

# Circular Supply Chain System for Electric Vehicle in Indonesia: A Conceptual Model

**Karsi Widiawati**

Industrial Engineering Program, Department of Mechanical and Industrial Engineering  
Universitas Gadjah Mada (UGM)  
Yogyakarta, INDONESIA  
[karsiwidiawati@mail.ugm.ac.id](mailto:karsiwidiawati@mail.ugm.ac.id)

**Bertha Maya Sopha**

Industrial Engineering Program, Department of Mechanical and Industrial Engineering  
Universitas Gadjah Mada (UGM)  
Yogyakarta, INDONESIA  
[bertha\\_sopha@ugm.ac.id](mailto:bertha_sopha@ugm.ac.id)

## Abstract

In an effort to overcome environmental issues related to increasing greenhouse gas emissions, Indonesia is one of the countries that has committed to supporting the use of electric vehicles to replace internal combustion vehicles. The potential increase in the use of electric vehicles creates a large potential for the generation of electric vehicles to reach the end of life (EoL). This EoL electric vehicle can pollute the environment if released into the environment. It will be very unfortunate if this consumable electric vehicle is left alone and becomes garbage even though it contains a limited number of metals. Therefore, a circular supply chain (CSC) system is needed in Indonesia to reduce waste in the form of EoL electric vehicles and reduce the need for raw materials for the manufacture of electric vehicles considering that the materials used are non-renewable. This research presents a conceptual model of the influential factors toward the CSC implementation of electric vehicles in Indonesia. The model was developed based on literature review and secondary sources analyses to capture both the difference between CSC in Indonesia and in developed countries based on the role of the informal sector in handling products that reach the EOL. The informal sector is usually small in scale and uses simple technology. This means the recycling process carried out will result in greater pollution than using standard methods with adequate technology. This causes the CSC system in Indonesia to produce greater pollution than in developed countries, considering that the role of the informal sector cannot be eliminated in Indonesia.

## Keywords

Circular Supply Chain, Electric Vehicles, Causal Loop Diagram, Recycle, Informal Sector

## Biographies

**Karsi Widiawati** is a Master Student of the Industrial Engineering Program, Department of Mechanical and Industrial Engineering, Gadjah Mada University, Indonesia. She earned a Bachelor of Agroindustrial Engineering from Institut Pertanian Bogor. She is currently the awardee of the Program Magister Menuju Doktor untuk Sarjana Unggul (PMDSU) scholarship.

**Bertha Maya Sopha** is an Associate Professor of Industrial Engineering Program, Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada, Indonesia. She was a former head of the Laboratory of Supply Chain Engineering and Logistics in 2013-2015, and a former director of the Industrial Engineering Undergraduate Program in 2016-2021. She currently serves as a chair of the Indonesian Association of Industrial Engineering Higher Education Institution (BKSTI), and vice-president of IEOM Indonesia Chapter. She earned a Bachelor of Engineering (best graduate) from Universitas Gadjah Mada, a master's degree of Management of Production specialization in Transportation and Logistics (graduate with distinction) from the Department of Industrial Economics and Technology Management, Chalmers University of Technology, Sweden. She holds a Ph.D. from the Industrial Ecology

Programme, Norwegian University of Science and Technology (NTNU), Norway. She has maintained a high quality of research throughout her academic career including international scholarly leadership in supply chain management and logistics, industrial ecology, and complex system modeling. She has also received various academic achievements, awards, and recognitions such as Distinguished Woman in Industry and Academia (WIIA) by IEOM Society, Editor Choice Award 2020 by Maritime Economics and Logistics Journal (Palgrave Macmillan), the Best Lecturer runner-up 2015 by Universitas Gadjah Mada, best paper awards at several international and national conferences, and research grantee awards from both Indonesia and abroad institutions. She has professional and community engagement activities to significantly improve the university's reputation through industrial projects and community services.