

INTISARI

Saat ini, kompetisi tidak lagi terjadi antara satu perusahaan dengan perusahaan lainnya, namun antar *Supply Chain Management* (SCM). *Supply Chain Network Design* (SCND) penting untuk meningkatkan performansi dan efisiensi jangka panjang supply chain. Kompleksitas supply chain dipengaruhi oleh perkembangan perusahaan dan industri. Keputusan strategis jangka panjang diperlukan untuk kelangsungan bisnis, dengan evaluasi yang melibatkan aspek ekonomi dan lingkungan. Fokus utama implementasi *supply chain* adalah mengurangi biaya dan emisi karbon.

Dalam penelitian ini, metode Priority Based Genetic Algorithm (pb-GA) digunakan untuk mengoptimalkan jaringan rantai pasok dengan pengendalian persediaan dan emisi karbon. Tujuan utama penelitian adalah pengembangan model matematis untuk jaringan rantai pasok multi-sourcing dan multi-echelon, dengan menggabungkan variabel kebijakan persediaan dan emisi karbon. Metode pb-GA digunakan untuk mencari solusi optimal dalam kasus numerik dan studi kasus hipotetis, dengan tiga jenis decoding yang digunakan untuk mengevaluasi performa indikator biaya pemesanan, biaya penyimpanan, dan biaya emisi karbon.

Hasil penelitian menunjukkan bahwa kombinasi dekoding biaya pemesanan dengan metode crossover WMX memiliki kinerja terbaik dalam aspek total biaya dalam mengoptimalkan jaringan rantai pasok. Selain itu, menemukan bahwa kombinasi terbaik untuk waktu komputasi adalah menggunakan crossover WMX dan dekoding biaya penyimpanan.

Kata kunci: *priority based genetic algorithm (pb-GA), inventory control, emission carbon, weight mapping crossover (WMX), improved partially mapping crossover (IPMX), ordering cost decoding (OCD), holding cost decoding (HCD), emission cost decoding (ECD), three echelon supply chain network, mixed-integer nonlinear programming (MINLP)*

ABSTRAK

Currently, competition no longer occurs between individual companies, but rather among Supply Chain Management (SCM) entities. Supply Chain Network Design (SCND) plays a crucial role in enhancing the long-term performance and efficiency of the supply chain. The complexity of the supply chain is influenced by the development of companies and industries. Long-term strategic decisions are necessary for business sustainability, involving evaluations encompassing economic and environmental aspects. The primary focus of supply chain implementation is cost reduction and carbon emissions reduction.

In this study, the Priority Based Genetic Algorithm (pb-GA) method is employed to optimize the supply chain network by considering inventory control and carbon emissions. The main objective is to develop a mathematical model for a multi-sourcing and multi-echelon supply chain network, incorporating inventory policy variables and carbon emissions. The pb-GA method is used to find the optimal solutions in numerical cases and hypothetical case studies, with three decoding types used to evaluate the performance indicators of ordering costs, storage costs, and carbon emissions costs.

The research results demonstrate that the combination of ordering cost decoding and the WMX crossover method performs the best in terms of overall cost optimization in the supply chain network. Additionally, it is found that the best combination for computational time is the use of the WMX crossover and storage cost decoding.

Key Word: *priority based genetic algorithm (pb-GA), inventory control, emission carbon, weight mapping crossover (WMX), improved partially mapping crossover (IPMX), ordering cost decoding (OCD), holding cost decoding (HCD), emission cost decoding (ECD), three echelon supply chain network, mixed-integer nonlinear programming (MINLP)*