DEVELOPING AND VALIDATING A SCALE FOR ASSESSING THE OPEN SPACE REDUCTION MANAGEMENT MODEL TO SUSTAIN COMMUNITY SOCIAL LIFE

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Abstract:

Rapid urbanization in Karachi has accelerated the reduction of urban open spaces, leading to declining environmental quality and weakening neighbourhood social cohesion. Although the significance of open space management is widely recognized, there are no systematically validated, empirically supported methods for measuring Open Space Reduction Management Models (OSRMM), particularly in new urban settings such as those in Karachi. To address a substantial gap in research methodology on urban planning and social sustainability, this study aims to develop and validate a multidimensional instrument to measure the management of open-space reduction and its efficacy in supporting neighbourhood social life. This study employed a quantitative research design with purposive sampling. The scale items were developed from a comprehensive review of relevant theories and expert opinions. Data was collected from N=281 residents and experts in urban settings. Exploratory factor analysis identified and validated key factors using IBM SPSS Version 26 software. The findings showed that the OSR scale was valid and reliable for measuring urbanization, community social life, and urban policy and planning. These factors collectively account for 75.8 percent of the variance in this study. This research provides a robust instrument for assessing the open space reduction management model and significantly adds to the open space

reduction literature. This study presents empirically validated and theoretically and practically significant instruments for future research and evidence-based management practices in urban open spaces. In conclusion, this study provides key insights by developing and validating a scale to assess the Open Space Reduction Management Model and its role in sustaining community social life in rapidly urbanizing cities like Karachi.

Introduction

Urban open spaces such as parks, playgrounds, recreational grounds, and community spaces are widely recognized as crucial components of a resilient and sustainable urban ecosystem that supports physical health, improves mental health, and fosters social engagement among citizens (Whyte, 1980; Gehl, 2011). Presently, rapid urbanization, land scarcity, and economic development have further accelerated the urban transition of open spaces to built-up land-use patterns, affecting their social and ecological functions (UN-Habitat, 2022). Between 2000 and 2020, there was a substantial per-capita loss of urban open spaces in major urban agglomerations worldwide, reducing collective social engagement spaces and neighborhoods for citizens (Seto et al., 2014). Additionally, as urbanization expands, urban open spaces play a crucial role in sustaining social lifelines within a populated urban ecosystem.

A similar trend of reduced public space is observed in Pakistan, and especially in Karachi. The rapid population growth in Karachi and the uncontrolled dynamics of land-use patterns have led to the contraction of public open spaces, which account for only 2.3% of the city's total land area, well below global standards (Hasan, 2020). The steady encroachment on public recreation spaces and the subsequent privatization of these areas have further exacerbated the likelihood of social fragmentation and reduced place-based identification, which are essential for engaging communities and sustaining interactions crucial to social life within them. The continuity of public open spaces is therefore paramount for the involved actors, including the civic bodies that oversee the city.

Although extensive literature exists on urban open space planning, environmental sustainability, and the socio-economic impacts of urbanization, few studies specifically examine open space reduction. In rapidly urbanizing cities such as Karachi, little attention has

been given to how the reduction of open spaces affects community social life. More importantly, a major research gap is the absence of a comprehensive, validated instrument to measure the various aspects of open space reduction and their impacts. This includes factors influenced by urbanization forces and sustainability implementation mechanisms.

This study addresses this gap by developing and validating a scale for the Open Space Reduction Management Model (OSRMM) to examine its role in sustaining community social life. The scale provides an evidence-based approach to guide open space management and preserve social interaction in rapidly urbanizing environments.

Literature Review

One of the main goals of modern urban development is to maintain community social life, which is directly related to the quantity, quality, and accessibility of public open spaces. Parks, plazas, community gardens, and recreational corridors are examples of urban open spaces that are essential social infrastructure that facilitate everyday encounters, create social networks, and improve urban liveability (Qasim et al., 2023). According to empirical research, well-planned open spaces offer venues for social gatherings, recreational pursuits, and casual interactions, all of which improve social cohesiveness and lessen feelings of loneliness in crowded cities (Yang et.al., 2025).

Additionally, urban open spaces are essential to community resilience, particularly in times of crisis or disturbance. By serving as social network hubs, public spaces can promote adaptive capacity by allowing people to sustain relationships and group support even in stressful situations (Socio-spatial roles of public space, 2025). This resilience function highlights the socio-spatial function of open spaces as adaptable social contexts that support community stability and well-being in addition to being physical locations (Asadollahi Asl Zarkhah et.al., 2025).

Theoretically, the sustainability of open spaces depends on how effectively urban governance systems manage and integrate them into broader socio-spatial planning processes. Decisions related to institutional support, planning priorities, and resource allocation play a key role in the creation and maintenance of these spaces. Based on theories of place attachment, urban planning, and urban transition, it can be identified that communities and local governments can sustain open spaces and community-based sociability more effectively by having emotional attachments facilitated by proper planning instruments and governance techniques that are adaptable in urban transition. To promote long-term stewardship and activity within these places, effective management entails not only maintaining the physical infrastructure but also utilizing stakeholder collaboration and community participation (Pratama & Roziqin, 2021).

In addition to governance and planning concerns, the physical and perceptual aspects of open spaces significantly influence their social worth. The research studies identified elements, including safety, accessibility, a range of facilities, and connectivity with pedestrian networks, which promote social contact and recurrent use, both of which are critical for social sustainability (Systematic study on green open spaces and social interaction, 2025). Open spaces with diverse physical attributes support a range of activities that attract different demographic groups, thereby strengthening community inclusion and shared identity (Yang et.al., 2025; Craig et.al.,2024).

In urban settings, place attachment and community identity are also essential for maintaining social life. Residents are more inclined to preserve and cherish spaces that they emotionally identify with—through shared history, cultural customs, or neighborhood gatherings—over time, strengthening social ties and collective memory. Increased local involvement in planning procedures and cooperative efforts to prevent encroachment on open areas can result from the existence of such a connection (Ho et.al.,2020).

Institutional theory further explains how governance structures, policy incentives, and regulatory frameworks influence land-use choices and the persistence of open spaces. Zoning regulations, mandates for participatory planning, and funding sources are examples of effective institutional support that help cities strike a balance between the demands of development and the need to protect social set-ups like open spaces (Social life in public open spaces, 2025). By ensuring that open spaces continue to be essential components of the urban fabric, such support promotes community sustainability and resilience (Asadollahi Asl Zarkhah et.al., 2025).

When combined, these viewpoints show that open space sustainability entails a complex interaction between management techniques, institutional backing, community involvement, and physical design rather than just protecting land area. Urban stakeholders may better protect open spaces and maintain the social life that underpins thriving, liveable cities by comprehending these dynamics.

Methodology

Instrument

The instrument development process was guided by previous literature and theoretical frameworks. Domains and constructs were identified through a review of open space reduction, urban planning, and community social sustainability literature. To measure community resilience, respondents were asked about the condition of their community's social life and interaction patterns during urban transformation (Boateng et al., 2018; Jahanvi & Sharma, 2021). Since it measures community social sustainability and open space viability or survival, it sought to gauge the present state and future viability or survival of open spaces in the community, as well as the perceived effects of open spaces in relation to social interactions and neighborhood cohesion (Francis et al., 2012; Lewicka, 2011).

A total of 65 initial items were created in order to portray well the main OSRMM-CSL domains that encompass urbanization factors, urban policy and planning, community social life, and open spaces reduction and results of the social life in the communities. Items were created in a way that improved from previous tools and literature from different studies, such as (Alwi, 2016; Minakuro et.al., 2016; Malek et.al.,2018; Zhang et.al., 2021; Puplampu et.al., 2021; Yun Su & Muhammad, 2023; Balandi et.al., 2024)

Overall, several items were used to develop the Open Space Reduction Management Model (OSRMM) scale, and these items were measured using a 7-point Likert scale (Likert, 1932; Taherdoost, 2019). The scale items were adapted from studies by various researchers to ensure validity and reliability. These items help measure open space dynamics, urban policy effectiveness, and community social interaction sustainability in rapidly urbanizing cities such as Karachi.

Pretest

Pretesting is an important step in establishing the context, accuracy, and quality of survey research tools before actual data collection is conducted at a larger scale. It can help ensure that research tools are related context-wise, linguistically clear, logically ordered, and able to measure targeted constructs (Roopa and Rani, 2012). In this research, pretesting is conducted in a manner that aims at establishing context accuracy or expert validation—a commonly accepted practice in determining questionnaire quality and enhancing research quality (Olson, 2010; Zamanzadeh et al., 2015).

The content validation was conducted according to the assessment criteria outlined in Yusoff (2019) through a relevance rating of five points. In line with suggestions that two to ten experts offer adequate levels of rigour in terms of assessment (Davis, 1992; Polit & Beck, 2006), the current study involved five experts who reviewed the questionnaire-three of these experts were specialists in urban planning and community social sustainability in academia and two worked in related fields of open space development, municipal planning, and community activism.

The relevance of items was measured employing the Item Content Validity Index (I-CVI), as proposed by Lynn (1986). The steps to be taken in the process of content validity were: (1) developing the evaluation form, (2) selecting the evaluators, (3) performing the evaluations, (4) Domain consistency analysis, (5) Scoring items, and (6) Calculating I-CVI. Based on the I-CVI results, items with values above 0.90 were retained without changes (Othman et al., 2019), while items between 0.70 and 0.79 underwent changes aimed at making them clear and construct-oriented, while items below 0.70 were eliminated (Zamanzadeh et al., 2015). After the process, 60 items were retained out of the 65, thus completing the final OSRMM-CSL instrument for use in the pilot study.

Data Screening

Data screening was done in order to ensure the accuracy, reliability, and applicability of the data for factor analysis and correlative tests. Data screening improves the validity of the empirical findings (Soewin & Chinda, 2018). The measures of data screening included normality, outliers, linearity, and homoscedasticity tests using the SPSS software.

Normality was investigated using skewness and kurtosis statistics, and all the statistics remained within the required bounds, which ensured the data was not normally distributed. Also, outliers were first determined using some graphical methods such as stem and leaf plot, boxplot, and scatterplot. However, after analysis, it was necessary to eliminate eleven respondents who presented outliers that could affect the validity of the data. Z-score analysis ensured the data was within the +3 and -3 bounds to ensure there were no overt outliers (Soewin & Chinda, 2018).

Linearity between the variables was checked with the use of scatter plots, and it showed that the observations were following a clear linear relationship between the variables (Watkins, 2018). Residual plots were used to check the assumption of homoscedasticity, and they showed that the observations were randomly scattered around the line with equal variance, thus not violating the assumption of homoscedasticity.

In summary, the final data met the requirements for exploratory factor analysis and correlation analysis, having no significant departures from normality, independent outliers, linearity, or homoscedasticity. The data could thus proceed to dimensional validation and reliability analyses.

Results And Discussion

This study developed the scale items through a review of relevant theoretical literature and expert consultation to ensure conceptual clarity and reduce redundancy before confirmatory analysis (Fabrigar et al., 1999). The Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity assessed the suitability of the dataset for factor analysis. As shown in Table 1, the KMO value of 0.792 indicates acceptable sampling adequacy with strong shared variance among items. Bartlett's Test of Sphericity was significant (χ^2 = 12840.945, df = 528, p < 0.001), confirming sufficient correlations among variables. Anti-image correlations above 0.50 further supported the adequacy of the data for Exploratory Factor Analysis (EFA).

Table 1. KMO And Bartlett's Test.

Kaiser-Meyer-Olkin	Measure of Sampling Adequacy.	0.792
Bartlett's Test of Sphericity	Approx. Chi-Square	12840.945
	df	528
	Sig.	0

After confirming sampling adequacy, this study applied Principal Component Analysis (PCA) with varimax rotation to refine the items of the Open Space Reduction Management (OSRM) scale. A minimum loading threshold of 0.60 guided item retention. Through iterative PCA cycles, items with low loadings, conceptual overlap, or cross-loading were removed. The final solution retained 56 items, which were grouped into four key components: urban policy and planning, urbanization factors, open space reduction, and community social life.

Table 2. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.61	44.273	44.273	14.61	44.273	44.273	6.159	18.664	18.664
2	3.811	11.547	55.821	3.811	11.547	55.821	5.76	17.455	36.119
3	2.191	6.639	62.46	2.191	6.639	62.46	4.396	13.323	49.441
4	1.999	6.058	68.518	1.999	6.058	68.518	4.017	12.171	61.613

5	1.385	4.196	72.713	1.385	4.196	72.713	3.057	9.264	70.877
6	1.008	3.055	75.768	1.008	3.055	75.768	1.614	4.891	75.768
7	0.915	2.772	78.541	-	-	-	-	-	-

Extraction Method: Principal Component Analysis.

Table 3. Internal Consistency Reliability Coefficients

Construct	Alpha (α)
Urbanization Factors	0.833
Open Space Reduction	0.717
Community Social Life	0.811
Urban Policy and Planning	0.928

The factor structure demonstrated strong explanatory power. As presented in Table 2, the four factors explained a cumulative variance of 75.18%, exceeding the 60% threshold recommended by Hair et al. (2014). Each factor contributed meaningfully to the total variance, confirming that the extracted components represent distinct dimensions of the OSRM framework.

Construct validity was assessed using Pearson correlation coefficients. For df = 528 at $p < 0.05$, the critical correlation value is approximately 0.124. The observed item correlations ranged from 0.704 to 0.975, indicating strong and significant relationships between items and their constructs. Reliability analysis further confirmed internal consistency. As shown in Table 3, all constructs reported Cronbach's alpha values above 0.70, meeting the reliability criteria suggested by Hair et al. (2019).

This study shows that effective urban governance and policy intervention play a key role in managing open space reduction and sustaining community social life in rapidly urbanizing cities. Governments and planners can reduce the negative effects of shrinking public spaces through better urban planning, policy implementation, and institutional support. These efforts help communities preserve social interaction and maintain the value of remaining open spaces.

In addition, this study contributes by integrating urban planning and socio-spatial governance perspectives to explain how cities can sustain community social life despite increasing urban density. The findings highlight the importance of planning priorities, resource management, and institutional support in addressing open space reduction. This study also provides useful insights for policymakers and urban planners to manage open space loss and promote socially sustainable urban development in cities such as Karachi.

Conclusion

These measurement tools play a crucial role in evaluating how the Open Space Reduction Management Model (OSRMM) can support the resilience of community social life in rapidly urbanizing cities. The implementation of comprehensive scale development and validation procedures is essential for establishing a reliable and valid instrument to measure the dynamics of open space reduction, community interaction, and the role of urban planning and policy practices. This scale serves as an important guide for policymakers, urban planners, and communities, enabling informed decisions to sustain social interaction and community vitality despite the reduction of public open spaces.

This study provides valuable insights into how urban areas can manage the loss of open spaces while maintaining community social life. Therefore, future studies should aim to increase the sample size and include diverse urban communities to gain broader perspectives on the social impacts of open space reduction. Such efforts will contribute to the development of a more robust and reliable measurement model for understanding the relationship between urban development and community social sustainability.

Furthermore, it is important to note that the development of measurement tools related to open space reduction in South Asian metropolitan contexts, particularly Karachi, remains limited. Hence, the proposed comprehensive scale development and validation procedures are essential for establishing reliable metrics to assess and manage open space reduction while promoting social sustainability in rapidly growing cities.

Contribution/Practical Implications

This study contributes to theory by developing and validating the first OSRM scale for measuring relationships between open space reduction, urbanization, and community social life. This study provides a useful tool for policymakers and planners to better manage open space loss and support community social sustainability through urban planning and participatory governance.

References

Alwi, N. M. (2016). Ruang terbuka hijau: observing green social spaces in Central Jakarta. *Journal of Urban Culture Research*, *12* (1), 38-53

Asadollahi Asl Zarkhah, S., Harteveld, M., van Dorst, M., & Adlakha, D. (2025). The socio-spatial roles of public space as an enabler for community resilience. *Urban Design International*, 1-10.

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. Frontiers in Public Health, 6 (June), 1–18. https://doi.org/10.3389/fpubh.2018.00149

Davis, L. L. (1992). Instrument review: Getting the most from a panel of experts. Applied Nursing Research, 5(4), 194-197.

Farooq, M. U., ur Rahman, A., Qasim, M., Hashim, M., & Batool, S. (2023). Evaluation of Physical Expansion of Built Environment in District Sargodha (Pakistan). *Journal of Asian Development Studies*, *12* (3), 1223-1235.

Gehl, J. (2011). "Three Types of Outdoor Activities,""Life Between Buildings," and "Outdoor Activities and the Quality of Outdoor Space": from Life Between Buildings: Using Public Space (1987). In *The city reader* (pp. 586-608). Routledge.

Ho, R., & Au, W. T. (2020). Scale development for environmental perception of public space. *Frontiers in psychology*, *11*, 596790.

Hasan, M. T. (2020). Influence of Rules on User Behavior in Public Open Space of Hong Kong. *Architecture Research*, *10* (4), 102-108.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Jahanvi, J., & Sharma, M. (2021). Brand respect: Conceptualization, scale development and validation. Journal of Business Research, 132 (June 2020), 115–123. https://doi.org/10.1016/j.jbusres.2021.04.016.

Kyriazos, T. A. (2018). Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. Psychology, 9 (8), 1-24. https://doi.org/10.4236/psych.2018.98126.

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years?. *Journal of environmental psychology*, *31*(3), 207-230.

McDougall, C. W., Malden, S., Morrison, K., Mason, S., Williams, A. J., & Jepson, R. (2024). Development and testing of the Perceived Wellbeing in Outdoor Shared Spaces (PWOSS) scale. *Wellbeing, Space and Society*, *6*, 100203.

Malek, N. A., Mohammad, S. Z., & Nashar, A. (2018). Determinant factor for quality green open space assessment in Malaysia. *Journal of Design and Built Environment*, *18*2), 26-36.

Nolasco-Cirugeda, A., Serrano-Estrada, L., & Martí Ciriquián, P. (2014). The study of the public space. *Urbanismo 2*.

Othman, N.H., Othman, N., & Juhdi, N.H. (2019). Determining the validity and reliability of entrepreneurial emotion. Academy of Entrepreneurship Journal, 25 (3), 1-5.

Puplampu, D. A., & Boafo, Y. A. (2021). Exploring the impacts of urban expansion on green spaces availability and delivery of ecosystem services in the Accra metropolis.*Environmental Challenges*, *5*, 100283.

Polit, D. F., & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. Research in Nursing & Health, 29 (5), 489-497.

Pratama, I. D., & Roziqin, A. (2021). Tata Kelola Kolaboratif Ruang Terbuka Hijau: Sebuah Kajian Pustaka Terstruktur (Systematic Literature Review). *Jurnal Komunikasi Pembangunan*, *19*(02), 125-139.

Sharifi, A. (2023). Resilience of urban social-ecological-technological systems (SETS): A review. *Sustainable Cities and Society*, *99*, 104910.

Soewin, E., & Chinda, T. (2018). Factors affecting construction performance: exploratory factor analysis. IOP Conference Series: Earth and Environmental Science, IOP Publishing, 140 (1), 012102. https://doi.org/10.1088/1755-1315/140/1/012102

Taherdoost, H. (2019). What is the best response scale for survey and questionnaire design; review of different lengths of rating scale/attitude scale/Likert scale. *International Journal of Academic Research in Management (IJARM)*, *8*.

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. Journal of Black Psychology, 44 (3), 219-246. https://doi.org/10.1177/0095798418771807

Yang, C., Wang, K., Shi, S., & Ma, X. (2025). Associations between green open spaces and social interaction in neighbourhoods: a systematic literature review. *Urban Forestry & Urban Greening*, 128991.

Yang, R. (2024). Analysis of Influencing Factors of Urban Green Space Accessibility and Residents' Satisfaction.

Zhang, L., Cao, H., & Han, R. (2021). Residents' preferences and perceptions toward green open spaces in an urban area. *Sustainability*, *13* (3), 1558.