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Safety Considerations for All Road Users on Edge Lane Roads

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Despite their novel approach of allowing automobile traffic in two opposing directions to share one lane of traffic, Edge Lane Roads (ELRs) have been reported to be effective in a variety of contexts. This research provides the most comprehensive safety evaluation of these facilities to date.

Study Methods

To assess the safety effects of ELRs, we used a simulation-based approach as well as crash data analysis. We assembled crash data from ELR installations in the US and from Queensland, Australia. Crash data were used to conduct corridor-based and project-based Empirical Bayes (EB) before-and-after evaluations to estimate the safety effectiveness of ELRs. Both approaches are documented in the Highway Safety Manual. The corridor-based approach is less data-intensive for the study sites but provided a very conservative estimate of the Crash Modification Factor (CMF) for ELRs. The more accurate but more data-intensive project-based approach provides a more realistic estimate of the CMF.

Findings

Based on the simulation, the rate of critical interactions between oncoming motor vehicles (MVs) increases significantly as the automobile volume goes up. Hence, volume and not speed may be a critical factor in the siting of ELRs. In the urban context, ELRs lead to crash reduction compared to traditional two-lane roads. Evidence is mixed on the rural facilities with low volume and higher speeds, and more data are needed for a more conclusive determination. Overall, the CMF for ELRs using the project-based EB approach was estimated to be 0.56, which represents a 44% reduction in crashes during the post-ELR installation period.

Policy/Practice Recommendations

ELR conversion of existing two-lane undivided roads allocates roadway space for vulnerable road users (VRUs) and forces motorists to pay attention to the oncoming traffic. Some may believe that the use of a single lane for vehicles traveling in two directions is too unconventional or unsuitable for use in the North American context. However, the aggregate Crash Modification Factor (CMF) estimate of 0.56, representing a 44% overall crash reduction compared to previously existing 2-lane configurations, indicates that ELRs may be a safer alternative to two-lane roadways.

ELRs can be effective treatments on low-volume roads where vulnerable road users (VRUs) need to be accommodated. They can also provide safety benefits in terms of reduced crashes.

The existing siting criterion for ELRs is based on daily traffic volume represented by ADT (Average Daily Traffic) and prevailing speed. A simulation analysis of conflicts at varying volume, speed, and directional split of traffic demonstrated a rapid rise in the critical interaction rate, i.e., the rate of interactions involving motorists approaching each other and at least one VRU, as vehicle volume increases. Asymmetric directional traffic volumes and increased vehicle speeds reduce the critical interaction rate. The critical interaction rate also varies significantly depending on which VRUs use the facility; pedestrian use shows a higher rate of critical interactions as compared to bicyclists. The results lay the foundation for an ELR siting criterion that is based on an acceptable likelihood of VRUs being party to a critical interaction while on a facility.

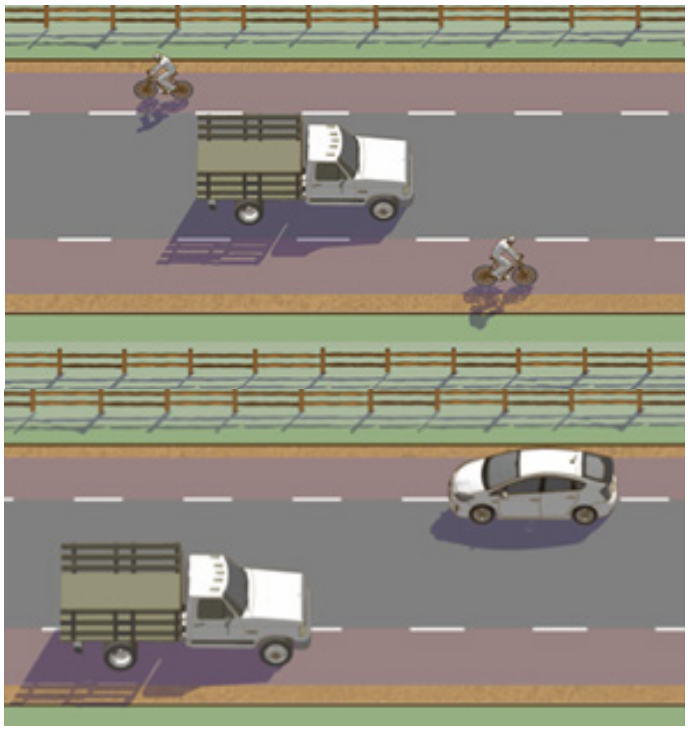

Figure 1. Typical ELR Design and Operation (FHWA 2016)

About the Authors

Michael Williams is the owner of Michael Williams Company, a transportation consultancy. He conducts research on edge lane roads and is a national expert on the treatment. **Marcial Lamera** is a graduate student at California Polytechnic State University, San Luis Obispo. **Aleksander Bauranov** is a graduate student at Harvard University. **Carole Turley Voulgaris, PhD, PE (WA)**, is an Assistant Professor of Urban Planning and Design at the Harvard Graduate School of Design. Her research focuses on travel behavior, sustainable mobility, and institutional decision-making. **Anurag Pande, PhD**, is a Professor of Civil Engineering at California Polytechnic State University, San Luis Obispo. His research interests include before-and-after evaluations of traffic operations and safety.

To Learn More

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