Editorial Article

Integrated Evaluation of Urban Transportation, Structural Performance, Environmental Impacts, and Human Safety in Developing Cities

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Summary

The Editorial Board is pleased to present Volume 2, Number 2 (October 2025) of the Disasters in Civil Engineering and Architecture journal. This volume two presents an integrated evaluation of urban transportation systems, structural performance, environmental impacts, and human safety in the context of developing cities.

Accelerated urbanization and unregulated traffic expansion have markedly intensified environmental noise pollution, elevating it to a serious public health issue in Dhaka city, Bangladesh. A recent investigation by Abhi et al. [1] demonstrates a strong positive correlation between traffic volume and ambient sound levels, driven largely by high densities of private vehicles, motorcycles, and excessive horn usage. However, the findings also indicate that traffic volume alone does not fully account for the observed spatial variability in urban noise. Factors such as road geometry, pavement condition, intersection configuration, and surrounding built environments exert substantial influence on local acoustic environments. Prolonged exposure to elevated noise levels has been widely linked to increased risks of hearing loss, cardiovascular disorders, sleep disruption, and psychological stress. Collectively, these findings underscore the pressing need for integrated urban noise mitigation strategies. Strict enforcement of horn-use regulations, the development of roadside green buffers, improved traffic flow control, and the systematic integration of noise management into urban planning policies are critical to safeguarding public health and promoting long-term urban sustainability.

Traffic congestion at urban intersections remains a major constraint on mobility, economic efficiency, and environmental quality in many developing nations. In response to these challenges, Bolaji et al. [2] developed an Arduino-based Intelligent Traffic Control System (ITCS) for the Araromi intersection in Akure, Nigeria, presenting a cost-effective and practical solution. The system integrates infrared sensors with a microcontroller-driven adaptive control algorithm to dynamically assign right-of-way through innovative gapping-out and maxing-out operations. This approach minimizes wasted green time during off-peak periods while maintaining fair and efficient traffic discharge under congested conditions. Simulation results indicate rapid sensor response (≈11 centiseconds), an optimized 80-second signal cycle, and marked reductions in delay, fuel consumption, emissions, and economic losses. Importantly, the development cost of approximately USD 193 underscores the system's affordability and scalability for resource-constrained urban environments. Beyond performance gains, the study highlights the critical need for locally tailored intelligent transportation solutions rather than direct adoption of expensive systems from developed regions. Despite current limitations in object discrimination by infrared sensors, the proposed ITCS provides a strong platform for future field validation, sensor integration, and smart-city applications, with significant implications for sustainable traffic management in developing economies.

Understanding why commuters persistently favor private vehicles remains central to sustainable transport policy in rapidly urbanizing cities. The study by Ruslan et al. [3] provides timely and rigorous empirical evidence on the dominant role of travel time and travel cost in shaping mode choice in Banda Aceh, Indonesia. Using a binary probit model and stated preference data from over 500 respondents, the authors demonstrate that longer travel time, higher operating costs, trip distance, gender, education level, motorcycle ownership, and driving license status significantly influence transport choices. Simulation results reveal that even a modest 10% reduction in public transport travel time increases the probability of choosing public transport by 3%, underscoring time efficiency as the most elastic and policy-sensitive variable. By contrast, reductions in private vehicle operating costs produce weaker behavioral responses, suggesting that congestion, convenience, and service reliability dominate cost considerations. The findings clearly reaffirm that improving bus speed, access time, and reliability is far more effective than price-based interventions alone. This study offers strong quantitative support for prioritizing dedicated bus lanes, intersection priority, and integrated networks. It also highlights the limitations of relying solely on fare subsidies without parallel investments in operational performance. Ultimately, evidence-based elasticity analysis such as this provides a critical foundation for designing credible, locally adapted strategies to shift travel behavior toward sustainable mobility in developing cities.

Driver fatigue has long been recognized as a major contributor to traffic accidents, yet the psychological roots of fatigue remain underexplored in transportation safety discourse. The study by Mauladea et al. [4] provides compelling empirical evidence that boredom proneness plays a critical role in triggering sleepiness and subsequent microsleep events among drivers on the Banda Aceh–Medan corridor. Using Structural Equation Modelling on data from

310 drivers, the authors confirm a significant causal chain: boredom increases drowsiness (β = 0.329), boredom directly induces microsleep (β = 0.242), and sleepiness further amplifies microsleep risk (β = 0.191). These findings shift the focus of road safety beyond physical fatigue toward cognitive-emotional mechanisms embedded in monotonous driving environments. Expressway driving and late-night travel were shown to intensify boredom, drowsiness, and microsleep, underscoring how road geometry and temporal factors interact with human psychology. From a policy perspective, this research highlights the urgency of integrating psychological countermeasures into traffic engineering and safety management. Rumble strips, visual stimulation, adequate rest areas, and in-vehicle drowsiness detection systems should complement conventional fatigue-based interventions. By recognizing boredom as a measurable risk factor, this study strengthens the scientific foundation for more holistic, human-centered road safety strategies in developing regions.

The tensile strength-to-yield stress (TS/YS) ratio remains a critical yet often underemphasized parameter in ensuring the ductility and seismic resilience of reinforced concrete structures. The experimental study by Islam et al. [5] provides timely and robust evidence on the comparative performance of Grade 40, 60, and 72.5 reinforcing bars across diameters of 12–20 mm. Although Grade 72.5 bars exhibit the highest yield stress and elastic modulus, their TS/YS ratios frequently fall below the code-recommended threshold of 1.25, raising concerns regarding post-yield energy dissipation capacity in seismic applications. In contrast, Grade 60 rebars consistently demonstrate superior TS/YS ratios (≈1.5–1.58) and higher elongation (≈18–21%), reflecting more stable strain-hardening behavior and reliable ductile failure. Stress–strain curves and fracture observations further confirm that Grade 60 bars exhibit more favorable cup-and-cone failures and uniform plastic deformation, particularly at the 16 mm diameter. These findings challenge the prevailing assumption that higher strength automatically equates to better seismic performance. From a design perspective, this study reinforces the necessity of prioritizing balanced mechanical behavior rather than yield strength alone when selecting reinforcement for earthquake-resistant structures. Grade 60 rebar emerges as the most reliable compromise between strength, ductility, and structural resilience.

The growing depletion of natural aggregates and the escalating burden of construction and demolition waste have compelled the construction industry to seek sustainable material alternatives. The study by Rabby et al. [6] offers timely and quantitative evidence on the mechanical and economic feasibility of using recycled coarse aggregate (RCA) in structural concrete. Through controlled M20 mix designs and standardized ASTM testing, the authors demonstrate a clear strength–cost trade-off across varying RCA replacement levels. At 28 days, concrete with 50% RCA achieved a compressive strength of 25.5 MPa only a 3.92% reduction compared to the conventional mix while delivering an 18.4% cost saving. Increasing the replacement to 70% RCA produced moderate strength loss (24 MPa) with higher economic benefit, whereas full replacement caused a severe 59.63% reduction in strength, rendering it unsuitable for structural use. These outcomes, supported by the cost analysis per cubic meter,

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establish 50% RCA as the most rational compromise between performance and affordability. Beyond material efficiency, the study reinforces RCA as a practical pathway toward sustainable construction in developing countries, provided that replacement levels are carefully optimized. This evidence-based balance between environmental responsibility, economic efficiency, and structural safety is essential for the future of resilient infrastructure.

Hospitals represent the backbone of emergency response during earthquakes, yet many critical facilities in high-seismic regions remain structurally vulnerable. The study by Lathifah et al. [7] provides compelling evidence on the effectiveness of X-bracing systems in enhancing the seismic performance of hospital structures in Aceh, Indonesia one of the most earthquake-prone regions in the Pacific Ring of Fire. Using time-history analysis based on real Simeulue earthquake records, the authors demonstrate a clear improvement in lateral stiffness, displacement control, and overall structural stability after the installation of X-bracing. The reduction in axial force, significant decrease in maximum lateral displacement, and consistently low story drift values well below the 2% limit prescribed by Indonesian seismic standards confirm the reliability of X-bracing as a practical strengthening strategy. Importantly, this research advances beyond conventional static or response-spectrum approaches by employing realistic dynamic earthquake loading, thereby offering more credible insight into actual structural behavior. From a policy and engineering perspective, the findings reinforce the urgency of proactive hospital retrofitting in seismic zones. The integration of X-bracing not only safeguards structural integrity but also ensures post-earthquake service continuity an outcome that directly translates into lives saved. This study offers strong technical justification for embedding seismic retrofitting of essential facilities as a core priority in national disaster-resilience strategies.

Escalating flood disasters driven by climate change and rapid urbanization demand a fundamental shift in how development projects address risk. Saad et al. [8] present a timely and conceptually robust framework that embeds Flood Risk Management (FRM) across the entire project lifecycle, moving beyond the traditional practice of treating flood mitigation as a secondary or post-disaster concern. Through a rigorous scoping review of 27 peer-reviewed studies, the authors synthesize four foundational theories risk hazard modeling, risk assessment, project lifecycle theory, and risk management theory into a unified, process-oriented framework for resilient urban planning. The proposed framework emphasizes early exposure and vulnerability assessment, continuous monitoring, adaptive mitigation, and sustained stakeholder engagement. By integrating FRM into planning, design, construction, and operation phases, it directly addresses the long-standing gap between risk theory and project-level implementation. Importantly, the framework aligns disaster resilience with broader sustainability and governance objectives, offering practical value for policymakers, planners, and developers. This work advances the discourse on resilient urban development by demonstrating that flood resilience is not a standalone technical task but a continuous management process. While regulatory, financial, and data constraints remain significant barriers, this

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framework provides a critical foundation for institutionalizing proactive flood risk governance in fast-growing, flood-prone cities.

In conclusion, it synthesizes key findings from traffic noise assessment, intelligent traffic control, travel behavior analysis, and driver alertness to understand transportation efficiency and safety challenges. Structural investigations on reinforced concrete, recycled aggregate concrete, and seismic strengthening systems are examined to evaluate infrastructure resilience and economic viability. Environmental and disaster-related dimensions, including urban noise exposure and flood risk management, are also addressed to highlight sustainability concerns. By combining engineering performance, environmental quality, and human factors, this work provides a multidisciplinary perspective to support safer, more resilient, and sustainable urban development in rapidly growing cities.

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Conflicts of Interest

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Author Contributions

Reza Pahlevi Munirwan: writing, reviewing and editing. **Ramadhansyah Putra Jaya:** writing, reviewing and editing. **Aizat Mohd Taib:** writing, reviewing and editing.

Declaration of Generative Ai and Ai-Assisted Technologies in the Writing Process

During the preparation of this work, the authors used ChatGPT to enhance the clarity of the writing. After using the ChatGPT, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

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