# Chapter 14
# Navigating Sustainability in Supply Chains: Challenges and Opportunities in the Era of Industry 4.0

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## ABSTRACT

*This chapter is organized around three main questions related to the concept of the green Supply Chain, 4.0 technologies and the use of these technologies to ensure sustainability. Our main goal is to provide answers to the question: how and to what extent can sustainable supply chains be successfully implemented economically, socially and ecologically with the help of 4.0 technologies? Methodologically, we took an exploratory approach supported by qualitative and quantitative data extracted from literature, reports and the websites of the companies involved. This has allowed the focus to be on the cutting-edge practices and experiences of companies of different sizes and activities, as well as on the successes in reducing CO2 emissions and respecting social ethics.*

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## 1. INTRODUCTION

This chapter discusses the role that 4.0 technologies can play in achieving sustainability goals throughout the supply chain (SC).

First, a conceptual approach that focuses on the SC in its different dimensions is presented. In the second part, the most important technologies of Industry 4.0 are briefly examined both technically and functionally. The third section is mainly devoted to the green SC. The main practices in this area are presented.

In the last part, Green Supply Chain 4.0 is dealt with in terms of reducing greenhouse gas emissions and social issues. We focus on the potential of each Technology 4.0 to achieve sustainability goals within SC. As a concrete example, we present at least one experiment for each 4.0 technology in a large international company that has led to the reduction of CO2 emissions and/or the preservation of the rights of stakeholders (employees, customers, suppliers, etc.).

## 2. GREEN SUPPLY CHAIN (GSC) CONCEPTUAL APPROACH

In the literature, we can distinguish several definitions of Supply Chain (SC) and Supply Chain Management (SCM). For the SC We can cite the definition of Lambert and Cooper (2000), that of Mentzer et al (2001), that of Chopra and Meindl (2004) and that of Simchi-Levi et al. (2019). Among the most recent we find the definition presented by Sunil Chopra, Peter Meindl [1] in 2020. According to which, an SC "is a network of facilities and distribution options that performs the functions of sourcing materials, processing those materials into intermediate and finished products, and distributing those finished products to customers." This definition emphasizes the interconnection of the different entities in the supply chain, from suppliers to manufacturers to customers, and the flow of materials and products through the network.

Overall, we can define the suppy chain as a network that brings together all the tasks and actors acting on the flows. This network has a common purpose and a leader who ensures the coordination and integration of the whole. It associates a company with its suppliers and customers with the aim of integrating and synchronizing flows.

In addition, to define SCM, we can propose Martin Christopher's definition[2] of "the management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at a lower cost to SC as a whole".

We can also say that SCM corresponds to all the methods, techniques and tools used to optimize the Supply Chain. It consists of refocusing the organization on the needs of the customer.