

# Decarbonization of vehicle fleet through land uses: examining the effect of '3Ds' on urban vehicle fuel efficiency

Tiebei Li, Neil Sipe, and Jago Dodson

## ABSTRACT

Land-use planning has been identified in the major literature for its potential in forming sustainable transportation in cities. Appropriate land-use planning can reduce vehicle trips and emissions in several ways. However, its potential effect on the fuel consumption rate of vehicle fleets is an unexplored area. This paper explores whether the fuel consumption rate of urban private vehicle fleets is associated with the land-use environment in an urban area. To do this, we conduct a range of land use measures at both suburb and street level to capture key dimensions of land use (density, diversity, and design) and test how these features would affect private vehicle ownership and fuel efficiency. Through a quantitative analysis, we find that at the suburb level, areas with high density and close land use proximity are strongly associated with newer and more fuel-efficient vehicles. At the street level, smaller land parcels and narrower streets are features that enable more efficient vehicles in the local fleet. Lastly, we find that improving '3Ds' not only encourages active travels in a neighborhood but also offers additional benefits in increasing more fuel efficient vehicles in the local fleet. The finding will help land-use planners identify various land-use approaches and explore new pathways for emissions reduction through land-use planning.

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Private vehicle fleet  
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Street characteristics  
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