnerships, and fair procurement practices in fostering trust and mutual benefits among stakeholders. Moreover, the favourable attitudes towards green procurement underscore the necessity of environmentally sustainable practices in mitigating the ecological footprint of humanitarian operations while promoting resource efficiency and resilience. However, supplier relationship management does not show a significant impact on performance, suggesting that while effective communication and collaboration with suppliers are essential, they may not directly influence the overall performance of WFP in South Sudan.

The results pertaining to green procurement reveal a positive perception among respondents regarding the WFP's commitment to environmentally responsible sourcing practices. The findings underscore the significance of integrating sustainability considerations into procurement decisions, encouraging the adoption of eco-friendly products and materials, and reducing the carbon footprint of humanitarian operations. This highlights the pivotal role of green procurement in fostering environmental stewardship, promoting sustainable development, and aligning humanitarian efforts with global sustainability goals. The positive attitudes towards green procurement underscore its potential to enhance the resilience and long-term viability of humanitarian supply chains while contributing to broader environmental objectives. Green procurement also demonstrates a significant positive relationship with performance, indicating the importance of environmentally sustainable sourcing practices in mitigating the environmental impact of humanitarian activities and promoting operational resilience.

The findings related to reverse logistics highlight the importance of responsible waste management practices in humanitarian supply chains. Respondents perceive WFP's efforts in reverse logistics positively, indicating effective communication of procedures, efficient disposal and recycling processes, and a commitment to minimizing waste. These results underscore the significance of integrating reverse logistics strategies into humanitarian operations to optimize resource utilization, reduce environmental impact, and support local communities. Through promoting ethical and sustainable waste management practices, WFP can enhance its operational efficiency, reduce costs, and reinforce its commitment to environmental responsibility and social welfare. Reverse logistics shows a significant positive effect on performance, underlining the importance of responsible waste management practices in optimizing resource utilization, reducing costs, and supporting environmental sustainability efforts.

The results concerning transportation optimization emphasize the critical role of efficient transportation systems in enhancing the performance of WFP in South Sudan. Respondents perceive WFP's transportation optimization practices positively, indicating their contribution to efficient goods delivery, cost reduction, and environmental sustainability. These findings underscore the importance of strategic transportation planning, route optimization, and the use of energy-efficient vehicles in ensuring timely and reliable aid delivery while minimizing environmental impact. Through prioritizing transportation optimization, WFP can enhance its operational agility, responsiveness, and overall effectiveness in addressing food insecurity and humanitarian needs in South Sudan. Transportation optimization further emerges as the most influential predictor, with a significant positive effect on performance. This highlights the critical role of efficient transportation systems in enhancing operational efficiency, timely delivery of aid, and overall performance of WFP in humanitarian operations.

## 7.0 Recommendations

Based on the study findings, several recommendations can be proposed for various stakeholders involved in humanitarian operations in South Sudan. The study first recommends that Authorities prioritize investment in transportation infrastructure to improve road networks and access to remote areas, facilitating the efficient delivery of humanitarian aid. Authorities should also encourage the adoption of sustainable procurement practices, including green procurement and responsible waste management, to minimize environmental impact and support long-term sustainability goals. There is also need for Authorities should enhance collaboration with humanitarian agencies like the World Food Program to streamline procurement processes, improve communication, and ensure effective coordination in delivering aid to vulnerable populations. Further, Authorities should invest in capacity building initiatives to enhance the skills and capabilities of local communities and organizations involved in humanitarian operations, empowering them to contribute effectively to relief efforts.

For Service Users/Beneficiaries, the study recommends that service users and beneficiaries should advocate for transparency and accountability in humanitarian operations, ensuring that aid distribution processes are fair, equitable, and responsive to their needs. Service users and beneficiaries can also actively participate in sustainability initiatives promoted by humanitarian agencies, such as waste reduction and environmental conservation programs, to support long-term resilience and community development. Service users and beneficiaries should also provide feedback to humanitarian agencies regarding the quality and effectiveness of aid delivery, helping to identify areas for improvement and ensuring that assistance meets their evolving needs.

Other stakeholders, including private sector organizations and non-governmental organizations, should collaborate with humanitarian agencies to leverage their resources, expertise, and networks for more efficient and sustainable aid delivery. Stakeholders should also support innovative solutions and technologies that enhance the efficiency, safety, and sustainability of humanitarian supply chains, enabling more effective responses to humanitarian crises. Stakeholders should further advocate for policy reforms that promote sustainable development, address root causes of food insecurity, and create an enabling environment for humanitarian operations in conflict-affected regions like South Sudan.

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