

Evaluation of Landscape Design and plant Elements in Nader Bridge

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Abstract. The functions of botanical gardens have highly expanded from not just preserving the plant biodiversity but also creating aesthetically pleasing refugees from modern life. A study is carried out to evaluate garden design and botanical elements on Nader Bridge in Babylon City, Iraq. Many plants were used randomly after several experiments and the results showed that The Oleander plant, Egyptian Cassia and *Callistemon viminalis* were the best for tolerance to the site conditions. For the questionnaire, the results showed that 74% of the respondents consider caring for street gardens and intersections necessary while 26% consider it unnecessary. The objectives of this paper are 1) to study this site to find out the reasons for the deterioration of these green spaces., 2) Identify current problems at the site and know the opinions of elite members of society about these green spaces, who are knowledgeable in the field of garden engineering and design, 3) Preparing recommendations for the development of these green spaces by international design standards for green spaces surrounding bridges and street afforestation.

Keywords. Evaluation, Garden Design, Botanical Garden, Nader Bridge.

Introduction

Since the beginning of creation, man began to feel the beauty of the surrounding nature interacted with it and tried to imitate it. With the development of life and the increase in its concerns and troubles, green spaces turned into an urgent need as a result of urban sprawl and the increase in the concerns and troubles of life[1]. In addition, environmental pollution are resulting from industrial development and the increase in means of transportation.

The green areas in the city are of great importance and have an essential role in providing opportunities for rest in the joys of nature for the city's residents, as the development and progress of many nations are measured by the amount of their artistic and aesthetic taste, and the most beautiful cities in the world are those in which the coordinated and beautiful green spaces spread. It is worth noting that its studies and research on modern technology in garden design and modern management methods in perpetuating it is nothing but a continuation of the ancestral

heritage [2]. Therefore, the attention of city planners was directed towards the importance of green spaces, because they are among the necessary elements that indicate the development of the quality of urban life in the city.

The green areas are an integrated system and constitute one of the main parts of the urban planning of residential communities and cities because the beauty of these communities does not depend on the beauty of the facades of their buildings, the elegance of their appearance, and the wideness of their streets and squares that form one painting, but rather in the presence of sufficient areas of green areas in which life springs. Green spaces of all kinds have become evidence of the taste and sophistication of peoples and nations [3].

The afforestation of streets, squares and road intersections is not only due to its aesthetic and environmental importance, but also to the possibility of exploiting large areas as recreational places. A rare bridge is considered one of the modern bridges whose construction

was completed in 2019. It is an important bridge not at the level of Babylon Governorate and the central governorates, but rather to the level of Iraq as a whole because it is the connecting point between northern and southern Iraq. The wide green spaces surrounding are an integral part of the aesthetic and importance of the modern design of this bridge . Rather that it plays an important role in reducing the severity of environmental pollution resulting from the movement of thousands of cars on it, and it can also be used as entertainment place due to its wide area.

Literature Review

Green spaces are important in improving the quality of life for the city community as a result of the fact that these spaces perform many important functions for the sustainability of life, including the environmental function represented by air and water purification, noise reduction, thermal psychological comfort and recreational services, in addition to allowing people to contemplate the surrounding nature [4]. Orientation interest schematic the cities toward important spaces green for it from elements necessary and vitality that indicate to development quality life Urban area in city , especially after get up revolution industrial in nineteen century [5].

Spaces form element adult is important to any city seeking to achieve an item comfort and prevention and hiking to its inhabitants, as it counts lung city, which the field the only to save leisure and entertainment in ocean urban besides its function aesthetic forming it scenery picturesque, then give value for cities and the neighborhoods residential, and as know regions green areas with several definitions, of which that regions that operate spaces green wide excellence in its area the places open [6]. In this definition we find

confirmation of important spaces that turn on regions green, and it knew as others that it is regions that maybe agriculture number from trees big and high. Which, confers beautiful on biological residential, and in habit penetrate regions green numbers from arcade that benefits of which population to navigate or strolling and spend time emptiness [7].

Prepare gardens and flats green are the most important services required of the population when it has benefits and effect effective in improvement level health for them and why the garden has from fun to look and effect good on their souls, as maybe signal to number from jobs for gardening the public of which on way example function health and cultural social and entertainment and aesthetic [8]. It excels recreation by going to the gardens is a human behavior that can only be done by the user himself.

Represent spaces with green elements are essential in any system environmental Urban . where easy regions Urban areas green activity physical and relax pose refuge from noise. Trees produce oxygen, and it help filter pollution and air harmful, as well as provide safe ways for walking and riding bikes for purposes of transport. In addition, sites have activity physical and interaction social and entertainment [9].

Modern gardens are one of the most important types lethargy physically associated badly ability on movement and not access to regional entertainment, accounts for 3.3% of deaths international [10]. Lead regions are green careers schematic so working on organizing the cities their locations residential and general, and dismissal between accompanying different. It adds on the environment adds so beautiful that most cities do not seem advanced of which lot this the side a lot from interest, so much from the

cities seeking to save spaces green within it, and try preservation on her in various ways and means. Spaces green are important in belittle limit from pollutants the environment of urban Represent spaces green element are essential in any system environmental Urban. where easy regions Urban area green activity physical and relax pose refuge from noise. Trees are produced oxygen, and it helps on filtering pollution air harmful, as well and provide safe ways for walking and ride bikes for purposes transport. In addition, sites have activity physical and interaction social and entertainment [9].

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The plants solve engineering technical problems visual effects of plants. The necessary investigation objectives and purposes are selected to plan green spaces in terms of integration. A group of elements such

as harmony and balance and specific centre. Sovereignty and bonding must be provided group the job appropriate for green spaces so that each specialist works in his field of competence[12]. It identifies physical and natural ingredients as well as a collection the information and studies necessary and knowledge complete. All relates work to the site and you understand features place from topographical the site and projects that may be contain it the site and any items aqua exist in it, as well any buildings and installations present, and change that from studies the soil such as (texture , salinity, ground water level and climate)[13].

Background of Research Areas

Hilla City

Constructed city Hilla in late century Fifth Hijri 495 (AH / 1101 AD) , and it gained relevance from it legacy Urban derived from the civilization Babylon that prepared from older civilizations in the world the old by containing it. The hanging rockeries is one wonders of the seventh world. The fall middle Iraq is in the region Euphrates middle and represent one of the larger cities of the plain Al-Rassobi [14] . Given be location the study is located in the Hilla centre, so will touch to climate city Hilla with a picture general. It is considered climate city Hilla that it a climate desert is Hot, dry in summers, cool and semi-arid in winter. It has a similar climate in plateau central and this include 70% of in Iraq, so go up grades the heat especially in the season summer that extends from May to October the first and height begins from month March and up maximum monthly July. Then take it down until reaches below in December the first and the second in season winter [15]. The relationship between all from degree the heat and radiation solar and evaporation stuck parcel . Relativity humidity

characterize is height in winter and decreases in the summer in regards to rains. It is clear that Hilla city is located in a region with low rains besides wiggling it from one year to others. It is reported by [14] that the wind prevailing for Hilla city wind north western one year in all chapters of the year. In winter, be dry and cool but she Moderates in summer and underestimates from rising grades heat.

Afforestation of Streets and Road Intersections in the City of Hilla

Prepare regions is a task and vital because of its view aesthetic because it contributes to belittling emissions negative for exhaust. The cars and tempering ambiance are city's own so it was completed. They took advantage of it in a form optimized that it represents spaces big from the city wan intersection spaces are spaces big from the earth. it was gesticulate gone neglected and poor with its lid vegan represented with bushes small or weed [16].

Hilla has suffered streets especially the lot period that the events of 2003 followed that because of neglect it where ruined fully because of projects. It was completed and implemented such as projects constructional for exchange health gesticulate follow it from operations removal of carrots and sidewalks. It was completed and created in the centre city where company workers for this the mission creates projects and by the ways old lead to holes streets and sabotage it. For circumstances environmental importance is big in life human from during effect on items life the basic like air and food health and rest besides effect on vegetation [4].

Providing suitable soil and the lack of systems irrigation has been a reforestation movement of streets, squares and intersection areas after 2003, but it is irregular and random and

follows the old methods and does not keep up with modern methods. In urban afforestation reliance is on non-specialized cadres in this field and does not provide modern mechanization in maintenance operations to reduce the need for workers due to the lack of technical workers in the field of garden maintenance. Graduates of the agriculture preparatory school and agricultural institutes must be relied upon to carry out maintenance operations, divide the city into partitions, and distribute maintenance personnel to partitions to determine the responsibility for default.

Research Methodology

There are several stages , and these stages can be explained as follows

The On-Site Assessment of the Green Spaces Surrounding Nader Bridge and the Evaluation of its Natural Elements, Including:

Plants

The species used in the bridge , the way they were distributed, their health status, and their natural condition were recorded in terms of colour, flowers, growth efficiency, and the purpose of their cultivation.

Soil

The following factors have been studied, three soil samples were taken from the centre of each of the four yards surrounding the Nader bridge (Figure 1) at depths (0-15) (15-30) (30-45) cm and dried in the laboratory for a week as the samples were wet despite the absence of previous rains and no process was carried out . Irrigation of the squares more than a week ago, then the samples were analysed in the laboratories of the soil and water department / college of agriculture, Al-Qasim Green University.

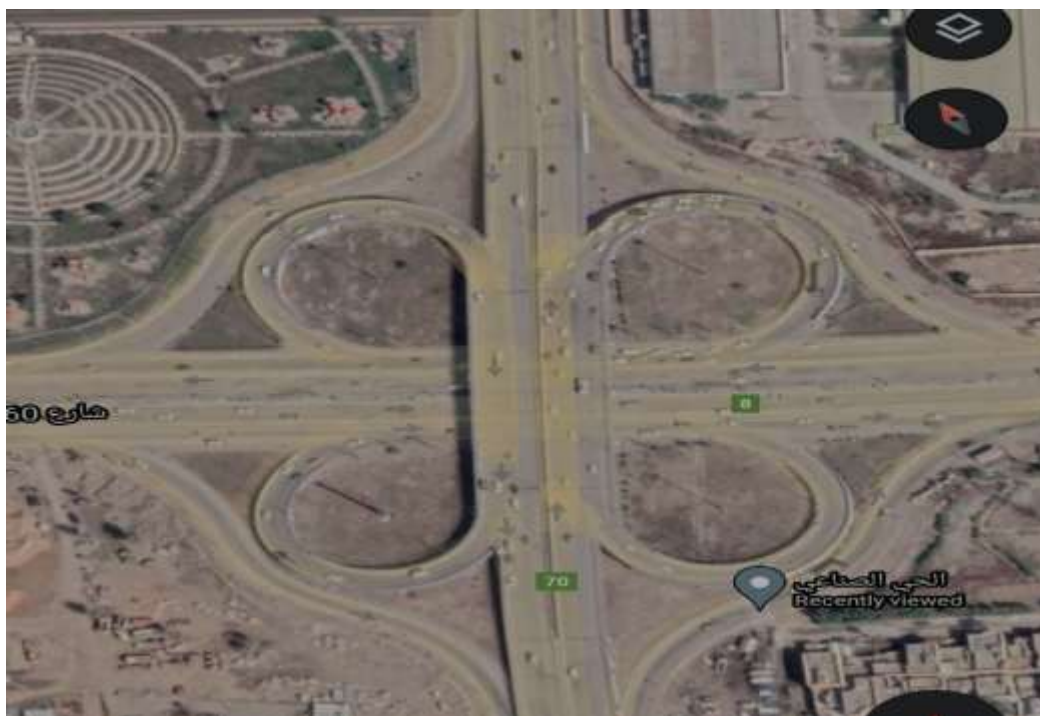


Figure 1. An aerial view from the middle of Nader Bridge in Hilla.

Salinity

The same previous models were used to measure salinity in the laboratory. Also, Ground water level: It was measured using an auger (screw auger), where drilling was used until water appeared.

Irrigation Water and Irrigation Method

A sample was taken from the irrigation water used, and salinity was measured in the

laboratories of the soil and water department. The source of irrigation water was as well as for the irrigation method used, it was rainwater irrigation.

The Design Used on the Site

There is no typical design for the Nader Bridge (Figure 2) under modern design standards for such important sites.



Figure 2. An aerial view from south west side of Nader Bridge in Hilla.

The Questionnaire

It was conducted to find out the views of the students of the Department of Horticulture and Landscaping, where 100 questionnaires were distributed to students of the second, third and fourth stages, because they had received lessons in the field of designing gardens and ornamental plants, noting that the numbers of students in each stage are (46 second, 53 third, 33 fourth). The number of forms distributed was as follows: The second stage 36 forms - the third stage 40 forms - the fourth stage 24 forms.

Results and Discussion

Results of the On-Site Assessment

The results of the field study indicate that the plants and their method of distribution were counted on the site such as trees for example Albizia. It is a tented tree used for shade, widespread, deciduous, fast-growing, and tolerant of the climatic conditions of the region as well as bad soil. Moreover, Shrubs like Conocarpus, it considered a shrub that was recently introduced to Iraq, characterized by rapid growth and resistance to extreme

heat, but it is affected by low temperatures and resistance to poor soil conditions. It was used prohibited after research and studies showed that its root system affects the infrastructure of projects and buildings. The *Callistemon viminalis* is a beautiful shrub with drooping branches. It is recommended to be used around lakes and water basins. Its flowers are red and resistant to the climatic conditions of the region and the poor soil conditions. Egyptian Cassia is a beautiful shrub with yellow flowers that bloom for long periods and bear the climatic conditions of the region because it is affected by poor soil conditions.

The Oleander plant is a tree that is resistant to various environmental conditions and soil conditions. It also has beautiful flowers. The green flat, One of the commonly used flat hybrids, Bermuda, was used, and its scientific name is *Cyndon dactylon*. It is one of the summer green flats that turn yellow and stop growing in winter [17]. It covers about 90% of the area of the four sites surrounding the bridge and shows signs of being in poor

condition, such as yellowing, rotting, and bare areas.

Plants are generally characterized by yellowish leaves, and slow growth (dwarfed), despite the passage of several years of cultivation, and this is due to the waterlogged soil at depth (0 to 30)cm due to the presence of the polyethylene layer. Also, the irrigation method and the unevenness of the soil caused thirst in some plants and the green surface because the water did not reach them at a time when the water gathered in the low areas, causing suffocation of the roots of trees and shrubs, rotting the green surface, yellowing of plant leaves, damage and yellowing flat green in intermediate places. The distribution of plants and the purpose of their use was done randomly after several failed experiments for different plants, and this is due to poor soil conditions and poor maintenance operations.

The Soil and Irrigation Methods

Table 1. Shows the soil texture analysis at the studied depths and its salinity.

Depth cm	Sand%	Silt%	Calcic %	Ec (dsm ⁻¹)
0-15	610	275	110	5.3
15-30	589	321	90	5.7
30-45	40	102	820	7.1

The results of soil salinity are in Table. 1 shows that the salinity is high at the three depths and that the soil is saline according to the classification of the American Salinity Laboratory 1-2 Brackish 2-4 Moderately saline 4 > Saline. The level Ground water, it is 80 cm And it is considered Depth not Appropriate where that depth is Critical 0-1 m causing salinity soil [18].

Topographical soil observed non level of the soil in spaces. The four its dimensions were 38 * 68 m the reason distribution was not regular for water irrigation was lost it causes in gathering of water in the places low and not arrival for places elevated than effect on

The results in Table 1. showed that sand is the dominant component, then silt, sand at depths (0-15) (15-30)cm. As for depth (30-45)cm, the dominant component is clay, then silt, then sand, and this indicates that the surface soil is of (15-30)cm depth . 0 to 30)cm is soil transported from the river sides. It is a light soil characterized by its easy drainage of water. As for the soil at a depth of (30-45)cm, it is the original soil of the site, and it is heavy soil in which water drainage is slow. A layer of polyethylene has been laid on the soil. The original layer of the site was to prevent the rise of salinity due to the high ground water level, then the transported soil was added, but the polyethylene layer has its disadvantages, as it prevents the leakage of excess water to depths far from the surface of the soil, and thus leads to the flooding of this part of the soil (0-30) cm with water and the rise of salinity at a height the summer temperature, which caused the models that were taken to be humid.

growth flat the green and plants the other. The results of laboratory analysis showed that the salinity of the water used for irrigation is 2.1(DSM⁻¹), which is considered saline water, which causes salinization of the surface layer of the soil (0-30)cm.

The irrigation method that used it irrigation by the Christian which was from ways old that it caused in vain. In addition, the soil is not level, which caused waterlogging in the low areas, as well as the rotting of the green surface. In addition, the high areas do not reach the irrigation water, and thus this method requires land flat until distributed water with a picture regular in all the sites. It

is a green surface that covers more than 98% of the sites with a scattered group of trees and shrubs, i.e. there is no design according to the design standards of such important sites. Hence, we conclude that the most important problems of the current site are :high salinity, ground water height, and soil unevenness. Using the old method of irrigation causes many problems, [15].

Results of the Questionnaire

The results of the questionnaire in Table. 2 showed that 94% of the respondents are interested in the afforestation of streets, astronomy gardens, and squares, because this subject is at the heart of their academic studies. In addition, their desire in this scientific field, as the beautiful scenery that people see through television and social media, and some of them travel abroad. The sense of pleasure that these beautiful scenes arouse in their souls, caused their interest in the beauty of their cities by afforesting the streets and squares and comparing them with what they see through visual means. As for people's interest in the afforestation of streets and intersections. The results also showed that 74% of the respondents consider caring for street gardens and intersections necessary and 26% consider it unnecessary, and this

indicates the importance of this type of gardens as well as caring for street planting.

The results of the questionnaire also showed that 57% of the respondents believe that the green spaces around the causeway Nader is in moderate condition, and 43% of them think it is poor. This reflects their level of academic understanding of this field, their sense of beauty and the beauty of garden design, and their familiarity with pictures and scenes of modern cities in Europe, America and the East. As for the proposed design of the bridge gardens , the results of the questionnaire showed that 91% of the respondents want the design to be symmetrical, because the engineering design is appropriate for squares and squares, and this is what students are taught about . The four gardens to break the boredom of repeating the same scene. The results showed that 45% prefer bilateral symmetry, and this is because bilateral symmetry gives more opportunity for diversity, as each of the four gardens is symmetrical with the garden opposite it on the other side of the bridge. As for the fences that can be used in the gardens of the bridge , the results showed that 58% prefer plant fences, as they add a beautiful view to the bridge

Table 2. Shows the results of the questionnaire.

Questions (questionnaire)	Yes %	No %
Do you excite your interest in street gardens, square gardens, astronomy, and intersections?	94%	6%
Do you consider caring for the landscaping of streets and intersection gardens (bridges) necessary?	74%	26%
What do you think about green space design around Nader Bridge ?	Good %	6
	Medium %	45
	Not good %	29
What design do you suggest for the green spaces around the bridge ?	Symmetrical geometry%	80
	Mixed%	7
	Natural%	3
What kind of symmetry do you prefer?	Bilateral%	45
	Quadruple%	32
	Radial%	23
Do you prefer wooden or vegetable fences (Botanical) around the bridge gardens?	Wooden%	42
	Botanical%	58
Do you prefer to sit in the bridge gardens ? If the answer is yes, what is the reason, and if the answer is no, what is the reason?	6%	94%
Would you like to add fountains and water basins ?	100%	0%
Do you prefer creating walkways to connect parts of the garden and facilitate movement when watering the garden?	100%	0%
Would you prefer to have walkways included in the garden levels?	57%	43%
Do you prefer erect arches covered by climbers?	84%	15%
Would you prefer to add annual flowering herbaceous plants in the bridge gardens?	94%	6%
Would you prefer to add statues and monuments that represent the history of the city of Hilla, its personalities and its martyrs?	100%	0%
Diversity in the use of trees and shrubs to bear the environmental conditions of the city of Hilla and tested in other locations?	100%	0%
Using soil covers in multiple places instead of the green surface	68%	32%

Note/ the percentage (%) was taken from 100 people and these persons have different genders and different ages. Also, from different backgrounds cultures.

In addition, they can be easily replaced during their decline, and they do not allow animals to cross. The results showed that 94% do not prefer to sit in the bridge gardens , because the design of the bridge gardens is completely far from the parks and does not give a feeling of comfort and freedom, as it makes the seated feel that they are under the watch of the eyes of people passing by on the sidewalks or cars,

in addition to the noise and dust resulting from the movement of cars. They answered yes, as they explained that they prefer to wait for their friends or the cars that transport them in the garden instead of standing on the sidewalk. The results showed that all respondents prefer the presence of the water element in any form, whether fountains or basins, due to the aesthetic and environmental importance of water. In addition, on square or field in Hilla that contains a fountain or water basin except for one in the association. Also all respondents prefer the establishment of walkways due to

their importance in linking the parts of the garden used and facilitating movement within the garden. The results of the questionnaire showed that 57% of the respondents prefer to have walkways on the levels of the garden, as it gives a clearer vision of the areas in the depth of the bridge and a sense of breadth, where the distant features of the garden stand out. The results also showed that everyone prefers to erect arches that are covered by climbers, to confirm the entrances and their aesthetics, in addition to the pleasant smell when using Arabian jasmine or red jasmine. While the results showed that 94% prefer adding annual flowering herbaceous plants for their aesthetics and what they add to gardens in terms of aesthetics, as well as the colours and scent they add to the place. As for adding historical statues and monuments, as well as the diversity in the use of trees and shrubs. The results showed that all respondents prefer to add historical statues and monuments, and therefore to get to know the personalities of Hilla or the methods affecting the cultural, social and political aspects, as it is a way to educate people and learn about the history of their city. In addition, the results showed that everyone prefers diversity in the use of trees and shrubs because of their environmental and aesthetic importance to the bridge gardens. It is possible to obtain a variety of textures , flower colours, and flowering dates. In addition, softening the atmosphere provide shade, and lowers temperatures. The use of soil covers is instead of the green surface, the results showed that 68% of the respondents prefer planting soil covers because they need little maintenance and bear environmental conditions like Carissa , *Japanese jasmine*, and the rolia plant .

Conclusion and Recommendations

The field study has shown non-employment standards design the basic design gardens a rare bridge as well as existence failure and neglect in application methods. Scientific studies must be carried out before planting, such as studying soil investigations and their problems. Preparing the land and preparing the required designs are important. This requires existence specialists with experience and efficiency works afforestation lack of maintenance and operations the service and the perpetuation and control and composting remove the jungle. In addition, to non-perpetuate the plants cultivated and take care of it lack of water assigned to irrigate prepare from most importantly the reasons that affected in deterioration gardens in the study site. In addition, to not exist a plan to irrigate gardens and lack most gardens and spaces external convert the bridge to the components Supplementary like seating sitting and columns luminance and containers waste and others. Than decrease from worth it functional and environmental aesthetic. Diversity in the plants and the plants herbal and seasonal forms normal or geometric to add aesthetic to the site. Maybe benefit from important place put monuments and statues for personalities historical the mission. Use elements constructional like fountains and tubs water and for its importance aesthetic and environmental such as using of sprinkler irrigation.

References

- [1] Cullingworth, J. B. (2012). Problems of an Urban Society: The social framework of planning. Routledge.
- [2] Oke, T. R. (2009). Chandler, TJ 1965: The climate of London. London: Hutchinson, 292 pp. Progress in Physical Geography, 33(3), 437-442.

- [3] Uren, H. V., Dzidic, P. L., & Bishop, B. J. (2015). Exploring social and cultural norms to promote ecologically sensitive residential garden design. *Landscape and Urban Planning*, 137, 76-84.
- [4] Mohammed, Light Jabbar . 2014. Importance sector Tourist in development sustainable, project Diploma graduated higher, Planning Center vegetative and regional, university Baghdad . Iraq .
- [5] Chiesura, A. 2004. The role of urban parks for the sustainable city: *Landscape and Urban Planning*. Department of Leisure, Tourism and Environment Wageningen University Wageningen Netherlands 68:129-138.
- [6] Abu Dahab, Muhammad. 1998. *Garden design and landscaping*, Arab House for Publishing and Distribution.
- [7] Kaiser, E. J., Godschalk, D. R., & Chapin, F. S. (1995). *Urban land use planning* (Vol. 4). Urbana: University of Illinois press.
- [8] Hussein, Abdul Razzaq Abbas. 1977. *The geography of cities*, Asaad Baghdad Press.
- [9] Tratalos, J., Fuller, R. A., Warren, P. H., Davies, R. G., & Gaston, K. J. (2007). Urban form, biodiversity potential and ecosystem services. *Landscape and urban planning*, 83(4), 308-317.
- [10] Fainstein, S. (2000). New Directions in Planning Theory, *Urban Affairs Review*.
- [11] Jaber, Mahmoud Haider Salim . 1985 . Study reality gardens college Agriculture in my dad strange And some Solutions suggested to develop it . Master thesis . university Baghdad - College Agriculture . Iraq.
- [12] Pacione, M. (2009). *Urban geography: A global perspective*. Routledge.
- [13] Oh, K., & Jeong, S. (2007). Assessing the spatial distribution of urban parks using GIS. *Landscape and urban planning*, 82(1-2), 25-32.
- [14] Anbari, Mohammad Ali, Laden Taha and Ishraq Zahir. 2014. Assessment Green State of Hilla City and Required Green Policies. *Journals geographic*, (20).
- [15] Al-Ibrahimi, Y. A., & Ghalib, H. B. (2018). Hydrogeochemical Modelling of Groundwater at Al-Nile Area, Center of Babylon Governorate, Iraq. *Journal of University of Babylon for Engineering Sciences*, 26(9), 180-197.
- [16] behind, a prayer Hamid . 2013. plan Suggested in development activity Alza a grazing in governorate Babylon, research Higher Diploma, center planning ban And the regional . University of Baghdad . Iraq
- [17] Selim, K. H. H. M. H. (2022). Study of the design characteristics of Al-Hashemite Corniche Park-Babylon province. *Euphrates Journal of Agriculture Science*, 14(2).
- [18] Zaman, M., Shahid, S. A., Heng, L., Shahid, S. A., Zaman, M., & Heng, L. (2018). Soil salinity: Historical perspectives and a world overview of the problem. *Guideline for salinity assessment, mitigation and adaptation using nuclear and related techniques*, 43-53.