DOI(Journal): 10.31703/gssr
DOI(Volume): 10.31703/gssr.2025(X)
DOI(Issue): 10.31703/gssr.2025(X.I)

p-ISSN: 2520-0348

e-ISSN: 2616-793X

www.gssrjournal.com
Global Social Sciences Review
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GSSR

GLOBAL SOCIAL SCIENCES REVIEW

HEC-RECOGNIZED CATEGORY-Y

Volum X, ISSUE I WINTER (MARCH-2025)

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Doi: https://dx.doi.org/10.31703

Article Title

Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan

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Keywords: Walkability, Urban Form, 15-Minute City, SDG 11.2, Hyderabad

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Pages: 116-123
DOI:10.31703/gssr.2025(X-I).10
DOI link: https://dx.doi.org/10.31703/gssr.2025(X-I).10
Article link: http://www.gssrjournal.com/article/A-b-c
Full-text Link: https://gssrjournal.com/fulltext/
Pdf link: https://www.gssrjournal.com/jadmin/Auther/31rvIolA2.pdf

Global Social Sciences Review

p-ISSN: 2520-0348 **e-ISSN:** 2616-793x
DOI(journal):10.31703/gssr
Volume: X (2025)
DOI (volume):10.31703/gssr.2025(X)
Issue: I Winter (March 2025)
DOI(Issue):10.31703/gssr.2024(X-I)

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Volume: IX (2024)
https://www.gssrjournal.com/Current-issue

Issue: I-Winter (March-2025)
https://www.gssrjournal.com/Current-issues/10/1/2025

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www.humapub.com
Doi: https://dx.doi.org/10.31703

Citing this Article

10	Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan		
Authors	Uzma Arisar Sabeen Qureshi Rabia Soomro	DOI	10.31703/gssr.2025(X-I).10
		Pages	116-123
		Year	2025
		Volume	X
		Issue	I

Referencing & Citing Styles	
APA	Arisar, U., Qureshi, S., & Soomro, R. (2024). Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan. *Global Social Sciences Review*, *IX*(IV), 116-123. https://doi.org/10.31703/gssr.2025(X-I).10
CHICAGO	Arisar, Uzma, Sabeen Qureshi, and Rabia Soomro. 2024. "Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan." *Global Social Sciences Review* IX (IV): 116-123. doi: 10.31703/gssr.2025(X-I).09.
HARVARD	ARISAR, U., QURESHI, S. & SOOMRO, R. 2024. Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan. *Global Social Sciences Review,* IX, 116-123.
MHRA	ARISAR, U., QURESHI, S. & SOOMRO, R. 2024. Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan. *Global Social Sciences Review,* IX, 116-123.
MLA	Arisar, Uzma, Sabeen Qureshi, and Rabia Soomro. "Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan." *Global Social Sciences Review* IX.IV (2024): 116-123. Print.
OXFORD	Arisar, Uzma, Qureshi, Sabeen, and Soomro, Rabia (2024), 'Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan', *Global Social Sciences Review,* IX (IV), 116-123.
TURABIAN	Arisar, Uzma, Sabeen Qureshi, and Rabia Soomro. "Urban Form and Walkability: Assessing Meso- and Micro-Scale Interventions to Enhance Livability in Hyderabad, Pakistan." *Global Social Sciences Review* IX, no. IV (2024): 116-123. https://dx.doi.org/10.31703/gssr.2025(X-I).09.

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Global Social Sciences Review
www.gssrjournal.com
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Contents

Abstract

Developing cities depend on walkability for urban livability because their planning systems prioritize cars over pedestrians. The research analyzes how urban shape influences land use while determining walkability in Hyderabad, Pakistan, to find solutions for cultivating accessible pedestrian-oriented living spaces. The study utilized mixed-methods analysis, including GIS mapping with behavioral observations and walkability index calculation, to examine three urban locations (Qasimabad, Auto Bhan, and Chandni Mobile Market). The study revealed that streets in the sample area have only 30% walkable conditions despite the finding that 70% of sidewalks are without shade. The research proposes implementing a "15-Minute City" plan, which unites compact buildings with pedestrian paths and green spaces for urban development. Urban sustainability research achieves new progress when it demonstrates that both medium-scale and small-scale development interventions work toward achieving SDG 11.2 objectives for cities.

Keywords:

Walkability, Urban Form, 15-Minute City, SDG 11.2, Hyderabad

Introduction

The UN's eleventh Sustainable Development Goal (SDG) encourages inclusive and sustainable urbanization to build productive, easily accessible cities that draw talent, promote innovation, and propel economic progress.

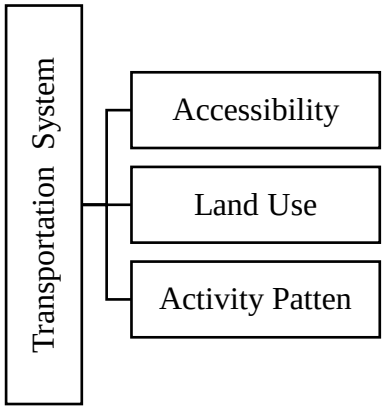
Target 11.2 is the focal point of this goal because it highlights the significance of enhancing urban transportation systems to guarantee sustainable, inexpensive, safe, and accessible transportation for all members of society, with a focus on vulnerable groups like women, children, older people, and people with disabilities (Irfan Ahmed Memon et al., 2020; Marvi et al., 2022, 2023; Qureshi et al., 2022; M. Soomro et al., 2025). To measure progress towards achieving Target 11.2, cities are encouraged

to assess the proportion of their population residing within a short walking distance of public transport systems (Marvi et al., 2024; Memon et al., 2014, 2015, 2022; Memon, Sahito, et al., 2021). This proximity indicator, typically set at 500 meters or a 5-minute walk, is crucial in determining the level of accessibility that residents have to reliable and efficient public transportation services. Localizing Target 11.2 involves city governments taking concrete steps to enhance the accessibility of public transport systems on two key fronts: physical access and economic affordability (Memon, Kalwar, et al., 2021; R. Soomro et al., 2022). By prioritizing both the physical and financial aspects of accessibility in public transport planning and regulations, communities may establish more sustainable, equitable, and inclusive urban settings that promote the prosperity and well-being of all residents. SDG 11's Target 11.2 requires the advancement of adequate transportation infrastructure and a dedication to social justice, environmental sustainability, and providing essential mobility services to all people.

Rapid urban growth in Hyderabad has devoted more importance to vehicle transportation than pedestrian requirements, thus creating separated living areas that diminish public health outcomes. City leaders must make transport safe and inclusive for all citizens according to the SDG 11.2 standard. Still, Hyderabad's sprawl and mono-functional features prevent it from meeting these goals.

Figure 1

Show Evolution of Land Use And The Transportation Network



As shown in Figure 1, At the macro scale, two primary variables are associated with the link between urban form, travel behavior, and walkability. Evolution of land use and the transportation network

In this instance, transportation networks are often necessary to preserve the environment, social cohesion, and economic growth. Most of the time, inclusive, sustainable, clean, and safe transportation networks promote national prosperity, particularly in cities and metropolitan areas. Numerous studies, however, demonstrate that most towns and urban regions' transportation infrastructures are unsustainable. Olaverri, C. (2016) (Olaverri-Monreal, 2016) said that vehicle-to-pedestrian and pedestrian-to-vehicle information systems aim to increase road safety by alerting application users to hazards that might cause collisions. This type of road safety effort has been well studied, and the majority of contemporary vehicles.

Dastan et al. 2019 suggest that several significant places suffer from traffic congestion and that cycling can help alleviate this problem while enhancing the rider's health(Bamwesigye & Hlavackova, 2019). In Annecy, France, most people possess bikes since they are more economical than vehicles and are used for a large portion of city travel. Most smart cities worldwide may benefit significantly from sustainable transportation options like cycling. For instance, simple connectivity is often provided via economical and efficient mobility routines inside and outside smart cities. Nonetheless, several regulations must be strictly followed to guarantee a long-lasting,

actively effective cycling culture in sustainable and smart cities.

Literature Review:

Walkability and Urban Form

The five core walkability components are density, diversity, design, destination accessibility, and distance to transit (Forsyth, 2015). The combination of dense residential and commercial areas in neighborhoods allows people to walk more frequently, according to (Zeng et al., 2018). The expansion of cities through sprawl produces higher dependency on cars while at the same time increasing carbon emission levels.

Global Case Studies

The pedestrian movement in Valdivia, Chile, increased by 40% due to narrow streets and mixed land zoning (Zumelzu & Barrientos-Trinanes, 2019).

The livability rating of traditional streets in Tehran reached 25% higher levels than modern residential corridors, according to (Zarin et al., 2015).

Challenges in South Asia

The urban structure of Hyderabad fails to connect different areas because only 21% of the population lives within walking distance of 500 meters from transit stops (Khahro et al., 2023). The condition of sidewalks alongside dangerous street crossings function as obstacles that discourage people from walking (Jawed et al., 2019).

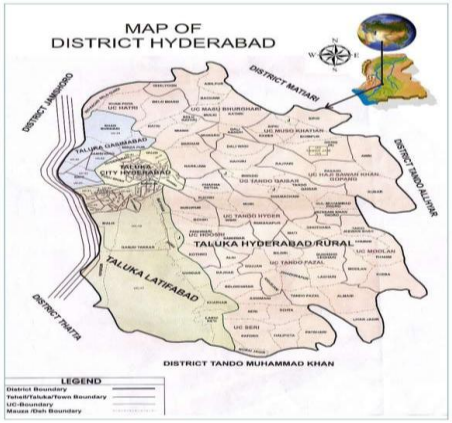
In the face of increasing urbanization and transportation challenges in developing countries, there is a pressing need to enhance accessibility and livability through sustainable urban transport systems. The reliance on private vehicles and inadequate public transit options has led to less walkable and livable cities, impacting the overall quality of urban life. The urban areas in Hyderabad, Sindh, Pakistan, face significant challenges related to transportation, including inaccessible public transportation, inadequate park accessibility, and traffic congestion issues. These problems are exacerbated by the lack of sustainable transport planning, which hinders urban accessibility and liveability. Hyderabad can enhance urban accessibility and liveability while promoting environmental sustainability and public health. Addressing these issues is crucial to creating more sustainable, inclusive, and pedestrian-friendly urban environments.

- To assess walkability measures at meso and micro levels, considering factors such as safety, orientation, attractiveness, comfort, diversity, and accessibility to local destinations.

By aligning the problem statement, research aims, and objectives, this study contributes valuable insights toward creating safer, more walkable urban environments that prioritize pedestrian well-being and sustainable transportation practices.

Figure 2.

shows the location of Hyderabad, Sindh, Pakistan



As Figure 2 shows, Hyderabad is the second-largest city in Sindh Province. The three distinct neighborhoods in the district of Hyderabad have been selected as case study areas for this research. Qasimabad, Auto Bhan, and Chandni mobile markets are considered study sites for this research.

Although Hyderabad's city center has become more saturated and the spaces between transition zones have been filled, the city's built-form density has become unbalanced. The city center appears dense, but its urban meso-form lacks the essential elements of urban compactness, such as density, consistency, and mixed usage parameters. Consequently, the principal city cores see an unnatural increase in density. On both the macro and meso levels, the multi-functionality of the centers and the presence of a linked road network between them are crucial for the city's livability.

Research Methodology

The analysis of the effectiveness of existing pedestrian safety measures, road design standards, and traffic regulations concerning pedestrian safety, urban accessibility, and sustainable travel modes is shown in Figure 3.

Primary Data Collection:

Walk Score Method

This scoring method evaluates walkability by counting the distance to vital services, including grocery outlets and educational institutions, parks, healthcare facilities, and public transit points. The GIS-based network analysis determines distances in which accessibility-based weights determine score values (areas scored higher if they are easy to reach). The standardized scoring system makes it possible to evaluate walkability on a scale between neighborhoods and detect locations with missing key infrastructures. The accessibility index indicates that areas with a score less than 50 tend to rely on automobiles, but areas above 90 create a perfect walking environment.

Vehicular Traffic Count Method

As part of this evaluation method, unique counts of pedestrian-vehicle touchpoints occur at strategic intersections and corridors across peak and off-peak periods. Data includes:

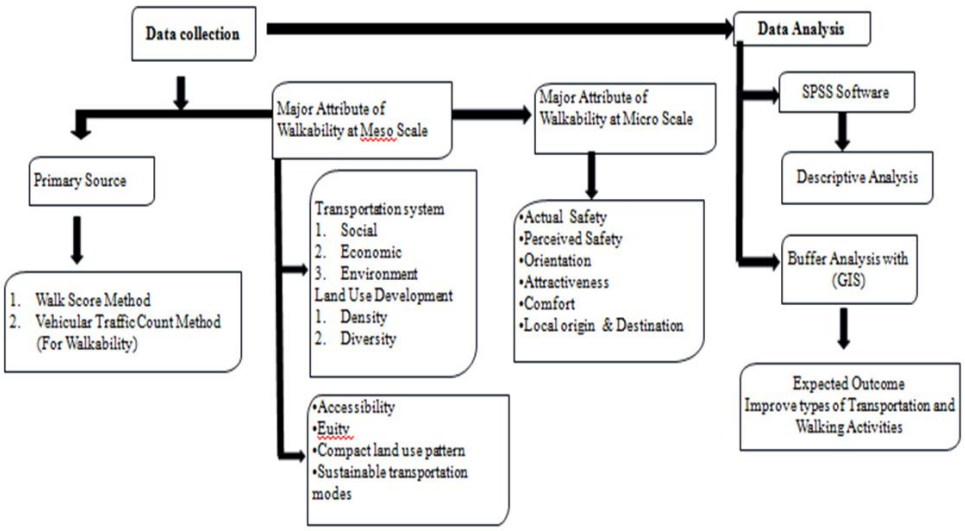
Pedestrian Volume: Number of walkers, cyclists, and wheelchair users.

The following data sets are part of the traffic study: Vehicles include their movement speeds, density measurements, and automobile bus and motorcycle operation classifications.

Locations with regular reports of near-misses as well as accidents represent conflict points.

Figure 3

Methodological Flow Chart



The obtained data reveals potential safety hazards (such as high-speed areas) that guide infrastructure redesigns through pedestrian crossings and traffic calming measures.

Meso-Scale Analysis:

Transportation System

Surveys, along with focus groups, help identify community requirements that include residents' preferred pathways along with road obstacles such as insufficient pathways and navigation barriers targeting specific population segments, including the elderly demographic population.

Thinking Economically: Investment analysis helps determine the return on investment that widened sidewalks will have on local business revenue.

Reducing travel-related emissions becomes possible through carbon footprint models when people switch from driving to walking.

Land Use Development

The building intensity gets assessed using data on population density (residents/km²) combined with floor area ratio (FAR). Scanning of high-density zones concentrates on overcrowding assessment.

The Shannon Diversity Index determines the land-use mix through an analysis that divides areas into residential, commercial, and recreational categories. The planners focus on mixed-use areas because they help create efficient travel paths while adding street variety.

Micro-Scale Analysis:

Safety

Actual Safety evaluation through infrastructure audits examines how sidewalks' condition appears, how well lighting measures up, and how local authorities track accidents.

The evaluation measures overall resident confidence through surveys examining their comfort during night walks, street illumination, and security staff presence.

Orientation

Evaluated through:

Wayfinding: Clarity of street signage and digital navigation tools (e.g., Google Maps).

The integration of street networks can be improved by the density of intersections combined with streets that are short in length and structured in a grid pattern.

Attractiveness

The auditors evaluate physical appearances through these criteria:

The assessment rates both tree canopy coverage and park proximity under the category of greenery.

Public Art: Murals, sculptures, and cultural landmarks.

Public amenity structures such as benches, trash receptacles, and protective shelters should be accessible.

Comfort

Field observations measure:

Shade: Tree-lined pathways or awnings.

Seating: Density of benches per kilometer.

Pavement Quality: Smoothness and slip resistance.

Local Origin & Destination

The GIS system enables users to determine the nearness to significant daily resources like schools positioned within 500 meters and identify locations where public transit stops and cycling bus routes intersect.

Expected Outcomes

Data analysts use quantitative alongside spatial tools in the analysis stage to convert raw data into relevant solutions during the undertaking. Descriptive statistical analysis within the SPSS platform processes observational data and surveys to produce quantitative information regarding pedestrian conduct and infrastructure inadequacies. The frequency analysis reveals that 65% of streets do not feature shaded sidewalks together, with 80% having dangerous crossings, thus identifying crucial intervention areas. Metrics used to understand walkability barriers are developed using variables including pedestrian counts, accident reports, and user-rated safety indicators that enable precise analysis.

Using Geographic Information Systems (GIS) produces spatial buffer analysis by showing walkability metrics through 500-meter service radii measurements around transit hubs. The technique makes it possible to visualize accessibility gaps and reveal the locations of neighborhoods with public transport services outside walking distance. Combining different land-use areas in mixed-use

zones leads to 2.5 times higher pedestrian flow because such areas show effective urban diversity.

The comparison between SPSS and GIS data generates information to build a policy framework with three core elements.

Community infrastructure retrofitting should include fixing inadequate shaded walkways and unsafe crossings through expanded walkable areas, plant life, and safe pedestrian zones.

The 15-minute city concept achieves decentralization of schools, colleges, and markets to satisfy daily necessities without cars while allowing people to walk or cycle for access.

Mixed-use zoning laws require developers to plan projects with integrated land-use schemes to create high-activity, walkable, and vibrant neighborhoods.

This approach standardizes spatial data analysis with statistical data to link top-level environmental targets (emission reduction) with personal user convenience (safety and comfort) through coordinated policies. This comprehensive method provides equal access to urban spaces and reduces automobile rules while improving neighborhood quality according to Sustainable Development Goal 11.2.

Conclusion

The future development of sustainable and livable Hyderabad depends on changing its urban formulation to support walking-oriented development as its fundamental planning principle. The study evidence shows that combining mixed-use zoning alongside high-density transit-oriented development is essential to creating active, vibrant, accessible neighborhoods. Land-use diversity, which combines residential, commercial, and recreational components, leads to 2.5 times higher pedestrian activity since such environments draw people to walk because they reduce trip distances. The SDG 11.2 requirement of accessible transportation systems becomes achievable through decentralization using a 15-minute City approach, allowing residents to reach their daily necessities by walking or cycling while reducing their automobile dependency in Hyderabad.

Shaded walkways and safe intersections with greenery pathways form targeted improvements to resolve Hyderabad's infrastructure gaps, where 65% of streets need walkway shelters, and 80% of crossings are unsafe. The implemented safety enhancements boost both physical protection and perceived comfort, which motivates walking, specifically among elderly populations together with children. Aesthetic elements that combine public art with street furniture and wayfinding tools that use clear signage and digital mapping systems make streets more vibrant and customizable for people.

The conversion process of Hyderabad into an accessible city carries significant impacts throughout South Asia since rapid urbanization frequently ignores pedestrian requirements. The proposed framework based on SDG 11.2 principles allows Hyderabad to develop a template that merges economic advancement with high-quality living standards. The city-wide transformation requires strict enforcement of regulations that combine residential and commercial areas in all new construction projects while implementing pedestrian-oriented upgrades to existing areas. A combination of community outreach and subsidy programs for low-income areas will create fair accessibility through the prevention of neighborhood displacement.

The dedication of Hyderabad to pedestrian-friendly urban development pushes South Asian urbanism towards new directions. By establishing partnerships between mesoscale and micro-scale planning initiatives, Hyderabad can achieve lower pollution rates, better social equality, and regained public places for people, demonstrating that sustainable mobility serves basic needs for thriving and resilient urban centers. As a leading city in terms of sustainability goals, Hyderabad is a model of innovation that guides other municipalities toward the future implementation of walkable and inclusive spaces.

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