

# **Leveraging Generative AI and Large Language Models for Sustainable Supply Chain Optimization**

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## **Abstract**

The increasing concern for the environment and the enforceable demands for sustainability have turned optimization of operations into a very critical focus by industries across the world. This study explores the transformative potential of Generative Artificial Intelligence (AI) and Large Language Models (LLMs) in fostering sustainable supply chain optimization, focusing on how AI-powered solutions could further enhance efficiency to reduce waste, carbon emissions, or creating more supply chain visibility. The methodologies pursued in this research adopt an integrated approach to the analysis of case studies, assessment of quantitative data, and AI-driven simulations. First, the review of recent literature assembles literature on applications of AI with regard to supply chain management and sustainability. Finally, AI simulations were conducted to model different supply chain scenarios with the possibility of making predictions about various sustainability outcomes. Our findings have implications for both academia and industry, suggesting that Generative AI and LLMs significantly enhance supply chain efficiency and sustainability. The AI-driven demand forecasting model is better compared to traditional approaches, considering the ability to reach appropriate market demand by reducing overproduction and waste generation. Moreover, AI-enabled simulations showed that supply chains involving the introduction of AI technologies reduce excess inventory, thus minimizing emissions and resource consumption. As such, large amounts of unstructured data from supplier reports and complex regulatory documents were made more transparent and compliant with environmental standards through the use of LLMs.

## **Keywords**

Generative AI, Sustainability, Supply Chain Optimization, Large Language Models (LLMs), Circular Economy.

## **Biography:**

**Sergio Mastrogiovanni** is an Associate Professor and Researcher at New York University, New York, USA; Austral University, and IAE Business School, Buenos Aires, Argentina.

Senior data scientist, executive, entrepreneur, lecturer, and educator with career success leveraging advance data analytics and technology integration to boost sustainable revenue, manage change through digital transformation and continuous improvement, and his passion in this world is about making data accessible to people.

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