

Electric Vehicles: A Sustainability Challenge and Opportunity

The transition to electric passenger vehicles is a key pillar of the EU's decarbonization strategy. EVs offer significant potential to reduce global greenhouse gas emissions and local air pollution while enhancing energy security by decreasing dependence on imported fossil fuels. However, their widespread adoption also introduces challenges, including the environmental impact of raw material extraction, the strain on energy and charging infrastructure, and concerns regarding lifecycle sustainability.

This work aims to examine the major challenges and opportunities associated with mobility electrification, focusing on economic and environmental dimensions, as well as social issues related to raw material extraction for battery production. The analysis covers battery production impacts, charging infrastructure deployment, total cost of ownership, and policy measures needed to ensure sustainable growth. Additionally, it explores variations in EV deployment across countries, particularly the correlation between GDP per capita, charging network expansion, and electricity generation mix. Special attention is given to EV size and its economic and environmental implications.

EVs are reshaping automotive markets, energy and infrastructure demand, investments, influencing cost competitiveness and supply chain stability. Furthermore, the increasing market share of large EV models, particularly SUVs, raises concerns regarding affordability, accessibility, and additional infrastructure requirements. This work contributes to a deeper understanding of the economic and environmental trade-offs of EV deployment and explores how EVs can serve as a transformative force in sustainable transportation while addressing key challenges to their long-term success.