

# Sustainable design of products: Balancing quality, life cycle impact, and social responsibility

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## ABSTRACT

The shift towards sustainable mobility has increased the demand for energy-efficient and environmentally friendly vehicles, such as Hybrid Electric Vehicles (HEVs). However, designing HEVs that simultaneously meet high product quality, minimize environmental impact, and adhere to social responsibility standards remains a complex challenge. This study presents a decision-making model aimed at integrating these key sustainability criteria into the design and improvement of HEVs. The model combines three indices: the Aggregated Quality Index (AQI), Environmental Impact Index (EII) based on Life Cycle Assessment (LCA), and Social Responsibility Index (SRI), to assess and compare different HEV prototypes. By processing customer expectations, environmental impacts, and social responsibility considerations, the model predicts the optimal prototype that balances quality, environmental sustainability, and social standards. The findings demonstrate that applying this model can significantly enhance decision-making in sustainable vehicle development and support the creation of HEVs that better align with global sustainability goals. This approach has practical implications for automotive manufacturers aiming to innovate responsibly in the green mobility sector.

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