Journal of Urban Development and Management
https://www.acadlore.com/journals/JUDM

Integrating the Biophilia Concept into Urban Planning: A Case Study of Kufa City, Iraq

Wafaa Abbas Hussein, Ahmed Shamkhi Al-Khafaji*

Faculty of Physical Planning, University of Kufa, 54001 Al-Najaf, Iraq

* Correspondence: Ahmed Shamkhi Al-Khafaji (ahmeds.alkhfaji@uokufa.edu.iq)

Received: 08-13-2023 **Revised:** 09-14-2023 **Accepted:** 09-20-2023

Citation: W. A. Hussein and A. S. Al-Khafaji, "Integrating the biophilia concept into urban planning: A case study of Kufa City, Iraq," *J. Urban Dev. Manag.*, vol. 2, no. 3, pp. 125–134, 2023. https://doi.org/10.56578/judm020302.

Abstract: In an exploration of biophilic cities, this study examines the integration of nature into urban environments, emphasizing its critical importance to human well-being. Biophilic cities are characterized by abundant green and blue spaces, facilitating human interaction within natural settings. These cities prioritize pedestrian spaces, cultural and historical sites linked to nature, and diverse usage ensuring habitat conservation. To ascertain the key factors enabling effective and sustainable incorporation of nature into urban spaces, two primary components were identified. Firstly, the block-level nature integration factor was investigated, represented by the Meso Index. This index is calculated by the green area's ratio within a designated block. Secondly, the citywide nature integration factor, which emphasizes the interconnectedness of green spaces throughout the city, was examined. This factor promotes direct interaction with nature across various urban functions, including housing, commerce, education, and recreation. Both the lawn afforestation index and the linear garden index serve as measures for this integration. Direct and indirect indicators affected by the establishment of biophilic cities were then applied to Kufa City, Iraq. Employing GIS for map production and analysis alongside mathematical models, indicators were analyzed through field surveys, observation, and feedback forms. Results revealed the innate human predisposition towards nature, highlighting its significance in daily life. Adverse effects on human life and behavior were observed in areas devoid of greenery. Kufa City exhibited potential for biophilic transformation, contingent upon accurate indicator application and improved green space planning.

Keywords: Landscape; Biophilic city; Meso scale; Natural areas; Urban planning; Kufa City; GIS analysis

1 Introduction

Biophilic cities are typically defined by their prevalent open green and blue spaces, spaces that are believed to enhance community interaction and deepen engagement with nature [1]. The term 'biophilia' finds its roots in ancient Greek, combining 'bio' (life) and 'filia' (love), signifying a profound 'love for life' [1]. In contrast, 'nicrovilia' (or 'necrophilia') represents an affinity for death, with inclinations towards darkness, nocturnal realms, concealed spaces, and deceased entities. Historically, this term first surfaced in medical dictionaries of the early 20th century, where it was characterized as either an inherent behavioral pattern or an intrinsic force advocating survival [2]. Thus, biophilia can be interpreted as a representation of the enduring relationship between humans and nature, a bond thought to have evolved as humans adapted to diverse natural settings across varying temporal scales [2].

The term 'biophilia' was first introduced to the academic world by Erich Fromm in his essay, The Human Heart. His work, heavily influenced by Sigmund Freud's theories, sought to explain this intrinsic mental predisposition towards life preservation and an aversion to death. Central to biophilia, it is posited, is the experiential union between humans and nature, contingent upon preserving the autonomy and sanctity of both [3].

Later, the concept was further refined by biologist Edward Wilson. In his seminal work, titled Biophilia, he elaborated on the human propensity for an innate emotional bond with other life forms. Wilson suggested that such tendencies are likely underpinned by genetic factors, emphasizing the pivotal role of nature in human well-being across physical, emotional, intellectual, and moral dimensions.

By 2011, the scope of biophilic studies had considerably widened. Betley and McDonald [4] put forth a vision for "Beauvilean Cities", a conceptual framework that transcended mere architectural and urban design. Their perspective encompassed comprehensive urban planning, ranging from interstitial spaces between structures,

encompassing entire neighborhoods, cities, and even broader territorial extents. Notably, their model emphasized the imperativeness of safeguarding natural ecosystems and promoting biodiversity on both continental and global scales.

Recent studies underscore the importance of regular human-nature interactions for optimal health and productivity. It is believed that such an affinity stems from broader evolutionary interconnections humans share not only amongst themselves but also with nature and its myriad entities. This intricate interplay is often articulated as an inherent emotional connection humans possess with other living organisms [5].

Biophilic cities are characterized by their ample green and blue open spaces, designed to foster communal interactions amidst natural settings. In such cities, pedestrian areas are notably dominant, coupled with cultural and historical sites that echo nature's significance. There is also an intentional effort to maintain a multiplicity of uses, ensuring that natural habitats and areas are conserved [6]. In the foundational phase of biophilia, biologist Edward Wilson defined the term in 1984 as the intrinsic emotional connection humans possess towards other living organisms. This connection is posited to be innate, suggesting it is hereditary and an intrinsic facet of human nature [7].

It is understood that human external senses, upon perceiving stimuli, formulate preliminary notions. These notions are subsequently conveyed to the first element of the internal senses - commonly termed as the 'common sense'. This 'common sense' gathers sensations and forwards them to what can be described as the 'photographic force'. Consequently, an individual, upon perceiving an entity, forms a related cognition through this mechanism, suggesting that biophilia might be an inherent human disposition [8]. The interplay between humans and facets of their urban environment reflects their cultural progress and the expansiveness of human cognition. From these interactions, derivative concepts emerge, often accompanied by deep-seated emotions [9].

With the surge in urbanization, many green expanses have been usurped for alternative uses, leading to a notable dearth of natural spaces. Cities, over time, witnessed a depletion of their green belts, thereby distancing inhabitants from their innate environments. Such a detachment is believed to be deep-rooted in human neurology, and its absence can detrimentally impact the well-being of urban populations. Consequently, there has been an emerging emphasis on reconceptualizing cities that prioritize nature, both in planning and design phases.

Despite the recognized importance of these natural aspects, previous studies have seldom delved deep into the natural parameters that define biophilic cities. This research thus seeks to bridge this knowledge chasm by elucidating the factor of 'Integrating Nature with Urban Places', elaborating relevant indicators, exploring measurement methodologies, and laying down criteria for crafting a true biophilic city. A spotlight will be cast on Kufa City, nestled in Iraq's Najaf Governorate. Distinguished by its historical pedigree and natural riches such as the Kufa River (an Euphrates River offshoot), orchards gracing its banks, expansive palm groves along the riverfront, and significant urban agricultural expanses, Kufa City provides a fertile ground for this investigation.

2 The Biophilic Cities Model as a Sustainable Urban Paradigm

The concept of biophilic cities is intrinsically linked to the principles of sustainable development. In the realm of urban planning, the momentum for biophilic urbanization has been observed to be on an accelerated trajectory. As highlighted by UNEP, the integration of green spaces within urban landscapes has been found to regulate natural processes, notably in the mitigation of elevated local temperatures. The emergence of sustainable cities is not merely an incidental trend; rather, it is posited as a strategic response tailored to address a complex confluence of economic, environmental, and societal exigencies [10].

Numerous investigations have turned their focus on the interplay between urban green spaces — encompassing parks, trees, and prominent green landmarks — and the overarching theme of urban environmental sustainability. A robust correlation between these green urban infrastructures and urban environmental sustainability has been established [11]. Sustainability, in its essence, is typically conceptualized across three foundational pillars: economic, social, and environmental. These pillars serve as a holistic frame of reference, guiding the trajectory of urban evolution, emphasizing the minimization of environmental impacts, conservation of resources, enhancement of life quality, and expansion of economic opportunities, particularly for the marginalized populations.

The biophilic city model emerges as a noteworthy approach within sustainable urban planning paradigms. It mandates the precedence of nature in urban design, planning, and management, addressing the inhabitants' intrinsic need for daily interactions with the natural world. The incorporation of biophilia in urban planning and design has been demonstrated to yield multifaceted benefits. On the economic front, benefits such as enhanced employee well-being, prevention of ennui, increased dwell times in commercial areas, the advent of mixed-use zones, health improvement, augmented healing rates, mood enhancement, and behavioral betterment have been documented. From an environmental perspective, the promotion of green and blue spaces, fostering of diverse habitats, and facilitation of nature accessibility emerge as primary gains. Meanwhile, on the societal front, a surge in pedestrian activities, conservation drives, community involvement in habitat stewardship, and the resultant augmentation in social capital have been observed [12].

These multifarious benefits of biophilic cities resonate with the ethos of Sustainable Development Goal 11 (SDG 11), which champions the cause of molding cities and human settlements into hubs that are inclusive, safe, resilient, and sustainable. Specifically, SDG 11 endeavors to cultivate sustainable transport avenues, engender green and communal spaces, safeguard cultural and natural legacies, and fortify the synergies between rural and urban domains [12].

In biophilic cities, opportunities for innovative integration and rejuvenation of natural elements abound. Such environments, which emulate natural settings, proffer a spectrum of activities — from gardening and hiking to bird-watching and myriad nature-centric pursuits. Furthermore, inhabitants of these cities are often presented with myriad avenues to partake in the restoration and stewardship of their immediate natural milieu, nurturing a profound sense of belonging and kinship [13].

Illustratively, Banjul has harnessed its natural topography to carve out a sustainable, nature-integrated urban landscape. By seamlessly embedding nature across the cityscape, creating recreational zones, amalgamating multiple uses, and provisioning social spaces, Banjul has redefined its urban character. Moreover, by conserving heritage pathways and drawing design inspirations from indigenous environmental elements, the city has artfully intertwined nature with urbanity. A prominent feature that stands out in Banjul is its astute utilization of waterways as conduits for nature integration across the city, ushering in multifunctional zones along its flanks.

Conversely, Tanga City has strategically interspersed green expanses throughout its urban fabric. By knitting green patches, essential amenities, residential clusters, and other functional areas with coherent movement trajectories, Tanga City has accentuated connectivity and a pervasive sense of place. Additionally, the city's commitment to preserving historically significant trees and integrating green pockets, which were erstwhile forest fragments, into the broader urban matrix exemplifies its biophilic ethos.

Building on these illustrative insights, the subsequent section will delve deeper into the exploration of 'Integrating Nature with Urban Places' as a pivotal mechanism to embed biophilia within urban confines.

3 Integration of Nature Within Urban Environments

The assimilation of nature into urban spaces has emerged as a transformative approach in contemporary urban planning. This strategy endeavours to amalgamate various land utilizations - encompassing residential, occupational, recreational, commercial, and service-oriented domains - with natural elements, thereby redefining urban landscapes [14]. Central to this approach is the conceptualization of urban designs that seamlessly interlace built environments with green expanses, public realms, commercial sectors, industrial belts, and service precincts. These integrative actions encompass not only the introduction of green recreational spaces within urban confines but also capitalize on the intrinsic ecosystem services such as potable water storage, biodiversity preservation, natural habitat protection, and the conservation of agricultural expanses and woodlands [15].

In biophilic cities, it has been observed that green spaces don't merely exist in isolation; they are intricately woven with the urban fabric, manifesting in forms like parks, green rooftops, and verdant facades. Further innovation is seen in the confluence of these green spaces with the city's blue zones [16]. The nuanced approach to this integration can be elucidated by focusing on two granular dimensions: the integration at the block level and the broader urban matrix.

3.1 Nature Integration Within Mixed Land Uses: The Block-Level Perspective

At the very essence of biophilic urban design lies the principle of integrating nature at the micro-level, specifically within individual city blocks. The efficacy of such integration is often assessed using metrics like the green area-to-block ratio. According to established standards, a minimum of 35% of the mass area should be dedicated to green spaces, dispersed across no more than 26 distinct green patches with a recommended inter-patch distance of 7 meters. Such stipulations aim to strike a balance between ensuring green space accessibility and sustaining urban densities [12].

Unlike conventional urban parks, these green spaces, in their ideal form, replicate conditions prior to urban development, serving as reservoirs of native biodiversity. The inherent value of these green spaces is further augmented when they form part of an ecological corridor, essential for the sustenance of diverse wildlife. Such corridors play pivotal roles in facilitating species-specific activities like foraging, migration, refuge, and reproduction [12].

Two pertinent sub-indicators to gauge the effectiveness of this block-level integration are the Urban Forest Index and the Urban Orchards Index. An in-depth exploration of these indices is presented as follows:

3.1.1 Nature integration within mixed land uses: The urban perspective

At the urban scale, green spaces are meticulously planned to facilitate harmonious interaction between urban and environmental elements. A preference is exhibited for linear green spaces, primarily due to their intrinsic capability to span vast terrains, effectively connecting urban realms with natural environs and extant agricultural landscapes [13]. This overarching theme is further underscored by the following indicative parameters:

A. Street Afforestation Index: The ecological and aesthetic roles of street trees within the urban environment cannot be understated. It is documented that the specific species selection for street trees profoundly influences the green volume of urban corridors [10]. The implementation criteria for such afforestation, which encompass pavements, floral basins on walkways, shrubberies, and misinformation zones, are articulated as follows:

A standard range of 5-8, as detailed in the Standards and Controls for Intra-City Afforestation by the Ministry of Municipal and Village Affairs of Saudi Arabia (p. 7, 2020) (Refer to Figure 1).

B. Green Corridors/Linear Parks Indicator: In the architectural blueprint of biophilic cities, the inception of green corridors has been identified as pivotal to underpin urban sustainability and weave a nexus with urban parklands. Such corridors not only foster varied recreational pursuits across demographics but also lay the groundwork for establishing green urban enclaves tailored for holistic community needs. Their significance is further accentuated by their biodiversity-rich composition, granting passage to a myriad of organisms and proffering a multitude of environmental advantages. The connective nature of these corridors enhances urban open spaces, buttresses natural resource conservation, and bolsters overall environmental requisites [7]. The empirical assessment of this integration hinges on the following metrics:

(1) Eco-Hiking Corridors: Natural forested corridors of ecological significance that facilitate habitat mobility. These corridors are distinguished by their linear park attributes and span over 50 meters in width, often paralleling major thoroughfares bridging urban and rural divides [13].

(2) Productive Environmental Corridors: These mirror the attributes of eco-hiking corridors but are interspersed with productive tracts, potentially encompassing urban agricultural plots, agroforestry, or forestry with indigenous species. Their characteristic breadth extends beyond 20 meters, typically flanking primary urban roadways [13] (Refer to Figure 2).

Figure 1. An illustration of a cultural street in Mexico City, Mexico, developed in alignment with the biophilic approach. The depiction reveals streets enveloped in vegetation from all facets, fostering seamless interaction with pedestrian zones

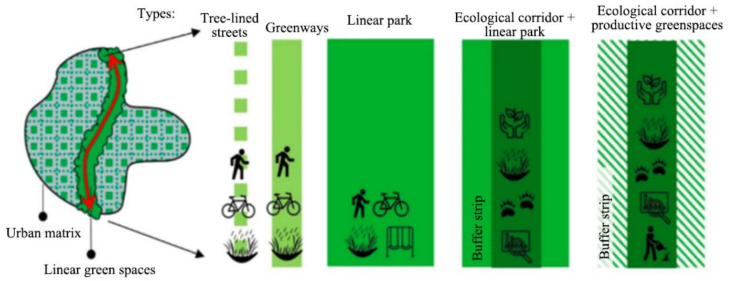

Figure 2. A schematic representation detailing the integration of nature within urban biophilic spaces. Emphasis is placed on linear greening techniques, encompassing street trees, green corridors, linear gardens, and diverse ecological corridors

For illustrative purposes, the Tengah City Project serves as an exemplary embodiment of the aforementioned principles. Nature-centric solutions permeate the city's proposed environmental blueprint, with green spaces intricately

woven through pivotal green zones, amenity centers, and residential precincts. This intricate network delineates a symbiotic relationship between built structures, the natural world, and the community at large, epitomizing the essence of seamless green integration (Refer to Figure 3).

Figure 3. The layout of Tengah City exemplifies the holistic integration of nature. A synergy is observed with green streets and corridors seamlessly interwoven throughout the urban fabric

4 Methodology

This research was informed by a thorough analysis of both theoretical and empirical literature, focusing on sustainability factors and their interplay with biophilic city principles. From the extensive literature review, a discernible knowledge gap was identified, emphasizing the ambiguity of indicators necessary for achieving optimal integration of nature within urban frameworks. Benchmarking served as the foundational strategy for the research, whereby specific indicators within the selected study area were meticulously measured. Subsequent analyses were conducted using mathematical methodologies to juxtapose observed data against predetermined standards, employing criteria such as the Street Afforestation Index and the Green Walkway Indicator/Linear Gardens.

Kufa City, situated 156 km south of Baghdad and 10 km northeast of Najaf, was chosen as the primary study area [14]. Recognized as one of the most venerable Islamic religious cities, Kufa City spans an area of 4914.04 hectares within its administrative boundaries, comprising five sectors which further bifurcate into 21 residential neighborhoods [15]. The city is bisected by a branch of the Euphrates River, colloquially termed the Kufa River. This riverine feature augments the urban landscape with verdant expanses characterized by palm forests, orchards, and farms, as recorded by the Kufa Municipality Directorate in 2022.

The choice of Kufa City as the research's focal point was underpinned by several salient features:

• **Natural Green Spaces**: Kufa City is punctuated by expansive natural green spaces, delineated by palm forests, agricultural lands, and orchards. Its topography, predominantly flat, renders the terrain propitious for agriculture. Additionally, the alluvial soil along the banks of the Kufa River proves especially fertile.

• **Blue Spaces**: The Kufa River, as the city's preeminent blue space, stands not only as a testament to the city's natural affluence but also as a hub of biodiversity, reflecting the vitality of urban life. Moreover, its banks serve as communal recreational zones. Pertinent illustrations and data are presented in Figure 4 and Table 1, respectively.

5 Study Area

Situated 156 km south of Baghdad and 10 km northeast of Najaf, Kufa City is recognized as one of the seminal Islamic religious cities [17]. This Iraqi city functions as the administrative epicenter of Najaf governorate in the central Euphrates region. Geographically, its coordinates are registered at 44° 23' 55" latitude and 32° 32' 11" longitude [18]. Spanning 4914.04 hectares within its administrative boundaries, the city is subdivided into five sectors, which are further fragmented into 21 residential neighborhoods. The Kufa River, a tributary of the Euphrates, traverses the city, punctuating it with expansive green areas characterized by palm forests, orchards, and farms, as recorded by the Kufa Municipality Directorate in 2022. A high percentage of green spaces has been documented within Kufa City [19].

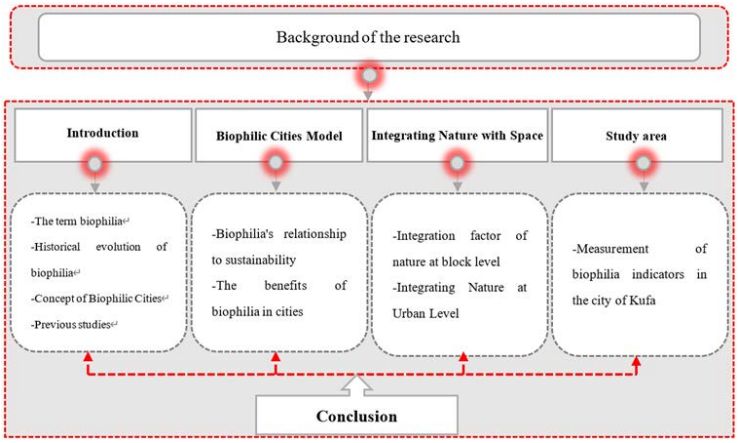

Figure 4. Schematic representation of the adopted methodology

Table 1. Enumerates the indicators employed in the study, the methodologies adopted for measurement, and the corresponding criteria against which the city's infrastructure was evaluated

Indicator	Measurement Method	Standard
Meso Index	Measurement of the green area area surrounding the block to the block area ratio	The percentage of green area shall be a minimum of 35% of the mass area and shall be spread to a maximum of 26 green spots and distance between green spots 7 m
Street Afforestation Index	Tree-to-Tree distance scale	Distance from tree to tree 7 m
	Pedestrian pavement display scale	Berth Width 3 m
Green Walkway Indicator / Linear Gardens	Ecological hiking corridor display scale	Width greater than 50 m
	Scale display of green spaces produced	Width greater than 30 m

5.1 Integration of Nature with Urban Spaces in the Study Area

The integration of nature into biophilic urban spaces can be gauged either by assessing the proportion of green spaces in relation to urban mass or via the presence of green corridors, streets, and linear gardens. The succeeding sections delineate the methodologies employed to measure this integration within the study area.

5.1.1 Integration factor of nature at block level

This factor signifies the relationship between green spaces and the percentage of urban blocks that are flanked by these verdant expanses. The Meso indicator was employed to ascertain the green space ratio within the study area, with the criterion stipulating that green spaces should occupy a minimum of 35% of the block area, with a maximum of 26 green spots at a distance of 7 meters between each spot. Discrepancies were observed, where certain blocks solely conformed to singular green areas instead of the stipulated multiple green spots. The Nature Harmony Index with residential blocks is considered a pivotal metric in biophilic cities, emphasizing the nexus between urban residents and nature. Such integration offers multifarious benefits, spanning psychological, health, and social spheres. For illustrative data, refer to Figure 5 and Table 2.

5.2 Integration of Nature at the Urban Level

The synthesis of nature within urban landscapes in the study area was evaluated through the subsequent indicators:

A. Green Street Indicator: Analyses revealed that Kufa City largely lacks an established green street network. A majority of streets manifest traditional designs, with some central islands sporadically punctuated with rudimentary vegetation. Many streets, in stark contrast, are devoid of any greenery, pedestrian canopies, or leisure spots. In quintessential biophilic cities, green streets play an instrumental role, forging connections between the city's green and blue spaces while simultaneously fostering pedestrian-friendly environments, fortified by dense vegetation that ensures thermal comfort. This is further complemented by aesthetic and functional amenities such as lighting and seating. For a visual representation, refer to Figure 6.

B. Green Corridors/Linear Parks Indicator: This metric underscores the prevalence of green corridors that seamlessly interlink the green and blue elements of the urban tapestry. Within the study area, the following

observations were made:

(1) Ecological Hiking Corridors: No ecological hiking corridors were discerned within the study area. Standards for biophilic cities advocate for the presence of ecological hiking corridors spanning at least 20 meters in width, serving both as habitats and connectors between the city's disparate green and blue spaces.

(2) Environmental Productive Corridors: Four productive environmental corridors were identified, primarily characterized by vegetable farms interspersed with fruit and palm trees—areas earmarked for urban agriculture. Although oriented towards the blue areas of the Kufa River, these corridors don't provide an interconnection between the city's public and natural green spaces. In quintessential biophilic cities, such corridors, both productive and recreational, are indispensable, forming an interconnected green network that facilitates seamless transition between various urban zones and the encompassing green and blue spaces. Visual representation can be found in Figure 7 and Figure 8.

The systematic approach outlined herein endeavors to provide an in-depth analysis of the intricate interplay between urban landscapes and nature, emphasizing the need for symbiotic integration to foster sustainable urban habitats.

Figure 5. Illustrates the juxtaposition of green space in relation to residential blocks in the Kufa City neighborhood

Table 2. Presents data detailing the proportion of green spaces juxtaposed with residential blocks within the neighborhoods, providing quantitative insights into the city's green space distribution

Neighbourhood Name	Proportion of Green Space Harmony with Block
The Mindful	31.5%
Military	24.4%
Teachers 1	34.2%
Kinda 1	3.5%
Kinda 2	12.6%
Misan 1	19.8%
Misan 3	12.2%
Mr. Ibr	1%

Figure 6. Depiction of Bridge Street in Kufa City, noticeably devoid of green expanses

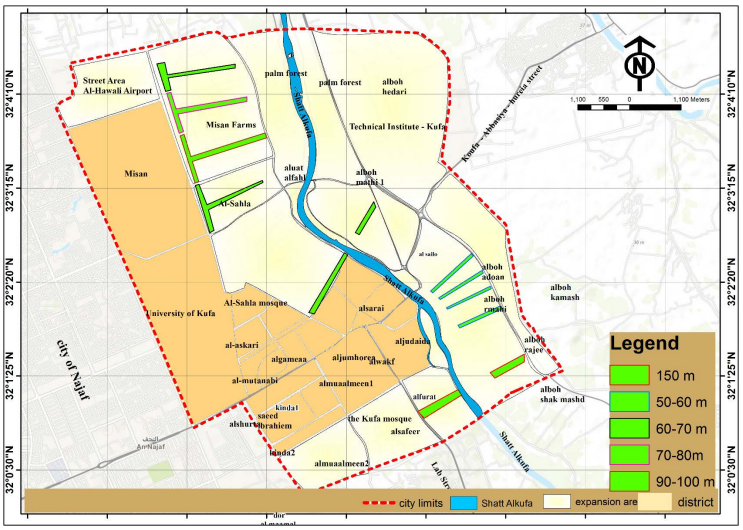

Figure 7. Depicts the agricultural production corridors, further highlighting the city's utilization of green corridors for agricultural endeavors

Figure 8. Showcases one of the green corridors utilized as productive agricultural land, underlining the dual functionality of these corridors in the urban landscape

6 Results

6.1 Green Spaces and Residential Blocks

Analysis of the study area revealed non-uniform distribution of green spaces in proximity to residential blocks. Instead of adhering to the standard which mandates the dispersion of green spaces around the block in the form of 26 patches, with a recommended separation of 7 meters between individual patches, the observed green spaces were predominantly concentrated in singular regions. Furthermore, these spaces exhibited minimal connectivity to other green expanses in the Kufa City neighborhood.

6.2 Green Infrastructure in Kufa City

While Kufa City boasts the presence of green corridors, a conspicuous absence of an integrated green grid was noted. This grid ideally should connect the green corridors to other verdant areas in the city, fostering a seamless green transition throughout the urban expanse. Additionally, the city displayed a marked deficiency in tree-lined streets, further detracting from its potential as a biophilic urban center.

The presented results underscore the paramount importance of strategically integrating green spaces within urban landscapes, not only for aesthetic appeal but also for fostering holistic, sustainable, and biophilic urban ecosystems.

7 Conclusion

Urban natural areas, emblematic of a city's natural heritage, are deemed invaluable assets to both the urban environment and its populace. When harnessed appropriately, the sustainability of urban spaces is believed to be enhanced. Biophilic planning, a burgeoning approach, has been identified as a potent strategy that promotes a more sustainable and effective interaction with urban natural spaces. This method posits the integration of nature into urban settings through the establishment of an interconnected green network, facilitated by distinctive environmental green corridors. Such a design ostensibly ensures holistic accessibility across the urban spectrum, allowing residents to maintain both direct and indirect communion with nature.

Through the undertaken study, it was revealed that Kufa City is in dire need of augmenting its green spaces and interlinking them with other urban functionalities. Furthermore, the establishment of a cohesive green network that interconnects these green areas is deemed imperative. Emphasis was placed on the biophilic integration into the urban framework through a set of indicators, notably the Meso Index, Street Afforestation Index, and the Green Walkway Indicator/Linear Gardens. The primary intent of the study was the identification of these indicators to facilitate nature's seamless integration into urban landscapes. Subsequent measurement of these indicators in Kufa City followed by data analysis divulged that the city manifests a conspicuous absence of uniformly distributed green spaces surrounding its blocks. Moreover, while the presence of green corridors was observed, a glaring lack of a comprehensive green network, which ideally should amalgamate these corridors with other green expanses, was noted. The dearth of tree-lined streets further exacerbated this deficiency.

For future urban planning endeavors in Kufa City, adherence to biophilic principles is strongly advocated. Such an approach is believed to proliferate green zones, thus fostering the harmonious melding of nature with urban spaces. Consequently, it is anticipated that this would elevate social interactions, enhance place connectivity, and nurture a heightened sense of belonging among residents. The findings of this research underscore the exigency for a transformative shift in urban planning paradigms towards embracing biophilia. Prospective studies are recommended to delve deeper into the uncharted realms of biophilic planning and design, with the overarching goal of devising a holistic framework aligned with the aspirations of sustainable and resilient urban development.

Author Contributions

Conceptualization, A.S.A. and W.A.H.; methodology, A.S.A.; software, W.A.H.; validation, A.S.A. and W.A.H.; formal analysis, A.S.A.; investigation, W.A.H.; resources, A.S.A.; data curation, W.A.H.; writing—original draft preparation, A.S.A.; writing—review and editing, A.S.A.; visualization, A.S.A.; supervision, A.S.A.; project administration, W.A.H.; funding acquisition, A.S.A. All authors have read and agreed to the published version of the manuscript.

Data Availability

Not applicable.

Acknowledgements

We would like to thank Dr. Tuqa R. Alrobaee, Ass. Professor at the Faculty of Physical Planning, University of Kufa-An-Najaf, Iraq, for her technical support and translation.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] G. Barbiero and R. Berto, "Biophilia as evolutionary adaptation: An onto-and phylogenetic framework for biophilic design," *Front. Psychol.*, vol. 12, p. 700709, 2021. https://doi.org/10.3389/fpsyg.2021.700709

[2] F. F. Bin Sulaiman, "Assessing biophilic criteria in urban neighborhoods of Saudi Arabia: A case study of the Diplomatic Quarter in Riyadh City," *J. Al-Azhar Univ. Eng. Sect.*, vol. 16, no. 59, pp. 300–324, 2021. https://doi.org/10.21608/auej.2021.166652

[3] C. G. Arvay, "Updating the biophilia hypothesis in the context of forest medicine," in *International Handbook of Forest Therapy*. Cambridge Scholars Publishing, 2019.

[4] R. McDonald and T. Beatley, *Biophilic Cities for an Urban Century: Why Nature is Essential for the Success of Cities*. Springer, 2020.

[5] P. Downton, D. Jones, J. Zeunert, and P. B. Roos, *Creating Healthy Places: Railway Stations, Biophilic Design and the Metro Tunnel Project*. Deakin University, 2017.

[6] T. Beatley and P. Newman, "Biophilic cities are sustainable, resilient cities," *Sustainability*, vol. 5, no. 8, pp. 3328–3345, 2013. https://doi.org/10.3390/su5083328

[7] A. A. Alaskary and T. R. Alrobaee, "Identifying and measuring biophilic planning indicators in Riverside neighborhoods," *Civ. Eng. J.*, vol. 8, no. 1, pp. 33–44, 2022. https://doi.org/10.28991/CEJ-2022-08-01-03

[8] A. S. Al-Khafaji, N. A. Al-Salam, and T. R. Alrobaee, "The cognition role to understanding planning and architectural production," *Civ. Eng. J.*, vol. 7, no. 7, pp. 1125–1135, 2021. https://doi.org/10.28991/cej-2021-03091715

[9] S. K. Al-Mosawy, A. A. Al-Jaberi, T. R. Alrobaee, and A. S. Al-Khafaji, "Urban planning and reconstruction of cities post-wars by the approach of events and response images," *Civ. Eng. J.*, vol. 7, no. 11, pp. 1836–1852, 2021. https://doi.org/10.28991/cej-2021-03091763

[10] H. A. Al-Ansari and A. S. Al-Khafaji, "Enhancing public health through sustainable urban design: An examination of transportation and green space integration," *J. Urban Dev. Manag.*, vol. 2, no. 2, pp. 104–114, 2023. https://doi.org/10.56578/judm020205

[11] K. Ziari, A. Pourahmad, B. Fotouhi Mehrabani, and A. Hosseini, "Environmental sustainability in cities by biophilic city approach: A case study of Tehran," *Int. J. Urban Sci.*, vol. 22, no. 4, pp. 486–516, 2018. https://doi.org/10.1080/12265934.2018.1425153

[12] H. Mohapatra, "Offline drone instrumentalized ambulance for emergency situations," *IAES Int. J. Robot. Autom.*, vol. 9, no. 4, p. 251, 2020. https://doi.org/10.11591/IJRA.V9I4.PP251-255

[13] P. A. Ghosh and P. M. Raval, "Reasoning the social benefits of mixed land-use and population density in an Indian city." *J. Eng. Res.*, 2022. https://doi.org/10.36909/jer.ACMM.16301

[14] P. Daniels, O. El Baghdadi, C. Desha, and T. Matthews, "Evaluating net community benefits of integrating nature within cities," *Sustain. Earth*, vol. 3, no. 12, 2020. https://doi.org/10.1186/s42055-020-00025-2

[15] D. De Koe and P. HvA, "Urban vitality through a mix of land-uses and functions: An addition to citymaker," 2013.

[16] P. Langdon, "Conclusion: Toward human-scale communities," *Within Walking Distance*, pp. 217–239, 2017. https://doi.org/10.5822/978-1-61091-773-5_8

[17] B. Mu, C. Liu, G. Tian, Y. Xu, Y. Zhang, A. L. Mayer, R. Lv, R. He, and G. Kim, "Conceptual planning of urban–rural green space from a multidimensional perspective: A case study of Zhengzhou, China," *Sustainability*, vol. 12, no. 7, p. 2863, 2020. https://doi.org/10.3390/su12072863

[18] N. A. Al-Salam, A. A. Al-Jaberi, and A. S. Al-Khafaji, "Measuring of subjective and objective aesthetics in planning and urban design," *Civ. Eng. J.*, vol. 7, no. 9, pp. 1557–1568, 2021. https://doi.org/10.28991/cej-2021-03091743

[19] T. R. Alrobaee, A. S. Al-Khafaji, N. A. Al-salam, and A. A. Al-jaberi, "The safer city: A new planning perspective for the traditional city development," *Int. J. Saf. Secur. Eng.*, vol. 13, no. 1, pp. 139–149, 2023. https://doi.org/10.18280/ijsse.130116