Cite this article
Long Z, Ma X and You L (2025)
Editorial: Navigating the future of intelligent transportation through equity innovation and resilience.
Proceedings of the Institution of Civil Engineers – Transport **178(4)**: 232–233,
https://doi.org/10.1680/jtran.2025.178.4.232

Transport

Editorial: Navigating the future of intelligent transportation through equity innovation and resilience

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The transportation sector is at a pivotal juncture, contending with the twin pressures of urbanization and sustainability while adapting to shifting societal demands. The six papers under review offer a comprehensive portrayal of the intricacies within modern transportation systems. They encompass a wide range of issues, from traffic congestion and accident risks to behavioral and technological innovations, and put forward approaches for more efficient, equitable, and resilient mobility solutions. Covering topics from behavioral psychology to cutting-edge technologies, these studies emphasize the significance of interdisciplinary collaboration and adaptive policymaking. By integrating their findings, we can steer toward transportation systems that are not only efficient and equitable but also robust in the face of rapid global change.

One of the most urgent issues examined is road congestion, which substantially affects urban efficiency and environmental quality. Two studies focus on Road Congestion Pricing (RCP), highlighting its potential to reduce traffic volumes (Zhou *et al*., 2025). In cities such as London and Stockholm, RCP resulted in an 18% and 22% decrease in traffic, respectively, within the first year, along with economic benefits like increased public transit investment and reduced nitrogen oxide emissions. However, these policies can also intensify social inequities. For instance, in London's peripheral boroughs, low-income communities experienced heightened pollution due to traffic spillover. Similarly, Singapore's electronic pricing system disproportionately impacts gig workers. These findings stress the need for equity-centered policy design, including dynamic pricing models and targeted relief programs.

Traffic congestion also elevates the frequency and severity of road accidents. Several papers point out that dense urban environments with high vehicle throughput are prone to collisions caused by erratic driving, poor infrastructure, and outdated traffic control systems (Bonela and Kadali, 2025). Inefficient signal coordination and the absence of dedicated lanes, for example, increase conflict points, especially during peak hours. Studies indicate that intelligent traffic management systems, such as real-time adaptive signaling and AI-based monitoring, can reduce collision rates by up to 62%, as demonstrated in Gothenburg, Sweden.

A groundbreaking study shifts the focus to the psychological foundations of commuting behavior, challenging conventional assumptions about rational decision making (PengCheng and BeiCheng, 2025). Through hierarchical regression analysis of 5,000 urban residents across three continents, the authors identify convenience and perceived safety as the primary factors in mode choice. Yet the study's most striking finding is its quantification of "perceived family attitudes" (PFA). In collectivist cultures like Japan and India, individuals are 40% more likely to adopt sustainable transport modes if they believe their family supports such choices. This PFA effect reduces annual household CO_2 emissions by an average of 1.2 metric tons, equivalent to planting 50 mature trees per family.

These insights call for a reimagining of policy frameworks. Instead of relying solely on financial incentives, cities could introduce "family sustainability certifications" or intergenerational awareness campaigns. Barcelona's "Superblock" initiative serves as a prime example: by redesigning neighborhoods to prioritize pedestrian spaces and positioning it as a family-friendly policy, the city increased cycling rates by 58% among parents with young children. The study also advocates for gender-responsive planning, as women were found to prioritize route safety three times more than men, a statistic that accounts for the 70% female ridership on Bogotá's women-only Trans Milenio buses.

Technological innovation is another central theme. Advances in Connected and Autonomous Vehicles (CAVs) using bio-inspired algorithms have shown a 27% reduction in energy consumption and a 33% increase in intersection throughput, minimizing phantom jams and associated rear-end collisions (Wu *et al*., 2025). Meanwhile, Vehicle-to-Everything (V2X) communication systems enable green-wave coordination and predictive braking alerts, cutting idling times and improving crash avoidance. A pilot project in Gothenburg, Sweden, equipped electric buses with real-time traffic signal data, enabling "green wave" coordination that reduced idling times by 44%. When scaled across the city's 500-bus fleet, this translated to annual CO_2 savings equivalent to removing 1,200 cars from roads. The paper also highlights cybersecurity as an emerging concern: while V2X systems reduced intersection collisions by 62% in trials, they remain vulnerable to spoofing attacks—a risk that necessitates blockchain-based authentication protocols now being tested in Seoul's smart corridor (Dong *et al*., 2025).

These interdisciplinary insights converge on a shared vision: transportation planning must evolve from siloed strategies to integrated, human-centered systems. For example, revenue from congestion pricing could fund safer cycling infrastructure in underserved areas identified through PFA analysis (Li *et al*., 2025). The adoption of autonomous shuttles could be accelerated through intergenerational tech literacy programs. Moreover, participatory platforms like Medellín's community-led urban planning committees demonstrate how inclusive governance can enhance mobility access and safety outcomes.

Looking ahead, transportation systems must confront existential threats such as climate change. Rotterdam's floating autonomous ferries and Miami's elevated AR-enabled transit corridors offer glimpses of climate-adaptive infrastructure. Decentralized technologies also play a significant role: blockchain-enabled "mobility wallets" in Dubai allow users to seamlessly pay for metro, scooters, and ride-shares while earning carbon credits—a system that boosted multi-modal usage by 41% in its first year. Yet challenges persist. The ethical implications of AI-driven traffic management, the privacy trade-offs in V2X ecosystems, and the workforce displacement risks from automation require urgent scholarly attention. As these papers emphasize, solutions will demand unprecedented collaboration between behavioral scientists, data ethicists, and civil engineers.

The reviewed research underscores that transportation is not merely about moving vehicles—it's about advancing human potential. To realize this vision, we must foster platforms where commuters, policymakers, and researchers co-design solutions. Medellín's participatory urban planning committees, which transformed the city's violent reputation through cable cars linking favelas to economic hubs, demonstrate the power of inclusive innovation. As we stand on the brink of mobility revolutions—from hyperloops to urban air taxis—let us ground progress in equity, sustainability, and human dignity. The journey ahead is complex, but by bridging rigorous research with community wisdom, we can engineer transportation systems that don't just connect places, but uplift lives.

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