Chapter 8
Supply Chain and Logistics Optimization Through GIS:
Enhancing Visibility, Efficiency, and Strategic Decision-Making

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ABSTRACT

The integration of Geographic Information Systems (GIS) has significantly transformed supply chain and logistics operations by enabling enhanced visibility, improved efficiency, and data-driven strategic decision-making. This chapter explores the fundamentals of GIS, its applications in real-time tracking, route optimization, warehouse management, risk assessment, and sustainability planning. It highlights how GIS integrates with emerging technologies such as IoT, AI, machine learning, blockchain, and digital twins to support predictive analytics and autonomous logistics

DOI: 10.4018/979-8-3373-7941-8.ch008

systems. Through industry case studies and analysis of future trends, the chapter emphasizes the growing role of GIS in building resilient, agile, and environmentally sustainable supply chains.

1. INTRODUCTION

1.1 Background and Motivation

Digitalization, globalization, evolving customer demands, and disasters such as pandemics, geopolitical disputes, and extreme weather conditions have led to a fast-changing global supply chain environment. The supply chains of the contemporary world are more intricate, geographically dispersed and interdependent than ever and require constant monitoring, real-time decision making and adaptive planning (Bentalha, B. 2023). To this end, organizations are increasingly adopting better technologies in order to achieve operational visibility, cost effectiveness, resilience and sustainability. GIS has emerged as one of the powerful facilitators of spatial intelligence improvement of supply chain and logistics operations. GIS integrates spatial data with real-time location data and analytics to provide actionable data about how goods move, the behavior of transportation networks and supply chain node performance. This integration helps the companies to optimize the routes, reduce the transportation costs, risk management, and the strategic decision making capabilities(Suganya, P et al., 2026). The optimization of agility, responsiveness, and situational awareness may be of paramount importance with an ever-changing number of uncertainties encountered by supply chains(Muduli, K., & Barve, A. 2015).

1.2 Importance of GIS in Modern Supply Chain Systems

Conventional supply chain management has relied on past information, where tracking and plan in place are done manually. However, in most cases, these methods are not sufficient to deal with dynamic and uncertain real-life scenarios. GIS bridges this gap since it enables organizations to map, analyze and interpret geographical patterns that dictate their logistic decision-making. The concept of GIS incorporates real-time tracking of vehicles, deliveries, stocks and environmental status, and this is why it is inevitable in the implementation of end-to-end supply chain visibility. As the location-based information is utilized in the decision-support systems, companies will have the opportunity to streamline transportation routes, identify the areas of vulnerability, efficiently manage their assets, and respond to