

Small Vehicles, Big Potential: Assessing the Potential of Light Electric Vehicles to Replace Car Trips in Germany and Switzerland

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Abstract Urban mobility systems are under increasing pressure. Growing traffic volumes contribute not only to greenhouse gas emissions but also to congestion, noise, air pollution, and a massive demand for space—both in motion and at rest. These problems exacerbate land use conflicts, and quality-of-life concerns in urban areas. Addressing them requires more than just technological innovation: it calls for changes in mobility behavior and vehicle concepts. A key challenge is how to reduce these negative impacts without giving up the benefits of individual mobility, which remain essential for many people. Light Electric Vehicles (LEVs) offer a promising answer. They enable flexible, personal transport while significantly lowering environmental and spatial burdens. LEVs are energy-efficient, lightweight, and require less battery capacity and infrastructure than conventional cars, thereby reducing emissions, resource consumption, and occupation of space. This study estimates the theoretical potential of LEVs to substitute car trips in two countries: Germany and Switzerland. The German analysis is based on the national travel survey “Mobilität in Deutschland” (MiD 2017) with about 960,000 trips; the Swiss case uses data from the “Mikrozensus Mobilität und Verkehr” (MZMV 2021) with more than 200,000 recorded trips. Considered LEV types include e-scooters, pedelecs, cargo bikes, and lightweight three- and four-wheeled electric vehicles. The findings reveal that in Germany, up to 76% of car trips and 50% of car kilometers could theoretically be replaced by LEVs. For Switzerland, the potential is even slightly higher: 82% of car trips and 57% of kilometers could be covered by LEVs. The substitution potential is particularly pronounced for short urban trips and varies by trip purpose and age group. The study compares both national cases and discusses enabling conditions for realizing this potential, such as infrastructure improvements, regulatory frameworks, and behavioral incentives. It also highlights the limitations of a purely technical substitution model and points to further research needs on real-world acceptance and system integration.