

At the Chair of Logistics and Supply Chain Management at the TUM School of Management, we are looking for an interested and qualified student to conduct their

Master's Thesis

on the topic:

Supply Optimization Under Sustainability Constraints: Modeling the Impact of CO₂ Certificates, Recycled Materials, and Secondary Markets

Companies operating in the European Union increasingly face binding CO₂e pricing as well as circularity requirements. These constraints must be incorporated into supply chain optimization (e.g., in procurement). Internalizing CO₂-certificate prices, recycled-content targets, and secondary-market valuations is an important step toward specifying objective functions and constraints designed for modern supply chain decisions. A mixed-integer linear programming approach allows to analyze how circularity affects optimal sourcing and inventory planning with respect to total cost, emissions, and service performance. The model will provide future-oriented guidance on supply chain decisions to practitioners and academics alike and sensitivity analyses will be used to assess robustness.

Key project tasks:

- Conduct a literature review on circular supply chains, circular supply chain optimization models, and carbon pricing and/or certificate trading.
- Identify, justify, and collect relevant data and parameters (e.g., demand, lead times, emission factors, certificate prices, recycled-content targets, salvage values).
- Develop and implement a linear programming (LP/MILP) model that integrates CO₂-certificate pricing, recycled -content requirements, and secondary-market options.
- Perform scenario and sensitivity analyses (e.g., price and target shocks) and map cost–emissions–service trade-offs (i.e., Pareto analysis).
- Derive managerial guidelines for a future-proof supply chain strategy and discuss policy and implementation implications.
- Analyze and discuss results, limitations, and implications.

Requirements:

This thesis is suitable for Master Management and Technology (MMT) as well as Master in Management (MiM) students with a focus on operations and supply chain management. Candidates should possess the ability to work independently and demonstrate strong analytical skills. Candidates should possess the ability to work independently and demonstrate strong analytical skills. Proficiency in a general-purpose programming language (e.g., Python), as well as a solid

understanding of mathematical programming and optimization (e.g., Gurobi), are required. A keen interest in supply chain optimization modeling; familiarity with ESG-related performance indicators; and knowledge of supply chain strategies and multi-criteria decision-making would be advantageous.

Earliest Start Date: As soon as possible.

Supervisor: Ben Mischeck

Application: Email with curriculum vitae and transcript of records to **logtheses.log@mgt.tum.de**