

Developing A Sustainable Urban Planning Index: A Multi-Criteria Decision-Making Framework for Master Plan Evaluation in Developing Countries

Ramane Chuhdary¹, Muhammad Zaly Shah², Shahram Chuhdary³, Mufeeza Tahira⁴, Rana Tahir Mehmood⁵ 4206-4230
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Ramane Chuhdary¹, Muhammad Zaly Shah², Shahram Chuhdary³, Mufeeza Tahira⁴, Rana Tahir Mehmood⁵

^{1,2,3}Faculty of Built Environment, University Technology Malaysia, 81310, Skudai, Johor Bahru, Malaysia

^{3,4}Independent Researcher

⁵Corresponding Author

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ABSTRACT

Urban sustainability frameworks are increasingly being localized to reflect area-specific conditions, yet existing assessment tools remain inconsistent, relying on either conceptual models or physical evaluations that demand extensive datasets. This poses challenges, particularly in data-limited settings such as developing countries, where structured sustainability evaluations are lacking. A key gap exists in assessing and ranking development plans, including master plans and spatial strategies, due to the absence of a standardized ranking mechanism for sustainability indicators. This study introduces the Sustainable Urban Planning Index (SUPI), a structured multi-criteria decision-making (MCDM) framework designed for prioritizing sustainability indicators through expert-driven validation and statistical ranking. Tailored for developing countries, SUPI integrates literature review, expert consultations, and quantitative ranking techniques. Two datasets were analyzed: (1) a broad assessment of 30 sustainability indicators evaluated by 64 experts using Relative Importance Index (RII), Fractional Ranking, and Analytical Hierarchy Process (AHP); and (2) a sector-specific weighting analysis conducted by 20 urban planning professionals employing AHP-based pairwise comparisons. These datasets were synthesized hierarchically through a structured normalization process, ensuring the convergence of sectoral priorities with individual indicator rankings. The final model integrates these rankings through normalized priority vectors, enhancing consistency and applicability in sustainable urban planning assessments. Findings reveal that land use efficiency, environmental resilience, and governance effectiveness are the most influential sustainability factors, whereas traditional indicators such as population density and zoning regulations exhibit weaker correlations with sustainability performance. The final SUPI model offers policymakers a quantifiable, adaptable evaluation framework for urban sustainability assessment. Future research will focus on real-world validation, refining predictive capabilities, and integrating geospatial analysis and real-time monitoring tools to enhance applicability in data-limited environments, making SUPI a practical decision-support tool for sustainable urban development.

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Paper Overview:

The paper “*Developing a Sustainable Urban Planning Index: A Multi-Criteria Decision-Making Framework for Master Plan Evaluation in Developing Countries*” (2025) introduces a practical framework — the Sustainable Urban Planning Index (SUPI) — designed to evaluate city master plans in data limited contexts.

SUPI applies Multi-Criteria Decision-Making methods (Analytic Hierarchy Process + Relative Importance Index) to assess 30 sustainability indicators grouped across seven core sectors: land use, environment, infrastructure, economy, governance, community, and mobility. The model combines literature review, expert surveys, and weighting analysis to create a transparent and adaptable decision-making tool for evaluating how well master plans align with sustainability principles.

Key Framework Highlights

- Land Use Efficiency, Environmental Resilience, and Governance Effectiveness emerged as the strongest drivers of sustainable performance.

- Traditional planning indicators (like zoning density or land allocation ratios) showed weaker correlation with real sustainability outcomes.
- The framework is structured to operate effectively even where data availability is limited, making it especially relevant to fast growing cities in developing regions.

Why it matters locally:

Across the Gulf, in Bahrain, Saudi Arabia, and the UAE — cities are rapidly expanding under national visions such as Saudi Vision 2030. While investment in urban development is unprecedented, few tools exist to objectively measure whether master plans truly advance sustainability goals.

The SUPI framework provides a way to:

- Evaluate plans against measurable, weighted sustainability indicators.
- Identify performance gaps between planning intent and implementation outcomes.
- Prioritize investments in the most impactful sectors.

For Gulf cities facing climate stress, data limitations, and rapid growth, SUPI offers a structured and evidence-based approach to guide urban decision-making.

Solutioners Perspective

- At Solutioners, we believe frameworks like SUPI can transform the way cities plan, monitor, and adapt. By localizing the index to the Gulf context, we can: Integrate heat resilience, density management, and transit accessibility as localized indicators.
- Connect SUPI with GIS-based dashboards for visual plan tracking.
- Align urban plan KPIs directly with Vision 2030's sustainability targets.

This integration bridges the gap between policy ambition and on-ground performance, ensuring data-driven, transparent, and resilient master plan evaluation.

Key Takeaway:

Sustainable urban planning isn't just about vision statements — it's about measuring, weighting, and improving what truly drives livable, resilient cities.