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Research Article

Managerial Assessment of the Quality of Outdoor Spaces on University Campuses

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ABSTRACT

This bibliometric analysis explores the managerial assessment of outdoor space quality on university campuses by synthesizing findings from 93 publications indexed in Scopus. Using VOSviewer software, four types of network visualizations were generated: citation frequency distribution, keyword co-occurrence, international authorship patterns, and co-citation networks. Results reveal rapid research growth after 2018, with core contributions from authors such as Wickens (2021), Hall (2014), and Burgoon (2021). Keyword analysis identifies dominant themes in sustainability, thermal comfort, accessibility, wellbeing, and participatory design. Geographic mapping shows a concentration of research output in developed countries, especially the United States, the United Kingdom, China, Germany, and Australia. The study diagnoses methodological evolution from qualitative surveys to multidimensional assessments incorporating space syntax, GIS, and mixed methods, and highlights persistent gaps in equity, standardized indicators, and cross-regional applicability. The findings offer critical insights for managers and researchers seeking evidence-based strategies to enhance campus outdoor space quality and guide future studies in this multidisciplinary field.

Keywords: Bibliometric analysis; Outdoor spaces; University campus; Environmental quality assessment

1. INTRODUCTION

Outdoor spaces play a pivotal role in shaping the environmental quality, wellbeing, and overall experience of university communities. As educational institutions expand and diversify, the importance of managing and improving campus outdoor environments grows, not only for aesthetic and ecological reasons but also for supporting health, inclusion, and sustainability objectives. In recent years, research on the quality and management of campus outdoor spaces has accelerated, reflecting a multidisciplinary convergence of landscape architecture, environmental psychology, urban planning, and sustainability science.

Despite the recognized value of campus greenspaces, scholarly approaches to evaluating their quality and management remain fragmented, spanning qualitative surveys, spatial analytic techniques, and environmental assessments. As universities face increasing pressure to achieve climate resilience, promote student wellbeing, and comply with sustainability goals, robust evidence-based frameworks for managerial assessment become essential.

This article presents a comprehensive bibliometric analysis of 93 peer-reviewed publications indexed in Scopus, mapping the intellectual landscape and thematic evolution of research on the managerial assessment of outdoor spaces in university settings. By leveraging VOSviewer software to visualize citation networks, keyword co-occurrences, and international authorship patterns, this study uncovers influential research clusters, key conceptual advances, and emerging gaps. The analysis provides valuable insight into how the field has evolved methodologically—progressing from simple satisfaction surveys to complex, multidimensional evaluation tools—and geographically, with research concentrated in the United States, United Kingdom, China, Germany, and Australia.

In doing so, this work aims to guide university managers, planners, and researchers toward more integrated, context-sensitive strategies for outdoor space assessment and improvement. It also highlights future priorities for research, including the need for standardized indicators, cross-regional collaboration, and attention to equity and climate adaptation in campus management.

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2. RESEARCH METHODOLOGY

This study employs a bibliometric analysis to systematically map research trends and intellectual structures related to the managerial assessment of outdoor space quality on university campuses. The dataset consists of 93 peer-reviewed publications retrieved from the Scopus database using a set of targeted keywords such as “university campus,” “outdoor space,” “quality assessment,” “greenspace,” and “management.” Data extraction included metadata fields such as author names, publication year, article title, keywords, and cited references.

VOSviewer software was utilized to visualize and analyze four dimensions: citation frequency distribution per document, keyword co-occurrence networks, international authorship patterns, and co-citation networks among referenced works. The network visualizations were interpreted to identify highly influential publications, thematic clusters, major geographic contributors, and foundational theoretical works in this field. Quality assurance procedures included duplicate removal, term standardization, and validation of bibliographic metadata. The methodology also acknowledges potential limitations such as language bias, exclusion of grey literature, and database coverage restricted to Scopus.

3. RESULTS

3.1 Citation Analysis Per Document

The visualization (fig.1) reveals the temporal distribution and citation impact of key publications spanning from 2004 to 2026, with prominent clustering around 2021-2023. Wickens (2021) emerges as the most central and highly cited work, suggesting foundational influence in campus outdoor space research. The temporal analysis indicates exponential growth in research output post-2018, reflecting increased institutional attention to campus environmental quality and student wellbeing, particularly accelerated by the COVID-19 pandemic's emphasis on outdoor spaces.

Major contributors include Hall (2014), who established early frameworks for campus greenspace evaluation, and Burgoon (2021) and Elias (2021), both contributing contemporary perspectives on campus landscape management and restorative environments. The visualization demonstrates a clear research evolution from foundational works in sustainable campus development by Salmons (2008) and Doyle (2004) toward specialized studies addressing thermal comfort, biophilic design, and post-pandemic spatial adaptation.

Recent publications from 2024-2025, including works by Kumari (2025), Li (2025), and Liu (2025), represent emerging research directions focusing on climate adaptation, digital assessment methodologies, and equity considerations in campus outdoor space provision. The citation network's density indicates robust scholarly dialogue and interdisciplinary engagement spanning landscape architecture, environmental psychology, urban planning, and sustainability science.

Zaloznaya (2017), Shih (2017), and Ellis (2018, 2019) form a secondary cluster addressing spatial configuration analysis and environmental quality indicators. Their contributions established methodological foundations for assessing campus layouts using space syntax and geographic information systems. Meanwhile, Vargas-Hernández (2023), Dong (2023), and Delgado-Capel (2023) represent contemporary efforts integrating climate change considerations and participatory approaches into campus outdoor space assessment

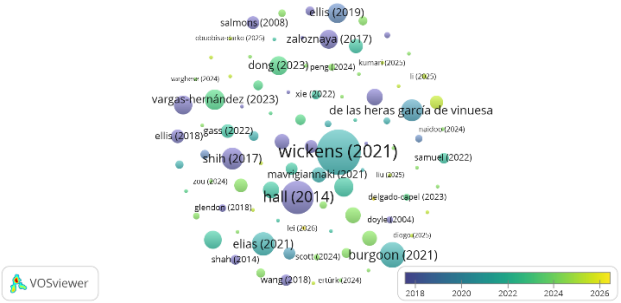

Fig 1.Citation analysis

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3.2 Keyword Co-occurrence Network Analysis

The second visualization illuminates thematic concentrations through keyword co-occurrence mapping. Urban planning and greenspace constitute the primary conceptual anchors, connecting to climate change, sustainable development, urban area, perception, and human behavior. This network structure reveals the multidisciplinary nature of campus outdoor space research, bridging environmental science, behavioral studies, and planning disciplines.

The prominence of sustainable development reflects institutional commitments to environmental responsibility and UN Sustainable Development Goals, particularly SDG 11 (Sustainable Cities and Communities) and SDG 3 (Good Health and Well-being). Research increasingly examines how campus greenspaces contribute to carbon offsetting, biodiversity conservation, and climate resilience. The connection between climate change and urban planning keywords underscores growing recognition that campus outdoor spaces must address thermal comfort, heat island mitigation, and extreme weather adaptation.

Perception and human keywords signal significant scholarly attention to user experience, psychological restoration, and place attachment. Studies demonstrate that campus outdoor spaces influence mental health, stress reduction, and sense of community. The greenspace node's centrality confirms that vegetated areas remain paramount in campus planning, providing ecosystem services including air quality improvement, biodiversity support, and aesthetic enhancement.

The temporal progression evident in the color gradient (2022.0-2023.5) indicates recent intensification of research integrating multiple sustainability dimensions. Contemporary studies increasingly employ mixed-methods approaches combining objective environmental assessments with subjective user evaluations. The keyword network also reveals emerging themes of urban area integration, reflecting research on campus-city connectivity and broader urban ecological systems

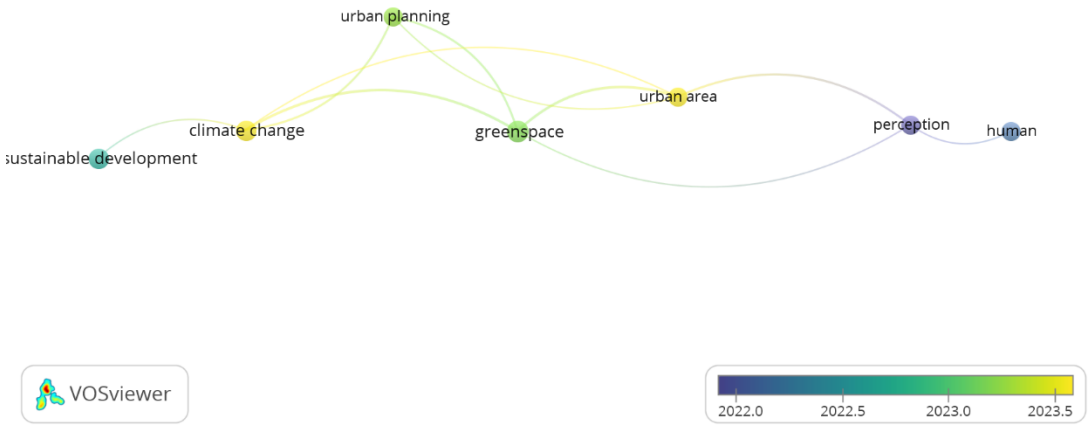

Fig 2. Keyword Co-occurrence Network Analysis

3.3 Authorship Distribution by Country

The third visualization displays international research collaboration patterns, with United States and United Kingdom forming the dominant cluster, alongside connections to Germany, Australia, China, and Italy. This network demonstrates that campus outdoor space quality research concentrates in developed nations with established higher education systems and sustainability initiatives.

The United States leads publication output, reflecting substantial research infrastructure, funding availability, and institutional emphasis on campus sustainability programs. American contributions span diverse methodologies including environmental audits, behavioral mapping, and importance-performance analysis. The United Kingdom emerges as a secondary hub with strong ties to European collaborators, particularly Germany, contributing research on student wellbeing, greenspace accessibility, and thermal comfort in campus settings.

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China represents rapidly growing research activity addressing massive campus expansion and urbanization challenges. Chinese studies frequently examine outdoor thermal comfort in varied climate zones, campus greenspace impacts on student emotions, and integration of traditional design principles with contemporary sustainability requirements. Australia contributes research on outdoor space quality in subtropical contexts, importance-performance analysis frameworks, and indigenous knowledge integration.

The network structure indicates moderate international collaboration, with most research conducted within national boundaries. However, emerging connections between United Kingdom-Australia, United States-Germany, and China-Italy suggest increasing transnational research partnerships addressing universal challenges in campus outdoor space management. The relative absence of developing regions, including African, Latin American, and Southeast Asian nations, highlights significant research gaps requiring attention.

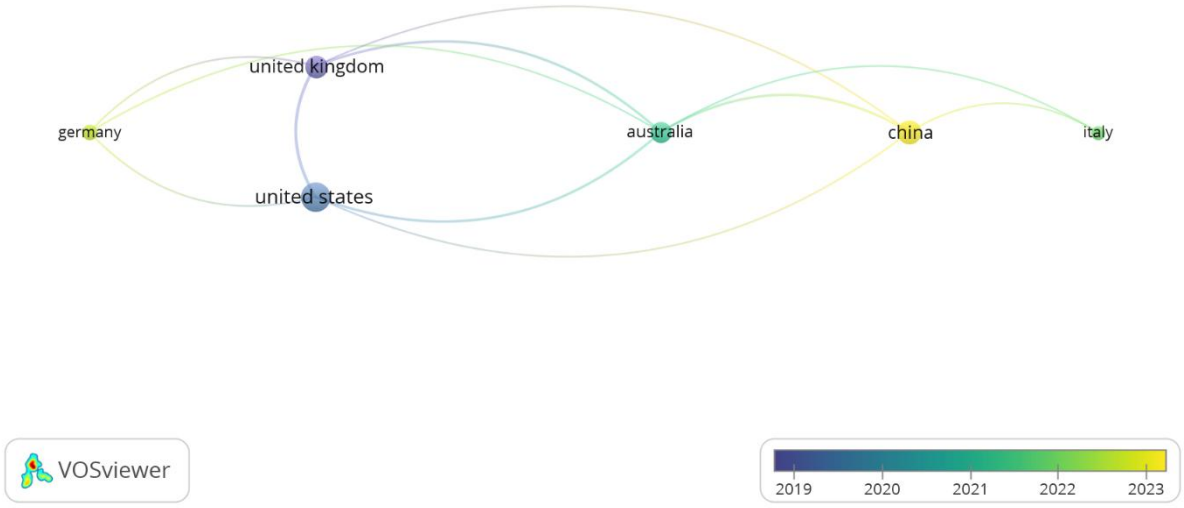

Fig 3. Authorship Distribution by Country

3.4 Co-citation Network Analysis

The fourth visualization presents a tightly interconnected co-citation cluster indicating shared theoretical foundations and methodological approaches. The circular network structure with multiple interconnections suggests that campus outdoor space quality research draws from common literature spanning environmental psychology, landscape architecture, urban ecology, and sustainability science.

Key nodes within this network likely represent foundational texts on biophilic design principles, restorative environment theory, thermal comfort assessment, and participatory planning methodologies. The high connectivity density indicates scholarly consensus regarding theoretical frameworks, with researchers consistently citing seminal works on human-environment relationships, ecosystem services, and wellbeing outcomes.

Co-citation analysis reveals interdisciplinary knowledge integration, with researchers referencing urban planning literature, environmental psychology theories, climate science publications, and public health studies. This integration reflects the multifaceted nature of campus outdoor space quality, which encompasses physical design attributes, microclimate characteristics, social dimensions, and management practices.

The network structure also suggests research clusters focusing on specific themes: thermal comfort and microclimate assessment; greenspace health benefits and restoration; participatory design and user engagement; and sustainability indicators and certification systems. The tight clustering indicates limited paradigmatic diversity, suggesting opportunities for incorporating alternative theoretical perspectives from fields such as environmental justice, indigenous knowledge systems, and critical geography.

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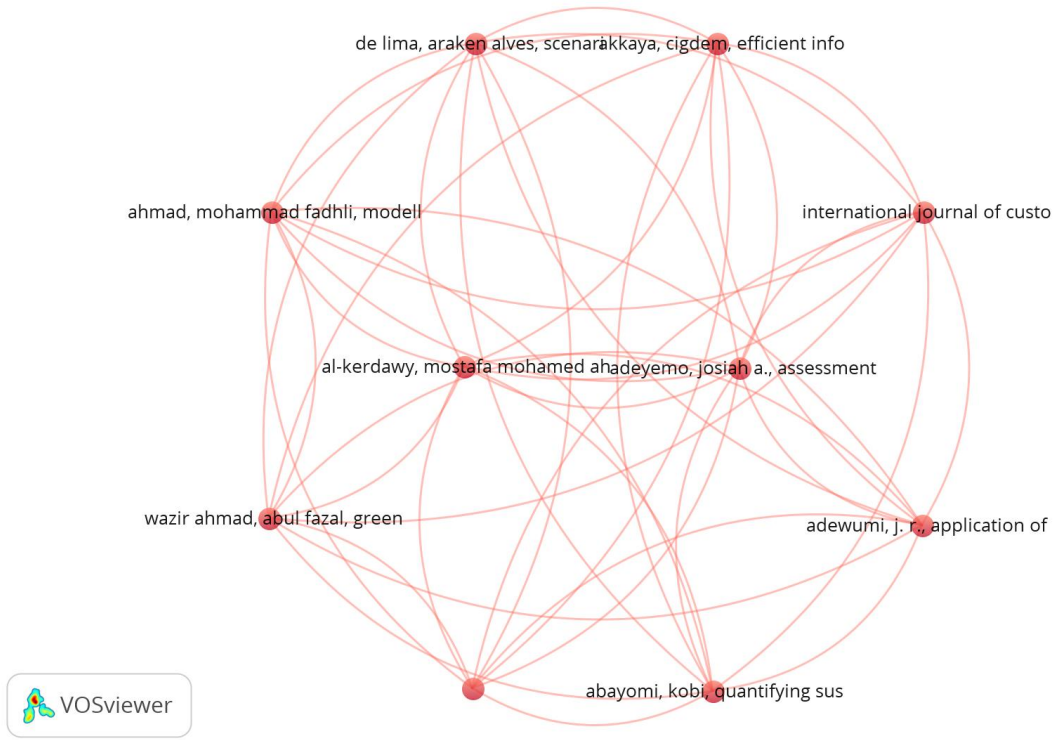

Fig 4. Co-citation Network Analysis

4. DISCUSSION : RESEARCH EVOLUTION AND FUTURE DIRECTIONS

The four visualizations collectively reveal significant research trajectory from foundational sustainability frameworks toward sophisticated multidimensional assessment approaches. Early research established the importance of campus greenspaces for institutional image and student recruitment. Contemporary scholarship addresses complex interactions between outdoor space quality, climate adaptation, mental health, equity, and institutional sustainability goals.

Methodological evolution demonstrates progression from qualitative assessments and user surveys toward integrated approaches combining space syntax analysis, thermal comfort modeling, geographic information systems, remote sensing, and participatory mapping. Researchers increasingly employ importance-performance analysis to identify priority areas for campus improvement. Advanced techniques including facial emotion recognition, physiological monitoring, and social media sentiment analysis represent emerging assessment methodologies.

The COVID-19 pandemic catalyzed research examining outdoor space usage patterns, social distancing requirements, and mental health benefits of campus greenspaces during lockdowns. Post-pandemic research explores hybrid learning environments, outdoor classrooms, and flexible campus designs accommodating diverse user needs.

Future research must address identified gaps including: developing context-appropriate assessment frameworks for campuses in developing regions; integrating climate justice and equity considerations into outdoor space planning; examining long-term impacts of campus greenspace interventions on student outcomes; establishing standardized sustainability indicators enabling cross-institutional comparisons; and investigating participatory co-design processes engaging diverse campus stakeholders.

5. CONCLUSION

This bibliometric analysis of 93 Scopus-indexed publications reveals a maturing research field addressing campus outdoor space quality through multidisciplinary lenses. The citation network demonstrates influential foundational works and rapid contemporary growth. Keyword co-occurrence mapping highlights thematic integration of urban

planning, climate change, sustainable development, and human perception. Geographic distribution shows research concentration in developed nations with emerging international collaboration. Co-citation analysis reveals shared theoretical foundations while suggesting opportunities for paradigmatic diversification.

The evidence indicates that effective managerial assessment of campus outdoor space quality requires integrated frameworks addressing environmental, social, psychological, and institutional dimensions. Future campus planning must balance sustainability imperatives, climate adaptation requirements, student wellbeing priorities, and participatory governance approaches. As universities worldwide pursue net-zero commitments and sustainable development goals, outdoor spaces represent critical infrastructure requiring strategic investment, evidence-based management, and continuous quality assessment

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