

ABSTRACT

Due to COVID-19, more and more people reduce their trips to stores and choose to shop online. However, online shopping takes a long time for customers to receive their orders due to the delivery process, while customers are demanding to get their daily needs as soon as possible. In Indonesia, some grocery stores and convenience stores have started to offer click-and-collect or in-store pick-up services in addition to home delivery, giving customers an option of getting their orders faster. Considering home delivery and in-store pick-up in omnichannel retailing may increase the carbon footprint due to the increase in last-mile deliveries. The transportation of the customers to the stores also has the potential to increase the carbon footprint. One way to reduce the carbon footprint is by implementing a carbon tax policy that imposes a tax on greenhouse gas emissions.

This research aims to determine which store serves customers as an in-store pick-up location, where customers can pick up their orders at the nearest store. In addition to delivery services, this research considers product return services with similar options. Each store can serve returns through a carrier (carrier ship return) or an in-store return location, where customers can return products. The carbon tax policy is considered to evaluate the environmental impact of providing last-mile delivery and return options. This research also considers demand uncertainty to represent a more realistic condition. A Mixed Integer Non-linear Programming model is developed to solve the problem. The objective is to minimize the total cost incurred by the firm, customers, and the carbon footprint. By comparing the results of minimization without environmental and with environmental in the optimization process, the result is that the calculation by considering the environmental side can reduce the cost in the optimization results.

Keywords: last-mile delivery, last-mile return, carbon tax policy, mixed-integer non-linear programming, click-and-collect