Environmental Engineering and Management Journal

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DYNAMIC TRAFFIC NOISE EXPOSURE ASSESSMENT FRAMEWORK FOR SHARED CYCLISTS: INTEGRATING ADAPTIVE MAP MATCHING AND SPATIOTEMPORAL NOISE MODELING

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Abstract

Traditional environmental noise assessments predominantly rely on static monitoring at fixed locations, failing to capture the dynamic, cumulative exposure experienced by active travelers. To bridge this gap, this study presents a dynamic exposure assessment framework leveraging high-resolution shared-bicycle GPS trajectories. The methodology integrates a context-aware adaptive map-matching algorithm—specifically designed to correct urban GPS drift—with a minute-resolution traffic noise model that accounts for real-time speed, flow dynamics, and building morphology. Exposure intensity is quantified via Total individual-level (*TNE*) and population-level (*MNE*) metrics. Case study results from Shanghai reveal that exposure is not uniformly distributed but spatiotemporally clustered: cyclists face significantly elevated risks near arterial corridors and intersections, particularly during morning and evening rush hours. Sensitivity analysis confirms the framework's robustness against positioning errors. By resolving exposure at a fine-grained spatiotemporal scale, this scalable, behavior-aware approach provides critical empirical evidence to support health-oriented transport planning and targeted noise mitigation strategies.

Key words: map matching, shared bicycle, spatiotemporal modeling, traffic noise exposure, trajectory data

Received: July, 2025; Revised final: February, 2026; Accepted: February, 2026

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