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Assessing adoption barriers and environmental impact of electric two-wheelers in Bhubaneswar: Policy-driven strategies for urban sustainability

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ABSTRACT

In alignment with India's national sustainability goals, electric two-wheelers (E2Ws) present an urgent and promising alternative to traditional vehicles, with substantial potential to reduce urban emissions. However, adoption remains limited due to infrastructural challenges and behavioral barriers. This study empirically examines E2W adoption challenges and environmental impacts in Bhubaneswar, Odisha and using data from 700 respondents in the Bhubaneswar Municipal Corporation region. Respondents were categorized into four groups: current ICE (internal combustion engine) users with no intention to shift, ICE users considering E2Ws, E2W users planning upgrades, and E2W users contemplating a return to ICE vehicles. The findings reveal that specific attitudinal factors—perceived reliability, range anxiety, pro-technology orientation, and social influence—significantly shape the behavior of each group in distinct ways. Current ICE users with no intention to shift prioritize the reliability and value of ICE vehicles, along with concerns about E2W resale value. ICE users considering E2Ws are concerned about range limitations and insufficient charging infrastructure but are motivated by cost savings and environmental benefits. E2W users planning upgrades focus on battery degradation and service center accessibility, yet their interest in advanced technology drives them to consider newer E2W models. In contrast, E2W users contemplating a return to ICE vehicles cite inadequate subsidies and high maintenance costs as key deterrents. These insights allow further classification of users into pro-technology adopters, followers, and laggards. Results underscore the need for city-specific policy measures addressing these unique group-specific barriers. Recommendations include expanding charging infrastructure, enhancing service center accessibility, and implementing battery longevity initiatives. Additionally, a scrappage scheme tailored for Bhubaneswar is proposed to accelerate the shift from ICE vehicles to E2Ws, supporting urban sustainability goals. Findings emphasize that targeted, localized policies can substantially increase E2W adoption rates and contribute to India's broader environmental objectives.

Keywords: Electric two-wheelers (E2Ws); Urban sustainability; Adoption Barriers; Behavioral barriers; Policy strategies