

# **Toward Sustainable Business Models for Shared Reverse Logistics of Electric Vehicle Battery**

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## **Abstract**

The rapid growth of the electric vehicle (EV) industry is driving an unprecedented demand for batteries, underscoring the importance of implementing reverse logistics practices. A shared reverse logistics (SRL), in which multiple entities collaborate to tackle the complexities of managing returned products and end-of-life processes, can play a vital role in ensuring the sustainability of EV reverse logistics. To ensure revenue generation, sustainability, and effective collaboration among stakeholders of an EV shared reverse logistics network, a well-defined business model is essential. However, reviewing literature reveals that a sustainable business model for EV shared reverse logistics have not been adequately developed. This paper aims to develop a novel business model by emphasizing on the importance of the Triple Bottom Line approach for a SRL within the EV battery sector. The proposed business model offers several key benefits, including addressing the complex challenges of managing product returns in the EV industry, maximizing recaptured value, promoting sustainability, achieving cost-effectiveness, reducing waste, and increasing profitability through efficient management of returned goods and materials. By integrating collaborative efforts across the supply chain components, the model optimizes resources and reduces environmental footprint, addressing the growing concern for sustainable handling and recycling of spent EV batteries. To perform this study, firstly we conducted a literature review on existing closed-loop supply chain EV battery, shared reverse logistics, and business models. Next, we propose a business model for EV shared reverse logistics focusing on sustainability KPIs. The study delves into potential sustainability indicators relevant to the EV battery's reverse supply chain while also highlighting components that can be shared among stakeholders. Our findings emphasize the potential of SRL as an enabler for sustainable growth in the EV battery industry. This work not only emphasizes the significance of innovative sustainable practices but also charts a viable pathway for stakeholders to collectively address the challenges of the end-of-life EV battery.

## **Keywords**

Shared reverse logistics, Sustainable Business Models, Battery Electric Vehicle

## **Biographies**

**Aysan Mahboubi** is currently a Ph.D. candidate in Industrial Engineering at Polytechnique Montreal. She holds a Master's degree in Financial Engineering, specializing in predicting corporate bankruptcy through the innovative use of a hybrid algorithm. Driven by her commitment to sustainability, she persists in her academic journey with a strong focus on sustainable practices, particularly within the domains of reverse logistics and the circular economy. Her primary objective is to advance the development of optimization models to facilitate greener production and contribute to a more sustainable future.

**Mina Kazemi Miyangaskary** earned her M.S. in Industrial Management from Guilan University and subsequently achieved her Ph.D. from Tehran University, Iran. Presently, she serves as a research assistant at Polytechnique

Montreal University. With a decade's worth of academic and industrial exposure in both Canada and Iran, she has made significant contributions in teaching, research, and development. Mina's research is at the forefront of advancing our understanding of uncertainty in supply chain dynamics, with a special focus on fuzzy mathematical modeling.

**Samira Keivanpour** is an assistant professor in the Department of Mathematical and Industrial Engineering at Polytechnique Montréal, Canada. She conducts research on sustainable solutions for supply chain and logistics management, with a focus on end-of-life product treatment, circular manufacturing, and the integration of Industry 4.0 technologies.

**Amina Lamghari** After receiving a BSc and a Master's in Applied Mathematics, Amina Lamghari obtained a PhD in Operations Research from the University of Montreal, Canada, after which she worked as a post-doctoral fellow and later as a research associate at the COSMO Stochastic Mine Planning Laboratory at McGill University. Amina is currently an associate professor in the Management School at the University of Quebec at Trois-Rivières. Her research interests are centered on various techniques and algorithms —(meta)heuristics, hyper-heuristics, and matheuristics -- for optimization and their integration and application to solve complex scheduling and planning problems in an efficient manner accounting for uncertainty