

The role of aesthetic elements in the sustainability of the pedestrian environment of Karbala city center

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Abstract:

Walking is one of the most important manifestations of sustainable cities and occupies a large space in modern planning trends, related to the planning of pedestrian streets many variables that must be taken into account when planning pedestrian streets such as protection, ease of access and other important elements, and the elements that add the aesthetic dimension of the streets are one of the most important aspects that affect walkability and encourage towards the use of walking as a means of transportation within city centers for distances that can be reached on foot, as Arab cities in general and Iraqi cities in particular suffer from great neglect of aesthetics aspects due to the general trend in car planning and underestimating the importance of pedestrian streets, especially the aesthetic aspects with a direct impact on pedestrians, so the importance of identifying the elements that provide the aesthetic aspect in pedestrian streets and the possibility of providing them is very important We assume the achievement of sustainable pedestrian streets, including in particular the aesthetic elements that increase walkability in cities, as the descriptive analytical approach is applied in research in determining the elements of pedestrian street aesthetics and studying the relationship between those elements through the analysis of the multiple regression of parametric variables and their relationship to the independent variable (walkability) for a sample questionnaire The research to indicate many concepts such as walking and walkability and review of literature on pedestrians and the benefits of pedestrian streets and then extract indicators to achieve the beauty of the pedestrian

environment through the elements and the work of a questionnaire to show the strength of expression and the relationship between indicators and address the analysis of the Central Library Street in the center of Karbala city was reached to the absence of indicators of the beauty of pedestrian streets except for the element of symbolism and control and recommendations were developed to address the problems in fact to increase walkability And the shift towards sustainable pedestrian streets by focusing on finding elements that add the beauty of the pedestrian environment to increase walkability in areas where walking is the most important means of transportation within the city center, especially in cities that witness a continuous high turnout such as the city of Karbala.

Keywords: sustainability, aesthetics, pedestrians, walkability, Karbala

Introduction

The emphasis lies in the fact that each element of pedestrian paths has a functional role to serve pedestrians and road users, in addition to that some elements of the road enter into the formation of an aesthetic image An urban scene is important in the success of pedestrian streets, so after identifying pedestrian streets and walkability and knowing what are the important elements as aesthetic elements and applying them to the study area

Walking can be defined as human behavior that can be influenced by a number of factors that differ in nature, such as environmental dimensions, individual preferences, characteristics and conditions,

cultural perspectives, people’s culture, preferences, characteristics and circumstances are subjective factors related to individuals’ backgrounds and personal perceptions , while environmental factors are objective in nature and relevant to the physical characteristics of the built environment that accommodate walking activity, and in order to determine whether an area is pedestrian-friendly or not, the state of the built environment of the area is one of the main determinants that encourage or discourage walkability, and therefore walkability can be referred to as a measure of how suitable the environment is for pedestrians. (Sahar, 2016, p31)

In the definition of walking, the availability of good walking conditions in the sense that the built environment encourages walking by providing a comfortable, safe, comfortable and attractive path for pedestrians. (Sahar, 2016, p31)

Therefore, walkability: it is the suitability of the urban environment for people who live, shop, visit, enjoy and spend time in an area, as well as the possibility of walking depends on the human behavior of the inhabitants of the area (Diyana, 2011, p620). In another definition of walkability: It is the extent to which the built environment supports and encourages walking by providing comfort and safety for pedestrians, connecting people with diverse destinations within a reasonable amount of time and effort, and providing visual interest to trips across the network. (Michael, 2005, p248).

“If we could develop and design the streets so that they are wonderful and satisfying places to be – places to build community,

attractive to all people – we would have successfully designed about a third of the city directly and we would have a tremendous impact on the rest” Jacobs (Mohammad,2014, p301)

Benefits of pedestrian streets

1. Visual perception: improving the visual landscape, visualization and perception of the city environment
2. Perception of time (interconnection with the city environment of walking speed and easy access to activity centers)
3. Psychological relaxation, pedestrian protection, participation in economic and social activities
4. Maintaining the city’s environment and stability: reducing pollution, improving environmental conditions, lighting centers, and establishing psychological and physical well-being.
5. Strengthening social relations as well as establishing various activities and commercial activity (new activities and applications to live actively and stability, safety in pedestrian streets, and attracting various investments).
6. Culture, identification, distinction, historical and customary values in pedestrian streets, discrimination of places, and other factors that connect people socially in the city. (Sepideh, 2012, p574)

The concept of pedestrian paths: It is a type of pedestrian road only and does not allow other types of movement to pass as the main function of it is to provide the possibility of movement from one place

to another in an easy, safe and fast manner and pedestrian movement represents the most types of movement within residential areas and the most sustainable and priority in the planning and design of roads and then users of public transport followed by bicycle users and the end of the pyramid motor vehicles, and the encouragement of pedestrian movement is based on the degree of preparation of paths allocated to them as determined Route Design Selection of Individuals for Transportation. (Ismail, 2022, p. 124)

Aesthetic elements of pedestrian streets

1. Sculptural elements (symbolic): add the aesthetic dimension of the path, and derive from the surrounding environment, which is in



Image (1) showing different shapes of sculptural elements

Source respectively: (<http://gefилtequilt.blogspot.com/>), (<https://www.flickr.com>)

line with the area and the formation of a form that expresses the surrounding environment was heritage or archaeological, square, religious and others (Al-Nakhili, 2022, p. 104), the general environment can be characterized by the property of control, meaning that there is a dominant element within the urban environment so that it serves as a distinctive sign, and this helps residents to know and identify this place (Abdelkader, 2014, p. 5), As the signs are what distinguish the place and can be distinctive buildings or plastic works, these signs are usually associated with meeting points to strengthen them or be on medium sites on the movement paths, especially when changing the direction of the paths. (Farhat, 1999, p. 12)

It helps to create an identity for the pedestrian axis, provides information on the direction and location of activities, people gather around the clocks sometimes, which makes it as a visual sign, the city clock is an element that leaves a strong impression on the eye and mind of pedestrians throughout the day, its design must be carefully and sensitively, so it is a landmark with a strong visual image (Awad, 2016, p. 7), taking into account cultural vocabulary, historical legacies and the local environment, which confirms the identity of the path (Ismail, 2022, p. 125) ‘Pedestrian streets have the ability to confirm the three stages of time (past, present and future), the symbol or landmarks can be a witness to the past and its fixed values through time through groups of old trees, heritage buildings, sculptures and

historical symbols, and it can also give indication of the present with the actual reality in it, human presence and social presence, as well as the features of the future and the aspirations of societies and the desire for growth and development. (Yassin, 2015, p. 28), In addition to the fact that the sustainable urban environment is characterized by complexity, the complexity increases the user's desire to meditate on the views and try to understand them more, the complexity rarely makes the view boring and often captures attention (Abdelkader, 2014, p. 5), and for the environment to work with greater attractiveness, the surrounding areas must be clean and well maintained, with storefronts nearby for activities that provide the benefit of the sidewalk to increase the attractiveness of residents. (Sahar, 2016, p35),

2.Plant elements: The presence of shade trees improves the level of comfort of pedestrians on hot summer days, shade trees are effective in keeping pedestrians cool as well as blocking sunlight from their eyes, as well as shade trees add a pleasant aesthetic element to the street (Jaskiewicz, 2000, p7)



Image (2) showing different forms of plant elements

Source respectively: (720•ICONArchitecture|Dubai|Facebook),(<https://www.flickr.com/>)

Tree protectors whose importance is in aesthetic appearance and preservation of plant soil from contaminants and sometimes contribute to good design in providing seats for users. (Al-Nakhili, 2022, p. 104)



Image (3) showing different uses of tree protectors

3. Diverse awnings / roof lines: The presence of balconies, awnings and various roof lines enhances the pedestrian experience in the same way that buildings are formulated through diverse materials and

decorations, contributing to contrast and aesthetic quality, from a functional perspective, overhanging awnings and awnings contribute to pedestrian comfort by providing shade from sunlight and shelter from precipitation. (Jaskiewicz, 2000, p8)



Image (4) showing the ceiling lines and polygons

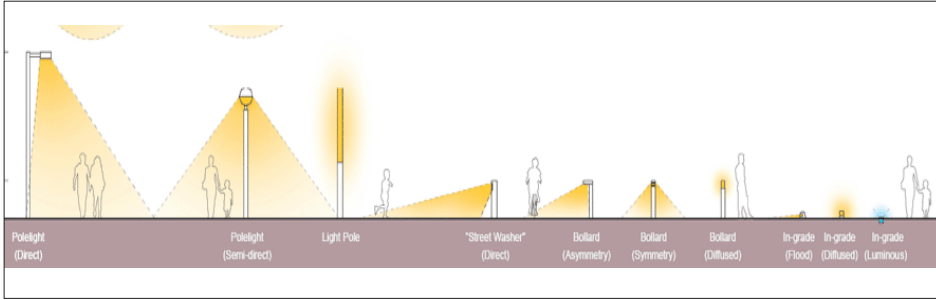
In addition to the arcades that are used in areas crowded with pedestrians in order to provide protection from rain and wind in winter and heat in summer and provide a safe path separated from the movement of cars, and building owners benefit from the exploitation of the roof of the hallway in adding it to the spaces of repeated roles, the arcades give the road a distinctive pattern depending on the shape of the columns, arches and materials used (Al-Nakhili, 2022, p. 104), The property of spaciousness in the public environment can add the pleasure of contrasting between the closed and the exposed through the connection between the internal and external spaces through which the residents feel spacious and spacious, which increases the sense of freedom. (Abdelkader, 2014, p. 5)



Picture (5) showing different types of arcades

Source respectively: (<https://www.geograph.org.uk/photo/948897>),(<https://wallhere.com/en/wallpaper/918850>),(<https://dancingtosculpture.blogspot.com>)

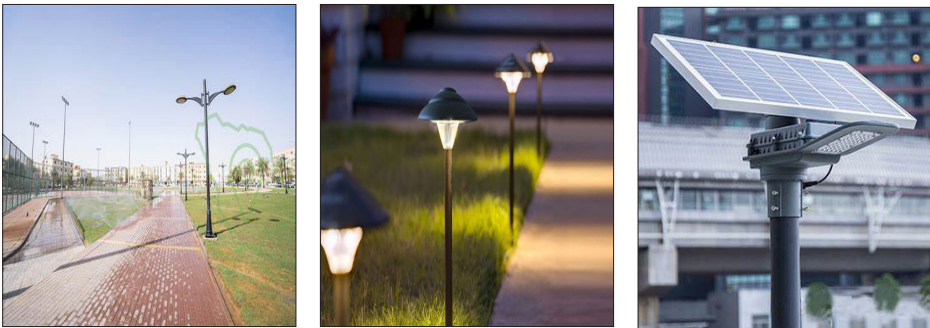
4. Lighting: Lighting is an important element of the design that prolongs the period of practicing activities because it has a direct impact on security and safety and in addition to its basic contribution to increasing visibility, it is given a variety of attention and effects plantings, fountains, sculpture, drawings and buildings, should make enough light at the slopes and the difference in heights such as stairs, as well as taking into account the lighting standards for pedestrians in street lighting such as the height of lighting and the distance of its placement, to illuminate the pedestrian area the light source must be low Relatively on the ground (Awad, 2016, p6)



Picture (6) shows the different forms of lighting elements

Source: (Yassin, 2015, p. 65)

Good lighting has many benefits that can be summarized in (quiet pedestrian relaxation, prevention of various crimes, increased attraction in shops, increased ability to see objects, appearance details and size of components) In places where pedestrian and vehicle systems operate, lighting must be sufficient, although lighting alone is not enough, but it provides a sense of security for people. (Sepideh, 2012, p578)



Picture (7) shows different types of lighting elements

Source respectively: (<https://sa.aqar.fm/blog>),(<https://www.decksdirect.com>),(<https://www.alibaba.com>)

Table (1) shows the aesthetic benefits and their most important indicators

Aesthetic benefits	Elements of pedestrian paths	Interpretation	Indicators for the realization of pedestrian aesthetics
Improve the visual landscape	Awnings / Miscellaneous roof lines	The various canopies and roof lines enhance the pedestrian experience, which contributes to the contrast and aesthetic quality of pedestrian streets, as well as that the arcades give the road a distinctive aesthetic pattern depending on the shape of the columns, arches, and materials used.	The harmony of the shades and roof lines with the overall view of the track
Psychological relaxation	Botanical elements	The presence of trees increases the level of comfort of pedestrians, shade trees are effective in keeping pedestrians cool as well as blocking sunlight from their eyes, as well as shade trees add a nice aesthetic element to the street and tree protectors that add aesthetic dimension and comfort to users	The presence of plant elements sufficient to add comfort to pedestrians

<p>Distinguishing places, identifying identity and historical values</p>	<p>Sculptural elements (symbolic)</p>	<p>It adds the aesthetic dimension of the path and derives from the surrounding environment, which is in line with the area and forms a form that expresses the surrounding environment, whether it is heritage or archaeological, square, religious, and others, as well as the dominant elements that add distinction and the possibility of knowing the place</p>	<p>The control of distinctive elements that add aesthetic dimension and distinction to pedestrian streets</p>
<p>Lighting centers and establishing psychological well-being</p>	<p>Lighting</p>	<p>Good lighting has many benefits that can be summarized as (calm and relaxed pedestrians, prevention of various crimes, increased attraction in shops, as well as it gives attention, and various effects on plantings, fountains, sculptures, drawings, and buildings).</p>	<p>The presence of sufficient lighting along the pedestrian path</p>

Source: Researchers

A questionnaire was prepared for a random pedestrian sample (50 questionnaires), through the questionnaire and analysis of the strength of the correlation between the influential variable (extracted indicators) and the dependent variable (aesthetic benefits) using the statistical analysis program spss to verify that these indicators can achieve the aesthetic elements of pedestrians in different streets. To find out whether these indicators have an actual relationship and the correlation of their relationship with street aesthetics and before multiple linear regression is analyzed, the degree of Conbachs alpha must be known as follows

1. Does the presence and coordination of shades and ceiling lines affect the visual landscape?
Strongly Agree Agree Neutral Disagree Reject Strongly
2. Do plant elements represent an auxiliary element in psychological relaxation on pedestrian streets?
Strongly Agree Agree Neutral Disagree Reject Strongly
3. Does good lighting add aesthetic character to the streets and add psychological well-being?
Strongly Agree Agree Neutral Disagree Reject Strongly
4. Do the dominant elements (symbols and sculptural elements) add distinction and help define the identity of the city?
Strongly Agree Agree Neutral Disagree Reject Strongly
5. Do beauty elements increase your desire to walk on pedestrian streets?
Strongly Agree Agree Neutral Disagree Reject Strongly

Sample test using multiple linear regression:

Based on the main hypothesis of the statistical study and based on the following decision-making rule

$$H_0 = M = 0$$

There is no effect of the dimensions of the independent variables (transit areas, corridors, lighting, floors, and recovering, common paths)

On the dependent variable (feeling safe)

$$H_1 = M \neq 0$$

There is an effect of the dimensions of independent variables on the dependent variable

Error level (0.05) and confidence (0.95) using multiple linear regression model as in the equation

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5$$

Whereas,

a = constant value

b₁ = coefficient of the first independent variable

b₂ = coefficient of the second independent variable

b₃ = coefficient of the third independent variable

b₄ = coefficient of the fourth independent variable

b_5 = coefficient of the fifth independent variable

The stability of the indicators and the internal consistency between the questions (each other all questions in general) can be measured through the analysis of Krombach alpha through the statistical analysis program ((SPSS v.29) its value is between (0-1) and shows the ability of the tool used in the research to measure what is meant by it, that is, the re-application of the questionnaire in similar circumstances, we get the same results were the ratio as in Figure (1) (86.4%), which is a very acceptable ratio for the case under study.

Table (2) shows the analysis of Alpha Kornbach
Case Processing Summary

		N	%
Cases	Valid	50	84.7
	Excludeda	9	15.3
	Total	59	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.864	5

Source: Researchers based on the statistical analysis program SPSS. V25

Table (3) Correlation coefficient and coefficient of determination

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.898a	.807	.785	.432

Source: Researchers based on the statistical analysis program SPSS. V25

a. Predictors: (Constant), Do the dominant elements (symbols and sculptural elements) add distinction and help define the identity of the city, do plant elements represent an auxiliary element in psychological relaxation in pedestrian streets, does the beauty of the streets increase walkability, does good lighting add an aesthetic character to the streets and add psychological well-being, does the presence and coordination of shades and ceiling lines affect the visual scene

Table (4) Analysis of variance to show the impact of indicators on achieving safety

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7708.101	5	1541.620	25.082	.000b
	Residual	2704.399	44	61.464		
	Total	10412.500	49			

Source: Researchers based on the statistical analysis program SPSS. V25

a. Dependent Variable: Does the beauty of the streets increase

walkability?

b. Predictors: (Constant), Do beauty elements increase your desire to walk on pedestrian streets? Do good lighting add aesthetic character to the streets and add psychological well-being, Do the dominant elements (symbols and sculptural elements) add distinction and help define the identity of the city, Do plant elements represent an auxiliary element in psychological relaxation in pedestrian streets, Does the presence and coordination of shades and ceilinglines affect the visual landscape?

Table (5) shows multiple linear regression coefficients

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	10.701	3.224		3.319	.002
	Does the presence and coordination of shades and ceiling lines affect the visual landscape?	16.118	1.826	1.123	8.827	.000
	Do plant elements represent an auxiliary element in psychological relaxation on pedestrian streets?	-.370	1.796	-.025	-.206	.838

1	Does good lighting add an aesthetic quality to the streets and add psychological well-being?	1.831	1.519	.121	1.206	.234
	Do the dominant elements (symbols and sculptural elements) add distinction and help define the identity of the city?	-12.655	2.114	-.749	-5.987	.000
	Do beauty elements increase your desire to walk on pedestrian streets?	2.555	2.326	.171	1.098	.278

Source: Researchers based on the statistical analysis program SPSS. V25

a. Dependent Variable: Does the beauty of the streets increase walkability?

Statistical analysis of the analysis of independent variables in multiple linear regression

1. Note the value of the coefficient of determination (0.807), meaning that the extracted elements were able to interpret by (80.7%) of the possibility of achieving the possibility of walking, meaning that achieving the presence of the mentioned elements provides the beauty of the environment by 807%, while the remaining percentage is explained by other elements and indicators that were not included in this study.
2. The response of the elements to the impact on the level of beauty

of the environment can be confirmed can be seen at the value of 3.319 $t =$ which is greater than the tabular value of 2.000 in statistical significance 0.002 which is less than 0.05

3. Statistical analysis can be conducted in order to test the validity of the hypotheses resulted in a correlation coefficient with a value of (89.8%), which is an acceptable and good value, as it represents the relationship with a positive direct correlation between the indicators of achieving walkability for pedestrian roads and a sense of comfort for the beauty of the environment by users.
4. The positive signal in the analysis of multiple linear regression indicates that there is a direct relationship between each (polygons and ceiling lines, native, lighting, symbols, and sculptural elements) and walkability, meaning that an increase in each variable (element) by one unit leads to an increase in walkability.

Thus, we conclude from this questionnaire that the previous elements as indicators to achieve the possibility of walking higher with a positive impact and direct correlation force in achieving the environment sentences for pedestrians on the roads, especially in the study area, by addressing the indicators to measure the level of beauty and work to propose the provision of all elements to reach the desired goal of the research

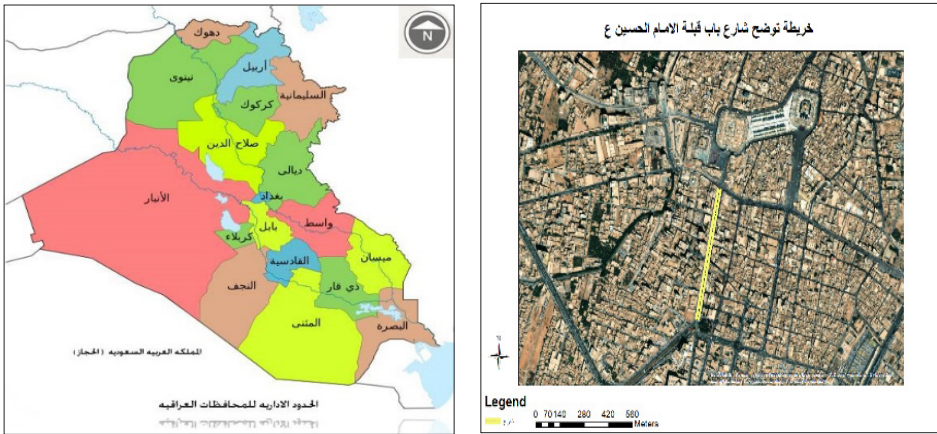
Therefore, we reject the null hypothesis (H_0), which means that there is no effect of the independent variable (polygons and ceiling lines, natives, lighting, symbols and sculptural elements) on the dependent variable (beauty of the environment and walkability).

We accept the alternative hypothesis (H_1) which means that there

is an effect of the independent variable (polygons and ceiling lines, natives, lighting, symbols and sculptural elements) on the dependent variable (beauty of the environment and walkability).

Practical application (study of the central library street of the center of Karbala)

The study area is located in Iraq, the center of the city of Karbala, and the street is one of the important axes leading to the center of the old city (religious center), as the street extends from the intersection of Bab Qibla Imam Hussein to the Central Library with a length of 550 meters



Map (2) showing the location of the Central Library Street in the city of Karbala

Source: GIS researchers

For a street with a width of (40 meters) consisting of sidewalks on both sides, one side with a width of (2 meters), the opposite side (7 meters) and the street basin by (31 meters)

Cars are going on the street in one direction (exit from the old city center) traffic in general is common between pedestrians and cars, sidewalks on both sides occupied by street vendors, shops and hotels (pedestrians cannot walk in them), and the crawl from the sidewalks to the first lanes of the street exceeds as vendors exceed more than (5 meters) from each side of the street, i.e. the net common path for the use of vehicles and pedestrians is up to 20 meters.

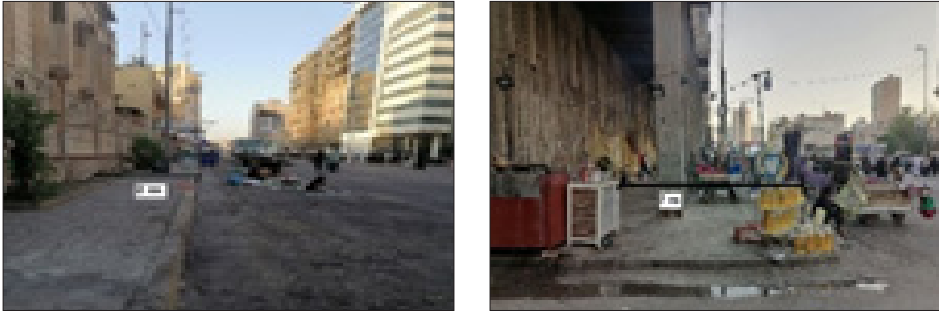


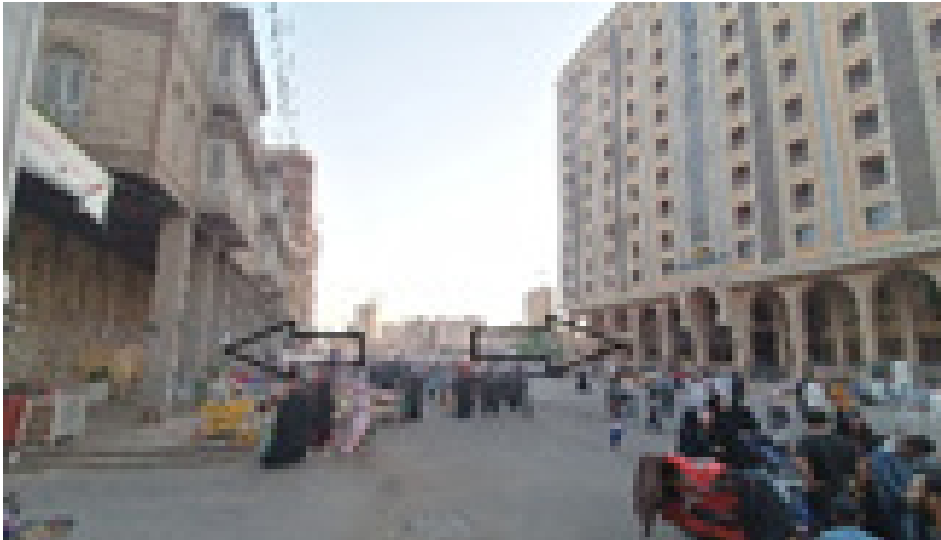
Image (9) showing the width of the sidewalks

source: Field Study



Picture (10) shows the sidewalks in the Central Library Street

Source: Field Study



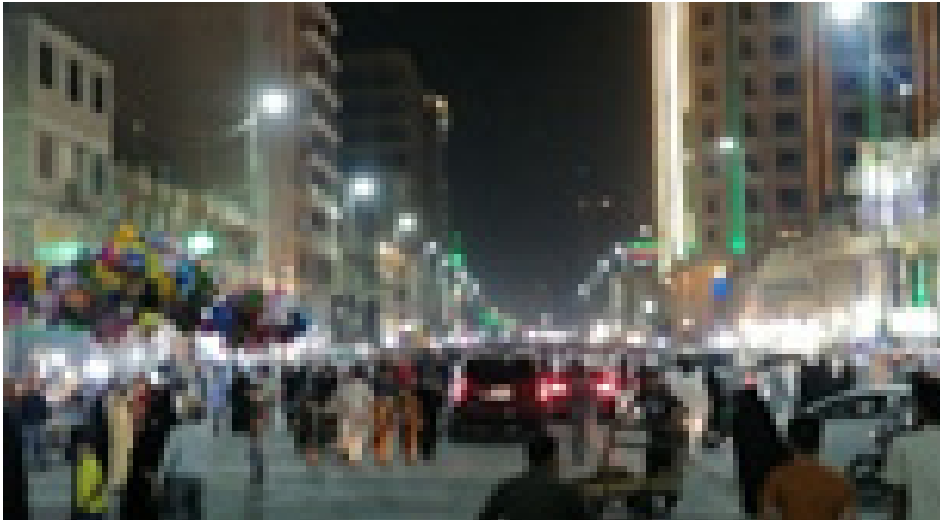
Picture (11) showing the arcades and shades

Source: Field Study



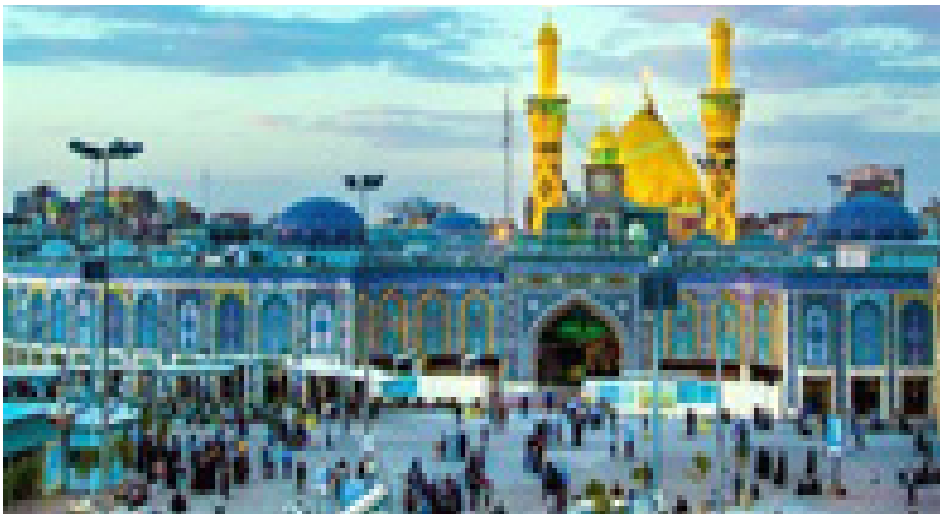
Picture (12) shows that the street is free of afforestation

Source: Field Study



Picture (13) shows the lighting

Source: Field Study



Picture (14) showing the shrine of Imam Hussein, peace be upon him

Source : <https://wattanna.net>

t	Indicators	Fact
1	The harmony of the shades and roof lines with the overall view of the track	There are no roofing lines or shaded to protect pedestrians from weather conditions despite the harsh weather in the area, there are arcades in some areas of the street that differ from each other and are inconsistent, as well as they cannot be used by pedestrians because they are used by shop owners and hotels
2	The presence of plant elements sufficient to add comfort to pedestrians	There is no type of plant elements and the street is free of afforestation and there are no areas designated for afforestation
3	The presence of sufficient lighting along the pedestrian path	In general, there are good lighting units such as lighting poles for every 50 meters, in addition to lighting that shops and hotels use lighting in different forms, which performs the purpose of having lighting and adds a sense of comfort to pedestrians to clarify the details of the street

4	The control of distinctive elements that add aesthetic dimension and distinction to pedestrian streets	In general, the most prominent element in the city of Karbala is the presence of the shrine of Imam Hussein, peace be upon him, which is the center of attraction in the city, as well as the presence of a large banner that distinguishes the end of the street, adding something of privacy and distinction to the street
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Conclusions

1. The positive indication in the analysis of multiple linear regression indicates that there is a direct relationship between each of (polygons and ceiling lines, natives, lighting, symbols and sculptural elements) and walkability, meaning that an increase in each variable (element) by one unit leads to an increase in walkability.
2. The study area (Central Library Street in the center of Karbala city) suffers from poor planning in general and attention to the planning of pedestrian streets in particular, so many problems appear clearly .
3. The lack of misleading to protect pedestrians and roof lines to protect pedestrians from different weather conditions and their role in adding the aesthetic character of the street turns into discouragement to rely on walking and reduce the walkability index, as well as neglect of arcades and their incorrect use by

- street vendors and shop owners.
4. The plant element plays an important role in the planning of pedestrian streets, so one of the great weaknesses in the focus of the study is the lack of afforestation that works to soften the atmosphere and add an aesthetic character with a great psychological dimension, which is reflected in the ability to walk
 5. Lighting has great privacy in all roads, but in the pedestrian axis it needs special care and finding special standards In the focus of the study, there are lighting elements that perform their functional role in street lighting, but the importance of the lighting element is not focused on adding the beauty dimension and the psychological role on pedestrians, especially in the Central Library Street, as it is random and acted by the shops without any standards or laws .
 6. The city of Karbala is characterized by the religious character of the center of attraction for visitors from inside outside the city (holy shrines), but it has an important historical aspect that extends to previous eras that transmit important large cultures in the same recipients and there are no symbols or elements in the axis of the study to refer to the historical dimension .
 7. The phenomenon of irregular street vendors is a phenomenon that causes chaos and irregularity in pedestrian streets and has a negative impact on the scene of Basra and the comfort of pedestrians in the streets, especially the Central Library Street in the center of Karbala city

Recommendations

1. Focusing on planning in general and planning pedestrian streets in particular, so walking is the main means of transportation on which the old city centers were established, especially in the city of Karbala, which is characterized by narrow roads and alleys that are suitable for pedestrian use only
2. Focusing on finding elements that add the beauty of the pedestrian environment to increase walkability in areas where walking is the most important means of transportation within the city center, especially in cities that witness a continuous high turnout such as the city of Karbala
3. Paying attention to the shade, roof lines and corridors of the Central Library Street to protect pedestrians from climatic conditions and focus on the aesthetic character of the street due to the importance of the religious center of Karbala city and the importance of encouraging walking as a sustainable means of transportation
4. Adding the plant element and using modern means of watering and protecting it and focusing on coordinating it with the general character of the street and adding the beautiful dimension of afforestation and gaining the positive psychological impact of pedestrians and raising the index of walkability.
5. The street is characterized by straightness, as the landmark of the shrine of Imam Hussein, peace be upon him, can be seen from

the end of the street, and this adds a distinctive feature to the street, despite the lack of consistency in the buildings in the path and the absence of afforestation, which makes the visual scene a painting with a great positive impact on the hearts of pedestrians.

6. Finding public transportation with specific paths within the street that facilitate the process of visitors to reach all areas of Karbala city center.
7. Adding bicycle paths as they are within the means of sustainable transportation, which adds an aesthetic character to street planning.

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