Chapter 16
Humanitarian Logistics Challenges, Innovations, and Future Directions

Mubarak Malem
http://orcid.org/0009-0007-3604-4979
INTERSOS, Sudan

ABSTRACT

Humanitarian logistics (HL) is a logistics framework in a paradigm of extreme uncertainty (where the usual performance measures of commercial supply chain management are replaced by those of saving lives and reducing human suffering). By synthesizing extant literature using a rigorous qualitative research design, the article deconstructs the humanitarian logistics ecosystem to identify the "demand uncertainty paradox" and the "zero - lead time requirement" as ontological underpinnings. The study utilizes semi structured interviews and thematic coding to address the gap between the theoretical frameworks and the CSD level operational realities. The interview conducted three humanitarion logistics directors in Sudan. This work makes an important contribution to academic discourse by providing a nuanced understanding of the nature of the adaptation that humanitarian organizations can undertake, in processing geopolitical disruptions and cascading crisis in a rapidly changing global setting.

1. INTRODUCTION

The global humanitarian landscape faced a severe crisis in 2025, with over 300 million people requiring assistance due to conflict- and climate-related disasters (UN Office for the Coordination of Humanitarian Affairs, 2025). To address these

DOI: 10.4018/979-8-3373-6950-1.ch016

escalating demands, organizations implemented structural changes such as the "One Global Headquarters" model to enhance internal cohesion and streamline support for frontline activities (World Food Programme, 2025).

The utilization of digital tools, in particular, the artificial intelligence, is becoming used to complement decision-making, predicting the migration pattern and identifying what exact resources specific cohorts of vulnerable people need (Scotto et al., 2025; Hamid, & Alemu, 2023). Moreover, unmanned aerial vehicles also provide some rare functionalities on cartographic mapping of disaster areas as well as transport critical medical supplies to geographically isolated areas in which ground delivery is not sustainable . These online initiatives are successful bridges between public and private relationships hence allowing non-governmental organisations to tap on the technical expertise of the private sector actors, and the overall effect is the enhancement of humanitarian supply-chain performance (Akhtar et al., 2025). Similarly, other AI-based solutions, including blockchain applications in supply-chain management, have proven to be cost-effective, especially in human capital, data storage, and security, and reduce risks since data-management operations are automated and thus curtail chances of human error.

The blockchain technology provides a decentralised system that enhances the integrity of the fiscal flows by furnishing the transparency and reducing the predisposition to corruption when performing aid distribution (Niji, 2025). Such technology creates an unalterable registry of tracking merchandise, in such a way that it aids in solving the long-standing dilemma of fragmentation of information and shortages of materials that characterized the multilateral chain of supply . Although such innovation brings with it efficiencies, organisations should act cautiously; they should implement such innovation in small steps so that it does not drain organisational resources and during the process, hinder disaster response (Osu-Biu et al., 2025).

To build resilient humanitarian networks, it will be necessary to focus on enabling sustainability, especially by hyper-connectivity and strategic planning on renewable energy to support key infrastructure during a pandemic or the occurrence of natural disasters (Kashav & Garg, 2025). Strong optimisation models are developed with social vulnerability indicators and access to regional data so that the process of evacuation planning and relief delivery would be fair and effective at the same time (Seif et al., 2026). In sub-Saharan Africa especially, these approaches are particularly decisive because operations have to overcome severe infrastructure shortages and be able to fight with the fact that road systems become unusable during the rainy season (Grigoli et al., 2024).

Running a modern humanitarian logistics system is similar to running a complex ship through a dynamic environment at sea: its success depends not only on the availability of advanced navigational tools via artificial intelligence and blockchain, but