

MEKELLE UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS



FACTORS AFFECTING HUMANITARIAN LOGISTICS PERFORMANCE
IN THE CASE OF THE RED CROSS SOCIETY, TIGRAI REGIONAL
STATE, ETHIOPIA

**A THESIS SUBMITTED TO THE DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT**

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Declaration

I, Tewelde Atakilti as a result of this, the undersigned declare that this thesis entitled “Factors Affecting Humanitarian Logistics Performance: The Case of Red Cross Society in Tigray Region” is my original work. I have taken the research work independently with the guidance and support of the research advisor Abadi Afera (Ass.Prof). The thesis is original and has not been submitted for the award of a degree to any University. Accordingly, it is my own work in design and execution, and all sources and materials used for the study herein have been duly acknowledged.

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List of Abbreviations

CC = Coordination and Collaboration

CPD = Continuous Program Development

DPs = Disaster and Reliefs

EFs = External Factors

HLPR = Humanitarian Logistics Practice

HLP = Humanitarian Logistics Performance

HO-LSCM = Humanitarian Organization Logistics Supply Chain Management

HOs = Humanitarian Organizations

ICRS = International Committee of Red Cross Society

IFs = Internal Factors

KPIs = Key Performance Indicators

NGOs = Non-Government Organizations

OCHA = United Nations Office for the Coordination of Humanitarian Affairs

SCM = Supply Chain Management

SOPs = Standard Organizational Procedures

TRCS = Tigray Red Cross Society

UNDR = United Nations Disaster Response/Risk

UNHRD = United Nations Humanitarian Response Depots

Abstract

The performance of humanitarian logistics is shaped by a dynamic interplay of internal and external factors that collectively determine the efficiency, responsiveness, and reliability of aid delivery systems. This study examined the case of the Tigray Red Cross Society (TRCS) to identify and analyze the determinants of logistics performance in crisis conditions. Data were collected from 145 participants, including managers, sub-coordinators, and operational staff, using instruments adapted from validated logistics performance assessment tools and prior empirical studies. A mixed-methods, cross-sectional survey design was employed, integrating qualitative insights with quantitative evidence. Multiple regression analysis confirmed that all the selected independent variables—donor funding, government support, infrastructure quality, and the availability of skilled personnel—had a statistically significant and positive influence on TRCS's logistics performance. The findings demonstrate that effective humanitarian logistics is not the product of isolated activities but rather the outcome of a coordinated integration of internal processes and external enablers. Specifically, TRCS's ability to align core practices such as procurement, inventory management, warehousing, and transportation with strong partnerships, government collaboration, and infrastructure utilization has substantially enhanced its operational efficiency and timely response capacity. The originality of this study lies in its context-specific empirical evidence from a conflict-affected region, offering insights rarely captured in humanitarian logistics research. By emphasizing the role of institutional capacity-building, sustainable donor engagement, and strategic collaboration, the study positions TRCS as a potential model for resilient humanitarian logistics in resource-constrained environments. Recommendations include targeted investments in staff training, infrastructure upgrades, sustainable funding mechanisms, and stronger stakeholder linkages. Ultimately, the study contributes to both theory and practice by presenting a holistic framework for improving logistics performance that is adaptable to other humanitarian organizations operating in complex emergency settings.

Key Words: Humanitarian, Humanitarian Logistics, Logistics Performance, Internal Factors, External Factors

CHAPTER ONE

INTRODUCTION

This chapter provides an overview of the study's background, problem statement, objectives, research questions, significance, limitations, scope, and key term definition.

1.1 Background of the Study

A disaster is a significant event that disrupts a community's normal functioning, leading to severe consequences. It can be classified into natural disasters and human-made disasters. Natural disasters include meteorological, geological, climatological, and biological events. Human-made disasters result from human actions or negligence and can be technological, social, or environmental (UNDRR, 2021). Disaster severity depends on community preparedness, infrastructure resilience, and socioeconomic conditions. Understanding these challenges is crucial for effective disaster management and mitigation strategies (Sena & W/micheal, 2006, updated 2020). Many disasters are happening in this disrupted world such as the eruption of volcano Mount Vesuvius in 79 A.D. quenched Pompeii in Italy, even though today's human knowledge and technological progressions have cured various illnesses and solved numerous issues, it is still not sufficient to manage the enormous destruction disasters cause (Nikbakhsh & Farahani, 2011a, 2020b).

According to Relief Web (2013), the worst disaster happened in May 2013 in Uganda, where surges affected approximately 25,000 people. Consequently, the event of disasters could be a point of high reality. Storm Boris caused flooding in Central and Eastern Europe, resulting in 26 fatalities, thousands of evacuations, and widespread destruction, with Spain alone causing 95 deaths and many missing (UNDRR, 2023). Typhoon Yagi has caused severe flooding in Myanmar and Thailand, while seasonal monsoons in India and Bangladesh continue to cause recurring disasters. Wildfires in California pose a threat to communities (World Forum, 2021a, 2022b). Flooding has been reported in Kazakhstan due to rapid snowmelt, and in Tanzania and Kenya due to heavy rains, causing devastating impacts on local populations (Sena & W/micheal, 2006).

Further, the Yemeni civil war, originating in 2014, has escalated into a multi-faction conflict with significant foreign intervention, resulting in one of the world's worst humanitarian crises (Britannica, 2024). With over 150,000 deaths due to direct conflict and 227,000 additional deaths from famine and healthcare, despite peace talks and ceasefires, the path to lasting peace remains

fraught with challenges (Kali Robinson, 2023; Wikipedia, 2024). The Syrian civil war, which began in 2011 against President Bashar al-Assad, has escalated into a complex conflict, including government forces, rebel groups, and extremist organizations like ISIS (Moench, 2022). The war has resulted in over half a million deaths and displaced millions, creating one of the worst humanitarian crises in modern history (Center for Preventive Action, 2024). The fall of Assad in December 2024 marked a turning point, with geopolitical implications expected to shift dramatically (Britannica, 2024).

The COVID-19 pandemic, which began in late 2019, has caused over 776 million confirmed cases and 7.08 million reported deaths, making it one of the deadliest pandemics in history, and excess mortality estimates range from 18.2 to 33.5 million deaths (WHO, 2024; Wikipedia, 2020). Recent trends show a 23% increase in new cases and a 44% increase in deaths. Despite updated vaccines, only 22.5% of adults in the U.S. received the latest vaccines (Wong et al., 2024). Ebola remains a major public health issue in Africa, with recent outbreaks in Uganda and DRC highlighting the need for investment in health infrastructure and community engagement. Despite vaccine development advancements, challenges persist in adequate health system responses and vaccine distribution (Ekene M. Nnagha, 2024; African Union, 2024). The Africa Centers for Disease Control and Prevention has deployed 41 experts to implement key interventions, including laboratory services, training, and vaccinations. As of June 8, 2019, 2,056 Ebola cases have been reported (Dr Enria & Lees, 2024).

The Ethiopian civil war, involving multiple regions and groups, has escalated since the Tigray conflict in November 2020. Despite a Cessation of Hostilities Agreement signed in November 2022, tensions remain high due to unresolved issues that cause humanitarian crises to the worst (Liam Karr, 2024; Avery Borens, 2024). The Amhara region has experienced a resurgence of violence since mid-2024, driven by the Fano militia. The political landscape remains fragmented, with growing distrust among Amhara communities. The ongoing conflict has caused significant displacement, with over a million people affected in Tigray alone (K Desu & Yared, 2024).

Humanitarian logistics is a crucial aspect of disaster relief and humanitarian operations, ensuring that aid, such as food, water, medical supplies, and shelter, reaches vulnerable populations promptly and efficiently. The performance of humanitarian logistics directly influences the success of humanitarian interventions, particularly in conflict zones, areas hit by natural disasters, or regions suffering from prolonged humanitarian crises.

Humanitarian logistics is a vital component of disaster relief operations, ensuring the timely delivery of essential supplies and resources to affected populations. It involves coordinating efforts between various organizations, managing infrastructure, and analyzing data for post-event learning (Yohana Arsen Rutaba, 2022). It also optimizes resource use by managing inventory levels to avoid shortages or waste. Effective humanitarian logistics can mitigate losses, build community resilience, and improve public health outcomes (Malloy, 2022). Humanitarian logistics is the process of coordinating the storage, transportation, and delivery of relief supplies to those affected by disasters. It involves planning, sourcing, and delivering the right supplies to the right people at the right time (Warehousing Ltd., 2023). It also involves the coordination of relief workers, feeding, sheltering, and medical needs. The most crucial aspect is the timely delivery of relief supplies, as even a few days' delay can save lives.

As disasters become more frequent due to climate change, civil war, and pandemic diseases, enhancing humanitarian logistics capabilities will be increasingly vital for global disaster response strategies. By ensuring timely access to essential supplies, facilitating quick response times, and ensuring efficient resource allocation that help to humanitarian logistics contributes to the success of disaster relief efforts (Wong et al., 2024).

Humanitarian logistics is a complex field that faces political, financial, and legal challenges due to natural disasters, security restrictions, financial constraints, and compliance with local laws. Advances in technology, such as drones and robots, are transforming the industry, enabling efficient delivery of supplies and monitoring of relief supply transport. These technologies also aid in identifying and delivering resources to the right people (Karr & Borens, 2024). To get involved in humanitarian logistics, volunteers can volunteer with aid organizations like the Red Cross, Doctors Without Borders, or Save the Children, take courses in humanitarian logistics and management, or support charities and foundations that provide logistics services. With the right resources, humanitarian logistics can save lives and alleviate suffering (Liam, 2024).

The Tigray Red Cross Society, part of the Ethiopian Red Cross Society (ERCS), has been actively involved in humanitarian efforts in the Tigray region (OCHA, 2017, 2018, 2019 & 2020). Since the November 2020 conflict in Tigray, the organization has been providing emergency relief to affected populations, focusing on health services, food assistance, and water and sanitation. Despite losing many ambulances due to looting, the TRCS continues to operate ambulance services and mobile clinics (OCHA, 2020 & 2021; Relief Web, 2021). The Tigray region remains

inaccessible due to violence and logistical challenges, with 3.8 million people in need of urgent assistance. The TRCS collaborates with international organizations like the International Committee of the Red Cross (ICRC) to enhance resource mobilization and operational capacity. Overall, the Tigray Red Cross Society plays a crucial role in addressing humanitarian needs in the region (OCHA & ICRC, 2023, 2024). For example, in November 2020, armed violence in Tigray, northern Ethiopia, caused immense suffering for people. The International Red Cross and Red Crescent Movement (ICRC) is appealing for funding to scale up activities in northern Ethiopia and eastern Sudan. The ICRC is offering CHF 10,000 to help over 430 people meet essential needs, CHF 50,000 to help 10,000 people access safe water, and CHF 170,000 to provide medical supplies and training for victims of sexual violence (ICRC, 2021; Sisay Worku, 2023).

However, the Tigray Red Cross Society is grappling with significant humanitarian logistics challenges, including a shortage of medical supplies, communication issues, access restrictions, inadequate infrastructure, funding constraints, and coordination issues (Berhane Mekonen, 2022; Ben Parker, 2021). The organization struggles to maintain adequate stock levels in pharmacies due to supply chain disruptions and logistical issues. Access restrictions and bureaucratic hurdles have made it difficult to reach a fraction of the affected population. Insufficient funding and resource constraints further exacerbate supply shortages. Coordination challenges among humanitarian actors are also exacerbated by the chaotic environment created by ongoing conflict and displacement (Sisay Worku, 2022).

The complexity of these operations arises from the need to deliver aid under challenging and often unpredictable conditions, where logistical efficiency can mean the difference between life and death for affected communities (Kovacs & Spens, 2017; Behl & Dutta, 2019). Unlike commercial supply chains, humanitarian logistics faces unique challenges that require flexibility, responsiveness, and coordination among multiple stakeholders. These challenges are often compounded by the external environment, such as political instability, infrastructure damage, and funding constraints, as well as internal organizational factors such as resource availability, workforce skills, and operational capacity (Van Wassenhove, 2006a, 2019b; Thomas & Kopczak, 2020). For organizations like the Red Cross, which operate in diverse and often volatile regions, the ability to respond quickly and efficiently to humanitarian needs is critical but remains difficult due to these multifaceted and dynamic factors.

1.2 Statement of the Problem

Humanitarian logistics plays a crucial role in disaster relief and the delivery of humanitarian aid, particularly in regions affected by conflict and natural disasters (Van Wassenhove, 2006).

The availability of financial and material resources is one of the most significant internal factors influencing humanitarian logistics. Without adequate funding, relief agencies, including the Red Cross, may struggle to procure, store, and transport supplies, which can lead to delays and inefficiencies in aid delivery (Behl & Dutta, 2019). In addition, the organizational capacity to handle logistics operations—ranging from warehouse management to transportation logistics—is vital. Many humanitarian organizations face capacity constraints, especially in regions affected by conflict, where infrastructure and local markets are disrupted, further hindering their ability to carry out efficient logistics operations (World Forum, 2024; Cozzolino et al., 2012).

Infrastructure damage, particularly in conflict zones, is a key external factor affecting logistics performance. Roads, bridges, airports, and ports—critical for transporting goods—are often damaged or destroyed, making access to affected regions difficult. In regions such as Tigray, where infrastructure has been severely compromised due to the ongoing conflict, humanitarian logistics operations are often slowed down by destroyed roads, blocked supply routes, and limited access to affected populations. Additionally, geographic challenges, such as mountainous terrain or poor road networks, can impede the timely movement of goods (Lopez & Lopez, 2020).

Political and security factors are another key external influence on humanitarian logistics. In conflict zones or regions with unstable governance, such as Tigray, humanitarian organizations face significant security risks for their staff and volunteers, as well as difficulties in coordinating with local governments and military forces (Kovacs & Spens, 2007). Blockades, embargoes, or political restrictions can further limit access to regions in need, while conflicting agendas between humanitarian organizations and local or national governments can create delays or complications in the distribution of aid (Maughan et al., 2015). These security and political factors introduce a high level of uncertainty and risk into logistics planning. Effective coordination between various humanitarian actors—including local authorities, international organizations, and other NGOs—is essential for efficient logistics performance. In many cases, humanitarian organizations struggle with fragmented coordination, particularly when multiple actors are involved with overlapping mandates, resources, and goals (Maughan et al., 2015). The Red Cross, operating alongside governments, local NGOs, and international agencies, often faces coordination difficulties due to

differences in organizational priorities, decision-making processes, and operational systems. These challenges are exacerbated in regions like Tigray, where communication infrastructure may be damaged or restricted, making it harder to share critical information on supply needs, available resources, and logistical bottlenecks.

Accurate demand forecasting is a significant challenge in humanitarian logistics, particularly in regions with fluctuating or uncertain needs, such as conflict zones or disaster areas. The needs of affected populations can change rapidly due to ongoing violence, shifting weather patterns, or evolving crises, making it difficult for logistics teams to predict the quantity and type of supplies required (Behl & Dutta, 2019). The inability to accurately forecast demand often results in supply shortages or overstocking, both of which contribute to inefficiencies in aid distribution. In conflict regions like Tigray, where access is restricted, real-time data and accurate needs assessment are often difficult to obtain.

Technological tools, such as Geographic Information Systems (GIS), tracking systems, and data analytics, can significantly improve the efficiency of humanitarian logistics by optimizing supply routes, inventory management, and monitoring of aid distribution (Cuzzolino et al., 2012a, 2019b). However, in many regions with limited infrastructure and internet access, these technologies may not be easily accessible or fully integrated into logistics operations. The lack of advanced technology and real-time data systems in regions like Tigray often leads to slower response times, inaccurate inventories, and communication breakdowns.

Humanitarian organizations, including the Red Cross, are heavily dependent on donor funding for their operations. In many cases, donors' priorities, funding cycles, and amounts are not aligned with the urgent and fluctuating needs in crises. Donor funding may be insufficient, irregular, or slow to arrive, which can severely hamper the ability to mobilize resources quickly and manage supply chains effectively (Van Wassenhove, 2006). Additionally, donor preferences for specific types of aid, reporting requirements, and funding restrictions can further complicate logistical operations.

Humanitarian logistics is a dynamic and multifaceted field, influenced by a wide range of internal and external factors that can either facilitate or hinder the effectiveness of aid delivery. These challenges are particularly evident in conflict-affected regions such as Tigray, where political instability, infrastructure damage, and security risks exacerbate logistical difficulties. As organizations like the Red Cross continue to operate in these complex environments,

understanding and addressing these factors is critical to improving the performance of humanitarian logistics and ensuring that aid reaches those who need it most, even in the most challenging conditions. According to a preliminary survey conducted, the performance of humanitarian logistics has faced significant challenges due to the region's unique socio-political, economic, and infrastructural context. These challenges have directly impacted the effectiveness of the society's response efforts during the Tigray War (2020-2022) and other ongoing crises, hindering the timely and efficient delivery of aid to vulnerable populations. Despite the Red Cross's strong humanitarian responsibility, several factors affect its logistics performance in Tigray. This research aims to identify, analyze, and evaluate the key factors that have hindered or enhanced humanitarian logistics operations in the region. The issues can be broadly categorized into internal factors (such as organizational capacity, resource availability, and workforce issues) and external factors (such as political instability, infrastructure damage, and donor funding constraints).

1.3 Basic Research Question

1. How is humanitarian logistics currently practiced at the Tigray Red Cross Society?
2. What are the key internal and external factors affecting the performance of humanitarian logistics in the Tigray Red Cross Society, and
3. How do these factors influence the delivery of aid to affected populations in the region?

1.4 Objective of the Study

1.4.1 General Objective

The overall objective of this research was to assess the factors that affect the humanitarian logistics performance of the Tigray Red Cross Society.

1.4.2 Specific Objectives

1. To explain how humanitarian logistics is being practiced at the TRCS
2. To identify and evaluate the key internal and external factors affecting humanitarian logistics performance in the Tigray Red Cross Society.
3. To analyze how internal and external factors influence the effectiveness of aid delivery to affected populations in the Tigray region.

1.5 Significance of the Study

This study is valuable for both practical use and academic contribution. Its findings are important for improving the effectiveness and accountability of humanitarian logistics operations, especially

in Ethiopia, where research in this area is limited. The study will primarily assist humanitarian organizations like the Tigray Red Cross Society (TRCS) by identifying key operational challenges and suggesting specific solutions. This will help them plan logistics better, reduce risks, and improve the efficiency of aid delivery during disasters. For donors and government agencies, the research offers important insights into the complex supply chain management issues that relief organizations face. This understanding can lead to better collaboration, more effective use of resources, and support for policies that create a more supportive environment for humanitarian efforts. Academically, this study fills a gap in the literature on humanitarian logistics performance in Ethiopia. It serves as a foundational resource for future research, allowing scholars and researchers to build on its findings, concepts, and methods. By increasing knowledge in this area, the study contributes to the development of more resilient and responsive humanitarian supply chains worldwide.

1.6 Scope and Limitation of the Study

According to Creswell (2009), this study set clear boundaries by defining its population, main issue, and context. This careful limitation kept the research focused and efficient regarding both time and resources. The scope was specifically limited to four key areas: geographical, methodological, theoretical, and conceptual. Geographically, the investigation focused on the operations of the Tigray Red Cross Society (TRCS) within the Tigray Regional State of Ethiopia. The analysis covered the entire structure of the organization, from its main office in Mekelle to its zonal branches. Methodologically, a mixed-methods approach was used, combining qualitative and quantitative designs.

Theoretically, the study was based on established concepts in humanitarian supply chain management, including Supply Chain Resilience Theory, Collaborative Supply Chain Theory, and the Humanitarian Logistics Capability Framework.

Conceptually, the focus was limited to specific variables of interest. The independent variables included internal factors such as staff competency, technology, and coordination, as well as external factors like infrastructure, funding, and the political climate. The dependent variable was humanitarian logistics performance, assessed by its reliability, agility, cost-effectiveness, and responsiveness.

1.6.1 Limitations of the Study

The study was limited to the factors affecting humanitarian logistics on RCS in the Tigray region's performance and did not study other factors that could affect performance. In addition, the study conducted a significant evaluation of the factors affecting humanitarian logistics on performance might not be accepted by all because it may establish unintended consequences for some management members. Besides, the respondents might not give correct responses due to their unbalanced attitudes and disagreements with the management; this response may be either an exaggerated or unbalanced response, and may harm the study. The current political conditions, conflict, and uncertainty in our country are another limitation of the study. Due to these conditions, the organization might not function well, and the respondents might disperse to different locations, which might make it difficult to gather data.

1.7 Operational Definition of Key Terms

Key Terms: Humanitarian, Humanitarian Logistics, Logistics Performance, Internal Factors, External Factors

Humanitarian

Humanitarianism is an ideology that values human life and seeks to alleviate suffering and improve individual conditions, especially during crises like conflicts, natural disasters, and famines. It involves providing immediate assistance to those in need, focusing on necessities like food, water, shelter, and medical care. Humanitarians, often individuals or organizations, are driven by moral and altruistic reasons to help others, often working in challenging environments. The scope of humanitarianism includes immediate relief efforts and long-term recovery initiatives. As of mid-2023, around 360 million people worldwide needed humanitarian aid (Jeffrey Lewek 2024, and CDP, 2024).

Humanitarian Logistics

Humanitarian logistics is a specialized field that focuses on the efficient delivery and management of aid during emergencies, such as natural disasters and complex crises. It involves planning, implementing, and controlling the flow and storage of goods and materials from the point of origin to the point of consumption (UNDRR, 2024). Key components include assessment, procurement, transport, warehousing, distribution, and tracking and tracing. Effective logistics can mitigate the impact of disasters, improve data repositories, and facilitate coordination among humanitarian actors. Challenges include demand surges, uncertain supply chains, time constraints, and

technological advancements like drones. In summary, humanitarian logistics is crucial for effective disaster response and recovery, ensuring aid reaches those in need while navigating the complexities of emergencies (Lelisa & Kifle, 2006).

Logistics Performance

Logistics performance in the humanitarian sector is crucial for efficient aid delivery during crises. Key performance indicators (KPIs) include Appeal Coverage, Donation-to-Delivery Time, Financial Efficiency, and Assessment Accuracy. Measuring success involves Efficiency Metrics, which assess resource utilization, Utilization Metrics, Outcome Metrics, and Enabling Metrics. Challenges in humanitarian logistics include demand surges, infrastructure limitations, and complex coordination. Effective measurement of logistics performance improves response times, enhances accountability, and facilitates learning and adaptation. Continuous assessment enables organizations to learn from past operations and enhance their future responses. Thus, logistics performance is vital for saving lives and reducing suffering (UNDRR, 2023a, 2024b; Lewek, 2024).

Internal and External Factors

Both internal and external factors play significant roles in shaping the performance of humanitarian logistics. By addressing internal challenges such as staff training and resource management while navigating external influences like donor funding and regulatory environments, humanitarian organizations can enhance their operational effectiveness and improve outcomes for those in need. Continuous assessment of these factors is essential for adapting strategies to meet the evolving demands of humanitarian crises (ICRS, 2022; Joseph Zibulewsky, 2001).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter presented works of literature found on online web systems and as preliminary books as well for organizational performance, humanitarian logistics performance, and theories. The chapter also encompassed empirical reviews, findings, and results, and concluded with a conceptual framework for the study.

2.1 Theoretical Review

2.1.1 Concepts of Humanitarian Logistics

Humanitarian logistics is the process of planning, implementing, and controlling the efficient flow and storage of goods, services, and information during humanitarian crises. It is crucial for organizations that play a pivotal role in disaster relief and recovery (Lopez & Lopez, 2020; Kovacs & Spens, 2007). Understanding the underlying concepts, theories, and definitions in this field can provide insights into factors affecting logistics performance, especially within the context of the Red Cross (Thomas & Kopczak, 2005).

Humanitarian logistics is a multifaceted field influenced by internal and external factors. Theories like the Resource-Based View, Supply Chain Resilience, and Collaborative Networks Theory help understand the dynamics affecting performance in organizations. Key factors like infrastructure, financial resources, coordination, and technology shape logistics outcomes (Van Wassenhove, 2006). Addressing these challenges can improve the logistics performance, ensuring aid reaches vulnerable populations in a timely and effective manner. As humanitarian needs evolve, ongoing research and adaptation of logistics strategies are essential to meet the growing demands of disaster response and recovery efforts (Behl & Dutta, 2019; Cozzolino et al., 2012). Key concepts, theories, and definitions related to factors affecting humanitarian logistics performance, specifically within the context of the Red Cross Society, are reviewed. Organizations must navigate internal and external factors to ensure aid reaches those in need. Supply chain resilience and collaborative frameworks offer insights for improving performance. Focusing on resource availability, coordination, technology, and strategic planning is crucial for enhancing humanitarian logistics effectiveness (Maughan et al., 2015; Kovacs & Spens, 2007).

According to Thomas & Kopczak (2005a, 2019b, & 2021c), humanitarian logistics is a specialized form of supply chain management that involves the movement of goods from suppliers to disaster zones. It must be scalable and flexible, adapting to the scale and nature of the disaster. Effective

humanitarian logistics requires coordination with various stakeholders, including governments, NGOs, local authorities, and affected communities. Further, Thomas et.al (2021), in the study, stated that Supply Chain Management (SCM), Disaster Preparedness and Response (DPS), as well as Coordination and Collaboration (CC), are the key aspects of humanitarian logistics.

Several theories and frameworks have been developed to guide the understanding and improvement of humanitarian logistics performance.

2.1.1.1 Supply Chain Resilience Theory

This theory emphasizes the need for supply chains to be flexible and adaptable to disruptions, which is crucial in humanitarian logistics. In the context of organizations, the resilience of the logistics system ensures that aid continues to flow even during large-scale emergencies (Pettit et al., 2010).

2.1.1.2 Collaborative Supply Chain Theory

The collaborative supply chain theory focuses on the importance of partnerships and collaboration between various stakeholders (NGOs, governments, local authorities, and affected communities). In humanitarian logistics, collaboration enhances resource pooling, knowledge sharing, and overall operational effectiveness (Van Wassenhove, 2006).

2.1.1.3 Humanitarian Logistics Capability Framework

This framework focuses on identifying and developing the key logistics capabilities that impact performance, such as inventory management, transportation, and distribution systems. Organizations, as part of a global humanitarian network, must align their logistics capabilities with the demands of different disaster scenarios (Kovacs & Spens, 2007).

2.1.1.4 Strategies for Improving Humanitarian Logistics Performance

According to Maughan et.al. (2015) and Pettit et.al. (2010), to overcome the challenges and improve logistics performance, the following strategies are commonly adopted:

- **Pre-positioning of Resources:** Ensuring that relief supplies are pre-positioned in key locations to minimize response time.
- **Advanced Information Systems:** Investing in IT infrastructure to support real-time tracking and decision-making.
- **Local Partnerships:** Strengthening local partnerships to enhance logistical flexibility and reduce response times.

- **Training and Capacity Building:** Providing regular training for staff and volunteers to ensure effective disaster response.
- **Scenario Planning and Simulation:** Engaging in scenario planning to better prepare for unforeseen disruptions and emergencies.

2.1.1.5 Transactional Cost Theory

Transactional cost theory centers on the guideline that buyers and suppliers make choices based on the cost-efficient way of conducting business (Sandson et al. 2015). Buyers center on getting openings for accomplishing value for money from obtaining products and services at low cost, taking a high profit in the spot market, while providers endeavor to realize the objective of the buyer through advertising materials of high quality at the best price. Firms ought to make a choice that minimizes costs. Its suggestion for sourcing choice is buying when exchange costs are less than the cost of procuring goods/services

2.1.1.6 Humanitarian Organization's Logistics Performance

There are distinctive properties of logistics performance, even though much of the center is on specific measurements for each of these properties, the definition of these measurements, and how to measure them. For the most part, the center of logistics performance is on its viability and productivity. Breaking down these two, the wrangle centers on the estimation of things and handling quality, on-time delivery, versatility, time, and high efficiency, and user benefit levels (Daugherty et al., 1994; Beamon, 1999; Morgan, 2004). Here, time efficiencies relate to turnover measures (e.g., stock turnover) as well as money-related measures (e.g., cash-to-cash cycle times) and on-time delivery and lead times.

2.1.1.7 Humanitarian Organization's Logistics Practices

Logistics within the humanitarian segment encompasses a few conventional activities such as the procurement, transportation, and warehousing of products and services, as well as other particular activities such as disaster preparedness and planning (Thomas and Kopczak, 2005). The humanitarian logistics management practices incorporate needs evaluation hones (Selda& Emmett, 2010), fabric and benefit requesting practices (Mungatia, 2010), ideal gifts management practices (Cozzolino, 2012), best warehousing practices (Americas Alleviation Group, 2012), documentation, cataloging, union and recording practices (Oloruntoba, 2006), and, transportation and delivery practices (Moeiny & Mokhlesi, 2011).

2.1.1.8 Warehouse Management Practices of HOs in Humanitarian Logistics

The warehouse is a critical viewpoint in each humanitarian disaster reaction. The plan of the warehouse ought to be wiped out in a pre-cautious way to avoid waste or indeed defilement of what is stored. The warehouse makes a difference in the time of making deliveries, as activities can be facilitated from there. Either dissemination centers ought to be done accurately for ease of delivery and maximization of other critical components. Logisticians can use various procedures in this manner to guarantee the proper arrangement of warehouses and dispersion centers (Roh Jang & Han, 2013).

Supplies are put away until they are required to be dispersed or utilized, but it isn't a matter of finding a place to keep things. An organized framework ought to be utilized, which permits one to know the type, amount, and area of the existing supplies in this place, as well as save for afterward needs. This handle is called Warehousing, and it has vital significance for the security of supplies. The organization of a stockroom ought to take into consideration the vital rules for quality support and safeguarding items. A few warehouses have been uncommonly planned to encourage storage in most crises; one should settle for whichever spaces are accessible, and these are regular schools, community centers, exercise centers, and the like, that were not designed for capacity.

2.1.1.9 Inventory Management Practices

The foremost viable, most proficient reaction to any calamity is made possible by cleverly pre-positioning stock and ideal assignment of assets (Merminod et al. 2014). To pick up the benefits of pre-positioning stock, a gathering of HOs has created shared centralized stations called “United Nations Humanitarian Response Depots (UNHRD)” for pre-positioning of unexpected stock to reply to disasters around the world.

The warehouses have been set up in six distinctive areas: Brindisi, Italy; Dubai, Joined together with Center Arab Emirates; Panama City, Panama; Kuala Lumpur, Malaysia; Accra, Ghana; and Las Palmas, Spain. The UNHRD accomplices claim that this strategy of centralized stations and stock pre-positioning empowers them to respond to any adversity in the world within 24 to 48 hours (Dufour, Laporte, Paquette, Rancourt, 2018).

2.1.1.10 Transportation and Distribution Practice

Delivery of helpful services to beneficiaries is one of the foremost basic operations of HO-LSCM, which is known as last-mile delivery (Balcik et al. 2008). The center of final mile conveyance is the errand drive framework utilized to transport the stock, fabric, and individuals (Apte 2009). For HOs, armada management is the moment's greatest overhead cost, being 15 percent of the whole

helpful relief logistics fetched (Falasca, Zobel, 2011; Martinez, Stapleton, Van Wassenhove, 2011). Plans and approaches on sourcing and the task of vehicles by HOs can be abruptly rendered immaterial on genuine grounds: the event of characteristic calamities more regularly than cannot be anticipated. Regularly, the nature of such calamities, and nearby, social, political, security, and security scenarios for the alleviation mission demands different sorts of vehicles: heavy-duty hardware, 4WD vehicles, or light obligation vehicles. In one case study, most of the vehicles were not conveniently sent according to the demands of that HO's mission since 95 percent of the vehicles were light duty, and not useable (Eftekhari, VanWassenhove, 2016).

Successful and reasonable armada administration and distribution systems are significantly subordinate to the assurance of a proper course. (Dufour et al., 2018) made a computer recreation for optimization of transport courses, which suggested an unused course for the conveyance of help supplies from UNHRD to East Africa. Utilizing the unused course was 21 percent less expensive than utilizing the existing course. This showed that crisis operations transportation is more troublesome to orchestrate and actualize than normal, generation, and formative operations are. Cautious preparedness, coordination, and well-informed information outline works can overcome these issues to an extraordinary extent, it may (Berkoune, Renaud, Rekik, Ruiz, 2012). This study found that the literature focus was on crisis fleet or transportation management, and ordinary and formative operations armada management has not been tended to any great extent. Also, existing inquiries about regularly significant issues to the utilization and administration of HO's owned vehicle assets, and outsourcing of fleet management as an effectiveness and optimization strategy, could be a generally overlooked area.

2.1.1.11 Procurement Management Practices

Procurement in HOs is the securing preparation of goods, services, works, and leasing in the midst of and after a disaster, to empower the dispersal of help to influence and vulnerable communities. In HO-LSCM budgets, 65 percent is spent on obtainment exercises (Falasca, Zobel, 2011). Efficiency in depleting the acquisition budget can be ensured through clear and responsible management of the distinctive stages of the obtainment plan, including recognizable verification of needs, planning of needs, the confirmation of tenders, assessment of tenders, purchase orders, conveyance of supplies, appraisal of supplies, and installment to vendors, etc. Straightforwardness and duty in HO-LSCM procurement operations can be ensured through data innovation and standardization of common acquisition processes.

2.1.2 Factors Affecting Humanitarian Logistics Performance

Several factors influence the success of humanitarian logistics operations. These factors can be categorized into Internal and External determinants that shape how efficiently and effectively the organizations perform in disaster response (Behl & Dutta, 2019).

2.1.2.1 Internal Factors

Internal factors in humanitarian logistics performance refer to the organizational elements that significantly influence how effectively humanitarian aid organizations can deliver their services. These factors can include aspects such as staffing, training, technology use, and institutional learning (Beyene, 2018).

Organizational Structure

The structure of humanitarian organizations influences their logistics performance. A decentralized structure may enhance local responsiveness, but it can also create coordination challenges (Van Wassenhove, 2006). Poorly defined internal processes can lead to delays and mismanagement of logistics operations, including customs clearance and procurement issues. High turnover rates among logistics personnel can disrupt continuity and institutional knowledge, negatively impacting performance (Welde, 2016). Organizations lacking institutional learning may struggle to improve logistics performance over time, as continuous improvement practices are essential for adapting to new challenges in humanitarian contexts, and organizations must foster a culture of learning from past experiences (Listou et al., 2009).

Resource Availability: The availability of critical resources (financial, human, and material) directly impacts the ability to respond to emergencies. Inadequate resources often result in delays and inefficiencies in disaster relief efforts (Behl & Dutta, 2019). Organizations often face constraints due to limited financial resources, hindering their ability to invest in logistics and training, and restricting long-term planning and development efforts. Misallocation or underutilization of resources can lead to operational bottlenecks and negatively impact performance (Beyene, 2018).

Logistical Capabilities and Infrastructure

The preparedness and technical infrastructure of the Red Cross, including warehouses, transportation systems, and information technology, are crucial. Logistics capability can vary greatly based on geographical location, and the lack of infrastructure in disaster-prone areas often hampers quick response (Cozzolino et al., 2012).

Human Resources and Training/Availability of Professional Staff

Skilled and well-trained personnel are essential in managing humanitarian logistics operations effectively. Proper training in disaster response and logistics management is critical for achieving good performance under pressure (Kovács & Spens, 2007). The presence of qualified personnel is essential for effective humanitarian logistics. Studies indicate that a higher number of professional staff correlates positively with logistics performance, as they bring necessary skills and knowledge to manage operations efficiently (Demeke, 2016), as well Continuous training and institutional learning are vital for adapting to the dynamic challenges faced in humanitarian contexts. Organizations that invest in training their staff tend to perform better due to enhanced capabilities and knowledge sharing among team members (Listou, 2016).

Collaborative and Coordination

Effective collaboration within teams and with external partners is critical. Lack of cooperation can lead to inefficiencies, as fragmented efforts may result in delays and miscommunication (Fard & Papier, 2024). Poor infrastructure, such as inadequate transportation networks, can severely limit the effectiveness of humanitarian logistics operations. This is particularly critical in disaster-stricken areas where timely delivery is essential, and understanding these internal factors is crucial for humanitarian organizations aiming to enhance their logistics performance. By addressing these challenges, organizations can improve their operational efficiency and better meet the needs of affected populations during crises (World Economic Forum, 2024).

Technology Utilization

Insufficient technology and limited training in logistics can hinder operational efficiency, as outdated systems often hinder decision-making and information management as well, and insufficient technological training also prevents staff from effectively using these tools, exacerbating logistical challenges (Milad Keshvari, 2024).

2.1.2.2 External Factors

Improving humanitarian logistics performance within the organizations requires a multifaceted approach that addresses both internal capabilities—such as staffing and training—and external conditions like government support and infrastructure quality. By focusing on these factors, organizations can enhance their responsiveness and effectiveness in delivering aid during crises (Demeke, 2016; Melkamu, 2016).

According to the study by Alfred (2023), and Rutaba (2022), external factors humanitarian logistics performance is significantly influenced by various external factors. These factors can be categorized into several key groups, and the external factors affecting humanitarian logistics performance are stated as follows:

Governmental Support

Government policies and support play a significant role in humanitarian logistics. Strong governmental backing can streamline processes such as customs clearance and funding allocations, directly impacting the speed and effectiveness of aid delivery (Beyene, 2018). Political instability can hinder humanitarian efforts by creating an unsafe environment for logistics operations. Governments may impose restrictions or regulations that complicate the delivery of aid regulatory framework. Inefficient customs processes, bureaucratic hurdles, and a lack of clear guidelines can delay the importation of necessary supplies. The government's support in ensuring smooth logistics operations is vital for effective humanitarian response (World Economic Forum, 2024; Kittaneh & Jaaron, 2023).

Infrastructure Quality

The state of infrastructure—roads, transportation networks, and storage facilities—greatly affects logistics performance. Poor infrastructure can hinder timely access to affected areas, complicating the distribution of aid. For instance, inadequate road conditions can delay transport vehicles, impacting overall response times during emergencies (Monika & David, 2003; Qing & Daud, 2013). Transportation Infrastructure that Poor road conditions, inadequate transportation networks, and damaged infrastructure can severely limit access to affected areas, delaying relief efforts. This includes challenges related to the availability of vehicles and storage facilities. Communication Systems: Effective communication is essential for coordinating logistics operations. Disruptions in communication infrastructure can lead to delays in information flow and decision-making (World Economic Forum, 2024; Beyene, 2018; and Jaaron, 2023).

Socio-Economic Conditions

Local socio-economic factors, including the availability of suppliers and market stability, also influence logistics performance (Melkamu, 2018). In regions with unstable economies or limited local resources, humanitarian organizations may face challenges in procuring necessary supplies quickly (Beyene, 2018). Market Conditions in which the local economic environment, including the availability of suppliers and the competitiveness of local markets, affects procurement and

distribution processes. High transportation costs and a lack of financial donors are significant challenges. Cultural Factors: Local customs, languages, and trust levels among stakeholders can influence collaboration and communication within the logistics chain (Demeke, 2016; Derebe, 2020).

Environmental Situational Factors

The occurrence of unpredictable natural disasters such as earthquakes, floods, and hurricanes can severely disrupt logistics operations. The geographical and climatic conditions of the affected areas also play a crucial role in determining accessibility and the speed of response (Kovas, 2019). Climate Change, such that Long-term climate changes can affect the frequency and severity of disasters, complicating logistics planning and resource allocation (Mitiku, 2020).

The geographical and environmental context of a disaster site, including terrain, climate, and accessibility, can significantly affect logistics performance. Natural barriers, infrastructure destruction, and weather conditions can delay deliveries (Lopez & Lopez, 2020). Political and Social Environment Political instability, governmental policies, and social dynamics play a significant role in shaping the logistics environment. The Red Cross must navigate relationships with local governments, international organizations, and affected communities. Bureaucratic delays, conflicting agendas, and restricted access to affected areas can hinder logistics performance (Kovacs & Spens, 2007).

Funding Constraints

Limited Financial Resources, such as many humanitarian organizations, face funding shortages that restrict their operational capabilities. The inability to secure adequate funding can lead to insufficient logistical support during emergencies, and addressing these external factors is crucial for enhancing the performance of humanitarian logistics. By understanding and mitigating these challenges, organizations can improve their responsiveness and effectiveness in delivering aid during crises (Mitku, 2020). Coordination with other Humanitarian Actors and effective collaboration between various humanitarian organizations are critical. Coordination challenges arise from differences in organizational goals, operational strategies, and resource allocations (Maughan et al., 2015).

The Red Cross, as part of a global network, must manage these relationships to ensure efficiency. Demand Uncertainty and forecasting the unpredictable nature of disasters make it difficult to

estimate the precise needs of affected populations. Accurate forecasting and demand management are crucial to ensuring the right supplies are available at the right time (Behl & Dutta, 2019).

Donor Constraints and Funding Humanitarian organizations like the Red Cross often rely on donor funding, which can be unpredictable and limited. Funding constraints can limit the scale and scope of logistics operations and lead to inefficiencies (Van Wassenhove, 2006).

Technology and Information Systems

The use of technology—such as Geographic Information Systems (GIS), tracking systems, and data analytics—can enhance the efficiency and transparency of logistics operations. In the Red Cross, information systems help in tracking shipments, coordinating relief efforts, and managing resources (Cozzolino et al., 2012).

2.2 Empirical Review

2.2.1. Logistics infrastructure and Capacity

One of the key factors influencing humanitarian logistics performance in the Red Cross Society is the availability and quality of logistics infrastructure. This includes transportation systems (roads, ports, and airports), warehousing facilities, and distribution networks. Several studies have pointed out that inadequate infrastructure, especially in disaster-stricken regions, often delays relief operations and hampers the delivery of aid (van Wassenhove, 2006; Kovács & Spens, 2011). For instance, research by Bichou and Gray (2004) found that limited access to roads and ports during natural disasters in certain regions of Africa and Asia severely impacted the efficiency of supply chains. In the context of the Red Cross, poor infrastructure and lack of local storage facilities often result in delays in response times, insufficient stockpiles, and logistical bottlenecks (Beyene, 2018).

Coordination and Collaboration with Other Agencies Humanitarian logistics performance is highly dependent on the coordination and collaboration between multiple stakeholders, including government agencies, non-governmental organizations (NGOs), international bodies (e.g., UN agencies), and private sector partners. The Red Cross operates in a complex ecosystem of actors with sometimes conflicting priorities and interests, which can result in inefficiencies and delays (Melkamu, 2020). A study by Oloruntoba and Gray (2006) highlighted that coordination problems between agencies often lead to duplicative efforts, inefficient use of resources, and missed opportunities for synergy. The Red Cross, through its International Federation of Red Cross and Red Crescent Societies (IFRC), works to foster collaboration through established networks, but

challenges in aligning logistics operations with those of other organizations remain. Additionally, the humanitarian logistics community often faces problems with the sharing of data and real-time information, which can affect the timely deployment of resources. According to a report by the World Economic Forum (2020), integrated communication systems and data-sharing platforms are essential to improve coordination and avoid logistical inefficiencies.

Financial Resources and Funding Mechanisms The availability of financial resources is another critical determinant of logistics performance. Humanitarian operations require substantial financial investment to cover transportation, procurement, warehousing, and distribution costs. Insufficient or delayed funding can cause significant delays in relief operations, affecting both the speed and effectiveness of aid delivery (Beyene, 2018). A study by Langenus and Van de Voorde (2018) focused on the Red Cross and other humanitarian organizations and emphasized that financial constraints often hinder the timely purchase and transportation of relief goods. The reliance on donor funding can create cash flow issues, especially in the early stages of a disaster, which may lead to delays in response. In some cases, the unpredictability of funding sources or restrictions attached to the funds can limit flexibility in logistics operations.

Human Resources and Capacity Building Human resource capabilities are another major factor impacting the performance of humanitarian logistics. The Red Cross relies on a mix of paid staff, volunteers, and local partners to implement its logistics operations. A shortage of skilled logistics professionals, especially in crisis settings, can severely affect the operational efficiency of relief efforts. The International Federation of Red Cross and Red Crescent Societies (IFRC) has highlighted the importance of continuous capacity-building and training programs for both staff and volunteers to improve logistics management in disaster scenarios (IFRC, 2020). According to studies by Van Wassenhove (2006) and Thomas and Kopczak (2005), logistical performance improves significantly when human resources are properly trained in key areas such as supply chain management, warehouse management, and transportation planning. Furthermore, the Red Cross often faces challenges related to staff turnover, which can lead to knowledge gaps in logistics processes, particularly in high-turnover environments. The development of standard operating procedures (SOPs) and logistics training programs is crucial for ensuring consistency and maintaining operational effectiveness across different geographic regions.

Technology and Information Systems, in which the role of technology in enhancing logistics performance is increasingly being recognized within the humanitarian sector. The application of

advanced information systems, tracking technologies (e.g., GPS, RFID), and data analytics tools can significantly improve the management of humanitarian supply chains. Recent studies, such as those by Sweeney and Lummus (2018), show that technology plays an important role in optimizing logistics in humanitarian settings by providing real-time data on inventory levels, transportation routes, and potential bottlenecks. The Red Cross has implemented several technologies aimed at improving logistics efficiency, including digital tracking systems to monitor the movement of goods and the use of mobile applications for coordinating between teams on the ground. However, the adoption of technology is often limited by factors such as high costs, lack of technical expertise in remote locations, and inconsistent infrastructure (e.g., lack of internet access in some disaster zones). A study by Renaud and Oloruntoba (2012) stressed that while technology can improve logistics operations, its successful integration into humanitarian relief efforts requires careful consideration of local conditions and needs.

Risk Management and Preparedness Humanitarian logistics is inherently risky due to the uncertainty of disasters and complex operating environments. The ability of the Red Cross to prepare for, mitigate, and manage risks is crucial for effective logistics performance. Risk factors can include natural hazards (earthquakes, floods), political instability, conflict zones, and supply chain disruptions. Research by McLachlin and Van Wassenhove (2012) suggests that organizations like the Red Cross need robust risk management strategies to ensure that logistics operations can continue under uncertain and challenging conditions. Preparedness activities, such as pre-positioning of supplies, establishing contingency plans, and conducting regular simulation exercises, are essential to reducing the impact of unexpected disruptions and improving response times during actual crises. A study by Holguín-Veras et al. (2014) further supports the idea that investment in preparedness initiatives helps organizations build resilience against shocks and minimize logistical delays during disasters.

2.2.2. Sustainability and Environmental Considerations

The environmental impact of humanitarian logistics is increasingly becoming a topic of concern. The Red Cross, as part of its broader humanitarian mission, must also consider the sustainability of its logistics operations. This includes minimizing waste, reducing carbon emissions, and ensuring that relief materials are procured and transported in an environmentally responsible manner (Beyene, 2018; Melkamu, 2020).

Several scholars, such as Beamon and Balcik (2008), have pointed out the need for incorporating sustainability into humanitarian logistics strategies. For example, the use of fuel-efficient vehicles, green warehouses, and sustainable packaging materials can help reduce the environmental footprint of humanitarian logistics. However, sustainability is often secondary to immediate operational concerns in crises, which may limit the ability to prioritize environmental considerations in the short term.

The performance of humanitarian logistics in the Red Cross Society is shaped by a range of factors, including infrastructure, coordination, financial resources, human resources, technology, risk management, and sustainability. Each of these factors has a significant impact on the efficiency and effectiveness of logistics operations during disaster response and recovery phases. While challenges remain, advancements in technology, better coordination practices, and increased focus on capacity building can help improve logistics performance. That's why this research was triggered to study that should continue to explore innovative solutions to address these challenges and enhance the overall efficiency of humanitarian logistics operations, particularly in complex and resource-constrained environments in the Tigray Red Cross Society.

2.3 Conceptual Framework

As discussed above in reviews, humanitarian logistics has been viewed as a deal between human need and organizations that respond to humanitarian crises and disasters that are caused by man-made or natural disasters. It has also been defined as a process of delivering aid to solve the disaster faced by humans.

Whatever, Miles and Huberman (1994) characterized a conceptual system as a visual or composed item, one that “explains, either graphically or in story frame, the most things to be examined-the key variables, concepts, or factors-and the assumed connections among them”. A variable may be a quantifiable characteristic that accepts distinctive values among subjects. Free factors are changes that happen in a trial that are straightforwardly caused by the experimenter. It can be changed as required, and its values don't speak to an issue requiring clarification in an analysis but are taken basically as given (Avoid, 2003). A dependent variable could be a variable subordinate to another variable: the independent variable. A dependent variable is what is measured within the test and what is influenced during the test. The subordinate variable reacts to the autonomous variable (Everitt, 2000)

The conceptual model below was developed for the present study to connect the study variables supporting the posited objectives. According to Rocco and Plakhotnik (2009), the goal of a conceptual framework is to categorize and describe concepts relevant to the study and map relationships among them and functions in providing support for the research design, method, and instruments to be used in a study. The framework was developed through reviewing related literature and is believed to conceptualize the study and provide a reference point for the interpretation of findings.

This study will seek to assess Factors Affecting Humanitarian Logistics on performance at RCS in the Tigray region. The model shown demonstrated the relationship among the variables for this study.

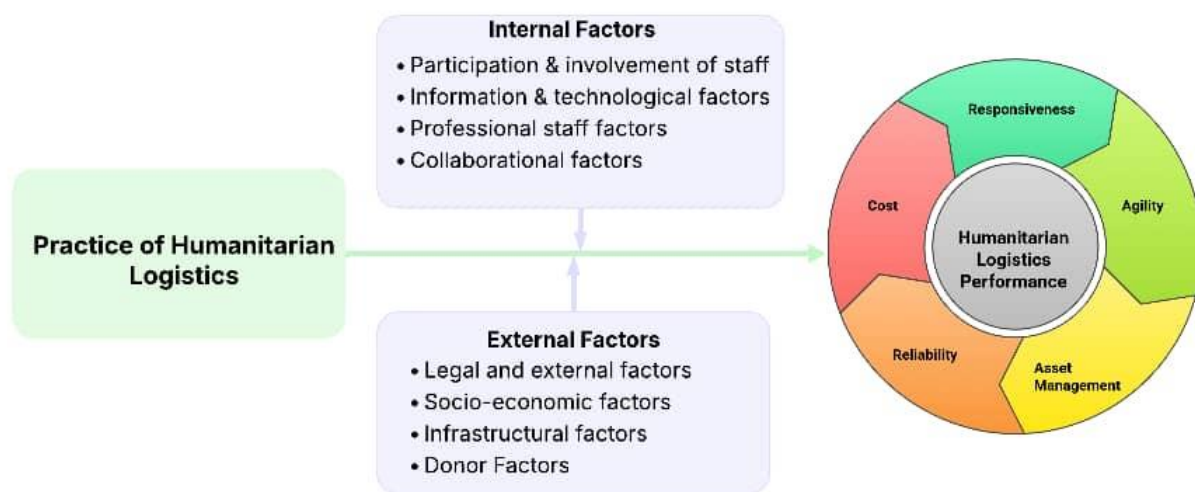


Figure 1: Conceptual Framework

Conceptual framework adapted from (Kunz & Reiner, 2012; Thomas & Kopczak, 2005; Beamon & Balcik, 2000).

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter covered the methodology and design of the study, including site selection, research design, data types, sampling technique, target population, sampling size, data collection, processing, and analysis. It also discussed research validity, reliability, and ethical considerations.

3.1 Site Selection and Description of the Study Area

3.1.1 Background of Tigray Red Cross Society

Tigray: The Tigray Region in Ethiopia is the northernmost state, home to the Tigrayan, Irob, and Kunama people. Its capital is Mekelle and is the fifth-largest by area, fourth-most populous, and fifth-most densely populated of the 11 regional states. Tigray is bordered by Eritrea, the Amhara Region, the Afar Region, and Sudan. The region has a population of approximately 5,443,000 such with 2,297,039 males and 2,367,032 females in 2012, with 80% being farmers and contributing 46% to the regional gross domestic product. The highlands have the highest population density, while the less densely populated lowlands comprise 48% of the area.

Red Cross Society: The Tigray Regional Branch of the Ethiopian Red Cross Society (ERCS) was established in 1977 to support emergency relief programs. It has grown to include 4 zonal branch offices, 47 Woreda branch offices, 46 sub-Woreda coordination offices, and a regional coordination office with 436 employees and volunteers that are located in Mekelle city, Kedemay Woyane sub-city. The ERCS provides emergency responses, ambulance, first aid, family reunification, essential drugs, and water and sanitation. The Red Cross was established in 1935. The organization's core values include care, learning, sensitivity, solidarity, and integrity (ERCS web <https://redcrosseth.org/> retrieved November 2024, 2:30).

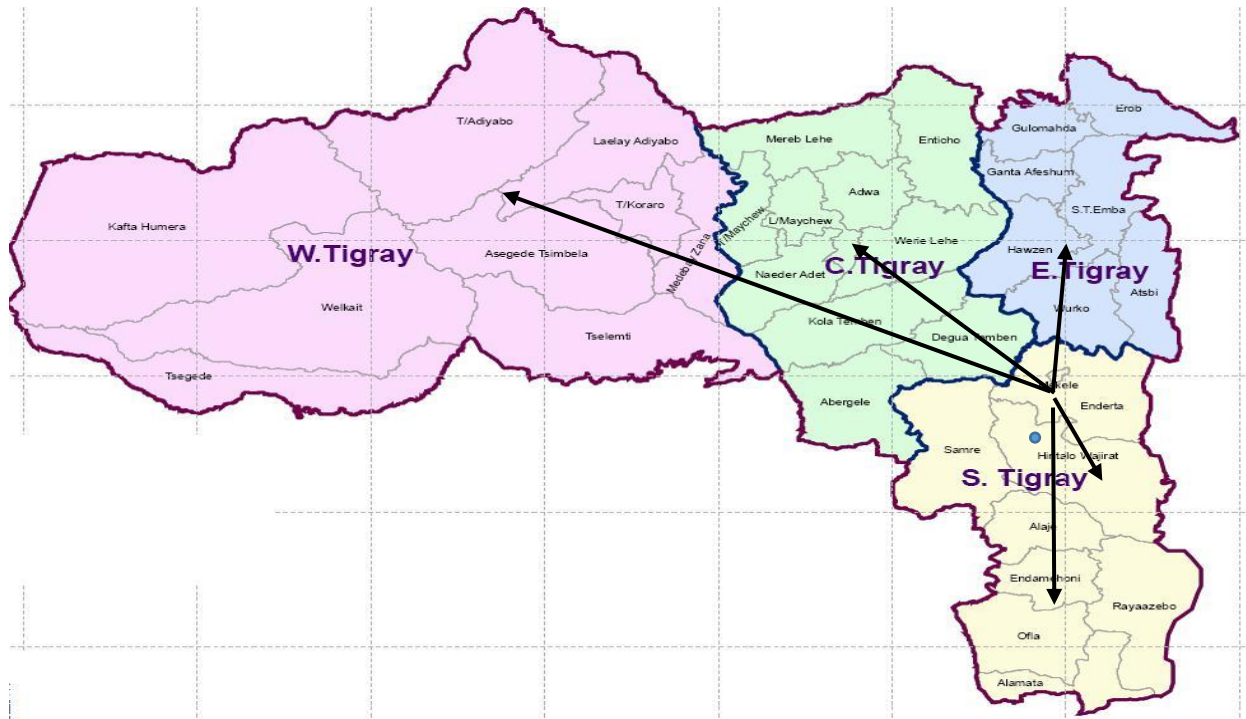


Figure 2: Map of the Study Area

Source: Shutterstock <https://www.shutterstock.com/>

3.2 Research Design and Approach

3.2.1 Research Design

Chandran (2004) defined research design as the arrangement of data collection and analysis conditions that align with the research purpose and the economy of procedures, focusing on several considerations that researchers should consider and adhere to during a research project. The researcher employed a mixed method incorporating both qualitative and quantitative approaches. The rationale for this choice stems from the need to gain a comprehensive understanding of relationships and effects between dependent and independent variables in the context of humanitarian logistics. In the field of humanitarian logistics, understanding complex interactions among various stakeholders, such as managers and employees, is essential. A mixed-method approach enabled the researcher to triangulate data, enhancing the validity of the findings and allowing for a robust interpretation of how logistics operations affect humanitarian outcomes.

The researcher utilized descriptive and explanatory designs to provide a detailed account of the current state of humanitarian logistics at the Red Cross Society and to explain the relationships between identified variables. Descriptive research helped outline the characteristics and challenges

faced by the organization, while explanatory research delved into the causal relationships that influence logistics performance.

3.2.2 Research Approach

Cresswell (2007) declared that a study utilized both qualitative and quantitative methods to counterbalance biases in both approaches. The mixed research method allowed for the analysis of multiple data sources in a single study, validating the congruence among them, despite the inherent inadequacies in each approach. In this study, the researcher employed a mixed (qualitative and quantitative) research approach to gain comprehensive information on the topic under investigation, ensuring a comprehensive understanding. The quantitative approach was used to gather primary data/Likert scale, for the factors affecting humanitarian logistics performance. The qualitative approach was used to collect primary and secondary data using interviews, relevant materials from online, books, etc.

3.3 Data Type and Source

This study used data from questionnaires, personal interviews, and observations, with a field study involving questionnaires and interview schedules. Secondary data was obtained through desk surveys, and primary data was obtained through field surveys. Cross-checking and reinforcing the obtained data were essential. Primary data was sourced directly from the Red Cross Society members and voluntary workers, aiming to gather firsthand information about the organization being studied. Interviews and questionnaires were used to gather primary data, ensuring the study's purpose and objective were considered.

Questionnaire: This was the major source of primary data used in the study. The data was collected from this source, obtained through the use of a questionnaire constructed by the researcher, and was approved by the Advisor.

Face-to-face interview: Apart from the use of a questionnaire, a semi structured interview was conducted for managers, supervisors, employees, and volunteers at different department levels of the Red Cross Society. The interview was used to counterbalance the data obtained by the closed-end questionnaire and the secondary data obtained. The interviewee was selected from the top managers, middle managers, subordinates, and staff members randomly. This selection process helped to get balanced and unbiased data by taking the mixed background of the interviewee.

Secondary data: This study analyzed past research work on the areas' performance results, utilizing sources such as the internet, textbooks, organizations, government publications, and

unpublished research and journals, as needed. Besides, this study looked at the performance results of the organization's documents.

3.4 Population and Sampling Design

3.4.1 Target Population

According to Mugenda (2013), the target population that a researcher wanted to generalize the results of the study to was defined. The target population designed for this study was managers, subordinates, supervisors, permanent employees, and volunteers who have served for more than one year, which comprised 436 workers of the Red Cross Society (Semere HRD head, 2024).

3.4.2 Sampling Technique and Procedure

Sampling is a method of selecting a portion of a population that accurately represents the entire population, including objects, people, and events, as defined by Chandra (2004) and Walliman (2011). The study employed a stratified random sampling technique to select participants from each group, ensuring all parts of the population were represented in the sample, thereby increasing the efficiency of the study because the settlements of the population are at different levels of position and gender. So, this study used a stratified random sampling technique to involve the division of the population into its subgroups of managers, subordinates, supervisors, staff, and voluntary workers. In addition, this study adopted the simple random sampling method, a fundamental probability sampling technique, to ensure equal opportunity for all subjects in the population at the Red Cross Society in Tigray region, ensuring every subject would have an equal chance of selection.

3.4.3 Sample Size

This study utilized a simple random sampling method due to its simplicity, convenience, and bias-free nature. The researcher used Yamane's formula (1967) to determine the sample size of the population because it provides a simple, statistically sound, and widely accepted method of calculating an adequate sample when dealing with a finite population. This formula is reliable 95% but it only has 5% deviation factor.

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

Where: n = Sample size, N = Size of population, e = the level of precision (e = 0.05)

$$n = \frac{N}{1 + N(e)^2} = \frac{436}{1 + 436(0.05)^2} = 145.$$

This study employed simple random sampling of probability sampling to investigate the factors affecting the performance of humanitarian logistics within the Tigray Red Cross, ensuring that every individual in the target population has an equal opportunity to contribute to understanding logistical challenges and operational effectiveness.

Table 1: Sample Distribution

Target population from the staff group	Target population size N			Sampling fractional n(i/N)	Selected sample		
	Male	Female	Sum		Male	Female	Sum
Region Staff	25	12	37	12	10	2	12
Managers	1	0	1		1	0	1
Subordinators	3	1	4		2	0	2
Staff	21	11	32		7	2	9
Mekelle Zone	40	16	56	18	15	3	18
Managers	1	0	1		1	0	1
Subordinators	0	0	0		0	0	0
Staff	39	16	55		14	3	17
Southern and south-eastern zone	65	10	75	25	21	4	25
Managers	1	0	1		1	0	1
Subordinators	3	1	4		1	1	2
Staff	61	9	70		19	3	22
Eastern Zone	64	15	79	26	22	4	26
Managers	1	0	1		1	0	1
Subordinators	4	0	4		2	0	2
Staff	59	15	74		19	4	23
Central zone	69	11	80	27	22	5	27
Managers	1	0	1		1	0	1
Subordinators	3	1	4		2	1	3
Staff	65	10	75		19	4	23
North west zone	70	17	87	30	25	5	30
Managers	1	0	1		1	0	1
subordinators	4	0	4		1	0	1
Staff	65	17	82		23	5	28
West zone	21	1	22	7	6	1	7
Managers	0	0	0		0	0	0
subordinators	0	0	0		0	0	0
Staff	21	1	22		6	1	7
Grand Total	354	82	436	145	121	24	145

Source: Data of the Red Cross and Own Computation (2024)

3.5 Data Collection Methods

Primary data was used for the study. The researcher collected quantitative data relating to the humanitarian logistics practice and organizational performance at the Red Cross Society. This was achieved by the use of a structured questionnaire containing closed-ended questions (CEQ). The questionnaire was divided into four sections, each section addressing a specific objective of the study. The respondents were the Red Cross Society in Tigray Region, which included senior leadership, middle leadership, and staff members. The questionnaire was physically distributed to respondents.

The questionnaire was the preferred data collection instrument. According to Kothari (2004), the data collection method depends upon the information being collected, the purpose of collecting data, the skills of the researcher, and the resources available for the investigation. Data for this study were collected using two types of data collection methods: questionnaires and the second was interviews.

The questionnaire consisted of a Likert scale and was divided into four parts. Part 1 contained the demographic profile of the respondents (DPR), Part 2 the measurement of factors affecting humanitarian logistics performance (FAHLP), Part 3 the measurement of organizational performance (MOP), and Part 4 the Interview guide questionnaire (IG).

The interview guide was semi-structured and used to gather additional information from respondents, purposively sampled from various categories, including senior leadership, middle leadership, job coordinators, supervisors, and employees of the RCS, to triangulate the data obtained from the questionnaire.

3.6 Data Processing and Analysis

The demographic facts obtained from the respondents are summarized using a frequency distribution. As mentioned above, scale-type questionnaires were used as a way of data collection tool, and then the Scale-type questionnaires were analyzed by using descriptive statistics, correlation, and particularly regression analysis to answer the research questions. The study used descriptive (mean and standard deviation) and inferential statistics to analyze data, including Pearson's correlation and multiple regression analysis to assess the relationship between and the effect of the independent variables (IDVs) on the dependent variables (DVs) to test the objective of the study. The Statistical Package for Social Science (SPSS) version-27 software was used to analyze the effect of independent variables. The researcher also used descriptions of data gathered

through interviews to interpret both quantitative data obtained from the questionnaire and qualitative data obtained from interviews and secondary data obtained from different materials. This approach was used to test the study's objective.

3.7 Research Validity and Reliability

3.7.1 Validity

To determine the relevance of the statement in the questionnaire and interview guide to the study, assuring validity is important. In this study, the researcher asked if the instrument made the study valid, and the questionnaire was developed in previous studies, and reviewed related literature to increase validity.

Validity, also known as construct validity, is the extent to which a test accurately measures what it is supposed to measure. Content validity, as defined by Kothari (2004), refers to the extent to which a measuring instrument provides adequate coverage of a topic. Good content validity is determined by a representative sample of the universe. The advisor of the research, discussions with fellow researchers, and feedback from the pilot survey were used to verify content validity. This study employed relevant articles and literature from academic, scientific, and marketing databases. The researcher also discussed with the advisor before distributing the questionnaire to ensure the validity of the study.

3.7.2 Reliability

To check the accuracy and precision of a measurement procedure, the ability of the instrument to test the same results over time and the reliability of the instrument were sought. Reliability is the extent to which data accuracy reflects the instrument's measure of what supposed to measure. Thus, the researcher used a standardized questionnaire. Reliability is concerned with the findings of the research and refers to the consistency of a measuring instrument (questionnaire). Reliability is internal consistency used to measure consistency between different items of the same construct. Cronbach's alpha is a reliability measure designed by Lee Cronbach in 1951. As well as according to Khotari (2004), reliability denotes consistency, and internal consistency involves correlating the responses to each question in the questionnaire with those of other questions in the questionnaire. One of the most commonly used indicators of internal consistency is Cronbach's alpha coefficient of scale must be 0.70, and the higher the better.

Table 2: Measurement of Reliability Analysis

Variable	Number of Items in the Scale	Cronbach's Alpha Result	Case Valid N	Excluded list-wise based on all variables in the procedures	Total	%
Humanitarian Logistics Practice of TRCS	32	0.851	145	0	145	100%
Internal factors affecting the humanitarian logistics performance of TRCS	32	0.940	145	0	145	100%
External Factors Affecting Humanitarian Logistics Performance TRCS	32	0.935	145	0	145	100%
Humanitarian Logistics Performance of TRCS	40	0.880	145	0	145	100%

Source: SPSS V-27 (2025)

As shown in Table 2, the result of the Cronbach's Alpha coefficients is beyond 0.70, such that Humanitarian Logistics Practice of TRCS (0.851), Internal Factors Affecting the Humanitarian Logistics Performance of TRCS (0.940), External Factors Affecting Humanitarian Logistics Performance of TRCS (0.935), and Humanitarian Logistics Performance of TRCS (0.880). This shows that each variable represented a reliable and valid construct, and the internal consistency of the data is acceptable as it is greater than 0.70.

3.8 Research Ethical Considerations

The researcher was responsible for addressing ethical issues in data collection and ensuring respondents' privacy and anonymity. The researcher was to seek consent, avoid deception, maintain confidentiality, and respect privacy. Participants were informed about the study's purpose and objectives, and any information collected was used for academic purposes with the highest confidentiality. Data collection instruments were designed considering ethical issues related to the Red Cross Society administration.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter analyzed and interpreted the questionnaire responses, presenting the study's findings and discussing the relationship between factors that affect humanitarian logistics performance. It also presented relevant statistical analysis to answer research questions. The chapter presented the data presentation, analysis, findings, and interpretation of the study's findings.

4.1 Demographic Information

4.1.1 Response Rate

The study utilized through stratified random sampling method to survey senior management (managers and coordinators), middle management (subordinates), and staff (professional employees and others) of TRCS. The researcher randomly distributed self-completion questionnaires to respondents from each stratum, aiming to collect data from the target groups through simple and understandable methods. The researcher aimed and distributed 145 questionnaires in-person to respondents, with 136 questions in Likert scale, 4 open-ended/ interview questions, and 6 demographic questions, and received a 100% response rate, as shown in Table 3, collected in 2025.

Table 3: Response Rate of Respondents

No	Description	Respondents
1	Total target Population (number)	436
2	Designed sample Size (number)	145
3	Distributed questionnaire (number)	145
4	Returned Questionnaire (number)	145
5	Response Rate (%)	100%
6	Used Response ((number)	145

Source: Computed by the researcher (2025)

As discussed above, the questionnaire was distributed to managers, Coordinators, sub-coordinators, and staff (professionals and others) of Tigray Red Cross Society. The response rate to each stratum in the organization was prepared as follows.

Table 4: Response Rate Stratum

No	Stratum	Total Stratum size	Sample size proportionate	No. of Respondents	Response rate
1	Managers	6	6	6	100%
2	Sub-coordinators	20	11	11	100%
3	Staff and others	410	128	128	100%
total		436	145	145	100%

Source: Researcher Computation (2025)

As summarized in Table 4, the study involved participants from TRCS, including 6 managers, 11 coordinators/Sub-coordinators, and 128 staff members. The questionnaires were completed and returned at a full rate, indicating a successful survey. Others referred to the employees as volunteers, administration supporters, and drivers. According to Mugenda (2003) and Cooper and Schindler (2014), a 50% response rate is adequate for analysis, while 60% is good and 70% excellent, indicating that a 100% response rate for data analysis. Therefore, the research's response rate was 100% which is excellent to proceed to data analysis.

4.1.2 Demographic Information

Table 5: Gender of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	121	83.4	83.4	83.4
	Female	24	16.6	16.6	100.0
	Total	145	100.0	100.0	

Source: Own Survey (2025)

Table 5 indicates that from the total respondents, this study 145 such that 24 (16.6%) were females and 121 males.

Table 6: Age of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 25 Years old	11	7.6	7.6	7.6
	26 - 35 Years old	19	13.1	13.1	20.7
	36 - 45 Years old	66	45.5	45.5	66.2
	46 - 55 Years old	34	23.4	23.4	89.7
	Above 55 years	15	10.3	10.3	100.0
	Total	145	100.0	100.0	

Source: Own Survey (2025)

Table 7: Descriptive Statistics of Age of respondents

	N	Minimum	Maximum	Mean	Std. Deviation
Age	145	1	5	3.16	1.03
Valid N (list-wise)	145				

Source: own Survey, SPSS V-27 (2025)

Tables 6 and 7 reveals that the majority of respondents were between 36 and 45 years old, accounting for 66 individuals (45.5%), indicating a predominantly mid-career workforce. This group is followed by those aged 46 to 55, comprising 34 respondents (23.4%). Younger respondents aged 26 to 35 made up 13.1% (19 individuals), while the 18 to 25 age group represented only 7.6% (11 respondents). Those aged above 55 accounted for 10.3% (15 individuals). Statistically, the mean age category is 3.16, with a standard deviation of 1.03, indicating a moderate dispersion around the average. The minimum and maximum age group values were coded as 1 and 5, respectively, showing the presence of respondents from all predefined age brackets. Overall, the data suggest that the respondent pool is skewed toward older age groups, particularly those in their late 30s to mid-40s, which reflects the age composition of the workforce in the studied organization.

Table 8: Education Level of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	College Diploma	18	12.4	12.4	12.4
	First Degree	96	66.2	66.2	78.6
	Masters and Above	31	21.4	21.4	100.0
	Total	145	100.0	100.0	

Source: Own Survey (2025)

Table 8 indicates that from the total respondents 145, the highest number belongs to first degree holders (66.2%), followed by master's and above (21.4%), and 12.4% were college diploma holders.

Table 9: Job Position of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manager	6	4.1	4.1	4.1
	Sub-coordinator	11	7.6	7.6	11.7
	professional	112	77.2	77.2	88.9
	Other	16	11.1	11.1	100.0

Total	145	100.0	100.0
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Source: Own Survey (2025)

As shown in Table 9, the majority of respondents held professional positions, accounting for 112 individuals (77.2%), followed by other staff members at 16 (11.1%). Additionally, 6 respondents (4.1%) were higher and middle-level managers, while 11 (7.6%) served as sub-coordinators.

Table 10: Experience of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1 - 5 years	3	2.1	2.1	2.1
6 - 10 years	20	13.8	13.8	15.9
11 - 20 years	72	49.7	49.7	65.5
21 - 30 years	39	26.9	26.9	92.4
Above 30 years	11	7.6	7.6	100.0
Total	145	100.0	100.0	

Source: Own Survey, SPSS V-27 (2025)

Table 11: Descriptive Statistics of Experience of Respondents

	N	Minimum	Maximum	Mean	Std. Deviation
Experience in the specific job you are working	145	1	5	3.24	.86
Valid N (list wise)	145				

Source: Own Survey, SPSS V-27 (2025)

According to Tables 10 and 11, nearly half of the respondents (49.7%) have between 11 and 20 years of work experience, making it the most common range. This is followed by 26.7% who have worked for 21 to 30 years. Additionally, 13.8% have 6 to 10 years of experience, 7.6% have over 30 years, and only 2.1% have 1 to 5 years of experience. The data reveal a mean experience score of 3.24 with a standard deviation of 0.86, indicating a moderate spread in experience levels. The values range from a minimum of 1 to a maximum of 5, showing a broad spectrum of work experience, though the majority fall within the mid-to-upper range. This suggests that the study largely reflects insights from respondents with considerable professional experience.

Table 12: Work Unit of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Logistics and supply chain	29	20.0	20.0	20.0
	Program	101	69.7	69.7	89.7
	Others	15	10.3	10.3	100.0
	Total	145	100.0	100.0	

Source: Own Survey (2025)

As shown in Table 10, most of the respondents' work units indicated that program 101 (69.7%), logistics and supply chain 29 (20%), and other work units are 15 (10.3%). This means that the sample population is concentrated heavily in Program 101, and so the answers and opinions might mostly deal with the staff members at that particular unit's grievances, practices, and responses. In this case, with 20% being the logistics and supply chains personnel, their operational perspective is crucial, but in comparison to the Program staff, it is weaker. The 10.3% which makes the other units represent a small sample, but their opinions are useful as the rest of the survey is populated.

4.2 Descriptive Statistics Analysis

The section described the factors affecting logistics performance, focusing on the dominant factors. Data analysis results are presented in written descriptions, tables, and descriptive statistics, focusing on independent variables of humanitarian logistics factors as well as the outcome variable.

4.2.1 Practice of Humanitarian Logistics Performance at TRCS

Akmaliah and Pihie (2009) and Saeid et al. (2011) suggested that the mean score measurement is crucial for data interpretation, in which a score greater than 3.79 is considered high, between 3.40 and 3.79 is moderate, and below 3.40 is considered low. Regarding this, the variables were discussed below. The study explained factors affecting humanitarian logistics performance at TRCS, concentrating on humanitarian logistics practice, internal factors, and external factors, as well as the output variable logistics performance. The Likert-scale questions, secondary data, and interview guide responses were analyzed, providing insights into these factors. The grand mean score was used to interpret data.

4.2.1.1 Practice of Humanitarian Logistics

Based on Tables 13, 14, 15, and 16, the overall humanitarian logistics practices of the TRCS were assessed using four core components: procurement, warehousing, inventory management, and transportation and distribution. The respective mean scores and standard deviations were procurement (M = 4.11, SD = 0.71), warehousing (M = 4.17, SD = 0.73), inventory management (M = 3.86, SD = 0.87), and transportation and distribution (M = 4.04, SD = 0.83).

By aggregating these dimensions, the weighted average mean score of humanitarian logistics practices was found to be 4.04, with a standard deviation of 0.79. This overall mean exceeds the established threshold of 3.79, indicating a strongly positive perception among respondents regarding the effectiveness of humanitarian logistics practices within the TRCS. The relatively high means across all dimensions suggest that the organization performs well in ensuring the timely procurement, storage, and delivery of humanitarian supplies. The moderate standard deviations reflect a reasonable level of consensus among respondents, reinforcing the reliability of the overall assessment.

Table 13: Descriptive of Procurement Management Practice

No	Procurement Management practice	Frequency					Mean	SD
		1 SD	2 D	3 N	4 A	5 SA		
1	There are practices of a preliminary needs assessment conducted in a disaster-prone area before procurement is made.	0 (0%)	0 (0%)	39 (26.9%)	52 (35.9%)	54 (37.2%)	4.10	.79
2	The organization has clear and efficient procurement procedures in place for humanitarian logistics operations.	0 (0%)	0 (0%)	36 (24.8%)	58 (36.6%)	56 (38.6%)	4.14	.79
3	The procurement processes of the organization ensure the timely availability of relief supplies during humanitarian crises.	0 (0%)	0 (0%)	24 (16.6%)	82 (56.6%)	39 (26.9%)	4.08	.84
4	The organization regularly monitors and evaluates the performance of suppliers to ensure compliance with humanitarian logistics requirements.	0 (0%)	0 (0%)	45 (31%)	43 (29.7%)	57 (39.3%)	4.10	.65
5	The procurement management practices of the organization consistently ensure transparency in handling humanitarian logistics.	0 (0%)	0 (0%)	21 (14.5%)	33 (22.8%)	91 (62.8%)	4.48	.74
6	The procurement team has sufficient training and skill to handle humanitarian supply chain requirements.	0 (0%)	0 (0%)	0 (0%)	65 (44.5%)	80 (55.2%)	3.55	.49

7	There are clear procurement management practices such as issuance of purchase orders, administration of purchase contracts, and resolution related to procurement.	0 (0%)	0 (0%)	15 (10.3%)	64 (44.1%)	66 (45.5%)	4.35	.66
Weighted average mean							4.11	0.71
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
Source: SPSS V-27 output (2025)								

As shown in Table 13, respondents' perceptions of procurement management—one of the dimensions under the independent variable *humanitarian logistics practices*—were assessed using seven items. The analysis revealed a grand mean score of 4.11, which exceeds the benchmark threshold of 3.79, indicating a generally favorable perception. Additionally, the standard deviation of 0.71 suggests a relatively low level of variability in responses, reflecting a consistent viewpoint among participants. These findings imply that procurement management practices are perceived to be well-established and effectively implemented within the organization.

Table 14: Descriptive of Warehouse Management Practice

No	Warehouse management practice	Frequency					Mean	SD
		1 SD	2 D	3 N	4 A	5 SA		
8	There is a practice of identifying storage points to enable efficient disaster relief operations.	0 (0%)	0 (0%)	20 (13.8%)	95 (65.5%)	30 (20.7%)	4.07	.59
9	There is a practical identification of the required warehouse management equipment for stores.	0 (0%)	0 (0%)	30 (20.7%)	53 (36.6%)	62 (42.8%)	4.22	.77
10	There are proper storage practices to efficiently utilize storage space.	0 (0%)	8 (5.5%)	20 (13.8%)	35 (24.1%)	82 (56.6%)	4.32	.91
11	The warehouses have adequate capacity to store relief supplies during humanitarian operations.	0 (0%)	0 (0%)	54 (37.2%)	58 (40%)	33 (22.8%)	3.86	.76
12	There are regularly monitored inventory levels to ensure the availability of essential relief items.	0 (0%)	0 (0%)	8 (5.5%)	83 (57.2%)	54 (37.2%)	4.32	.57
13	The warehouse layout facilitates quick access and efficient distribution of humanitarian aid.	0 (0%)	0 (0%)	19 (13.1%)	76 (52.4%)	50 (34.5%)	4.21	.66
14	Warehouse records and stock movements are accurately maintained to ensure traceability of relief supplies.	0 (0%)	15 (10.3%)	0 (0%)	71 (49%)	59 (40.7%)	4.20	.89
15	Warehouse staff are adequately trained and capable of managing humanitarian logistics effectively.	0 (0%)	0 (0%)	30 (20.7%)	65 (44.8%)	50 (34.5%)	4.14	.73
Weighted Average mean							4.17	0.73

SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree
Source: SPSS V-27 Output (2025)

As shown in Table 14, the overall mean score for items 8 to 15—used to assess the warehouse management dimension under humanitarian logistics practices—was 4.17, which exceeds the benchmark threshold of 3.79. The associated standard deviation of 0.73 indicates a relatively moderate dispersion in responses. This suggests that employees of the TRCS (Tigray Red Cross Society) generally hold a favorable and consistent perception of the organization's warehouse management practices within the context of humanitarian logistics.

Table 15: Descriptive of Inventory Management Practice

No	Inventory management	Frequency					Mean	SD
		1 SD	2 D	3 N	4 A	5 SA		
16	There is pre-positioning of inventory and optimal allocation of resources to respond to any disaster anywhere.	0 (0%)	53 (36.6%)	24 (16.6%)	59 (40.7%)	9 (6.2%)	3.17	1.00
17	There is a practical analysis of supply and demand, forecasting the risks of either supply or demand being too high or too low.	0 (0%)	0 (0%)	54 (37.2%)	76 (52.4%)	15 (10.3%)	3.73	.64
18	There is a practice of allocating time and money to inventory using activity-based costing.	0 (0%)	0 (0%)	51 (35.2%)	85 (58.6%)	9 (6.2%)	3.71	.58
19	There is a practice of making active decisions in the prioritization of goods needed.	21 (14.5%)	8 (5.5%)	0 (0%)	63 (43.4%)	53 (36.6%)	3.82	1.37
20	The inventory records always accurately reflect actual stock levels.	0 (0%)	8 (5.5%)	36 (24.8%)	54 (37.2%)	47 (32.4%)	3.97	.89
21	There is a frequently conducted physical inventory count to verify the accuracy of stock records.	0 (0%)	20 (13.8%)	0 (%0)	69 (47.6%)	56 (38.6%)	4.11	.97
22	The inventory management system helps prevent shortages or overstocking of humanitarian relief supplies.	0 (0%)	0 (0%)	10 (6.9%)	77 (53.1%)	58 (40%)	4.33	.60
23	There is an effective track of the expiry dates and shelf life of inventory items to avoid wastage.	0 (0%)	0 (0%)	54 (37.2%)	28 (19.3%)	63 (43.4%)	4.06	.89
Weighted Average Mean							3.86	0.87
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree Source: SPSS V-27 output (2025)								

As presented in Table 15, items 16 to 23 evaluated the inventory management practices applied in the context of humanitarian logistics. The findings reveal an average mean score of 3.86 with a standard deviation of 0.87. This mean value, which is slightly above the neutral benchmark of

3.79, indicates that respondents generally hold a favorable perception of the organization's inventory management practices. It suggests that core aspects such as stock control, storage procedures, replenishment systems, and inventory tracking mechanisms are seen as reasonably effective. Furthermore, the relatively moderate standard deviation signifies a fair degree of consensus among respondents, pointing to a consistent experience or understanding of inventory processes within the organization. This level of agreement enhances the credibility of the data and underscores that, while there may still be areas for improvement, inventory management is perceived as a functional and reliable component of humanitarian logistics operations.

Table 16: Descriptive Statistics of Transportation and Distribution Management Practice

No	Transportation and distribution management	Frequency					Mean	SD
		1 SD	2 D	3 N	4 A	5 SA		
24	There is a practice of careful consideration and measures for evaluating transport performance when choosing a carrier.	0 (0%)	8 (5.5%)	10 (6.9%)	74 (51%)	53 (36.6%)	4.19	.79
25	There is a practice of designing the flow of materials for distribution, keeping in mind the people who require them.	0 (0%)	0 (0%)	31 (21.4%)	47 (32.4%)	67 (46.2%)	4.25	.79
26	There is a practice of distributing supplies from central distribution centers.	0 (0%)	0 (0%)	0 (0%)	121 (83.4%)	24 (16.6%)	4.17	.37
27	There is a practice of using different distribution points to deliver supplies to the needy.	0 (0%)	0 (0%)	23 (15.9%)	63 (43.4%)	59 (40.7%)	4.25	.71
28	The organization effectively plans transport routes to ensure the timely delivery of humanitarian relief supplies.	0 (0%)	29 (20%)	24 (16.6%)	54 (37.2%)	38 (26.2%)	3.70	1.07
29	There is a regular track and monitor shipments to maintain visibility of humanitarian goods in transit.	0 (0%)	18 (12.4%)	65 (44.8%)	24 (16.6%)	38 (26.2%)	3.57	1.01
30	The transport fleet (vehicles and equipment) is adequate, reliable, and maintained regularly for humanitarian operations.	0 (0%)	10 (6.9%)	33 (22.8%)	32 (22.1%)	70 (48.3%)	4.12	.99
31	The distribution practices in the organization ensure that humanitarian aid reaches beneficiaries efficiently and accurately.	0 (0%)	10 (6.9%)	24 (16.6%)	64 (44.1%)	47 (32.4%)	4.02	.88
32	Transport and distribution staff in the organization have sufficient skills and training to manage humanitarian logistics effectively	0 (0%)	10 (6.9%)	24 (39.3%)	57 (39.3%)	54 (37.2%)	4.07	.90

Weighted Average Mean	4.04	0.83
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree		
Source: SPSS V-27 output (2025)		

As shown in Table 16, the weighted average score for items 24 to 32—measuring transportation and distribution management within the context of humanitarian logistics practices—was 4.04, with a standard deviation of 0.83. This relatively high mean indicates that respondents generally perceived the organization's transportation and distribution practices in a positive light. The moderate standard deviation suggests a fair level of consistency in responses, implying that most respondents shared a similar view regarding the effectiveness of transportation and distribution management. Overall, this dimension was rated as strongly practiced, reflecting a favorable implementation of logistics strategies in the organization.

4.2.1.2 Internal Factors affecting Humanitarian Logistics performance

As illustrated in Tables 17 through 20, the internal factors influencing humanitarian logistics performance were assessed using four key measures: Participation and Involvement of Logistics Staff (Mean = 3.82, SD = 0.81), Information and Technological Factors (Mean = 3.45, SD = 1.03), Professionals-Related Factors (Mean = 3.78, SD = 1.03), and Coordination and Collaboration Factors (Mean = 4.19, SD = 0.71). The overall grand mean of these internal factors was calculated to be 3.81 with a standard deviation of 0.89, exceeding the threshold mean of 3.79, which indicates a high overall influence of internal factors on logistics performance within the organization.

The findings suggest that various internal factors significantly impact humanitarian logistics performance within the Red Cross Society. Notably, professional staff are actively involved in decision-making processes, feel their expertise is valued, and operate within a technological infrastructure that supports accurate and timely information dissemination. Furthermore, logistics personnel possess the requisite experience and skills to manage tasks efficiently, adhere to best practices and standards, and maintain effective communication and collaboration both internally and with external partners.

Staff members report sharing resources such as warehouses and field sites with relevant stakeholders to enhance responsiveness. There is also evidence of collaboration with NGOs and other partners for joint logistics operations. The organization regularly shares accurate and timely logistics information with partners and coordinates logistics activities effectively with other humanitarian agencies and government bodies. Collaborative meetings among logistics

stakeholders occur frequently, reducing duplication and operational gaps while maintaining open communication channels that enhance coordination during humanitarian responses.

In addition to the strong influences noted above, the study also identified moderate effects in several areas. These include the functioning of standby assessment teams, recognition of logistics staff contributions, opportunities for feedback and improvement, provision of career development and training, and the availability of reliable information systems. While real-time information is available and accessible to logistics staff, the degree of impact was moderate. Similarly, the use of automated systems and mechanisms, the frequency of professional development training, and the team's overall problem-solving capabilities also exhibited moderate influence. Staff motivation, commitment to humanitarian goals, and ability to utilize relevant technologies were likewise found to be moderately effective. There was also a moderate capability among staff in terms of coordination skills, experience, attitude, and teamwork, coupled with relatively low staff turnover. However, certain technological aspects showed the weakest influence on logistics performance. Limited use of advanced tools like tracking systems, GIS, and logistics software, along with inadequate real-time tracking and poor IT training for staff, contributed to this. Mean scores below 3.40 highlight these as key areas needing improvement.

Table 17: Descriptive Statistics of Participation and Involvement of Logistics Staff

No	Participation and Involvement of Logistics Staff	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
1	Logistics staff are regularly involved in decision-making processes related to humanitarian supply chain activities.	0 (0%)	0 (0%)	31 (21.4%)	85 (58.6%)	29 (20%)	3.99	0.65
2	There is participation of logistics staff in humanitarian need assessments.	0 (0%)	21 (14.5%)	9 (6.2%)	86 (59.3%)	29 (20%)	3.85	0.91
3	There is a standby assessment team in the logistics unit to determine the needs of the beneficiaries.	0 (0%)	8 (5.5%)	91 (62.8%)	10 (6.9%)	36 (24.8%)	3.51	0.93
4	There are active program staff who determine the supplies that need to be acquired to provide relief services.	0 (0%)	8 (5.5%)	0 (%)	108 (74.5%)	29 (20%)	4.09	0.65
5	Logistics staff in the organization receive adequate recognition for their contributions during humanitarian operations.	0 (0%)	8 (5.5%)	44 (30.3%)	69 (47.6%)	24 (16.6%)	3.75	0.79
6	The organization provides opportunities for logistics staff to give feedback and suggest	0 (0%)	18 (12.4%)	20 (13.8%)	92 (63.4%)	15 (10.3%)	3.72	0.81

	improvements in humanitarian logistics practices							
7	Logistics staff members feel their expertise is valued and respected within our humanitarian logistics team.	0 (0%)	8 (5.5%)	20 (13.8%)	72 (49.7%)	45 (31%)	4.06	0.82
8	The organization provides sufficient training and career development opportunities for logistics staff involved in humanitarian activities.	0 (0%)	18 (12.4%)	44 (30.3%)	63 (43.4%)	20 (13.8%)	3.59	0.88
Weighted Average mean							3.82	0.81
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
Source: SPSS V-27 output (2025)								

As presented in Table 17, items 1 through 8 were used to assess the participation and involvement of logistics staff, categorized under internal factors affecting logistics performance. The analysis revealed an overall mean score of 3.82 with a standard deviation of 0.81, indicating a relatively high level of agreement among respondents. This suggests that logistics personnel generally perceive their participation and involvement as having a significant positive impact on logistics performance. The consistency of responses, as reflected in the standard deviation, also implies a shared perception across the surveyed group regarding their active engagement in the logistics processes.

Table 18: Descriptive Statistics of Information Technology Factor on HLP

No	Information and Technological Factors	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
9	The organization has an information technology setup that is able to disseminate accurate and timely information.	0 (0%)	18 (12.4%)	24 (16.6%)	36 (24.8%)	67 (46.2%)	4.05	1.06
10	The organization has reliable information systems to support humanitarian logistics effectively.	0 (0%)	18 (12.4%)	35 (24.1%)	83 (57.2%)	9 (6.2%)	3.57	0.79
11	The organization consistently uses technology (e.g., tracking systems, GIS, software solutions) to enhance visibility and traceability in humanitarian logistics	0 (0%)	71 (49%)	50 (34.5%)	0 (0%)	24 (16.6%)	2.84	1.07
12	There is organized technological support for updates and tracking of goods arriving in the field, which positively affects the agility of humanitarian logistics performance.	0 (0%)	71 (49%)	38 (26.2%)	21 (14.5%)	15 (10.3%)	2.86	1.02
13	Real-time information is readily available and accessible to all logistics personnel involved in humanitarian operations.	0 (0%)	42 (29)	20 (13.8%)	59 (40.7%)	24 (16.6%)	3.45	1.08
14	There are automated systems and mechanisms that affect the	0 (0%)	18 (12.4%)	62 (42.8%)	29 (20%)	36 (24.8%)	3.57	0.99

	reliability of humanitarian logistics performance.							
15	The technological infrastructure within the organization adequately supports effective decision-making during humanitarian emergencies.	0 (0%)	18 (12.4%)	18 (12.4%)	53 (36.6%)	56 (38.6%)	4.01	1.01
16	Logistics staff receive adequate training and support in the use of information technology systems deployed in humanitarian logistics.	0 (0%)	62 (42.8%)	18 (12.4%)	29 (20%)	36 (24.8%)	3.27	1.25
Weighted Average Mean							3.45	1.03
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
Source: SPSS V-27 output (2025)								

Table 18 presents items 9 to 16, which address information and technological factors as internal elements influencing logistics performance. The analysis yields a grand mean of 3.45 and a standard deviation of 1.03, reflecting a moderate level of agreement among employees regarding the effectiveness of information and technology use within the organization. This indicates that, although such systems are present, their accessibility, integration, or utilization may be inconsistent, potentially limiting their impact on logistics performance. The moderate perception underscores an area for strategic enhancement to improve operational efficiency and effectiveness.

Table 19: Descriptive Statistics of Professional-Related Factors on HLP

No	Professionals Related Factors	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
17	The logistics professionals of the organization have adequate experience and expertise to effectively manage humanitarian logistics operations	0 (0%)	18 (12.4%)	20 (13.8%)	62 (42.8%)	45 (31%)	3.92	0.97
18	Logistics professionals in the organization are provided with regular training to update their skills and knowledge.	0 (0%)	38 (26.2%)	42 (29%)	29 (20%)	36 (24.8%)	3.43	1.13
19	The logistics team demonstrates strong problem-solving capabilities during humanitarian emergencies.	0 (0%)	18 (12.4%)	41 (28.3%)	62 (42.8%)	29 (20%)	3.63	0.90
20	The workload of logistics professionals in the organization is manageable, allowing them to perform their duties effectively.	0 (0%)	18 (26.2%)	21 (14.5%)	77 (53.1%)	29 (20%)	3.81	0.90
21	Logistics professionals in the organization are highly motivated and committed to achieving humanitarian logistics goals	0 (0%)	38 (26.2%)	15 (10.3%)	63 (43.4%)	29 (20%)	3.57	1.09
22	Logistics professionals of the organization consistently follow the best practices and standards in humanitarian logistics management.	0 (0%)	38 (26.2%)	0 (0%)	42 (29%)	65 (44.8%)	3.92	1.23

23	Logistics staff of the organization are capable of effectively using technology and information systems relevant to humanitarian operations.	0 (0%)	42 (29%)	20 (13.8%)	38 (26.2%)	45 (31%)	3.59	1.21
24	Logistics professionals of the organization effectively communicate and collaborate within our team and with external partners.	0 (0%)	10 (6.9%)	0 (0%)	59 (40.6%)	76 (52.4%)	4.39	0.81
Weighted Average Mean							3.78	1.03
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
Source: SPSS V-27 output (2025)								

Table 19 indicates that respondents view professional-related factors as having a moderate influence on humanitarian logistics practices. This is demonstrated by an average mean score of 3.78 and a standard deviation of 1.03. Although this mean is marginally below the reference value of 3.79, it still reflects a general acknowledgment of the relevance of these factors. However, the relatively high standard deviation points to notable differences in perceptions among respondents, suggesting that opinions vary widely on the extent to which professional-related factors impact logistics performance.

Table 20: Descriptive Statistics of the Coordination and Collaboration Factor on HLP

No	Coordination and Collaboration Factors	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
25	The organization shares resources such as field sites and warehouses with relevant stakeholders to facilitate the responsiveness of humanitarian logistics performance.	0 (0%)	0 (0%)	29 (20%)	49 (33.8%)	67 (46.2%)	4.26	0.77
26	There is an ability to work together with NGOs or other partners for joint logistics set up & implementation in the organization.	0 (0%)	0 (0%)	24 (16.6%)	47 (32.4%)	74 (51%)	4.34	0.75
27	There is a capability among staff to carry out coordination efforts (i.e. skills, attitude, knowledge, experience).	0 (0%)	28 (19.3%)	10 (6.9%)	77 (53.1%)	30 (20.7%)	3.75	0.99
28	The organization regularly shares timely and accurate logistics information with partners involved in humanitarian response efforts.	0 (0%)	0 (0%)	29 (20%)	71 (49%)	45 (31%)	4.11	0.71
29	The organization effectively coordinates humanitarian logistics activities with other relief organizations and government agencies	0 (0%)	0 (0%)	15 (10.3%)	71 (49%)	59 (40.7%)	4.30	0.65
30	There is a consistent coordination effort in the humanitarian logistics network.	0 (0%)	0 (0%)	19 (13.1%)	81 (55.9%)	45 (31%)	4.18	0.64

31	Collaborative meetings among humanitarian logistics stakeholders frequently occur, helping to avoid duplication and gaps in relief operations.	0 (0%)	0 (0%)	9 (6.2%)	80 (55.2%)	56 (38.6%)	4.32	0.59
32	The organization maintains effective communication channels that facilitate coordination among logistics teams during humanitarian operations.	0 (0%)	0 (0%)	25 (17.2%)	50 (34.5%)	70 (48.3%)	4.31	0.59
Weighted average mean							4.19	0.71
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
<i>Source: SPSS V-27 output (2025)</i>								

The respondents from the TRCS indicated that coordination and collaboration—classified as an internal factor influencing logistics performance—had a grand mean score of 4.19 with a standard deviation of 0.71. This relatively high mean suggests that employees perceive coordination and collaboration within their organization as strong and effective. Furthermore, the low standard deviation indicates a consistent agreement among respondents. Overall, this finding implies that enhanced coordination and collaboration significantly contribute to improving logistics performance within the TRCS.

4.2.1.3 External Factors Affecting Humanitarian Logistics Performance

The descriptive statistical analysis was conducted to assess the extent to which external factors influence humanitarian logistics performance within the TRCS. The analysis covered four key dimensions: Legal and Political Factors (Mean = 3.99, SD = 0.87), Socio-Economic Challenges factor (Mean = 3.89, SD = 0.91), Infrastructural Factors (Mean = 3.77, SD = 0.97), and Financial Resources and Funding factor (Mean = 3.58, SD = 1.17). The overall weighted average mean for these external factors was 3.81 with a standard deviation of 0.98. This result suggests that respondents perceive external factors as having a significant influence on the performance of humanitarian logistics. Since the grand mean (3.81) exceeds the commonly accepted threshold of 3.79, it indicates a generally high level of agreement regarding the impact of these external conditions on logistics operations.

A closer look at individual items within these dimensions further highlights their effectiveness. Government policies and regulations are seen as facilitating the smooth entry and distribution of humanitarian aid. Governmental support is considered to positively enhance the agility of humanitarian logistics performance. Legal procedures are perceived to effectively support logistics activities during humanitarian crises. Adequate and stable electricity and communication infrastructure is noted to contribute positively to logistics agility. Transparent financial

management procedures within the organization ensure accountability for funds allocated to logistics operations.

High levels of poverty and unemployment among beneficiaries are recognized as complicating factors in the effective implementation of humanitarian logistics. All these individual items recorded mean scores greater than the threshold of 3.79, indicating that they exert a relatively strong influence on the organization's logistics performance. Overall, the analysis confirms that external factors—especially legal frameworks, socio-economic conditions, and infrastructure—play a critical role in shaping the effectiveness of humanitarian logistics in the TRCS context.

Table 21: Descriptive of Legal and Political Factor Impact on HLP

No	Legal and Political Factors	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
1	The organization experiences minimal bureaucratic delays during humanitarian operations.	0 (0%)	10 (6.9%)	20 (13.8%)	82 (56.6%)	33 (22.8%)	3.95	0.80
2	Government policies and regulations facilitate the smooth entry and distribution of humanitarian relief supplies	0 (0%)	10 (6.9%)	0 (0%)	68 (46.9%)	67 (46.2%)	4.32	0.79
3	There is available government support that positively affects the agility of humanitarian logistics performance.	0 (0%)	8 (5.5%)	0 (0%)	99 (68.3%)	38 (26.2%)	4.15	0.68
4	Political stability in the operational area positively influences the efficiency of humanitarian logistics.	0 (0%)	20 (13.8%)	0 (0%)	87 (60%)	38 (26.2%)	3.99	0.91
5	Legal procedures support the logistics activities of the organization during humanitarian crises	0 (0%)	8 (5.5%)	0 (0%)	99 (68.3%)	38 (26.2%)	4.15	0.68
6	There are no security challenges that affect the free operation in the affected areas.	0 (0%)	51 (35.2%)	9 (6.2%)	29 (20%)	56 (38.6%)	3.62	1.31
7	There are no restrictions on the entry of staff and goods from abroad that improve the cost and asset utilization of humanitarian logistics performance.	0 (0%)	8 (5.5%)	54 (37.2%)	34 (23.4%)	49 (33.8%)	3.86	0.96
8	The organization effectively manages political and legal challenges that could affect the timely delivery of humanitarian assistance.	0 (0%)	0 (0%)	55 (37.9%)	52 (35.9%)	38 (26.6%)	3.88	0.79
Weighted average mean							3.99	0.87
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								

Source: SPSS V-27 output (2025)

Items 1 through 8 in Table 21 measure the legal and political dimension under the broader category of external factors affecting logistics performance. The calculated average mean of these items is 3.99, which exceeds the benchmark onset mean of 3.79, indicating a generally high level of agreement among respondents regarding the impact of legal and political factors. The standard deviation of 0.87 suggests a moderate level of variability in the responses. Overall, the findings reveal that respondents perceive legal and political factors as having a significant influence on logistics performance within the organization.

Table 22: Descriptive Statistics of Socioeconomic Factor Impact on Logistics Performance

No	The Socio-Economic Challenges Factor	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
9	There is support from the local community and beneficiaries that positively affects the agility of humanitarian logistics performance.	0 (0%)	0 (0%)	56 (38.6%)	60 (41.4%)	29 (20%)	3.81	0.75
10	Uncertainty in demand and supply negatively affects the reliability of humanitarian logistics performance.	10 (6.9%)	8 (5.5%)	21 (14.5%)	44 (30.3%)	62 (42.8%)	3.97	1.19
11	Incompatibility with the culture and language of the affected area negatively affects the responsiveness of humanitarian logistics performance.	0 (0%)	29 (20%)	19 (13.1%)	73 (50.3%)	24 (16.6%)	3.63	0.98
12	Socio-economic conditions in the region significantly affect the organization's ability to efficiently deliver humanitarian aid.	9 (6.2%)	10 (6.9%)	9 (6.2%)	64 (41.1%)	53 (36.6%)	3.98	1.13
13	There are high levels of poverty and unemployment among beneficiaries that complicate the organization's humanitarian logistics operations.	0 (0%)	0 (0%)	18 (12.4%)	103 (71%)	24 (16.6%)	4.04	0.54
14	There are local economic instabilities that lead to increased logistics costs and operational complexity in humanitarian efforts.	0 (0%)	28 (19.3%)	9 (6.2%)	69 (47.6%)	39 (26.9%)	3.82	1.04
15	Humanitarian logistics operations effectively consider and address socio-economic barriers faced by beneficiaries.	0 (0%)	0 (0%)	50 (34.5%)	50 (34.5%)	45 (31%)	3.97	0.81
16	Social and economic disparities within the affected communities directly impact the speed and effectiveness of our relief distribution.	0 (0%)	0 (0%)	62 (42.8%)	39 (26.9%)	44 (30.3%)	3.88	0.85s
Weighted average mean							3.89	0.91

SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree

Source: SPSS V-27 output (2025)

Items 9 to 16, which pertain to external factors influencing logistics performance, yielded a grand mean score of 3.89 with a standard deviation of 0.91. This result indicates that respondents perceive a relatively high level of influence exerted by socio-economic challenges on logistics performance. The relatively high mean suggests consistent agreement among participants regarding the impact of these external factors, while the standard deviation reflects moderate variability in perceptions, implying that while most respondents recognize the significance of these challenges, the degree of perceived impact may vary slightly across individuals.

Table 23: Descriptive Statistics of Infrastructure Factor Impact on Logistics Performance

No	Infrastructural Factors	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
17	There are alternative-weather roads for use to field sites when main roads are damaged or blocked that enhance the responsiveness of humanitarian logistics performance.	0 (0%)	36 (24.8%)	24 (16.6%)	50 (34.5%)	35 (24.1%)	3.58	1.11
18	The transportation infrastructure (e.g., roads, airports, ports) adequately supports the timely distribution of humanitarian relief	0 (0%)	42 (29%)	20 (13.8%)	18 (12.4%)	65 (44.8%)	3.73	1.29
19	There are adequate and stable electricity and communication utilities that positively affect the agility of humanitarian logistics performance.	0 (0%)	8 (5.5%)	0 (0%)	108 (74.5%)	29 (20%)	4.09	0.65
20	Absence of Good communication and coordination between the supply chain partners negatively affects humanitarian logistics performance.	0 (0%)	8 (5.5%)	42 (29%)	60 (41.4%)	35 (24.1%)	3.84	0.86
21	Storage and warehouse facilities available in the region meet the capacity and quality requirements for humanitarian operations.	0 (0%)	18 (12.4%)	42 (29%)	50 (34.5%)	35 (24.1%)	3.70	0.97
22	Reliable communication infrastructure is available to facilitate effective coordination during humanitarian logistics activities.	0 (0%)	8 (5.5%)	43 (29.7%)	50 (34.5%)	44 (30.3%)	3.90	0.90
23	The organization's humanitarian logistics operations are not frequently disrupted due to poor or damaged infrastructure.	0 (0%)	15 (10.3%)	33 (22.8%)	77 (53.1%)	20 (13.8%)	3.70	0.83

24	Existing infrastructure conditions allow the organization to rapidly reach affected communities during humanitarian emergencies	0 (0%)	42 (29%)	20 (13.8%)	39 (26.9%)	44 (30.3%)	3.59	1.12
Weighted average mean							3.77	0.97
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
Source: SPSS V-27 output (2025)								

Infrastructural challenges, examined as one of the external factors in the study, were perceived by respondents to have a moderate impact on humanitarian logistics performance. This is evidenced by an average mean score of 3.77, which falls within the 3.40 to 3.79 range, indicating a moderate level of influence. While issues such as inadequate road networks, poor transportation systems, and limited access to remote areas are present, they are not viewed as major obstacles. Instead, they are seen as manageable constraints that can be navigated with appropriate adjustments. This perception may reflect institutional adaptability or the use of strategies like partnerships with local transport providers, decentralized logistics, or technology-driven route optimization. Although infrastructure remains a concern, it does not severely disrupt the efficiency or continuity of operations. Nonetheless, infrastructure improvements could further enhance logistical effectiveness, even though current conditions allow for reasonably effective performance.

Table 24: Descriptive of Financial and Funding Resource Factor Impact on LP

No	Financial Resources and Funding Factors	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
25	The organization consistently receives timely financial resources to support humanitarian logistics operations.	0 (0%)	17 (11.7%)	53 (36.6%)	39 (26.9%)	36 (24.8%)	3.65	0.98
26	There is an organizational ability to use the obtained funds right away that affects the agility of humanitarian logistics performance.	0 (0%)	8 (5.5%)	44 (30.3%)	84 (57.9%)	9 (6.2%)	3.65	0.68
27	Enough funds are allocated for logistic strategic preparedness that affects the responsiveness of humanitarian logistics performance.	0 (0%)	51 (35.2%)	38 (26.2%)	20 (13.8%)	36 (24.8%)	3.28	1.18
28	Available funding is sufficient to meet the logistics needs during humanitarian emergencies.	0 (0%)	52 (35.9%)	18 (12.4%)	39 (26.9%)	36 (24.8%)	3.41	1.21
29	There are no financial constraints that limit the organization's ability to respond rapidly to humanitarian crises.	10 (6.9%)	50 (34.5%)	29 (20%)	20 (13.8%)	36 (24.8%)	3.15	1.32

30	The organization effectively allocates available financial resources to ensure optimal logistics performance.	10 (6.9%)	17 (11.7%)	0 (0%)	74 (51%)	44 (30.3%)	3.86	1.77
31	The organization has reliable financial mechanisms in place to quickly access emergency funds when required for humanitarian logistics	10 (6.9%)	35 (24.1%)	9 (6.2%)	47 (32.4%)	44 (30.3%)	3.55	1.33
32	The organization has transparent procedures to manage and account for funding allocated to humanitarian logistics activities.	0 (0%)	10 (6.9%)	24 (16.6%)	57 (39.3%)	54 (37.2%)	4.07	0.90
Weighted average mean							3.58	1.17
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								

Source: SPSS V-27 output (2025)

The financial resources and funding dimension were perceived by respondents as having a moderate effect. This assessment is based on the computed average mean score of 3.58, which falls within the moderate range of 3.40 to 3.79. The result suggests that while financial resources are recognized as important, they are not viewed as the most critical factor influencing the performance of humanitarian logistics operations. This moderate perception may reflect constraints in consistent funding, budget allocation processes, or limited access to diversified financial sources.

4.2.1.4 Level of Humanitarian Logistics Performance in TRCS

The humanitarian logistics performance of the Tigray Red Cross Society is significantly influenced by its logistics practices, operational challenges, and the effectiveness of its management frameworks. Improving logistics performance requires addressing inefficiencies by focusing on key dimensions such as reliability, responsiveness, cost efficiency, agility, and asset management. While TRCS demonstrates notable strengths in procurement and warehouse management, its overall logistics effectiveness is undermined by weak inventory management practices, as well as persistent external challenges that disrupt supply chain continuity and service delivery.

The mission of the organization—to alleviate human suffering and save lives through humanitarian logistics—underscores the critical need for a robust and responsive logistics system (Selemawit Gebreyesus, 2020). Findings from the study indicate a high overall perception of logistics performance, with a grand mean score of 4.01. This suggests that respondents perceive TRCS as performing well across its logistics operations. To validate this overall performance, the study further analyzed five key logistics performance dimensions. The mean scores reported by

respondents for each dimension are Reliability (3.97), Agility (3.89), Cost efficiency (4.18), Responsiveness (3.95), and Asset management (4.02)

All the reported scores surpass the baseline mean value of 3.79, indicating that TRCS performs above average across all assessed areas. These results suggest that the organization's logistics systems are generally effective and positively perceived by stakeholders. Furthermore, the findings are consistent with previous research by Selemawit Gebreyesus (2020), which emphasized that systematic measurement and continuous improvement efforts significantly enhance humanitarian logistics performance. Detailed evidence supporting these conclusions is presented in Tables 25 through 29, reinforcing the importance of a strategic approach in optimizing logistics outcomes.

Table 25: Level of Reliability Dimension on Humanitarian Logistics Performance

No	Reliability	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
1	The organization consistently delivers humanitarian aid to beneficiaries within the promised or expected timeframe	0 (0%)	15 (10.3%)	45 (31%)	37 (25.5%)	48 (33.1%)	3.81	1.04
2	All the supplies are delivered at the right time so that beneficiaries are properly served.	10 (6.9%)	0 (0%)	44 (30.3%)	41 (28.3%)	50 (34.5%)	3.83	1.12
3	The right supplies are delivered in the right quantity with all the necessary documentation for the requested demand.	0 (0%)	10 (6.9%)	20 (13.8%)	70 (48.3%)	45 (31%)	4.03	0.85
4	The organization's logistics systems and processes are dependable, enabling consistent delivery of humanitarian assistance even under challenging conditions.	0 (0%)	0 (0%)	0 (0%)	100 (69%)	45 (31%)	4.31	0.46
5	The organization reliably maintains accurate and complete records of logistics activities for performance assessment.	0 (0%)	0 (0%)	36 (24.8%)	71 (49%)	38 (26.1%)	4.01	0.72
6	Beneficiaries regularly receive the correct quantities and types of humanitarian supplies without errors.	0 (0%)	0 (0%)	35 (24.1%)	60 (41.4%)	50 (34.5%)	4.10	0.76
7	The organization's logistics team consistently meets established standards and expectations during humanitarian responses	0 (0%)	0 (0%)	36 (24.8%)	80 (55.2%)	29 (20%)	3.95	0.67
8	The organization's humanitarian logistics operations rarely experience	0 (0%)	8 (5.5%)	51 (35.2%)	57 (39.3%)	29 (20%)	3.74	0.84

unexpected delays or disruptions.

Weighted Average Mean					3.97	0.81
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree						

Source: SPSS V-27 output (2025)

The items numbered 1 to 8 in the survey correspond to the *reliability* dimension of logistics performance. Based on the respondents' perceptions, this dimension demonstrated a relatively high level of agreement. Specifically, the average mean score reported in Table 25 is 3.97, which is notably higher than the threshold value of 3.79. This suggests that respondents generally perceive the reliability of logistics operations to be above average, indicating consistent and dependable service delivery. Such a result reflects positively on the organization's ability to fulfill logistics commitments in a timely and accurate manner, a critical component of overall humanitarian logistics performance.

Table 26: Level of Agility Dimension on Humanitarian Logistics Performance

No	Agility (flexibility)	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
9	The type of supplies required may change from the initial request during assessment and can still be absorbed by TRCS without any problem.	0 (0%)	47 (32.4%)	30 (20.7%)	53 (36.6%)	15 (10.3%)	3.25	1.02
10	There is easy accommodation for any change in the types of relief logistics supplies.	0 (0%)	8 (5.5%)	42 (29%)	75 (51.7%)	20 (13.8%)	3.74	0.76
11	The volume of supplies required may change from the initial request during the assessment, and can still be engaged without any problem.	0 (0%)	28 (19.3%)	42 (29%)	51 (35.2%)	24 (16.6%)	3.49	0.98
12	The organization's humanitarian logistics system can quickly respond and adapt to sudden changes during crises	0 (0%)	8 (5.5%)	29 (20%)	72 (49.7%)	36 (24.8%)	3.94	0.82
13	The organization is capable of rapidly adjusting logistics plans in response to new information or unforeseen challenges.	0 (0%)	0 (0%)	36 (24.8%)	60 (41.4%)	49 (33.8%)	4.09	0.76
14	The organization maintains flexibility in sourcing and delivering supplies to	0 (0%)	0 (0%)	33 (22.8%)	62 (42.8%)	50 (34.5%)	4.12	0.75

	address shifting humanitarian needs.							
15	The organization frequently demonstrates the ability to reallocate resources promptly as humanitarian conditions evolve.	0 (0%)	0 (0%)	24 (16.6%)	65 (44.8%)	56 (38.6%)	4.22	0.71
16	The logistics team efficiently handles unexpected demands or disruptions in humanitarian operations.	0 (0%)	8 (5.5%)	0 (0%)	72 (49.7%)	65 (44.4%)	4.34	0.75
Weighted Average Mean							3.89	0.82
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								

Source: SPSS V-27 output (2025)

As indicated in Table 26, Items 9 through 16 were designed to measure the organizational agility, specifically focusing on its flexibility in responding to dynamic conditions. The aggregated mean score for these items is 3.89, which is higher than the established threshold value of 3.79. This result signifies a relatively strong perception of agility among the respondents. The higher-than-threshold mean suggests that the organization is perceived as capable of adapting to changing environments, adjusting its processes, and responding effectively to emerging challenges. This positive assessment reflects the organization's capacity for flexibility and responsiveness, both of which are critical in humanitarian logistics operations where conditions are often unpredictable and time-sensitive.

Table 27: Level of Cost Dimension on Humanitarian LP

No	Cost	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
17	There are systems designed to ensure that optimum costs are achieved.	0 (0%)	0 (0%)	15 (10.3%)	90 (62.1%)	40 (27.6%)	4.17	0.59
18	Supplies are always distributed with optimal cost considerations.	0 (0%)	0 (0%)	0 (0%)	95 (85.5%)	50 (34.5%)	4.34	0.48
19	There is good management of all costs that arise from its activities in supplying and distributing materials where needed.	0 (0%)	0 (0%)	0 (0%)	83 (57.2%)	62 (42.8%)	4.43	0.49
20	The recognition of cost management and optimization is considered an important issue in its operations.	0 (0%)	0 (0%)	0 (0%)	109 (75.2%)	36 (24.8%)	4.25	0.43

21	The organization effectively manages logistics costs while maintaining high-quality humanitarian assistance.	0 (0%)	0 (0%)	0 (0%)	101 (69.3%)	44 (30.3%)	4.30	0.46
22	The organization regularly evaluates logistics expenditures to ensure cost-effectiveness in humanitarian operations.	0 (0%)	0 (0%)	0 (0%)	124 (85.5%)	21 (14.5%)	4.14	0.35
23	The organization's logistics practices minimize unnecessary costs, such as wastage, delays, or duplication, during humanitarian response.	0 (0%)	0 (0%)	24 (16.6%)	83 (57.2%)	38 (26.2%)	4.10	0.65
24	The organization's logistics decisions prioritize cost-efficient approaches without compromising the timely delivery of humanitarian aid	0 (0%)	20 (13.8%)	36 (24.8%)	51 (35.2%)	38 (26.2%)	3.74	1.00
Weighted Average Mean							4.18	0.56
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
Source: SPSS V-27 output (2025)								

Regarding the cost dimension, items 17 through 24 were used as measurement indicators. These items collectively yielded an average mean score of 4.18, which is notably higher than the overall onset means for the humanitarian logistics dimensions. This relatively elevated score suggests that cost-related practices are being implemented effectively within the TRCS.

The high mean value reflects a strong performance in managing costs, indicating that TRCS is likely optimizing its resource utilization, maintaining budgetary discipline, and possibly achieving cost-efficiency in its logistics operations. Among all the assessed dimensions, cost emerged as the highest-performing area, underscoring the organization's emphasis on financial control and cost-effectiveness in humanitarian logistics. This may further imply the presence of robust procurement procedures, strategic supplier engagement, and efficient allocation of logistics funds.

Table 28: Level of Responsiveness Dimension on the HLP

No	Responsiveness	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		
25	There is a decision at all levels to advance logistics operations immediately.	0 (0%)	8 (5.5%)	33 (22.8%)	50 (34.5%)	54 (37.2%)	4.03	0.91
26	All requested demands are delivered at the right time.	0 (0%)	0 (0%)	45 (31%)	56 (38.6%)	44 (30.3%)	3.99	0.79

27	There is an integrated relationship with suppliers and third-party service providers to ensure that TRCS is responsive to requests.	0 (0%)	10 (6.9%)	0 (0%)	90 (62.1%)	45 (31%)	4.17	0.75
28	The organization rapidly initiates logistics activities in response to humanitarian emergencies.	0 (0%)	10 (6.9%)	45 (31%)	61 (42.1%)	29 (20%)	3.75	0.85
29	The organization consistently meets urgent requests for relief supplies within an acceptable timeframe.	0 (0%)	8 (5.5%)	65 (44.8%)	48 (33.1%)	24 (16.6%)	3.61	0.83
30	The organization's logistics team effectively anticipates and addresses changing beneficiary needs during emergencies.	0 (0%)	10 (6.9%)	0 (0%)	111 (76.6%)	24 (16.6%)	4.03	0.67
31	Decision-making processes in the organization's humanitarian logistics operations allow for swift action during crises.	0 (0%)	8 (5.5%)	24 (16.6%)	69 (47.6%)	44 (30.3%)	4.03	0.83
32	The organization proactively prepares and maintains resources to ensure quick logistics responses to humanitarian demands.	0 (0%)	0 (0%)	36 (24.8%)	80 (55.2%)	29 (20%)	3.95	0.67
Weighted Average Mean							3.95	0.79
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								
<i>Source: SPSS V-27 output (2025)</i>								

As presented in Table 28, the responsiveness dimension—one of the key components under the logistics performance measures—achieved an average mean score of 3.95. This value exceeds the established threshold mean of 3.79, indicating a positive perception of responsiveness performance within the organization. The result suggests that the organization is generally effective in reacting promptly to logistics demands, addressing emergencies, and adapting to dynamic operational conditions. A higher-than-threshold mean reflects that staff and stakeholders perceive the organization's logistics system as agile and capable of timely response, which is essential in humanitarian logistics where speed and flexibility are critical. This outcome underscores the organization's commitment to responsiveness as a core element of its logistical operations.

Table 29: Level of Asset Management Dimension on HLP

No	Asset Management	Frequency					Mean	Standard Deviation
		1 SD	2 D	3 N	4 A	5 SA		

33	Supply storage in the warehouse is always maintained at the right quantity.	0 (0%)	10 (6.9%)	21 (14.5%)	99 (68.3%)	15 (10.3%)	3.82	0.70
34	There is no excess inventory in the warehouse.	10 (6.9%)	0 (0%)	21 (14.5%)	65 (44.8%)	49 (33.4%)	3.99	1.05
35	The organization regularly maintains and inspects logistics assets (vehicles, equipment, and warehouses) to ensure reliability during humanitarian operations.	0 (0%)	0 (0%)	31 (21.4%)	70 (48.3%)	44 (30.3%)	4.09	0.72
36	The organization has clear procedures in place for tracking and managing all logistics assets used in humanitarian activities.	0 (0%)	8 (5.5%)	30 (20.7%)	63 (43.4%)	44 (30.3%)	3.99	0.86
37	Assets required for humanitarian logistics are consistently available and operational when needed.	0 (0%)	21 (14.5%)	0 (0%)	80 (55.2%)	44 (30.3%)	4.16	0.65
38	The organization effectively manages logistics assets to minimize loss, theft, or damage during humanitarian operations.	0 (0%)	0 (0%)	41 (28.3%)	71 (49%)	33 (22.8%)	3.94	0.71
39	The organization systematically updates and replaces logistics assets to maintain their effectiveness during humanitarian operations.	0 (0%)	0 (0%)	0 (0%)	121 (83.4%)	24 (16.6%)	4.17	0.37
40	The logistics asset records in our organization accurately reflect asset conditions, locations, and availability.	0 (0%)	0 (0%)	24 (16.6%)	92 (63.4%)	29 (20%)	4.03	0.61
Weighted Average Mean							4.02	0.71
SD = 1 = strongly disagree, D = 2= disagree, N = 3 = neutral, A = 4 = agree, and SA = 5= strongly agree								

Source: SPSS V-27 output (2025)

The findings indicate that asset management practices were perceived to be strong among the respondents. This is evidenced by the average mean score of 4.02, which is notably higher than the established threshold mean of 3.79. The positive deviation suggests that the organization demonstrates a commendable level of effectiveness in managing its assets, including proper utilization, maintenance, and oversight. The result reflects a favorable perception of asset-related practices, implying that the organization's systems for asset tracking, accountability, and operational readiness are functioning well above the expected standard.

4.3 Relationship between Factors Affecting HL and HLP

Based on the responses obtained from the administered questionnaire, a Pearson correlation analysis was conducted to examine the strength and direction of the relationships between the independent variables—Logistics Practice, Internal Factors, and External Factors—and the dependent variable, Logistics Performance, within the TRCS.

The results of this analysis, as presented in Table 30, indicate the following correlation coefficients: The correlation between Logistics Practice and Logistics Performance is $r = 0.81$, the correlation between Internal Factors and Logistics Performance is $r = 0.75$, and the correlation between External Factors and Logistics Performance is $r = 0.78$. These values suggest strong and positive linear relationships between each independent variable and the logistics performance of the organization. Specifically, a correlation coefficient of 0.81 between Logistics Practice and Logistics Performance indicates that improvements in logistics practices are strongly associated with enhanced performance outcomes. The 0.75 correlation with Internal Factors implies that organizational elements such as leadership, structure, employee capacity, and internal coordination play a substantial role in shaping logistics performance. The 0.78 correlation with External Factors highlights the influence of environmental conditions, stakeholder engagement, donor policies, and government regulations on logistics performance.

Overall, the evidence suggests that Logistics Practice, Internal Factors, and External Factors all exhibit significant and positive correlations with Logistics Performance. This finding underscores the importance of both organizational and environmental considerations in driving effective humanitarian logistics within TRCS.

Table 30: Pearson’s Correlations

Variable		Logistics Practice	Internal factors	External Factors	Logistics Performance
Logistics Practice	Pearson	1			
	Correlation	.81			
	Sig. (2-tailed)	.000			
	N	145			
Internal factors	Pearson	.588**	1		
	Correlation	.75			
	Sig. (2-tailed)	.000			
	N	145			

External Factors	Pearson	.549**	.783**	1	.
	Correlation	.000	.000		
	Sig. (2-tailed)	145	145		
	N				
Logistics Performance	Pearson	.809**	.751**	.776**	1
	Correlation	.000	.000	.000	
	Sig. (2-tailed)	145	145	145	
	N				

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

Source: SPSS V-27 Output (2025)

The results from these analyses indicated that in Table 30 above, all measurements of Humanitarian logistics factors independent variables, the Logistics Practice had a strong positive significant relationship with logistics performance ($r = 0.81$, $P=.000$), the Internal Factors had a positive high significant relationship with Logistics performance ($r = 0.75$, $P=.000$), and the External Factors had a positive strong relationship with Logistics Performance ($r = 0.78$, $p = .000$) in the case of Tigray Red Cross Society.

4.4 Multilinear Regression Analysis

Multiple regression is a family of techniques used to explore the relationship between a continuous dependent variable and independent variables/predictors, and this analysis was conducted to investigate the influence of the independent variable on the dependent variable, i.e. the independent variable the effect of factors (logistics practice, internal factors, and external factors) to the dependent variable, i.e., logistics performance. There are several assumptions while running multiple linear regression, and to ensure reliability as well as validity of the result, the data must satisfy the given assumptions. Thus, before running multiple regression analysis, this study had conducted a basic assumption test for the data. These are normality test, linearity test, multicollinearity test, homoscedasticity test, and independence test. Accordingly, the necessary tests are elucidated below.

Multicollinearity Tests

A normality test is a fundamental statistical procedure used in multiple regression and other inferential analyses to verify whether a dataset follows a normal distribution—an essential assumption in methods such as ANOVA, correlation, and regression (OriginLab, 2015). In the current study, the normality test ensured the reliability and validity of data in assessing the impact of various factors on organizational logistics performance. Acceptable skewness and kurtosis

values typically fall between -2 and +2 (George & Mallery, 2010), with a tighter range of -1 to +1 indicating near-perfect symmetry; in this case, skewness ranged from -0.657 to 0.337 and kurtosis from -0.959 to 0.231, both within the acceptable range (Table 31 in annex), and the histogram (Figure 3, Annex II) visually confirmed approximate normality. Other essential regression assumptions were also tested: linearity was verified with no significant deviation ($p > 0.05$) (Sekaran, 2003); multicollinearity was ruled out as all VIF values were between 1.578 and 2.850 and tolerance values ranged from 0.351 to 0.634, within the thresholds set by Pallant (2005); homoscedasticity was supported by a scatterplot (Figure 5, Annex II) showing a random distribution of residuals; and independence of residuals was confirmed with a Durbin-Watson statistic of 2.287, well within the acceptable 0–4 range (Field, 2009). Overall, the results—presented in Tables 31 to 34 in the annex II—demonstrate that all regression assumptions were met, supporting the robustness and validity of the model used in this study.

The Effect of Internal and External Factors on HL and LP

Regression Analysis of Logistics Practices and Logistics Performance, a multiple regression analysis was conducted to examine the extent to which the independent variables—comprising the three dimensions of Logistics Practice, Internal Factors, and External Factors—predict the dependent variable, Logistics Performance. The analysis aimed to assess the strength, significance, and overall fit of the regression model. The Model Summary (Table 35) presents key statistical indicators, including the multiple correlation coefficient (R), the coefficient of determination (R^2), the adjusted R^2 , and the standard error of the estimate. These values help determine how well the regression model explains variations in the dependent variable.

The multiple correlation coefficient (R) indicates the strength and direction of the linear relationship between the observed and predicted values of the dependent variable. The R^2 value (coefficient of determination) represents the proportion of variance in Logistics Performance that is explained by the combination of the independent variables. A higher R^2 suggests a better explanatory power of the model. The adjusted R^2 accounts for the number of predictors in the model and provides a more accurate estimate of the population parameter, particularly when multiple predictors are included. The standard error of the estimate indicates the average distance that the observed values fall from the regression line, serving as a measure of the model's accuracy.

Additionally, the ANOVA table (Table 33) presents the F-ratio, which tests the overall significance of the regression model. A statistically significant F-value indicates that the model provides a

better fit to the data than a model without predictors, meaning that the independent variables, taken together, reliably predict logistics performance.

Furthermore, the regression model also considers the interaction effects among variables. In the context of regression analysis, an interaction effect occurs when the impact of one independent variable on the dependent variable varies depending on the level of another independent variable. This is particularly important in complex systems like logistics, where internal and external factors may moderate or amplify the effect of logistics practices on performance. The general form of the multiple regression equation used in this analysis, accounting for k independent variables, is expressed as:

$$Y = b_0 + b_1X_1 + b_2X_2 + \dots + b_kX_k + \varepsilon$$

Where Y = the Predicted Variable (Logistics Performance), b₀ = Constant, b₁, b₂, and b_k are unstandardized regression coefficients, and X₁, X₂, and X_k are the explanatory variables, and the error term ε (the Greek letter epsilon) is a random variable (Bluman, 2007).

Overall, the regression analysis provides evidence on how well the selected dimensions of logistics influence performance outcomes, and it supports further evaluation of both direct and interactive relationships among these key organizational elements.

Table 31: Model Summary of Regression Analysis

Model	R	R ²	Adjusted R ²	Stan. ERROR of Estimate	Sig.
1	.908	.821	.817	5.452	.001

a. Predictors: (Constant); Logistics practice, internal factors, external Factors

b. Outcome variable: Logistics Performance

Source: SPSS V-27 Output (2025)

The regression model summary presented in Table 35 highlights the effect of three independent variables—Logistics Practice, Internal Factors, and External Factors—on Logistics Performance. The multiple correlation coefficient (R) is reported as 0.908, indicating a strong positive relationship between the combined predictors and the dependent variable, logistics performance.

The coefficient of determination (R^2) is 0.821, signifying that approximately 82.1% of the variance in logistics performance can be explained by the combined effect of the three independent variables. The remaining 17.9% of the variation is attributable to other factors not captured within the scope of this study. This value of R^2 falls within the generally accepted range for a strong model fit. According to Nils and Frederik (2010), an R^2 value exceeding 0.67 is considered substantial, suggesting that the model provides a reliable explanation of the outcome variable.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This study aimed to examine the effect of factors on the logistics performance of TRCS. This chapter presented a summary of major findings, conclusions, and recommendations. The study employed descriptive analysis, demographic data, mean and standard deviation scores, and inferential statistical analysis to investigate the practice of logistics and its impact on logistics performance. The results provided insights into the nature and relationship between factors and logistics performance. The study also employed correlation and regression analysis to investigate the relationship between variables and the impact of factors on logistics performance. Inferential statistical analysis included correlation and regression analyses were used to show the relationship between independent variables (logistics practice, internal factor, and External factor), and the dependent variable (Logistics performance).

5.2 Conclusion

The study explored three fundamental issues. First, the study aimed at the humanitarian logistics practices. Second, the study attempted to overcome the effect of internal and external factors on the humanitarian logistics performance, and the third was to explore the relationship between practices and factors, and logistics performance in the TRCS. Having these research questions, investigations were made, and the conclusions are arranged within these sections, and these implications are presented below. This study focused on the three logistics operations out of many other factors, mainly internal and external factors, because research shows that humanitarian logistics performance is influenced by a combination of internal and external factors, including organizational practices, resources, operating environment, and external stakeholders (Demeke Welde, 2016). Therefore, these factors were enough to examine and explore the logistics performance of an organization in non-profit organizations that serve humanitarians in a disaster.

The study found that TRCS practices the humanitarian logistics measures at a high level, such as warehouse management, procurement, transportation-distribution, and inventory. Here, the organization practices more warehouse management, procurement, and transportation-distribution than inventory management.

The study revealed that internal and external factors significantly impact logistics performance. Humanitarian logistics performance is influenced by internal and external factors, affecting the

efficiency, responsiveness, and sustainability of disaster relief operations. Key determinants include professional staff competency, institutional learning, funding allocation, and collaboration and coordination. Professional staff competency enhances operational efficiency, while institutional learning improves decision-making and adaptive strategies. Adequate donor funds are crucial for long-term logistics infrastructure and disaster preparedness, while misallocation or short-term funding models disrupt sustainable operations. Collaboration and coordination between internal and external departments can also enhance resource utilization, while internal silos and poor interdepartmental collaboration can delay response times. Similarly, the study found that external factors affecting aid delivery include infrastructure situational challenges, government and political dynamics, environmental and socioeconomic conditions, and donor influence. Poor road networks, damaged utilities, and limited transportation options hinder timely aid delivery, especially in regions like conflict-prone areas, and strengthening partnerships with authorities and addressing seasonal challenges are crucial. To line up this study's findings, let's see some of the many other studies show that Internal factors like organizational culture, structure, leadership, decision-making, employee skills, and operational capabilities positively influence logistics performance, and these factors explain a significant portion of logistics efficiency variance. External factors like infrastructure, policy environment, technology, government policy, and economic growth also play a critical role in logistics performance. These factors are essential for enhancing logistics sector efficiency and competitiveness across different countries and industries (Nekesa and Kibara, 2024; Islam and Siddiqui, 2019). These studies supported this study's findings.

5.3 Recommendations

Based on this study's findings, the following recommendations are suggested for the Tigray Red Cross Society, donors, and government partners to improve humanitarian logistics in Tigray's post-conflict environment.

1. For Sustainable Funding and Resource Mobilization:

Diversify and Secure Multi-Year Funding: TRCS should actively connect with both traditional and non-traditional donors, including diaspora groups and private sector partners, to obtain multi-year, flexible funding agreements. This shift from emergency-focused grants allows for better long-term planning, capacity building, and investment in logistics infrastructure.

Create a Context-Specific Resource Mobilization Strategy: Develop a strategy that clearly outlines the funding needs for post-conflict rebuilding. This includes costs for fixing warehouses, setting up reliable communication technology, and pre-positioning supplies for recurring crises and recovery efforts.

2. For Infrastructure Rehabilitation and Technological Enhancement:

Invest in Decentralized and Resilient Infrastructure: Due to the damage to central infrastructure, focus on building a network of smaller, strategically placed warehouses across Tigray's zones. This approach supports inventory decentralization, eases last-mile delivery problems, and adds redundancy to the supply chain.

Adopt Basic and Practical Technology: Use simple, low-bandwidth technologies, such as SMS-based tracking and basic mobile data collection tools, which can work with limited connectivity. Partner with NGOs that specialize in technology to train staff on GIS for route planning and digital inventory management systems, even in low-infrastructure settings.

3. For Strengthening Coordination and Collaboration:

Re-establish and Formalize Coordination Mechanisms: TRCS should take the lead in revitalizing the Cluster System, such as the Logistics Cluster, in Tigray. Create formal information-sharing protocols and work together with other NGOs, UN agencies, and local government bodies to avoid duplication, identify gaps, and share resources like warehouse space and transportation.

Build Stronger Government Partnerships: Create structured partnerships with regional and local authorities to simplify customs clearances, secure travel permits for staff and supplies, and work together on repairing key supply routes. This is essential for managing the complicated post-conflict legal landscape.

4. For Capacity Building and Staff Development:

Implement a Focused Training Program: Create a continuous capability-building program that addresses specific gaps, such as advanced inventory management, procurement in fragile areas, fleet management, and the use of humanitarian logistics software. Target this training at both logistics staff and program staff involved in needs assessment.

Establish a Mental Health and Psychosocial Support (MHPSS) System: Acknowledge the significant stress on staff working in a post-conflict environment. Institutionalize MHPSS services

to support staff well-being, prevent burnout, and keep experienced personnel, which is vital for maintaining institutional memory and operational continuity.

5. For Data-Driven Decision Making and Preparedness:

Develop a Post-Conflict Preparedness Plan: Go beyond emergency response and create a preparedness plan suited to the recovery phase. This should include updated risk assessments, plans for pre-positioning recovery items like seeds and building materials, and stronger ties with local suppliers to help the local economy and shorten supply chains.

Institute a Simple Performance Monitoring Framework: Set up Key Performance Indicators (KPIs) for logistics, such as order fulfillment time, cost per beneficiary served, and inventory accuracy. Regularly collect this data for internal learning, demonstrate accountability to donors, and make informed decisions on enhancing logistics processes.

By following these specific recommendations, the Tigray Red Cross Society can move from merely responding to crises to becoming a more resilient and effective organization capable of handling the complex logistics needs of humanitarian response and long-term recovery in Tigray.

References

- African Union. (2024). *Safeguarding Africa's health: Update on actions in response to recent Ebola outbreaks*. December 13, 2024.
- Akhtar, P., Marr, N. E., & Garnevskaja, E. V. (2000). Coordination in humanitarian relief chains: Chain coordinators. *Journal of Humanitarian Logistics and Supply Chain Management*.
- Altay, N., & Green, W. G. (2006). Research disaster operation management. *European Journal of Operational Research*, 175(1).
- Antai, I., Mutshinda, C., & Owusu, R. (2015). A 3-R principle for characterizing failure in relief Supply chains' response to natural disasters. *Journal of Humanitarian Logistics and Supply Chain Management*, 5(2).
- Bank, T. W. (2018). *The 2018 Central Sulawesi earthquake and tsunami: Impact assessment*. Palu: The World Bank.
- Balcik, B., & Beamon, B. M. (2008). Facility location in humanitarian relief. *International Journal of Logistics Research and Applications*, 11.
- Behl, A., & Dutta, P. (2019). *Humanitarian logistics: A framework for effective management*. Springer.
- Beamon, B. M., & Balcik, B. (2008). Performance measurement in humanitarian relief chains. *International Journal of Public Sector Management*, 21(1). <https://doi.org/>
- Beamon, B. M. (1999). Measuring supply chain performance. *International Journal of Operations and Production Management*, 19(3).
- Beamon, B. M., & Kotleba, S. A. (2006). Inventory modeling for complex emergencies in Humanitarian relief operations. *International Journal of Logistics: Research and Applications*, 9(1).
- Bean, Viljoen, Ittmann, & Kekana. (2011). Challenges facing humanitarian logistics.

- International Journal of Applied Logistics*, 8(1), 35-56.
- Berkoune, D., Renaud, J., Rekik, M., & Ruiz, A. (2012). Transportation in disaster response Operations. *Socio-Economic Planning Sciences*, 46(1).
<https://doi.org/10.1016/j.seps.2019.11.016>
- Bhimani, S., & Song, J.-S. (2016). Gaps between research and practice in humanitarian logistics. *The Journal of Applied Business and Economics*, 18(1), 11.
- Blecken, A., & Tatham, P. (2010). Supply chain process modeling for humanitarian Organizations. *International Journal of Physical Distribution & Logistics Management*, 40(8/9).
- Bolsche, D. (2012). Performance measurement in humanitarian logistics – a process-oriented perspective. Paper presented at the Proceedings of the 2nd International Hum Log Workshop, Essen.
- Bichou, K., & Gray, R. (2004). A logistics and supply chain management approach to the Evaluation of the humanitarian supply chain.
- Britannica Hub. (2024). *Yemeni civil war to present: The unraveling of Yemen*. Retrieved October 2024, from <https://www.britannica.com/>
- Britannica Hub. (2024). *Syria's civil war and its present situation*.
- Center for Preventive Action. (2024). *Conflict in Syria: The Bashar al-Assad regime*. Retrieved From <https://www.cfr.org/global-conflict-tracker>, November 2024.
- Berhanu Mekonen. (2022). DW News: Ethiopian Red Cross unable to deliver services in Tigray Due to a lack of medical supplies, logistic challenges.
- Caplice, C., & Sheffi, Y. (1994). A review and evaluation of logistics metrics. *The International Journal of Logistics Management*, 5(2).

- CDP. (2024). *European floods: Several European countries were flooded in the early fall of 2024*.
- Chandes, J., & Pache, G. (2009). Investigating humanitarian logistics issues: From operations Management to strategic action. *Journal of Manufacturing Technology Management*.
- Christopher, S. (2011). A qualitative study exploring the challenges of humanitarian organizations. *Journal of Humanitarian Logistics and Supply Chain Management*, 1(2).
- Christopher, M., & Tatham, P. (2011). Introduction: In *Humanitarian logistics: Meeting the The challenge of preparing for and responding to disasters*. London.
- Cooper, D. R., & Schindler, P. S. (2013). *Business research methods* (12th ed.). McGraw-Hill Education.
- Coster, J. (2004). Data analysis in SPSS. Retrieved from <http://www.stathelp.com/notes.html>.
- Cozzolino, A. (2012). Agile and lean principles in the humanitarian supply chain: The case of the United Nations World Food Program. *Journal of Humanitarian Logistics and Supply Chain Management*, 2(1), 16–33.
- Cozzolino, A., Rossi, M., & Conforti, A. (2012). *Humanitarian logistics: Managing Humanitarian supply chains*. Springer.
- Data Cutoff. (2024). Retrieved from <https://www.criticalthreats.org/>, October 2024.
- Ekene Mary Nnagha. (2024). New microbes and new infections: How prepared are we to effectively curtail the next Ebola viral outbreak in Sub-Saharan Africa? *Letter to the Editor*, 60–61, 101430.
- Ethiopia's Tigray region. (2024). Published on October 16, 2024, in ISS (Institute for Security Studies). Retrieved from <https://issafrica.org/>
- Government, A. (2019). *The Australian bushfire crisis 2019-2020*. New South Wales and Victoria, Australia: Australian Government Department of Agriculture, Water, and the Environment.

- International Committee of the Red Cross (ICRC). (2021). Violence in Tigray - our response.
- Jeffrey Lewek. (2024). Global flooding crises 2024: Causes, impact, and relief efforts.
- Kali Robinson. (2023). Yemen's tragedy: War, stalemate, and suffering.
- Kovacs, G., & Spens, K. M. (2011). Humanitarian logistics: Research challenges. *International Journal of Physical Distribution & Logistics Management*.
- Kovacs, G., & Spens, K. M. (2007). Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management*, 37(2), 99-114.
- Langenus, M., & Van de Voorde, E. (2018). *Humanitarian logistics in a changing world: Optimizing the response of NGOs in disaster relief*.
- Liam Karr. (2024). The Critical Threats Project updates with support from the Institute for the Study of War. *Africa File*.
- Liam Karr & Avery Borens. (2024). *Africa file: Egypt, Ethiopia, and Somalia conflict looms; IS Gains in Niger; Russia aids Burkina Faso's nuclear energy push*. September 5, 2024.
- Lopez, M. L., & López, M. L. (2020). Humanitarian logistics and disaster relief. *Logistics Research*, 13(1), 1-9.
- Luisa Enria & Shelley Lees. (2024). A decade on from the devastating Ebola outbreak in West Africa: Response to expert opinion. *Ebola 10 years on: why trust remains key*. London School of Hygiene and Tropical Medicine, March 22, 2024.
- Mallory Moench. (2022). The global players in Syria before and after Assad. BBC News. Retrieved November 2024, from <https://www.bbc.com/>
- Maughan, A., Ford, J., & Gant, C. (2015). Humanitarian logistics coordination: Key issues and Challenges. *Supply Chain Management: An International Journal*, 20(4), 456-467.
- Meressa K. Dessu & Tegbaru Yared. (2024). Tigray must avert another cycle of war as tensions Between two TPLF factions rise; urgent measures are needed to prevent another crisis.

- McLachlin, R., & Van Wassenhove, L. N. (2012). Developing humanitarian logistics as a Discipline.
- Nations, U. (2015). *Nepal earthquake: A report on the disaster and response*. Kathmandu: United Nations Office for Disaster Risk Reduction.
- OCHA. (2017). Society distributes water rations to Kindo Koyasha Woreda communities.
- OCHA. (2019). Ethiopia drought - Midterm evaluation report (MDRET016).
- OCHA. (2020). Ethiopia: Nearly 500,000 animals vaccinated in support of violence-affected communities.
- OCHA. (2021). UNICEF funds ERCS to strengthen emergency humanitarian response.
- OCHA. (2021). ICRC and ERCS deliver emergency relief to people affected by the fighting in Tigray.
- OCHA. (2022). A step toward resilience: Joint initiatives addressing the protracted crisis in Somalia Region, Ethiopia.
- OCHA. (2023). Operational update on Ethiopia: ICRC concerned about humanitarian situation in rural areas of Tigray.
- Oloruntoba, R., & Gray, R. (2006). Humanitarian logistics and supply chain management: The Case of the Red Cross. *International Journal of Logistics Management*.
- World Health Organization. (2019). *COVID-19 pandemic timeline: Initial outbreak in Wuhan, China*. Retrieved from <https://www.who.int/>
- Pettit, T. J., Croxton, K. L., & Fiksel, J. (2010). The evolution of resilient supply chain Management: A historical and systematic review. *International Journal of Logistics Management*, 21(3), 437-455.
- Renaud, J., & Oloruntoba, R. (2012). Information technology and its role in humanitarian

Logistics.

Relief Web. (2018, 2021). ERCS launches Partners for Resilience II integrated disaster risk Management project in the Amhara region.

Sisay Worku Chaka. (2023). Assessment of humanitarian logistics practice and its effect on performance: The case of the Ethiopian Red Cross Society. Addis Ababa, Ethiopia.

Sweeney, E., & Lummus, R. R. (2018). The role of technology in humanitarian logistics.

Thomas, A., & Kopczak, L. (2005). From logistics to supply chain management: The evolution Of humanitarian logistics. *The International Journal of Physical Distribution & Logistics Management*.

Thomas, A. R., & Kopczak, L. R. (2005). From logistics to supply chain management: The path Forward in the humanitarian sector. *The Journal of Humanitarian Assistance*.

Van Wassenhove, L. N. (2006). Humanitarian aid logistics: Supply chain management in high gear. *Journal of the Operational Research Society*, 57(5), 475-489.

Warehousing Ltd. (2023). Everything you need to know about humanitarian logistics. Article, February 26, 2023.

Wikipedia. (2020). *The COVID-19 pandemic*. Retrieved from <https://en.wikipedia.org/wiki/COVID-19>, December 13, 2024.

Wikipedia. (2024). *The Yemen civil war*. Retrieved from https://en.wikipedia.org/wiki/Yemen_civil_war.

World Health Organization. (2024). *COVID-19 epidemiological updates overview: Emergency Situational updates V-17*, September 2024, Edition 171.

World Economic Forum. (2024). How four logistics companies stepped up relief efforts in humanitarian crises.

Yiu Chung, C., Ching-Yin Lam, P.-H. Tan, H.-F. Tsang, & Sze-Chuen Cesar Wong. (2024).

Comprehensive review of COVID-19: Epidemiology, pathogenesis, advancement in diagnostic and detection techniques, and post-pandemic treatment strategies. *International Journal of Molecular Science*.

Yohana Arsen Rutaba. (2022). Determinants of humanitarian logistics performance for effective disaster relief operations in addressing pandemics in Tanzania. *African Journal of Empirical Research*, 3, 128-139.

Annex I

Mekelle University
College of Business and Economics
School of Management
Department of Logistics and Supply Chain Management

Dear Participant

My name is Tewelde Atakilti, and I am a postgraduate student in the School of Management, Department of Logistics and Supply Chain Management at Mekelle University. Currently, I am conducting a research study entitled "Factors Affecting Humanitarian Logistics Performance: A Case Study of the Red Cross Society, Tigray Regional State Branch."

The primary objective of this research is to explore and assess the key factors that influence the effectiveness and performance of humanitarian logistics operations conducted by the Tigray Red Cross Society. Understanding these factors will significantly contribute to enhancing logistics practices, improving humanitarian assistance delivery, and better supporting vulnerable communities during emergencies.

Your participation in this research is vital to achieving comprehensive and meaningful results. Given your valuable experience and expertise in humanitarian logistics operations, your insights will be instrumental in identifying critical factors and potential improvements in logistics performance.

I kindly request your cooperation in completing this survey by sharing your knowledge and experiences. Please rest assured that your responses will be treated with strict confidentiality.

The information you provide will not be shared with any third parties, and all necessary measures will be taken to ensure your anonymity. Only the research team will have access to the data you provide.

Thank you very much for considering participating in this study. Your cooperation and contribution are greatly appreciated.

Please feel free to contact me at +251975507984 or by email at teweieatakilti963@gmail.com

If you have any queries concerning this study, you can also reach Mr Abadi Afera Gugusa, my primary supervisor, via email at abiquiha@gmail.com

Thank you very much!

Tewelde Atakilti

PART-I: Demographic Information

This part of the questionnaire tries to gather some demographic information about the background of the respondent and the organization. Please tick (✓) on the appropriate option and put your answers in the space provided for questions without options.

1. Gender

- A. Female ☐ B. Male ☐
2. Age: A. 18 – 25 B. 26 – 35 C. 36 – 45 D. 46 – 55 E. Above 55
3. Your Highest Level of Education:
A. College Diploma ☐ B. First Degree ☐ C. masters and above ☐
4. Experience in the specific job you are working A. 1 – 5 B. 6 – 10 C. 11 – 20 D. 21 – 30 E. 31 – 40 F. Above 40
5. Your department/work unit:
A. Logistics and supply chain ☐ B. Program ☐ C. Others ☐
6. What is your position:
A. Manager ☐ B. coordinator ☐ C. Sub-coordinator ☐ D. Professional ☐ E. other specify __

PART-II: Humanitarian Logistics Performance Assessment

The following sections are intended to measure attitudes and opinions of participants on the humanitarian logistics performance of the Tigray Red Cross Society. In every subsection, there are specific statements followed by a set of five response options (strongly agree, agree, neutral, disagree, and strongly disagree). Below is a detailed description of each response option to help you clearly understand their meanings.

Likers Scale	Description	Scale
Strongly disagree	Selecting this option means you completely oppose or strongly reject the idea presented. It indicates that your opinion or experience is entirely contrary to the statement, with little or no room for agreement.	1
Disagree	This indicates a moderate level of disagreement. You don't fully reject the statement as intensely as "Strongly Disagree," but you generally consider it incorrect or not reflective of your experience or viewpoint.	2
Neutral	Choosing this means you neither support nor oppose the statement. It reflects a neutral stance, indicating you either don't have sufficient information, have mixed feelings, or feel indifferent about the statement.	3
Agree	This suggests you generally support or find truth in the statement. Your agreement, however, is moderate rather than absolute, meaning you see validity or correctness in the statement, though not strongly enough to fully endorse it without reservations.	4
Strongly Agree	This option indicates a high level of agreement. You firmly believe the statement is correct, clearly reflective of your experience, or you strongly support the idea presented without any significant reservations.	5

Direction: Please tick (√) on the appropriate option to indicate the level of agreement.

1	Humanitarian logistics practice of TRCS	Score				
1.1	Procurement Management practice	1	2	3	4	5
1	There are practices of a preliminary needs assessment conducted in a disaster-prone area before procurement is made.					
2	The organization has clear and efficient procurement procedures in place for humanitarian logistics operations.					
3	The procurement processes of the organization ensure the timely availability of relief supplies during humanitarian crises.					
4	The organization regularly monitors and evaluates the performance of suppliers to ensure compliance with humanitarian logistics requirements.					
5	The procurement management practices of the organization consistently ensure transparency in handling humanitarian logistics.					
6	The procurement team has sufficient training and skills to handle humanitarian supply chain requirements.					
7	There are clear procurement management practices such as issuance of purchase orders, administration of purchase contracts, and resolution related to procurement-related issues.					
1.2	Warehouse management practice	1	2	3	4	5
1	There is a practice of identifying storage points to enable efficient disaster relief operations.					
2	There is a practical identification of the required warehouse management equipment for stores.					
3	There are proper storage practices to efficiently utilize storage space.					
4	The warehouses have adequate capacity to store relief supplies during humanitarian operations.					
5	There are regularly monitored inventory levels to ensure the availability of essential relief items.					
6	The warehouse layout facilitates quick access and efficient distribution of humanitarian aid.					
7	Warehouse records and stock movements are accurately maintained to ensure traceability of relief supplies.					
8	Warehouse staff are adequately trained and capable of managing humanitarian logistics effectively.					
1.3	Inventory management	1	2	3	4	5
1	There is pre-positioning of inventory and optimal allocation of resources to respond to any disaster anywhere.					
2	There is a practical analysis of supply and demand, forecasting the risks of either supply or demand being too high or too low.					
3	There is a practice of allocating time and money to inventory using activity-based costing.					

4	There is a practice of making active decisions in the prioritization of goods needed.					
5	The inventory records always accurately reflect actual stock levels.					
6	There is a frequently conducted physical inventory count to verify the accuracy of stock records.					
7	The inventory management system helps prevent shortages or overstocking of humanitarian relief supplies.					
8	There is an effective track of the expiry dates and shelf life of inventory items to avoid wastage.					
1.4	Transportation and distribution management	1	2	3	4	5
1	There is a practice of careful consideration and measures for evaluating transport performance when choosing a carrier.					
2	There is a practice of designing the flow of materials for distribution, keeping in mind the people who require them.					
3	There is a practice of distributing supplies from central distribution centers.					
4	There is a practice of using different distribution points to deliver supplies to the needy.					
5	The organization effectively plans transport routes to ensure the timely delivery of humanitarian relief supplies.					
6	There is a regular track and monitor shipments to maintain visibility of humanitarian goods in transit.					
7	The transport fleet (vehicles and equipment) is adequate, reliable, and maintained regularly for humanitarian operations.					
8	The distribution practices in the organization ensure that humanitarian aid reaches beneficiaries efficiently and accurately.					
9	Transport and distribution staff in the organization have sufficient skills and training to manage humanitarian logistics effectively					

2	Internal factors affecting the humanitarian logistics performance of TRCS	Score				
2.1	Participation and Involvement of Logistics Staff	1	2	3	4	5
1	Logistics staff are regularly involved in decision-making processes related to humanitarian supply chain activities.					
2	There is participation of logistics staff in humanitarian need assessments.					
3	There is a standby assessment team in the logistics unit to determine the needs of the beneficiaries.					
4	There are active program staff that determine the supplies that need to be acquired to provide relief services.					
5	Logistics staff in the organization receive adequate recognition for their contributions during humanitarian operations.					

6	The organization provides opportunities for logistics staff to give feedback and suggest improvements in humanitarian logistics practices					
7	Logistics staff members feel their expertise is valued and respected within our humanitarian logistics team.					
8	The organization provides sufficient training and career development opportunities for logistics staff involved in humanitarian activities.					
2.2	Information and Technological Factors	1	2	3	4	5
1	Their organization has an information technology setup that is able to disseminate accurate and timely information.					
2	The organization has reliable information systems to support humanitarian logistics effectively.					
3	The organization consistently uses technology (e.g., tracking systems, GIS, software solutions) to enhance visibility and traceability in humanitarian logistics					
4	There is organized technological support for updates and tracking of goods arriving in the field, which positively affects the agility of humanitarian logistics performance.					
5	Real-time information is readily available and accessible to all logistics personnel involved in humanitarian operations.					
6	Some automated systems and mechanisms affect the reliability of humanitarian logistics performance.					
7	The technological infrastructure within the organization adequately supports effective decision-making during humanitarian emergencies.					
8	Logistics staff receive adequate training and support in the use of information technology systems deployed in humanitarian logistics.					
2.3	Logistics Professionals Related Factors	1	2	3	4	5
1	The logistics professionals of the organization have adequate experience and expertise to effectively manage humanitarian logistics operations					
2	Logistics professionals in the organization are provided with regular training to update their skills and knowledge.					
3	The logistics team demonstrates strong problem-solving capabilities during humanitarian emergencies.					
4	The workload of logistics professionals in the organization is manageable, allowing them to perform their duties effectively.					
5	Logistics professionals in the organization are highly motivated and committed to achieving humanitarian logistics goals					
6	Logistics professionals of the organization consistently follow the best practices and standards in humanitarian logistics management.					
7	Logistics staff of the organization are capable of effectively using technology and information systems relevant to humanitarian operations.					

8	Logistics professionals of the organization effectively communicate and collaborate within our team and with external partners.					
2.4	Coordination and Collaboration Factors	1	2	3	4	5
1	The organization shares resources such as field sites and warehouses with relevant stakeholders to facilitate the responsiveness of humanitarian logistics performance.					
2	There is an ability to work together with NGOs or other partners for joint logistics setup & implementation in the organization.					
3	There is a capability among staff to carry out coordination efforts (i.e., skills, attitude, knowledge, experience).					
4	The organization regularly shares timely and accurate logistics information with partners involved in humanitarian response efforts.					
5	The organization effectively coordinates humanitarian logistics activities with other relief organizations and government agencies					
6	There is a consistent coordination effort in the humanitarian logistics network.					
7	Collaborative meetings among humanitarian logistics stakeholders frequently occur, helping to avoid duplication and gaps in relief operations.					
8	The organization maintains effective communication channels that facilitate coordination among logistics teams during humanitarian operations.					

3	External Factors Affecting Humanitarian Logistics Performance TRCS	Score				
3.1	Legal and Political Factors	1	2	3	4	5
1	The organization experiences minimal bureaucratic delays during humanitarian operations.					
2	Government policies and regulations facilitate the smooth entry and distribution of humanitarian relief supplies					
3	There is available government support that positively affects the agility of humanitarian logistics performance.					
4	Political stability in the operational area positively influences the efficiency of humanitarian logistics.					
5	Legal procedures support the logistics activities of the organization during humanitarian crises					
6	There are no security challenges that affect the free operation in the affected areas.					
7	There are no restrictions on the entry of staff and goods from abroad that improve the cost and asset utilization of humanitarian logistics performance.					
8	The organization effectively manages political and legal challenges that could affect the timely delivery of humanitarian assistance.					

3.2	The Socio-Economic Challenges	1	2	3	4	5
1	There is support from the local community and beneficiaries that positively affects the agility of humanitarian logistics performance.					
2	Uncertainty in demand and supply negatively affects the reliability of humanitarian logistics performance.					
3	Incompatibility with the culture and language of the affected area negatively affects the responsiveness of humanitarian logistics performance.					
4	Socio-economic conditions in the region significantly affect the organization's ability to efficiently deliver humanitarian aid.					
5	There are high levels of poverty and unemployment among beneficiaries that complicate the organization's humanitarian logistics operations.					
6	There are local economic instabilities that lead to increased logistics costs and operational complexity in humanitarian efforts.					
7	Humanitarian logistics operations effectively consider and address socio-economic barriers faced by beneficiaries.					
8	Social and economic disparities within the affected communities directly impact the speed and effectiveness of our relief distribution.					
3.3	Infrastructural Factors	1	2	3	4	5
1	There are alternative-weather roads for use to field sites when main roads are damaged or blocked that enhance the responsiveness of humanitarian logistics performance.					
2	The transportation infrastructure (e.g., roads, airports, ports) adequately supports the timely distribution of humanitarian relief					
3	There are adequate and stable electricity and communication utilities that positively affect the agility of humanitarian logistics performance.					
4	Absence of Good communication and coordination between the supply chain partners negatively affects humanitarian logistics performance.					
5	Storage and warehouse facilities available in the region meet the capacity and quality requirements for humanitarian operations.					
6	Reliable communication infrastructure is available to facilitate effective coordination during humanitarian logistics activities.					
7	The organization's humanitarian logistics operations are not frequently disrupted due to poor or damaged infrastructure.					
8	Existing infrastructure conditions allow the organization to rapidly reach affected communities during humanitarian emergencies					
3.4	Financial Resources and Funding Factors					
1	The organization consistently receives timely financial resources to support humanitarian logistics operations.					
2	There is an organizational ability to use the obtained funds right away that affects the agility of humanitarian logistics performance.					

3	Enough funds are allocated for logistic strategic preparedness that affects the responsiveness of humanitarian logistics performance.					
4	Available funding is sufficient to meet the logistics needs during humanitarian emergencies.					
5	There are no financial constraints that limit the organization's ability to respond rapidly to humanitarian crises.					
6	The organization effectively allocates available financial resources to ensure optimal logistics performance.					
7	The organization has reliable financial mechanisms in place to quickly access emergency funds when required for humanitarian logistics					
8	The organization has transparent procedures to manage and account for funding allocated to humanitarian logistics activities.					

4	Humanitarian Logistics Performance of TRCS	Score				
4.1	Reliability	1	2	3	4	5
1	The organization consistently delivers humanitarian aid to beneficiaries within the promised or expected timeframe					
2	All the supplies are delivered at the right time so that beneficiaries are properly served.					
3	The right supplies are delivered in the right quantity with all the necessary documentation for the requested demand.					
4	The organization's logistics systems and processes are dependable, enabling consistent delivery of humanitarian assistance even under challenging conditions.					
5	The organization reliably maintains accurate and complete records of logistics activities for performance assessment.					
6	Beneficiaries regularly receive the correct quantities and types of humanitarian supplies without errors.					
7	The organization's logistics team consistently meets established standards and expectations during humanitarian responses					
8	The organization's humanitarian logistics operations rarely experience unexpected delays or disruptions.					
4.2	Agility (flexibility)	1	2	3	4	5
1	The type of supplies required may change from the initial request during assessment and can still be absorbed by TRCS without any problem.					
2	There is easy accommodation for any change in the types of relief logistics supplies.					
3	The volume of supplies required may change from the initial request during the assessment and can still be engaged without any problem.					

4	The organization's humanitarian logistics system can quickly respond and adapt to sudden changes during crises					
5	The organization is capable of rapidly adjusting logistics plans in response to new information or unforeseen challenges.					
6	The organization maintains flexibility in sourcing and delivering supplies to address shifting humanitarian needs.					
7	The organization frequently demonstrates the ability to reallocate resources promptly as humanitarian conditions evolve.					
8	The logistics team efficiently handles unexpected demands or disruptions in humanitarian operations.					
4.3	Cost	1	2	3	4	5
1	There are systems designed to ensure that optimum costs are achieved.					
2	Supplies are always distributed with optimal cost considerations.					
3	There is good management of all costs that arise from its activities in supplying and distributing materials where needed.					
4	The recognition of cost management and optimization is considered an important issue in its operations.					
5	The organization effectively manages logistics costs while maintaining high-quality humanitarian assistance.					
6	The organization regularly evaluates logistics expenditures to ensure cost-effectiveness in humanitarian operations.					
7	The organization's logistics practices minimize unnecessary costs, such as wastage, delays, or duplication, during humanitarian response.					
8	The organization's logistics decisions prioritize cost-efficient approaches without compromising the timely delivery of humanitarian aid					
4.4	Responsiveness	1	2	3	4	5
1	There is a decision at all levels to advance logistics operations immediately.					
2	All requested demands are delivered at the right time.					
3	There is an integrated relationship with suppliers and third-party service providers to ensure that TRCS is responsive to requests.					
4	The organization rapidly initiates logistics activities in response to humanitarian emergencies.					
5	The organization consistently meets urgent requests for relief supplies within an acceptable timeframe.					
6	The organization's logistics team effectively anticipates and addresses changing beneficiary needs during emergencies.					
7	Decision-making processes in the organization's humanitarian logistics operations allow for swift action during crises.					
8	The organization proactively prepares and maintains resources to ensure quick logistics responses to humanitarian demands.					

4.5	Asset Management	1	2	3	4	5
1	Supply storage in the warehouse is always maintained at the right quantity.					
2	There is no excess inventory in the warehouse.					
3	The organization regularly maintains and inspects logistics assets (vehicles, equipment, and warehouses) to ensure reliability during humanitarian operations.					
4	The organization has clear procedures in place for tracking and managing all logistics assets used in humanitarian activities.					
5	Assets required for humanitarian logistics are consistently available and operational when needed.					
6	The organization effectively manages logistics assets to minimize loss, theft, or damage during humanitarian operations.					
7	The organization systematically updates and replaces logistics assets to maintain their effectiveness during humanitarian operations.					
8	The logistics asset records in our organization accurately reflect asset conditions, locations, and availability always.					

Part Three: Open Ended Questions

1. Can you mention any other internal factors that might influence the performance of humanitarian logistics but haven't been addressed above?

2. Can you mention any other external factors that might influence the performance of humanitarian logistics but haven't been addressed above?

3. What are the key challenges faced by the Tigray Red Cross Society in humanitarian logistics?

4. Can you mention any recommendation to enhance the performance of humanitarian logistics?

Thanks For your Golden time!

Annex II

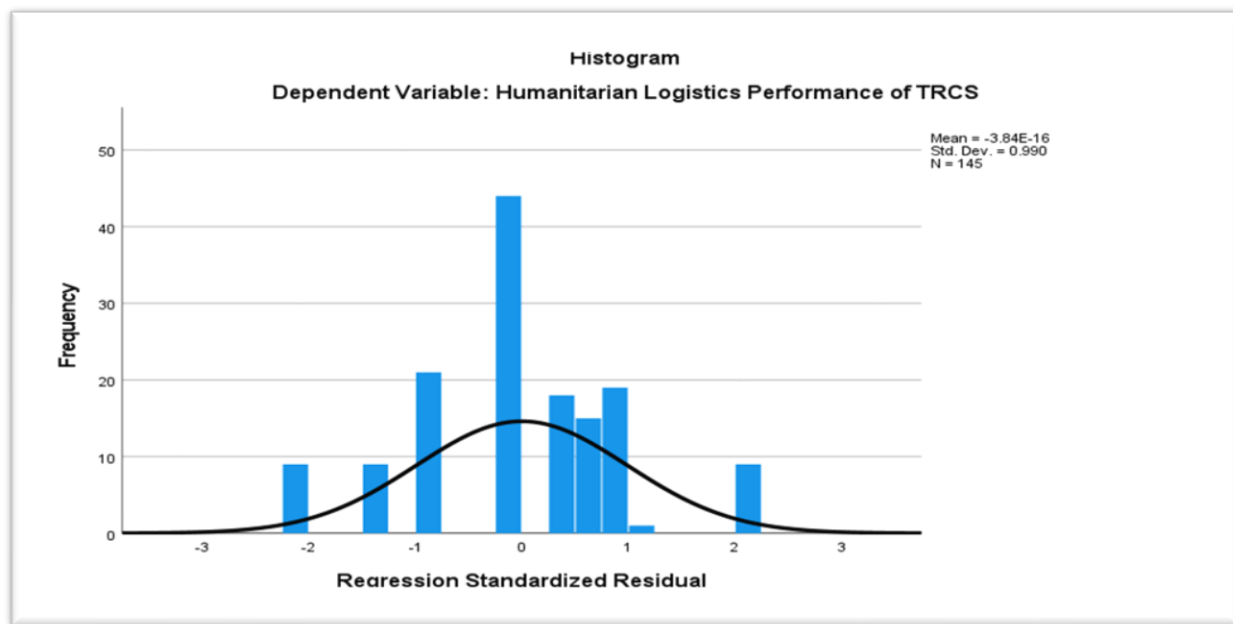


Figure 3: Histogram

Source: SPSS V-27 Output (2025)

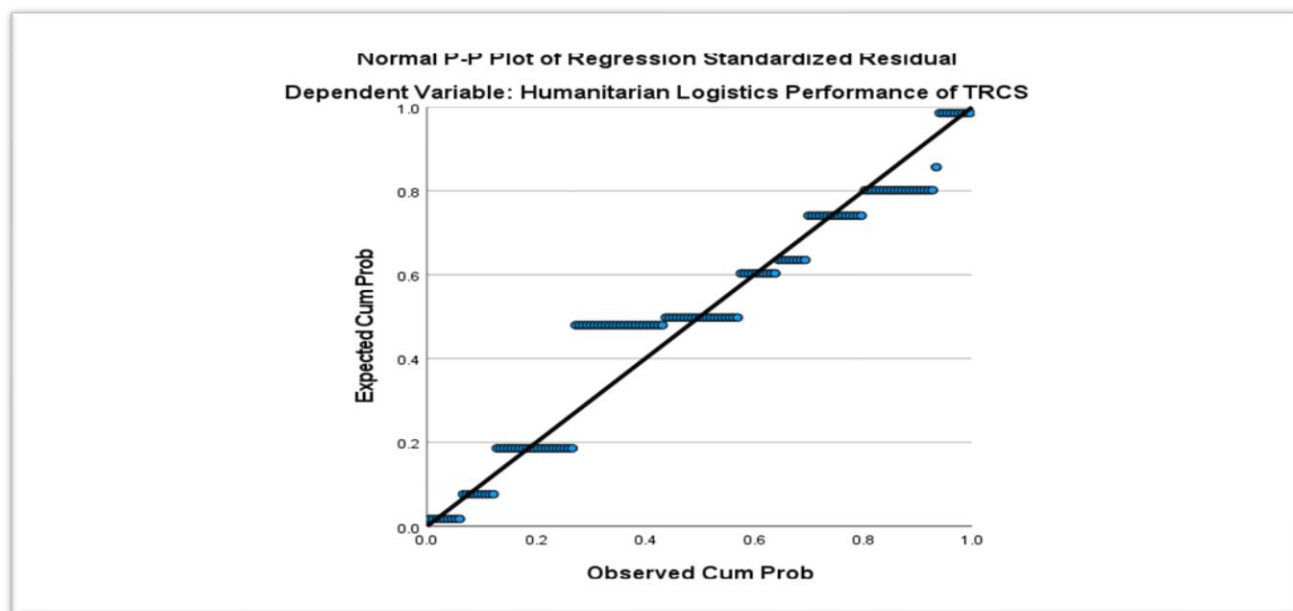


Figure 4: Plot of Regression Standardized Residual.

Source: SPSS V-27 output (2025)

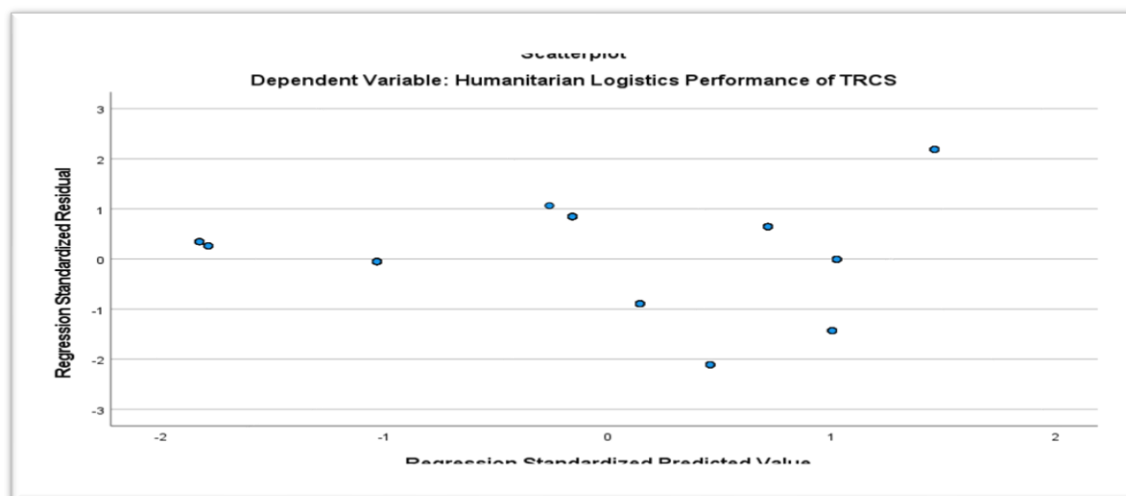


Figure 5: Scatterplot

Source: SPSS V-27 Output (2025)

Table 32: Skewness and Kurtosis

Constructs	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Logistics Practice	.178	.201	-.959	.400
Internal factors	-.657	.201	.231	.400
External Factors	.076	.201	-1.031	.400
Logistics Performance	.337	.201	-.358	.400
Valid N (listwise)	145			

Source: SPSS V-27 Output (2025)

Table 33: Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	139.12	177.07	160.21	11.548	145
Residual	-11.498	11.927	.000	5.395	145
Std. Predicted Value	-1.826	1.461	.000	1.000	145
Std. Residual	-2.109	2.188	.000	.990	145

a. Dependent Variable: Humanitarian Logistics Performance of TRCS

Source: SPSS V-27 Output (2025)

Table 34: Tolerance and variance Inflation Factor (VIF) Collinearity Statistics

		Collinearity Statistics	
	Model	Tolerance	VIF
1	(Constant)		
	Logistics Practice	.634	1.578
	Internal factors	.351	2.850
	External Factors	.375	2.667
a. Dependent Variable: Humanitarian Logistics Performance			

Source: SPSS V-27 Output (2025)

Table 35: Durbin-Watson Statistic Result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.906	.821	.817	5.452	2.287

Source: SPSS V-27 Output (2025)