Designing an environmentally conscious tire closed-loop supply chain network with multiple recovery options using interactive fuzzy goal programming [1]

"Significant environmental problems have been caused by the growth in the volume of used tires each year. In addition, remanufacturing and recycling options related to the end of life for tires are crucial issues at present because of difficulties related to the degradation of these scrap tires in the environment and the economic benefits of material and energy recovery. Thus, effective collection, storage, recycling, and appropriate disposal methods are required for used tires without damaging the environment by designing an efficient closed-loop supply chain network. Based on this motivation, we present a holistic modeling approach for a tire closed-loop supply chain using mixed integer linear programming. Alternative recovery options such as remanufacturing, recycling, and energy recovery are considered simultaneously in the model. The main objective of this study was to develop a multi-objective, multi-echelon, multi-product, and multi-period logistics network design model in a more holistic manner while also considering environmental issues. To quantify the environmental impact and the closed-loop supply chain, we used a life cycle assessment-based and damage-oriented method (eco-indicator 99). We applied the model to an illustrative case study and an interactive fuzzy goal programming approach was utilized to solve the proposed fuzzy multiple-objective network optimization model. In order to obtain the best profit values and to satisfy the environmental indicator targets, we examined the effects of some parameters (factors) within the profit and damage function using an experimental technique based on the Taguchi design. Experimental runs were conducted using the optimization solver in ILOG OPL Studio 6.3 and the results were evaluated based on Taguchi’s (S/N) ratios, analysis of means graphs, interaction graphs, and analysis of variance with MINITAB 14."

(http://www.sciencedirect.com/science/article/pii/S0307904X14005411 [2])

**Format:**

Scientific article

**Author names:**

Kemal Subulan, A. Serdar Tasan, Adil Baykasoglu

**Length (pp):**

42 (pp. 2661-2702)

**Year:**

2015

**URL:**


**Type of evidence:**
Sectors:
  - Manufacturing

Expected changes of economic processes:
  - Efficient use of resources
  - More recycling and use of recycled materials
  - Remanufacturing, refurbishment and reuse of products and components

Indirect effects on the economy:
  - Impact on value chains

Environmental impacts:
  - Use of resources
  - Pollution
  - Landscape

Time frame for impacts to materialize:
  - Not specified/not applicable

Administrative level:
  - Industry

Method of valuation:
  - Qualitative assessment
  - Quantitative assessment
  - Monetisation

Excel ID:
i00097

The CIRCULAR IMPACTS project has received funding from the European Union's Horizon 2020 Programme for Research and Innovation under the Grant Agreement no. 730316.

Source URL: https://circular-impacts.eu/library/1321

Links