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IMPACT OF SPATIAL ENVIRONMENT ON DESIGNING THE URBAN PLANT LANDSCAPE FOR THE RIVERBANK AT ABU NU'AS SITE WITHIN BAGHDAD CITY

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ABSTRACT

The study aimed to investigate the impact of location on the nature of the natural landscape along riverbanks and how the design of this landscape changes based on site-specific variables by establishing a theoretical framework that incorporates the principles of plant element design, considering these influences in the design of urban vegetative scenes. Subsequently, the study seeks to validate this theoretical framework along the banks of the Tigris River in Baghdad, focusing on the case study of Abu Nu'as, a site of cultural and natural significance for the city's residents. Among the key findings of the study is that the efficiency of designing urban vegetative scenes along riverbanks is enhanced through the use of local plant species that are adapted to the natural and cultural environment. This improvement is seen in both aesthetic and functional values of the riverbank due to the visual and functional characteristics possessed by these plants. Planting the appropriate species in designated locations contributes to achieving visual openness, especially with the neighboring areas and the roads perpendicular to the riverbank.

Key words: cultural values, plant design, river edge, visual openness
***Part of Ph.D. dissertation of the 1st author**

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INTRODUCTION

The spatial environment is defined as a combination of natural, cultural, and social systems where humans and other entities coexist. Individuals contribute to shaping this environment through their cultural awareness (Ginzarly and Teller, 2019). Urban areas located along rivers stand out compared to other regions, as the river therein forms the central axis around which the rest of the city's components weave. In addition to the river role in altering environmental and recreational systems and shaping the city in general, it contributes to creating a safe, healthy, and comfortable environment for both users and residents alike (Liu et al., 2021). Many cities have interested in adopting concepts and trends that call for a return to nature and its preservation through optimal exploitation of natural resources, protection of wildlife, and care for plants in accordance with the climatic characteristics of the region (Sharbazhery et al, 2022). whereas an increases in urban development at the expense of green spaces and without extensive studies, it leads to an increase in environmental and visual pollution in cities (Al-Totanje, and Jasim, 2023). Increases the likelihood of thermal foci

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formation (Al-zuhairi and Jasim, 2021). Natural landscapes also provide opportunities for the development of knowledge, spatial awareness, and the enhancement of social relationships (Khudhair and Jasim, 2020). Riverbanks represent the most natural spaces in urban areas, forming a structure with different levels that reflect the relationship between a set of natural and cultural elements within the urban system (Shehata, 2022). It is the area of interaction between water, land, nature, and humans, and it holds significant importance in urban development, contributing to substantial social and economic functions (Duan et al., 2021) Peoples prefer using greenway in urban environments near riverbanks as they provide a sense of comfort (Zhao et al., 2021). Aspects of optical and mobility access should also be considered for these roads to serve as an effective link and tool in enhancing the cohesion of external spatial components (Podolak, 2012; Fadhil and Waheeb, 2021). Preserving plant diversity achieves a balance between the natural and urban environment, providing a range of functional and aesthetic elements (Abdulateef and Al-Alwan, 2022). Plants are considered one of the fundamental natural components in urban environments, playing a vital role in biodiversity and reducing pollution rates (Zhang and Wu, 2022). It is crucial to ensure proper distribution of trees and shrubs and avoid planting them in locations that obstruct the view of the river, especially from branches perpendicular to the riverbank, in order to achieve visual access. The increases in vegetarian diversity greatly affect the identification of the numbers and types of organisms and their behavior within the ecosystem. The use of different types of herbs with varied growing seasons within the same green area ensures a continuous green grass cover throughout the year. In addition to the aesthetic appearance of the plant and the functions it performs, is possible to benefit from deciduous plants in the cold seasons, providing shade in the hot seasons and reducing the severity of harsh weather factors (Abdulateef and Al-Alwan, 2022). The plant element can be utilized to providing privacy for individuals and families through implementing the principle of containment. This involves providing semi-isolated areas by shaping the plant element and using suitable plant components (Cooper and .Francis, 1998 ; Al-Asadi, 2022). The city of Baghdad is considered one of the most important cities possessing a cultural and historical heritage rarely found in any other city in the world. One of its prominent features is its location on the Tigris River, which split the city into two sides and constitutes a vital part of the city's civilization and culture (Al-Hasani, 2012). However, the riverbanks in Baghdad suffer from neglecting and deactivate both in terms of designing the natural urban landscape of its local environment and its cultural aspect (Khauin and Al-Alwan, 2019). Accessibility plays a crucial role in achieving a good level of environmental and social communication. It also has a significant role in revitalizing open spaces. (Fadhil and Waheeb, 2021). this study aimed to examine the influence of spatial environment on the design of urban plant landscapes, while also addressing the lack of a comprehensive methodology governing the design of these areas

MATERIALS AND METHODS

The study adopted a descriptive analysis method for the indicators discussed in previous studies on riverbanks to establish a theoretical framework applicable to the case study of the Abu Nu'as site in Baghdad city, as shown in Table (1) where the first column represents the indicators affecting the plant design of The river edge and the second column represents the potential values of each indicator and the third column is a measure of These values

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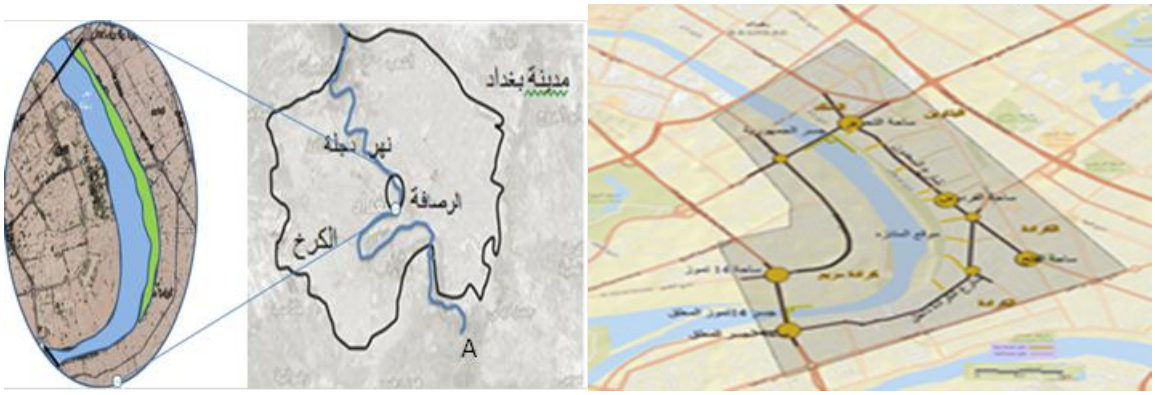
which range from 1 to 3, with 1 representing the lowest and 3 representing the highest to identify weaknesses and suggest treatments

Description of Abu nu'as site

Abu Nu'as site is located on the eastern edge of the Tigris River and on the Rusafa side. Figure (1-A) It extends from the Al-Jumhuriya Bridge towards the southern part of the capital, Baghdad, At a length of 3130 meters, between the Al-Saadoun and Al-Karrada area, Figure (1-B). The site is surrounded by a number of important areas in the city of Baghdad, as it is bordered from the north the Al-Jumhuriya Bridge and Tahrir Square and to the southern side The Karrada area, and to the east is the Bataween area, while it borders it to the west, and on the opposite edge of the river is the Karrada Maryam area. These areas are connected to the site by a number of important streets and bridges, such as Karrada Street inside, the Al-Jumhuriya Bridge, Al-Saadoun Street, and the Al-Mualak Bridge. These streets intersect in a number of important intersections and squares, such as Al-Firdous Square. Tahrir and Al-Fateh Square (Khauin and Al-Alwan, 2019), as in Figure (1-B). The site was established in 1980 as part of the development of the Abu Nu'as Street area, It began with planning and building the corniche and developing street gardens in order to hold cultural events in that area, where the plan to develop the River banks and gardens was linked to cultural projects, while these projects were linked by the pedestrians corridors. The site, in fact, contains spaces with different characteristics, mostly recreational and service in nature



Figure(1_A.) Explain the Abu Naas site in the city of Baghdad (1-B) map showing the boundaries of the main and vertical roads Studyer, based on ArcGIS, 2020

Around the site there are many government buildings and first-class hotels of a high character, which give a visual extension from and to the location. (Figure 3) Riverbanks are bordered by commercial and residential areas, where the commercial and administrative areas are concentrated in the northern half of site. Residential areas are concentrated in the southern areas adjacent to site. The most recent change in the form of architecture included the removal of old heritage buildings and the use of modern packaging materials individually according to the desire of property owners or tenants, while other buildings remained as they were or were modernized, which led to a state of heterogeneity of the buildings and visual pollution of the riverfront, which is harmful to site in general around the site The various spaces of the site are connected by paths designated for pedestrians, but the presence of a barrier separating the bank, and the river prevented access to the water and related to adding other activities that can be practiced when in contact with the water, such as water trips, boating, fishing, and sitting near the river.

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Figure 2. Some components of the site The studyer based on (Google, 2021)

Figure 3 The most important landmarks surrounding The studyer based on (Google, 2021) the site

There is an iron fence isolating the site from adjacent areas (Figure 4). The River banks is slightly winding, with medium to large (*Albizia lebbeck*) trees and a few large *(Zizyphus Vulgaris)* trees, along with grassy lands along the river bank (Figure 4). Natural views can be obtained from several sites when walking along Abu Nu'as Street or across the river. There are seating is limited and does not serve the intended purpose and there are also habitats for birds and wildlife due to the presence of reed plants and river islands. The land is flat within a flood plain, and the land area is increasing, due to the receding river

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water, there are areas that cannot be accessed by users, represented by water contact area, due to the presence of an iron fence in places and wires. Despite this, there is a feeling of liveliness and access as it is an open area on the river with the availability of green spaces and curved paths, especially in the middle site is due to the large area that has been designed In accordance with natural design, while the edges of site were designed according to the engineering system due to the limited space. There are large trees on site with green areas. With the existence of reed plants along the riverbank, which provide secure habitats for birds. The elements of the theoretical framework were applied to the study sample on the edge of the Tigris River for the Abu Nu'as site in the city of Baghdad as one of the urban edges that bears a recreational and cultural character and the largest area on the Tigris River, which is represented in Table1

Figure 4. The Impact of Plant and Non-Plant Components on the Riverbank

The Influential Indicators in Vegetative Urban Scene Design (Table 1).

1-Land use in the riverbank refers to how the spaces in the river zone are utilized or allocated. This involves determining the types of activities or functions assigned to the riverbank area or its adjacent zones. The term encompasses planning and design considerations to ensure effective and appropriate use of the land along the river, taking into account various factors such as environmental, cultural, and urban planning considerations. where mixed uses are more active, followed by dual-use areas and then single-use areas (Andini, 2011).

2-Cultural Characteristics: The diversity of adjacent uses, including cultural, heritage, and educational spaces, requires integration between the natural and urban environment. The appropriate plant species are used to showcase these buildings, or specific plant types are employed for educational purposes (Al-Ani, 2014).

3-Harmony with Sculptural Symbols and Heritage/Cultural Structures: The plant element can be utilized to guide users to the locations of these symbols. Using herbaceous plants, green spaces, and other plant species can showcase these symbols. It is also advisable to avoid using trees and shrubs that obstruct the view of heritage and historical

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buildings near the site. (Zhang and Wu, 2022).

4-Protection and Safety: Exaggerating plant densities, especially trees and shrubs, can contribute to the existence of unseen areas, somewhat diminishing the security condition. Additionally, incorporating lighting elements with vegetation supports the security state, especially during the night (Timur, 2013).

Table 1 Evaluates the indicators influencing the design of the urban vegetative landscape

Design indicators	Potential value	Measures of values
Land use in the riverine area	Single use	1
	Double use	2
	Multiple use	3
Cultural characteristics	The presence of individual traditional buildings	1
	The presence of heritage and cultural elements on the riverfront	2
	The existence of the features of heritage and culture at multiple levels	3
Harmony with Sculptural Symbols and Heritage	The presence of a plant element concealing the features of signs and sculptural symbols,	1
	keeping the signs and sculptures away from the plant element.	2
	Choosing plant types that integrate harmoniously with the design of signs and sculptural symbols.	3
Protection and safety	High Plant Density	1
	Balanced Plant Density	2
	Balanced Plant Density with Integration of Lighting Element	3
Organizing spaces	neglected spaces	1
	Partially designed spaces	2
	Fully designed spaces	3
Privacy	The presence of individual seating areas beneath the plant shading elements.	1
	The existence of areas surrounded by the plant element designated for families.	2
	The presence of both script	3
Vision	Vegetative density obstructs the view from the perpendicular branches and adjacent areas towards the river.	1
	Vegetative density achieves a kind of visual continuity.	2
	Balanced vegetative density achieves visual openness from the perpendicular branches towards the river	3
Water-related activities	limited	1
	Balanced	2
	High percentage	3
Plant diversity	Trees, shrubs and green spaces	1
	Trees and shrubs and green areas And fence plants	2
	Flowering trees and shrubs throughout the year and green areas And fence plants	3

5- Space Organization: This principle involves using plants to delineate spaces. Large-sized trees with dark colors can be employed for larger areas, while small shrubs and herbaceous plants can be used for smaller spaces or planted near walkways to divide and define the areas (Al-Sharbini and Ali, 2009).

6- Privacy: This can be practically achieved by ensuring containment, where semi-isolated spaces are created using the arrangement of plant elements. This also involves providing entrances, fences along the edge, and designated areas for families and others for individuals. Their collective provision gives a higher level of privacy (Al-Sharbini and Ali, 2009; Timur, 2013; Al-Asadi, 20223).

7- Visibility: This principle involves avoiding high plant density, especially large trees, as they can obstruct the view from adjacent areas and branches perpendicular to the riverbank (Alani, 2014)

8- Water-Related Activities The plant element, especially herbaceous plants, can be used to provide habitats for birds and fish. Floating gardens can also be utilized for cultivating flowering plants and vegetables (Al-Sharbini and Ali. 2009).

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9-Plant Diversity: This phenomenon is important and has a direct impact on the surrounding environment. It is influenced by the environment, climate factors, soil, and human activities. Plant diversity greatly affects determining the numbers, quality, and behavior of living organisms within its range, as well as the aesthetic landscapes of plants and the functions they perform. This includes having flowers throughout the year, utilizing drought-resistant plants in cold seasons, providing shade in hot seasons, and mitigating the extremes of weather conditions. (Alani, 2014).

RESULTS AND DISCUSSION

According to the indicators obtained from theoretical studies and the field study on the impact of the spatial environment on the design of urban plant landscape, the study revealed the following results. The northern part of the site is characterized by the diversity of land uses in its vicinity, including commercial, industrial, and residential areas, in addition to the presence of first-class hotels. This enhances the effectiveness of these areas and consequently increases the number of visitors to these regions.Especially since the majority of hotel residents are tourists and foreigners who prefer tourist and recreational sites agree with Khauin and Al-Alwan, 2019. this requires designing the riverfront in a way that meets the needs of users by providing green areas and seating spaces. Additionally, seating areas necessitate the provision of trees and shrubs to offer shade.Regarding the southern part, the predominant land use in the surrounding areas is residentia agree with Al-Sharbini and Ali, 2009. It is known that residential use diminishes the effectiveness of adjacent lands to the edge due to the privacy of individuals, resulting in fewer visitors. This is evident in these areas, necessitating a vegetative design that caters to the requirements of Eastern families. This involves providing secluded areas surrounded by plants to ensure privacy for families and offering solitary spaces for reading and contemplation for individuals agree with Al-Asadi, 2022.The presence of several roads perpendicular to the riverfront requires a vegetative design that minimizes the use of trees and shrubs that obstruct the visual extension from the intersecting branches towards the river edge or the river itself agree with Al-Ani,2014. The existence of heritage buildings in the adjacent lands, particularly in the northern part of the site, adds strength and dominance to the location. If a vegetative design for the riverfront is employed, these heritage buildings can be highlighted. It is preferable to use low-level plant species that do not obstruct the view Figure agree with Al-Asadi, 2022. Enhancing the beauty and showcasing these buildings. Harmonizing with sculptural symbols and statues requires the presence of green areas around these symbols. It is preferable to plant flowering herbaceous plants and low-height plant species to showcase and give strength and dominance to these symbols. This could be seen in the statue of Abu Nu’as in the northern part of the site and the statues of Shahrazad and Shahryar in the southern part of the site Figure agree with Al-Ani ,2014. Additionally, it is advisable to plant species that resonate with the symbolic essence of the sculptures. Planting local species that mimic the symbolic value of these sculptures is preferred. Regarding safety and security, 2016. it is advisable to have balanced vegetation densities as needed. High plant densities create visually and physically isolated areas, potentially leading to a weakened security situation. It is preferable to incorporate lighting elements alongside the vegetative elements, either in the form of directed lighting or a grid-like illumination around the trees. This enhances the aesthetic appeal of the site and reinforces the security

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condition, especially during s nighttime hours agree with Al-Sharbini and Ali, 2009. For privacy, there are individual seating benches in the north and south of the site under natural shading areas. This arrangement achieves a sense of privacy for individuals. However, it is observed that there are no specific areas designated for families Figure agree with Al-Ani ,2014. Introducing vegetative elements to provide seclusion, particularly suitable for the southern part of the site where adjacent areas are residential and inherently offer more privacy than the northern part, could address this gap.The presence of rows of large trees within the site or parallel to Abu Nu'as Street with high density causes visual obstruction from adjacent areas and branches intersecting with the riverfront, depriving residents and users of a clear view of the river and its activities. Water-related activities are also affected by the presence of a metal fence separating the riverfront from the river agree with Khauin and Al-Alwan, 2019. Additionally, cladding the cliff area with natural stone has added complexity, especially with the filling of these spaces with cement, causing complete isolation of the river waters from the edge.To address these issues, it is suggested to consider planting local grasses and green areas in these spaces. This approach would not only contribute to the aesthetics but also provide habitats for various natural ecosystems, improving the overall environmental quality of the area

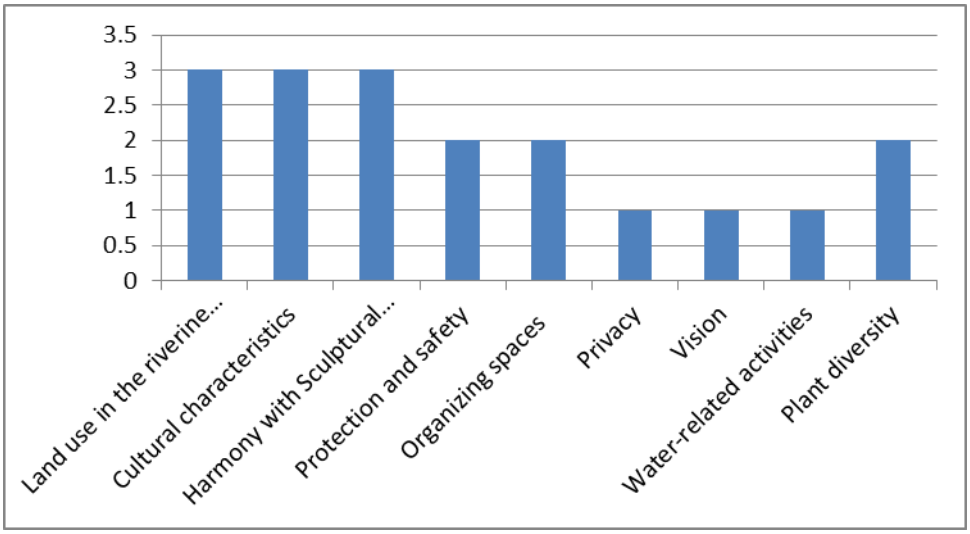

Figure 5. The percentages of achievement of the studied elements for the Abu Nu'as site

CONCLUSION

Below are a few concluding remarks based on the investigation The frequency of users on both sides of website the attributed to the presence of tourist attractions.especially the statues of Abu Nu'as, Scheherazade, and Shahrayar. This is positive because users prefer to take pictures near these sculptures. whereas The carved symbols give strength and dominance when present With the increased activation of the riverbank edge, In the northern part of the site and the diversification of its functions, there is a growing interest from users. This contributes to the use of additional means to access the site, such as walking, resulting in ease of access. The wider the space, the more people are connected to it, and it makes the River banks more beautiful and frequented. The curvature of the riverbank and the emergence of river islands have contributed to the increased abundance of local herbaceous plants, such as reeds, supporting natural and ecological life systems and enhancing habitats for other living organisms, such as birds. This also enhances the aesthetic values of the site. The limited plant diversity,

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confined to various tree and shrub species, restricts the aesthetic and design values of the site. Additionally, the lack of plant diversity prevents continuous blooming throughout the year. It was observed that the site lacks deciduous trees, depriving users of sunlight in seating areas near trees, reducing the opportunities for winter site usage. The lack of attention to lighting and its distribution methods limits the security aspect and nighttime use of the site. Paying attention to lighting enhances the security aspect and provides opportunities to use the site at night. The presence of heritage buildings In various locations along Abu Nu'as Street has a special appeal and increases the effectiveness of the River banks and is linked to the city's ancient history. Similarly, first-class hotels located in the northern part of the site serve as a tourist attraction to the riverbank

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

AUTHOR/S DECLARATION

We confirm that all Figures and Tables in the manuscript are original to us. Additionally, any Figures and images that do not belong to us have been incorporated with the required permissions for re-publication, which are included with the manuscript.

Author/s signature on Ethical Approval Statement.

Ethical Clearance and Animal welfare

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AUTHOR'S CONTRIBUTION STATEMENT

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تأثير البيئة المكانية في تصميم المشهد الحضري النباتي لحافة النهر في موقع ابو نؤاس ضمن مدينة بغداد

طالب احمد كاظم المشهداني
باحث

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المستخلص

هدف البحث الى بيان مدى تأثير المكان على طبيعة المشهد الطبيعي لحافة النهر وكيفية تغير تصميم المشهد الطبيعي تبعا لمتغيرات الموقع وذلك من خلال تكوين إطار نظري يتضمن اسس تصميم العنصر النباتي وفق هذه المؤثرات في تصميم المشهد الحضري النباتي ومن ثم التحقق بالاستناد على حافة نهر دجلة في مدينة بغداد كحاله دراسة وبالأخص موقع أبو نواس ذو الأهمية الثقافية والطبيعية. من أهم النتائج التي توصل اليها البحث، ان كفاءة تصميم المشهد الحضري النباتي لحافة النهر يتعزز باستخدام الانواع النباتية المحلية والمتكيفة مع البيئة المكانية الطبيعية والثقافية لتحسين القيم الجمالية والوظيفية لحافة النهر نتيجة للخصائص المظهرية والوظيفية التي تمتلكها تلك النباتات، كما ان زراعة الانواع النباتية في الاماكن المناسبة لها يعمل على تحقيق الانفتاح البصري خصوصا مع المناطق المجاورة والطرق المتعامدة مع حافة النهر.

الكلمات المفتاحية: القيم الثقافية، التصميم النباتي، الحافة النهرية، الانفتاح البصري

***جزء من اطروحة دكتوراه للباحث الاول**