Chapter 9
Sustainable Supply Chain Optimization in the Fish Processing Industry With an SSCM Approach for Efficiency and Sustainability

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ABSTRACT

The fish processing industry plays a strategic role in global food systems but faces critical sustainability challenges, especially in coastal regions of developing countries. This chapter explores how Sustainable Supply Chain Management (SSCM) can address issues such as supply-demand fluctuations, waste inefficiency, and limited adoption of digital technologies. It also highlights the integration of Circular Economy (CE) principles to valorize fish waste and reduce environmental impact. Using a systematic literature review of 35 studies, this research identifies major bar-

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riers including weak infrastructure, low awareness, and inadequate policy support. Case studies from Indonesia, India, and Norway illustrate contrasting conditions and provide context-specific insights. The chapter emphasizes stakeholder collaboration, digital transformation, and flexible operations as key enablers for SSCM success. It concludes by offering strategic recommendations to promote sustainable practices that support the achievement of SDGs and enhance competitiveness in the fish processing industry.

1. INTRODUCTION

The fish processing industry plays a crucial role in meeting the rising global demand for marine-based protein.. While the industry supports economic growth and food security, it faces growing challenges such as overfishing, inefficient supply chains, and environmental degradation (Pham et al., 2023). The situation is particularly concerning in developing countries with coastal economies, where infrastructure and technological support are often inadequate.

In this context, Sustainable Supply Chain Management (SSCM) emerges as a comprehensive framework for integrating environmental, economic, and social dimensions into supply chain strategies. The core objective of SSCM is to reduce environmental impacts, enhance resource efficiency, and promote equitable social outcomes while maintaining business profitability (Beske & Seuring, 2008). In the fish processing industry, SSCM provides viable solutions to various challenges, including traceability issues, inefficient waste management, and unsustainable sourcing practices.

Recent research indicates that the fish processing industry is a major source of waste production, with a significant portion inadequately managed. Many regions lack reliable cold chain facilities, which leads to spoilage and deterioration in product quality, reducing economic value (Martins et al., 2010). Additionally, transportation inefficiencies and poor logistics further complicate the sustainability of supply chains. These challenges underline the urgent need for an integrated approach that combines supply chain efficiency with sustainability goals.

Another critical approach involves the adoption of circular economy (CE) principles within fish processing operations. CE encourages the reuse, recycling, and regeneration of resources to minimize waste and reduce environmental damage. While this approach shows promise, its implementation faces considerable barriers. Small and medium-sized enterprises (SMEs), which dominate the industry, often lack the necessary financial resources, technological capacity, and institutional support to effectively adopt CE strategies (Reim et al., 2025).