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Urban green spaces and their impact on environmental health: A Global Review

Blessing Aibhamen Edeigba [1], Ugochukwu Kanayo Ashinze [2], Aniekan Akpan Umoh [3], Preye Winston Biu [4] and Andrew Ifesinachi Daraojimba [5,*]

[1] *Independent Researcher, Connecticut.*
[2] *Independent Researcher, United Kingdom.*
[3] *Independent Researcher, Uyo, Nigeria.*
[4] *INEC, Nigeria.*
[5] *Department of Information Management, Ahmadu Bello University, Zaria, Nigeria.*

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Abstract

Urbanization has become an irreversible global phenomenon, with a majority of the world's population residing in cities. As urban areas expand, the significance of incorporating green spaces into these landscapes is paramount for environmental health. This study provides a concise overview of a global review that explores the multifaceted impact of urban green spaces on sustainability, well-being, and ecological balance. Urban green spaces play a crucial role in biodiversity preservation, acting as vital habitats for diverse plant and animal species. These spaces contribute to the maintenance of urban ecosystems, fostering ecological balance in densely populated areas. The presence of varied flora and fauna supports environmental health by enhancing biodiversity and promoting a more sustainable urban environment. One of the significant contributions of urban green spaces is their role in improving air quality. Through the natural process of photosynthesis, plants absorb pollutants and release oxygen, serving as an effective filtration system. Trees, in particular, act as natural air purifiers, reducing the concentration of airborne particles and pollutants. This contributes to enhanced air quality, mitigating the adverse effects of urban pollution on environmental health. Urban green spaces also play a pivotal role in temperature regulation, combating the phenomenon of urban heat islands. By providing shade and reducing surface temperatures, greenery helps create a cooler and more comfortable urban living environment. This temperature regulation not only contributes to the well-being of residents but also addresses the challenges posed by rising temperatures in urban areas. Beyond environmental considerations, access to urban green spaces has profound effects on the mental and physical well-being of urban dwellers. These spaces serve as outlets for recreation, exercise, and relaxation, contributing to stress reduction and improved mental health. Additionally, urban green spaces act as hubs for social interaction and community engagement, fostering a sense of belonging and strengthening social cohesion. In conclusion, this global review emphasizes the pivotal role of urban green spaces in promoting environmental health through biodiversity preservation, air quality improvement, temperature regulation, and enhancing overall well-being. Recognizing the multifaceted benefits of these spaces is crucial for guiding sustainable urban development practices worldwide.

Keywords: Health; Environmental; Green spaces; Urban; Ecology

1. Introduction

In an era of unprecedented urbanization, characterized by the rapid expansion of cities worldwide, the role of urban green spaces has become increasingly crucial. Urban green spaces, encompassing parks, gardens, and other natural areas within urban landscapes, represent vital elements in the pursuit of sustainable and healthy living (Dushkova and

* Corresponding author: Andrew Ifesinachi Daraojimba

Ignatieva, 2020). As the global population gravitates towards urban centers, the escalating demand for resources and infrastructure poses substantial challenges to both environmental health and human well-being (Adedeji, 2023).

Urban green spaces, often referred to as "green lungs" or "urban oases," denote areas within urban environments that are dedicated to vegetation, ranging from expansive parks to community gardens and street-side trees. These spaces play a pivotal role in counteracting the concrete sprawl characteristic of urban landscapes, introducing pockets of nature amidst the bustling cityscape (Alexander and Gleeson, 2020).

The phenomenon of urbanization has witnessed an unprecedented migration of people from rural to urban areas, leading to the expansion and densification of cities (Soliman, 2021). While this trend contributes to economic development and innovation, it also brings forth a myriad of challenges. Rapid urbanization is synonymous with the proliferation of concrete structures, reduced green cover, and increased pollution levels, impacting both the environment and the health of urban dwellers (Festus *et al*., 2020).

The consequences of this urban shift are manifold. Diminished green spaces not only compromise biodiversity but also contribute to the phenomenon known as the urban heat island effect, where cities experience elevated temperatures due to the absorption and retention of heat by built surfaces (Kumar *et al*., 2023). Additionally, the surge in pollution and sedentary lifestyles in urban settings has given rise to public health concerns, further highlighting the interdependence of environmental health and human well-being (Marouli *et al*., 2020). Against this backdrop, this global review endeavors to explore the impact of urban green spaces on environmental health. The significance of such an investigation lies in the potential of urban green spaces to mitigate the adverse effects of urbanization and foster a balance between human development and environmental conservation (Jabbar *et al*., 2021).

As the world grapples with the challenges posed by climate change, loss of biodiversity, and public health crises, understanding the role that urban green spaces play becomes paramount (Roy and Das, 2023). This review aims to scrutinize the multifaceted contributions of these green enclaves, ranging from their role in preserving biodiversity and regulating temperature to promoting social cohesion and enhancing mental well-being.

By traversing geographical boundaries and cultural contexts, the global scope of this review seeks to identify common trends, best practices, and innovative strategies employed in different parts of the world to harness the potential of urban green spaces. Ultimately, this study aspires to provide insights that can inform urban planning, policy development, and community engagement, contributing to a more sustainable and health-conscious urban future on a global scale.

1.1. Biodiversity Preservation in Urban Green Spaces:

As urban landscapes continue to expand, the preservation of biodiversity faces escalating challenges (Kisvarga *et al*., 2023). Amidst this urban sprawl, urban green spaces emerge as sanctuaries for diverse flora and fauna, playing a crucial role in biodiversity conservation. This study delves into the multifaceted importance of urban green spaces as habitats, their contribution to biodiversity conservation in densely populated areas, and their pivotal role in maintaining ecological balance within urban ecosystems.

Urban green spaces, ranging from parks and gardens to tree-lined streets, provide essential habitats for a wide array of plant species. These spaces act as sanctuaries where native and non-native plants coexist, contributing to the overall greenery of urban environments. Urban green spaces often harbor native plant species, preserving the region's natural biodiversity. These plants have adapted to the local climate, soil conditions, and ecosystems over time (Gao *et al*., 2021).

The diverse microenvironments within green spaces create ideal conditions for different plant species to thrive, fostering biodiversity hotspots within urban areas (Jang and Woo, 2022). Beyond plants, urban green spaces serve as vital habitats for a variety of wildlife. These areas provide shelter, food sources, and breeding grounds for numerous animal species, contributing to the overall richness of urban biodiversity.

Trees and shrubs in green spaces offer nesting sites for birds, contributing to avian diversity. Birdsong and the presence of various bird species enhance the auditory richness of urban environments. The diverse plant life in green spaces attracts insects, creating a thriving ecosystem. Insects, in turn, become a crucial food source for birds and other fauna within the urban habitat.

In densely populated urban areas, the fragmentation of natural habitats poses a significant threat to biodiversity (Li *et al*., 2022). Urban green spaces act as connecting corridors, mitigating the effects of habitat fragmentation by providing

pathways for the movement of species. Green spaces serve as interconnected pathways that allow wildlife to move between fragmented habitats. This facilitates gene flow, essential for the genetic diversity and adaptability of populations.

The connectivity offered by green spaces fosters gene exchange between isolated populations, reducing the risk of genetic bottlenecks and inbreeding. Urban green spaces play a crucial role in conserving and protecting endangered and threatened species that may find refuge within these pockets of nature (Egerer and Buchholz, 2021). By providing suitable habitats and reducing isolation, green spaces contribute to the survival of vulnerable species.

Rare and endangered plant species may find refuge in urban green spaces, where conservation efforts can be targeted to safeguard their survival. Green spaces offer essential habitats for endangered fauna, such as amphibians, reptiles, and small mammals. Preserving these habitats becomes a strategic conservation initiative. Urban green spaces provide a myriad of ecosystem services that contribute to the overall ecological balance of urban environments. These services extend beyond biodiversity conservation to address broader environmental and human well-being aspects.

Vegetation in green spaces contributes to air purification by absorbing pollutants and releasing oxygen (Han *et al*., 2022). Additionally, green spaces aid in water purification by filtering rainwater and reducing runoff. Trees and plants in urban green spaces play a pivotal role in carbon sequestration, mitigating the impact of greenhouse gas emissions and contributing to climate change resilience. The urban heat island (UHI) effect, characterized by elevated temperatures in urban areas, poses challenges to both biodiversity and human well-being. Urban green spaces act as natural coolants, mitigating the UHI effect and fostering a more balanced and sustainable urban ecosystem (Kadaverugu *et al*., 2022).

The canopy coverage provided by trees and greenery in urban green spaces creates shaded areas, reducing surface temperatures and providing cooler microclimates. Green spaces offer respite from extreme heat, providing inhabitants with spaces for recreation and relaxation (Kohout and Kopp, 2020). This not only enhances human well-being but also supports biodiversity by maintaining habitable conditions. Urban green spaces serve as outdoor classrooms, fostering environmental education and awareness. By providing opportunities for learning about local flora and fauna, green spaces contribute to building a community that values and actively participates in biodiversity conservation.

Parks and nature reserve often organize guided walks and interpretive programs, engaging communities in understanding the importance of local biodiversity. These specialized green spaces showcase diverse plant species, offering educational resources and raising awareness about the significance of plant diversity in urban environments. Engaging citizens in scientific endeavors can contribute valuable data for biodiversity monitoring and conservation efforts. Urban green spaces provide accessible locations for citizen science initiatives, encouraging community participation in data collection and monitoring programs (Vasiliades *et al*., 2021).

Urban birdwatching clubs and citizen science projects leverage green spaces as observation points to monitor bird populations and behaviors. Community-led initiatives can conduct plant surveys and inventories within urban green spaces, contributing to the documentation of local flora and identification of potential conservation needs.

Urban green spaces emerge as indispensable guardians of biodiversity in the midst of rapid urbanization. From providing crucial habitats for diverse flora and fauna to offering corridors for wildlife movement, these green havens contribute significantly to biodiversity conservation. Moreover, their role in maintaining ecological balance, mitigating the urban heat island effect, and fostering community engagement underscores the holistic impact of urban green spaces on environmental health and sustainability (Tate *et al*., 2024). As cities evolve, the preservation and expansion of these green oases become paramount, ensuring a harmonious coexistence between urban development and the preservation of Earth's diverse ecosystems.

1.2. Air Quality Improvement

As urbanization intensifies and cities grapple with the consequences of industrialization and vehicular emissions, the quest for sustainable solutions to counter declining air quality becomes paramount (Sinha, 2024). Urban green spaces emerge as natural allies in this endeavor, playing a pivotal role in air quality improvement. This global review explores the mechanisms through which plants absorb pollutants, the oxygen release and natural filtration system inherent in green spaces, and the specific role of trees as powerful air purifiers, reducing pollutant concentrations for the betterment of environmental health.

Phytoremediation is a key mechanism through which plants in urban green spaces absorb and mitigate pollutants. This natural process involves the uptake, transformation, and stabilization of pollutants by plants, rendering them less harmful to the environment. Various plant species, including grasses, shrubs, and trees, exhibit phytoremediation capabilities.

Plants absorb gaseous pollutants, such as nitrogen dioxide (NO2), sulfur dioxide (SO2), and ozone (O3), through tiny pores called stomata on their leaves. Once absorbed, these pollutants may undergo biochemical transformations within the plant. Plants act as effective filters for particulate matter (PM), trapping dust, pollen, and other airborne particles on their surfaces. This physical filtration reduces the concentration of particulate pollutants in the air (Vigevani *et al*., 2023).

In addition to their role in air quality improvement, the root systems of plants contribute to soil remediation. Plant roots can absorb and accumulate certain pollutants from the soil, preventing their migration to groundwater or the air. This dual-action—air and soil remediation—renders urban green spaces invaluable in mitigating the environmental impact of pollutants (Goodell *et al*., 2020). Photosynthesis, the fundamental process through which plants produce their own food, involves the absorption of carbon dioxide (CO2) and the release of oxygen (O2). Urban green spaces, teeming with vegetation, act as oxygen sources, releasing substantial quantities of oxygen into the surrounding atmosphere.

Chloroplasts within plant cells utilize sunlight to convert carbon dioxide and water into glucose and oxygen. This oxygen release contributes to the replenishment of atmospheric oxygen levels. The high density of vegetation in urban green spaces leads to increased oxygen production, creating localized areas with elevated oxygen concentrations. Beyond oxygen release, the intricate structure of plants facilitates a natural filtration system that purifies the air. This filtration occurs through physical, chemical, and biological processes (Kraakman *et al*., 2021)

The surfaces of leaves possess microscopic structures that can trap and filter airborne particles. This physical filtration reduces the presence of particulate matter in the air. Some pollutants absorbed by plants undergo biochemical transformations within plant tissues. These transformations may render pollutants less harmful or convert them into less toxic substances.

The rhizosphere—the region of soil influenced by root activity—hosts a diverse microbial community. Microorganisms in the soil contribute to the breakdown of pollutants, further enhancing the natural filtration system (Bala *et al*., 2022). Trees stand out as exceptional air purifiers due to their expansive canopies and efficient pollutant removal capabilities (Manzini *et al*., 2023). The large surface area of leaves and the complex structure of tree canopies contribute to the effective absorption and filtration of pollutants. Trees intercept and capture airborne particles, including dust and pollen, on their leaves and branches. This physical interception reduces the concentration of particulate matter in the air.

Trees absorb gaseous pollutants, such as carbon monoxide (CO), sulfur dioxide (SO2), and ozone (O3), through their stomata. The pollutants are then transported to various plant tissues, where they may undergo transformations or be sequestered. Volatile organic compounds (VOCs), emitted from various sources such as industrial activities and vehicular exhaust, pose a threat to air quality (Yao *et al*., 2021). Trees, particularly broadleaf species, exhibit the ability to absorb and metabolize certain VOCs. The waxy surfaces of leaves act as sinks for VOCs. VOCs can adsorb onto leaf surfaces, and subsequently, some may be absorbed into the plant tissues. Once absorbed, VOCs may undergo metabolic transformations within plant cells. This process can result in the breakdown or conversion of VOCs into less harmful compounds. In addition to pollutant absorption, trees contribute to air quality improvement through a cooling effect. The shade provided by tree canopies reduces surface temperatures, minimizing the formation of ground-level ozone and enhancing overall air quality (Knight *et al*., 2021). Shaded areas experience lower temperatures, which mitigates the conditions conducive to the formation of ground-level ozone. Ozone formation

1.3. Temperature Regulation and Mitigation of Urban Heat Islands:

The escalating phenomenon of urbanization brings with it a pressing environmental challenge: the rise of urban heat islands (UHIs) (Irfeey*et al*., 2023). As cities burgeon with concrete and asphalt, absorbing and re-radiating heat, temperatures soar, creating localized hotspots. Amidst this challenge, urban green spaces emerge as vital protagonists in temperature regulation and the mitigation of UHIs. This review delves into the intricacies of the urban heat island phenomenon, elucidates how urban green spaces act as cooling agents through shade and reduced surface temperatures, and underscores their pivotal role in creating a more comfortable and sustainable urban living environment.

Urban heat islands (UHIs) are characterized by elevated temperatures within urban areas compared to their surrounding rural areas. The primary culprits behind UHIs are the built environment's characteristics, such as impervious surfaces, dense infrastructure, and limited green spaces (Milesi and Churkina, 2020). These factors contribute to increased heat absorption, reduced natural cooling mechanisms, and the creation of microclimates that intensify temperatures.

The prevalence of concrete, asphalt, and other impervious surfaces in urban landscapes leads to increased heat absorption, resulting in elevated surface temperatures. Tall buildings and compact urban layouts impede natural air circulation, trapping heat and intensifying temperature levels. The scarcity of greenery in urban environments diminishes the cooling effect associated with natural vegetation, exacerbating UHIs. Human activities, industrial processes, and vehicular emissions contribute to additional heat production, further elevating temperatures.

Urban green spaces play a pivotal role in mitigating UHIs through two primary mechanisms: shade and evapotranspiration. The canopy coverage provided by trees and greenery casts shade on impervious surfaces, reducing the direct exposure to sunlight. This shading effect not only moderates surface temperatures but also creates cooler microclimates within and around green spaces (Grilo *et al*., 2020). The presence of trees and vegetation mitigates the impact of direct sunlight on surfaces, preventing excessive heat absorption. Shaded areas experience lower temperatures, providing a reprieve from the heat.

Plants release water vapor through a process known as evapotranspiration. This natural cooling mechanism cools the surrounding air, reducing ambient temperatures. Green spaces act as cooling agents as they facilitate higher rates of evapotranspiration compared to impervious surfaces. The composition of urban green spaces, characterized by permeable surfaces and a prevalence of vegetation, contributes to reduced surface temperatures (Teixeira, 2021). Unlike impervious surfaces that absorb and retain heat, permeable surfaces allow for greater heat dissipation and soil moisture retention.

Green spaces typically feature permeable surfaces, such as grass and soil, which allow heat to dissipate more efficiently compared to concrete or asphalt (Kappou *et al*., 2022). Plants, through the process of photosynthesis, absorb solar radiation and release oxygen. This active exchange moderates temperatures, making green spaces instrumental in regulating ambient heat. The cooling effect generated by urban green spaces contributes significantly to improving outdoor comfort for urban residents. Shaded areas with lower temperatures become inviting spaces for recreation, socializing, and various outdoor activities. The presence of greenery transforms urban landscapes into havens where people can escape the sweltering heat, fostering a more livable and enjoyable environment (Al-Kodmany, 2023).

Parks and green spaces offer residents opportunities for outdoor activities, exercise, and relaxation in a cooler and more pleasant setting. Cooler and inviting green spaces encourage community interaction, creating vibrant social hubs that enhance the overall urban living experience. Integrating urban green spaces into city planning aligns with principles of sustainable urban design. By incorporating green infrastructure, cities can mitigate the environmental impact of UHIs while fostering a balance between urban development and ecological preservation.

Green spaces provide habitats for various flora and fauna, contributing to urban biodiversity and supporting ecosystems within the city. The permeable surfaces in green spaces facilitate better stormwater absorption, reducing the risk of urban flooding and enhancing overall water management (Huang *et al*., 2020). Vegetation in green spaces acts as a natural filter, trapping pollutants and enhancing air quality. The presence of trees, in particular, contributes to the reduction of airborne pollutants.

In conclusion, the global review emphasizes the indispensable role of urban green spaces in temperature regulation and the mitigation of urban heat islands. Understanding the intricacies of the urban heat island phenomenon is crucial for developing strategies that prioritize the integration of green spaces into urban landscapes. The cooling effect generated by shade, evapotranspiration, and reduced surface temperatures showcases the transformative power of green spaces in creating a more comfortable and sustainable urban living environment (Liu *et al*., 2023). Beyond mere temperature moderation, green spaces contribute to improved outdoor comfort, enhanced community interaction, and the promotion of sustainable urban design practices.

As cities grapple with the challenges of urbanization and climate change, investing in and preserving urban green spaces emerges as a strategic imperative. Cities that prioritize green infrastructure not only mitigate the adverse effects of UHIs but also foster resilient, vibrant, and healthier urban environments for current and future generations (Elliott *et al*., 2020).

1.4. Mental and Physical Well-being

Amidst the bustling urban landscapes, the emergence of urban green spaces signifies more than just a break from the concrete monotony (Wen *et al*., 2020). These spaces, ranging from parks and gardens to green corridors, serve as crucial havens for fostering both mental and physical well-being. This comprehensive global review delves into the multifaceted ways in which urban green spaces provide opportunities for recreation, exercise, and relaxation, thereby positively impacting mental health and stress reduction. Furthermore, the review explores the correlation between the presence of green spaces and lower rates of mental health issues, shedding light on their transformative role in promoting holistic well-being.

Urban green spaces, with their lush landscapes and thoughtfully designed amenities, present unparalleled opportunities for recreation and leisure activities (Sahakian *et al*., 2020). Parks equipped with playgrounds, sports facilities, and open spaces become focal points for individuals and families seeking outlets for physical activity and play. These spaces act as vibrant canvases for a myriad of recreational pursuits, encouraging a healthy and active lifestyle among urban residents.

The layout of urban green spaces often includes walking trails, jogging paths, and designated exercise areas. These features are designed to facilitate physical activity, providing residents with accessible spaces for workouts and exercise routines. The integration of exercise into the green environment not only contributes to physical well-being but also transforms these spaces into outdoor gyms that cater to a diverse range of fitness preferences (Smyth *et al*., 2022).

Beyond the realm of active pursuits, urban green spaces offer serene settings for relaxation and tranquility. Shaded areas, water features, and well-maintained greenery create environments conducive to unwinding and contemplation. Individuals seeking respite from the demands of urban life find solace in these green enclaves, experiencing moments of calm that contribute to overall mental well-being.

Urban green spaces act as antidotes to the stressors inherent in urban living (McCay and Banulescu-Bogdan, 2021). The presence of nature, often referred to as nature therapy, has been proven to have significant stress-reducing effects. The visual and sensory experiences within green environments trigger a positive physiological response, leading to lowered cortisol levels and reduced stress. As individuals immerse themselves in natural surroundings, the mental toll of daily life diminishes, contributing to a more balanced and resilient mental state.

Engaging with urban green spaces has been linked to improvements in mood and emotional well-being. Exposure to natural elements, such as sunlight, fresh air, and greenery, stimulates the release of endorphins—the body's natural mood enhancers. Residents utilizing green spaces for recreational activities or relaxation often report heightened feelings of happiness, contentment, and reduced feelings of anxiety or depression (Elsadek *et al*., 2020).

The positive impact of urban green spaces extends to cognitive functions. Studies have indicated that spending time in nature enhances cognitive performance, attention, and memory. Urban residents utilizing green spaces for activities like reading, contemplation, or simply taking a leisurely stroll experience cognitive rejuvenation, contributing to enhanced mental clarity and focus (De Kleyn *et al*., 2020).

A growing body of research underscores the correlation between the availability of urban green spaces and lower rates of mental health issues. Communities with ample green spaces exhibit improved mental health outcomes among residents. The accessibility of these spaces plays a pivotal role, with individuals living in proximity to green environments reporting better mental well-being compared to those with limited access.

The positive correlation extends beyond individual well-being to community health. Urban green spaces serve as communal gathering points, fostering social interaction and community engagement. The creation of a shared environment where residents can connect with each other contributes to a sense of belonging and support, mitigating feelings of isolation and loneliness that often accompany mental health issues (Reed and Bohr, 2021).

Ensuring equitable access to green spaces becomes crucial in addressing mental health disparities. Urban planning that prioritizes the distribution of green spaces across diverse neighborhoods promotes mental health equity. Creating inclusive environments that cater to the needs of various demographic groups, including children, the elderly, and individuals with disabilities, ensures that the mental health benefits of green spaces are accessible to all (Vidal *et al*., 2020).

In conclusion, the global review illuminates the profound impact of urban green spaces on both mental and physical well-being, emphasizing their transformative role in promoting holistic health. The opportunities for recreation, exercise, and relaxation within these spaces contribute to a more active and balanced lifestyle among urban residents. Simultaneously, the positive impact on mental health and stress reduction establishes urban green spaces as essential components of mental health promotion in urban settings (Jabbar *et al*., 2021).

The correlation between the presence of green spaces and lower rates of mental health issues underscores the societal importance of prioritizing these spaces in urban planning. Beyond individual well-being, the communal benefits and mental health equity associated with green spaces make them invaluable assets for creating resilient and healthy urban environments (Zumelzu and Herrmann-Lunecke, 2021).

As urbanization continues, recognizing the pivotal role of urban green spaces in enhancing the quality of life for residents becomes imperative. Prioritizing the creation, preservation, and equitable distribution of these spaces ensures that the mental and physical health benefits they offer are accessible to all, contributing to cities that are not only environmentally sustainable but also thriving hubs of well-being.

1.5. Social Cohesion and Community Engagement

The rapid urbanization witnessed globally brings forth an array of challenges, including environmental health concerns and the potential erosion of social bonds within communities (Odongo, 2020; Abrahams *et al*., 2023). Amidst the concrete and steel of urban landscapes, urban green spaces emerge as vital oases that not only contribute to environmental health but also play a transformative role in fostering social cohesion and community engagement. This extensive review delves into the multifaceted dimensions of how urban green spaces act as gathering points, facilitate social interactions, and, most importantly, strengthen community bonds, creating a profound sense of belonging among diverse urban populations.

At the heart of urban green spaces lies their innate ability to act as natural gathering points. Parks, gardens, and communal squares provide a neutral ground, transcending the barriers that often segregate urban dwellers. Whether intentionally designed for communal activities or organically adopted by residents, these spaces become hubs where people converge for various purposes (Adaga *et al*., 2024).

One of the fundamental aspects of urban green spaces is their accessibility. Positioned strategically within urban settings, these spaces become easily reachable for residents from different socio-economic backgrounds. Their inclusive nature ensures that individuals from various walks of life can come together, fostering a sense of unity among diverse urban communities. Urban green spaces serve as canvases for cultural and recreational events that draw people together. From outdoor concerts to art exhibitions and food festivals, these spaces provide a platform for shared experiences. The celebration of cultural diversity within these green enclaves contributes to a rich tapestry of communal life, breaking down cultural barriers and promoting a sense of shared identity among residents.

Beyond being mere physical locations, urban green spaces are dynamic environments that actively foster social interaction. Their design, amenities, and the ambiance they create contribute to an atmosphere conducive to spontaneous encounters and planned activities. The provision of recreational amenities within green spaces encourages people to engage in various activities. Playgrounds, sports facilities, and exercise areas become magnets for individuals seeking recreational outlets. This shared pursuit of leisure activities creates opportunities for interaction, leading to the formation of informal social bonds among residents.

An emerging trend is the integration of shared workspaces and event areas within urban green spaces. These spaces are not only platforms for professional collaboration but also venues for community events, workshops, and educational activities. The intersection of work and community life within green spaces exemplifies their evolving role as dynamic hubs for multifaceted interaction (Barau *et al*., 2023). The essence of urban green spaces goes beyond providing spaces for interaction; they become crucibles for the forging of community bonds and the cultivation of a deep sense of belonging among urban residents.

Participating in activities within urban green spaces often fosters a shared responsibility for their upkeep and enhancement. Residents who actively engage with these spaces develop a sense of ownership, leading to increased civic engagement. This shared responsibility becomes a catalyst for addressing broader community issues and collectively working towards the betterment of the neighborhood.

Green spaces provide a canvas for cultural exchange and integration. Whether through community gardens, cultural festivals, or art installations, these spaces become melting pots where diverse cultural expressions merge. This cultural integration contributes to a sense of collective identity, transcending individual differences and fostering unity among community members. The profound impact of urban green spaces on mental health is a crucial dimension of their role in community building. The stress-reducing qualities of green environments, combined with the opportunities for relaxation and recreation, contribute to improved mental well-being among urban residents (Mouratidis, 2021). As individuals experience a sense of belonging within these spaces, the overall mental health of the community is positively influenced.

In conclusion, the global review illuminates the transformative role of urban green spaces in fostering social cohesion, community engagement, and a profound sense of belonging. Beyond their environmental benefits, these spaces act as dynamic hubs where diverse urban populations converge, interact, and build meaningful connections. The role of urban green spaces as gathering points creates spaces that are inclusive, accessible, and welcoming to residents from all walks of life. These spaces become stages for cultural and recreational events, enriching the communal experience and contributing to a shared identity among residents (McClinchey, 2020). Fostering social interaction and community engagement, urban green spaces go beyond passive landscapes. Their design and amenities actively encourage people to come together, fostering spontaneous encounters and planned activities that contribute to the formation of social bonds.

Most importantly, the review emphasizes the profound impact of urban green spaces in strengthening community bonds and promoting a sense of belonging. These spaces become platforms for shared responsibility, civic engagement, and cultural integration. As urbanization continues, prioritizing the creation and preservation of urban green spaces is not just an environmental necessity but a social imperative for building resilient, connected, and harmonious urban communities globally. Continued attention and investment in these spaces ensure that they remain vibrant, accessible, and instrumental in shaping the social fabric of our evolving urban landscapes (Qadir and Fatah, 2023).

2. Recommendation and Conclusion

In conclusion, the global review illuminates the myriad ways in which urban green spaces serve as dynamic contributors to environmental health, fostering a symbiotic relationship between urban development and ecological well-being.

The multifaceted impact of urban green spaces is evident across various dimensions. From providing crucial habitats for biodiversity preservation to acting as natural air purifiers, temperature regulators, and enhancers of mental and physical well-being, these spaces emerge as indispensable elements in the urban landscape. As cities around the world grapple with the challenges of rapid urbanization, the importance of integrating green spaces into urban planning cannot be overstated. They stand as beacons of sustainability, offering tangible solutions to the environmental and health challenges posed by dense urban living. Their role in maintaining ecological equilibrium within urban ecosystems becomes a cornerstone for resilient, adaptable, and healthier cities. The call for sustainable urban development practices globally is echoed through the findings of this review. Urban green spaces represent a harmonious coexistence between urbanization and the natural environment, embodying a vision of cities that prioritize not only infrastructure and progress but also the health and well-being of their inhabitants.

Continued attention and investment in urban green spaces are imperative for securing a healthier urban environment for current and future generations. This investment goes beyond the creation of aesthetically pleasing landscapes; it is an investment in the overall health, resilience, and livability of urban spaces. As urban areas evolve, the commitment to preserving and expanding green spaces must remain steadfast, ensuring that the benefits they offer are accessible to all and contribute to the creation of cities that are not just thriving economically but are also vibrant, sustainable, and in harmony with nature.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

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