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# The Role of Road Elements in Providing a Safe Environment for Pedestrians

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**Abstract.** In the years recently city planning projects have been confirmed sustainable high concentration on planning streets and pedestrian paths being the most prominent component of the urban structure in the city and these me and diverse departments link the city's sectors and serve as a space for economic, service, and social activities. On the other hand, pedestrian traffic is an essential component of the various means of transportation within the city. Suffer cities in the Middle East and Arab cities in particular are neglecting pedestrian paths in the vital urban environment. Vehicle control mechanisms on roads, and changing the uses of pedestrian paths as result of encroaching on the sidewalks designated for pedestrians. Which leads to a weak level of safety and a lack of pedestrian protection, so it is assumed that there is a possibility to know the impact of the urban elements of pedestrian paths that provide protection

And a sense of safety for pedestrians through advanced simulation programs (Any Logic 8.8.0 university researcher 2022, GIS 10.4) and the possibility of achieving safe. And comfortable paths for pedestrians by providing the elements affecting the provision of a safe environment. And the protection of pedestrians, we aim through sustainable planning to enhance the role of pedestrian paths, the separation between automatic mobility paths, And pedestrian paths, knowing the extent of the impact of the elements of pedestrian paths in achieving safety and protection for users (it must be noted that the feeling of safety is not limited to traffic accidents only, but also protection from weather conditions and its effects). As the descriptive analytical approach is adopted. In the research to identify the road elements in providing a safe environment for pedestrians and then study the relationship between those elements by analyzing the multiple regression of the parameter variables and their relationship to the independent variable (feeling of safety) for a sample questionnaire

**Keywords:** pedestrian environment, road elements, multiple regression, Karbala

## INTRODUCTION

Pedestrian paths it is a type of road designated for pedestrians only, and other types of movement are not allowed to pass through, as its main function is to provide the ability to move from one place to another in an easy, safe, and fast manner. Public transport users followed by bicycle users and the end of the pyramid-motorized vehicles. Encouraging pedestrian movement is based on the degree of preparation of the designated paths for them, as the design of the paths determines the choice of individuals for the means of transportation (Ismail, 2022, p124)

### Pathways Must Be Employed to Achieve

*Protecting Pedestrians from the Danger of Traffic and Accidents*

The character of the pedestrian and its components have a direct impact on the safety of the path the environment of the track determines the behavior of drivers, so speed increases in open lines of sight and rivers on broad roads and exceeds the specified speeds. (Friday, 2017, p3)

Prepare reduction speed automatic transmission and its application for the number from standards such as:

Width, type, and location of the route are essential elements in maintaining the safety of pedestrians in addition, the failure to separate the paths designated for pedestrians and the infrastructure for pedestrians from the means of automatic transportation leads to the failure to provide an environment that achieves safety and

encourages walking. Moreover, the crossings need to be designed with high precision to achieve the safety of pedestrians. (Ismail, 2022, p124)

Tracks Safe: Interactions less with vehicles (parked or moving). (Tilly, 2021, p2)

Ease of Access: Ease of moving from the starting point to the target point by navigating within the pedestrian paths. Continuity of the path for pedestrians to walk without obstacles that impede its continuity and his design in the form of provides a gradual transition from sidewalks roads Main and middle Ways City to me sidewalks Biology Residential and private lanes (Ismail, 2022, p. 124)

protection pedestrians from factors weather bad Providing pedestrians with protection from climatic factors helps encourage walking and their ability to be in the environment of the track at all times of the day,

Whether in hot or cold weather, in the prevailing conditions in the study, the area must take into account the weather conditions that are characterized by extreme heat in summer and harsh cold in winter. (Friday, 2017, p7)

## **The Components of the Pedestrian Path That Have a Direct Impact on Achieving Protection and Safety for Pedestrian Movement**

### *Components of the Pedestrian Path*

The pedestrian path consists of (floors, walls, ceilings, and complementary elements), which play an important role in determining the shape of the road, the level of services in the path, and the extent to which users' needs are met.

Flooring:

It is represented in solid material, natural or industrial, and used as a surface layer on the floor of the site, The floor plays an important role in determining the path, and direction of movement and determining the uses and activities through a change in the color, type, and texture of the floor and the connection between the elements of the tracks, The colors and type of materials used affect the extent of heat absorption and reflection and atmospheric effects

The walking area is the main area in the path and is designated for pedestrians to walk without obstacles inside the sidewalk (the horizontal axis). (Al-Nakhili, 2022, p105)

a path pedestrians: he is a path It is intended for pedestrian traffic part From parts The Road Jovi region independent and customized to walk pedestrians without motorized transport and passes From through it pedestrians Methods are used control Traffic different to regulate pedestrian movement.(Qader, 2017, pg. 32)

crossing pedestrians: Known that Point Wasl between tracks pedestrians From sidewalks and walkways Which considered a System integrated From tracks pedestrians located at intersections and in the middle of The Road and her several Species: superficial, under, and upper(Hagiwara, 2013, p106)

Crossings pedestrian indicates to me the place Better to cross-pedestrians to be in it, priority pedestrian. Preferably Placing crossing areas at intersections, places where pedestrian densities are high, and traffic lights are usually added working to guide pedestrians on me a path Preferred walking In other areas, crossings provide warning signs to alert drivers Because of the crossings, that must be crossings comfortable and safe and clear.(Al-Muftah, 2017, p73)

Hurdles and obstacles:

They are the barrier or separating elements, as they are located next to the lanes of cars or parking places,

This area ends with different barriers such as pillars or ends of a turn or ramp for people with special needs, as well as signs and traffic lights and providing them with bicycle paths before the paths of cars there are a variety of types depending on the use. (Al-Nakhili, 2022, p105)

Hurdles designated for pedestrians:

Baffles fulfilled connect pedestrian traffic to automatic traffic, however,

It has set several criteria and conditions, the most important of which is that the width of the sidewalk is sufficient for pedestrians to walk so that pedestrians do not have to penetrate the barriers, so it becomes useless to put them into consideration and take into account the psychological aspect of their situation for drivers and pedestrians alike.

Fence protector to pedestrian toy The Pavement: Its placement is obligatory when pedestrian traffic is at high densities and high-density traffic at high speeds. It is placed on both sides of the road to provide safe pedestrian movement. It is usually placed at a height of 1 meter at the minimum acceptable width of the sidewalk. (Guide, 2021, p. 66)

Galleries: They are the roofs of the buildings surrounding the pedestrian path, especially in crowded areas to protect from climatic conditions such as sunshine, wind, rain, etc. There is another economic and aesthetic feasibility from it represented in exploiting the space on the higher floors and adding a distinctive pattern specific to the area based on the form of columns, arches, and decorations used. (Guide, 2021, p79)

Bishop Sometimes the path space is defined by a ceiling to give it a different character, as it may be a ceiling made of heavy materials such as concrete or light materials. Such as parachutes and wooden ceilings, or it can be plant elements such as trees and the ceiling of pedestrian paths is often the sky.

umbrellas: Element of the road used to Protection of pedestrians, occupants, and users of waiting stations from the sunshine And Other weather factors It can be either wooden, metal, or concrete Any made of materials for different weather conditions. (Dwaikat, 2009, p128)

Lighting units lighting has a functional role and another Plastic in pedestrian spaces, It is represented in adding a sense of security while wandering at night and adding an aesthetic complementary character to pedestrian paths, especially in transit areas, to raise the driver’s ability to see pedestrians. (Nakhili, 2022, p105)

**TABLE 1.** shows the elements of pedestrian paths that meet the necessary needs to provide protection and safety for pedestrians

Needs	Pedestrian path elements	Interpretation	Pedestrian safety indicators
1. saving protection against the movement of Traffic and accidents	<ul style="list-style-type: none"> <li>flooring</li> <li>Walking area and barriers and obstacles</li> <li>lighting units</li> </ul>	<ul style="list-style-type: none"> <li>The type, shape, and design of the floors play an important role in guiding pedestrians, especially those with special needs, and reducing their exposure to danger</li> <li>Allocating a lane for traffic in itself is important to separate vehicles and pedestrians and isolate pedestrian paths from the vehicular path by placing barriers along the path and defining crossing areas only</li> <li>Lighting adds a sense of safety inside pedestrian paths and reduces the possibility of crimes, thefts, and others</li> </ul>	<ol style="list-style-type: none"> <li>Quality of finishing materials and floor planning</li> <li>Allocating a particular area for pedestrian traffic by separating the vehicular paths and the pedestrian path</li> <li>Adequate lighting units for pedestrian paths</li> </ol>
2. ease Access	pedestrian crossings	<ul style="list-style-type: none"> <li>Allocating well-thought-out and safe pedestrian crossings that help smooth traffic and add a sense of safety for pedestrians</li> </ul>	<ol style="list-style-type: none"> <li>Planned and safe transit areas</li> </ol>
3. protection From factors weather bad	<ul style="list-style-type: none"> <li>Ceilings, corridors, awnings</li> <li>green elements and afforestation</li> </ul>	<ul style="list-style-type: none"> <li>Contribute to protecting pedestrians in different climatic conditions such as rain, heat, and cold, adding the possibility of pedestrians being present at all times of the day inside the path and encouraging safe walking</li> <li>In addition to its role in separating pedestrian walking areas from vehicle paths, it adds a sense of comfort, safety, and air purification along the path</li> </ul>	<ol style="list-style-type: none"> <li>Roofs, awnings, and active arcades to protect pedestrians</li> <li>Afforestation as an isolation area, adding a sense of safety and softening the environment</li> </ol>

Source: researcher

A random sample of (40) questionnaires was conducted through the questionnaire and analysis of the strength of the correlation between the influencing variable (the extracted indicators) and the dependent variable (protection

and safety) using the program SPSS statistical analysis to verify that these indicators can achieve protection and a safe environment for pedestrians in different streets. To find out whether these indicators have an actual relationship and its relationship with safety, and before the analysis of multiple linear regression, it is necessary to know the degree of CVONBACHS ALPHA

1. Is the poor quality of the materials feel safe?  
Strongly Agree      Agree      Neutral      Disagree      Reject Strongly
2. Is your presence with cars on a common path dangerous?  
Strongly Agree      Agree      Neutral      Disagree      Reject Strongly
3. Do lighting on the roads add a sense of safety?  
Strongly Agree      Agree      Neutral      Disagree      Reject Strongly
4. Do random crossings pose a danger when you cross the road?  
Strongly Agree      Agree      Neutral      Disagree      Reject Strongly
5. Do you consider that the roofs, corridors, and canopies are necessary to protect against the effects of the climate?  
Strongly Agree      Agree      Neutral      Disagree      Reject Strongly
6. Do you think that afforestation contributes to protecting from traffic accidents and the effects of climate?  
Strongly Agree      Agree      Neutral      Disagree      Reject Strongly

Sample testing using multiple linear regression:

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

$$H_0 = M = 0 \tag{1}$$

There is no effect on the dimensions of the independent variables (transit areas, galleries, lighting, floors, logging, and shared paths)

On the dependent variable (feeling safe)

$$H_1 = M \neq 0 \tag{2}$$

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

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

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6$$

Because

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

b5 = coefficient of the fifth independent variable

b6 = coefficient of the sixth independent variable

To measure the stability of the indicators and the internal consistency between the questions to each other,

All the questions in general will be addressed to any Krum Bach Alpha analysis through the statistical analysis program ((SPSS v.29 Its value is between (0-1) and it shows the ability of the tool used in the research to measure its intended purpose, that is to re-apply the resolution in similar circumstances, we get the same results. The percentage was (86%), which is a percentage of Very acceptable for the case under study.

**TABLE 2.** Shows the Alpha Cronbach analysis

<b>Case Processing Summary</b>		
N%		
Valid	40	100.0
Excluded	0	.0
Total	40	100.0

**TABLE 3.** a. Listwise deletion based on all variables in the procedure.

<b>Reliability Statistics</b>				
	Cronbach's Alpha	N of Items		
	.859	6		
<b>Item-Total Statistics</b>				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
areas Transit	9.55	9.844	.600	.845
afforestation galleries	9.18	12.097	.147	.924
And the parachutes	9.03	9.769	.759	.819
Lighting	9.60	9.118	.844	.800
Floors	8.80	8,831	.847	.797
Involved Tracks	9.60	9.118	.844	.800

Source: the researcher, based on the statistical analysis program SPSS .V29

Multiple linear regression is another analysis to determine the extent, to which the extracted indicators are related to the index of the feeling of safety and protection, The analysis will be done through correlation coefficients, coefficient of determination, and the possibility of influence using the statistical analysis program (SPSS v.29)

**TABLE 4.** Correlation coefficient and coefficient of determination

<b>Model Summary</b>				
Model	R	R Square	Adjusted R Square	std. The error in the Estimate
1	.971a	.943	.933	3.030

a. Predictors: (Constant), Floors, Trees, Crossing Areas, Corridors and Peripherals, Sharing Paths, Lighting

b. Dependent Variable: Feeling safe

Source: the researcher, based on the statistical analysis program SPSS .V29

**TABLE 5.** Analysis of variance to show the effect of indicators on achieving safety

ANOVAa						
Model	Sum of Squares	DF	Mean Square	F	Sig.	
1	Regression	5027.000	6	837,833	91.249	<.001b
	Residual	303,000	33	9.182		
	Total	5,330,000	39			

a. Dependent Variable: Feeling safe

b. Predictors: (Constant), Floors, Trees, Crossing Areas, Corridors and Peripherals, Sharing Paths, Lighting

Source: the researcher, based on the statistical analysis program SPSS .V29

**TABLE 6.** Shows the coefficients for multiple linear regression

Coefficients						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	std. Error	Beta			
1	(Constant)	15,507	6.580		2.357	.025
	afforestation	1.256	.870	.093	1.443	.158
	Galleries And the parachutes	1.847	1.387	.114	1.331	.192
	transit areas	.815	.747	.059	1.091	.283
	Lighting	3.889	1.912	.260	2.034	.050
	Sharing tracks	-6.201	1.420	-.516	-4.366	<.001
	Floors	1.491	1.823	.106	.818	.419

a. Dependent Variable: Feeling safe

Source: the researcher, based on the statistical analysis program SPSS .V29

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

1. Note the value of the coefficient of determination (0.943) I Thee laments extracted managed to the breathy RBR ate (94.3%) From The possibility of achieving protection and safety for pedestrians, meaning that achieving the presence of the mentioned elements protects by 94.3%, while the remaining percentage is explained by other elements and indicators that were not included in the study
2. To confirm the response of the elements to the effect on the level of protection value can be sent =2.357It is greater than the tabular value of 2.000 with a statistical significance of 0.001 which is less than 0.05
3. Perform statistical analysis to Hypothesis the test result of the correlation coefficient and a value (97.1%) It is a good value because represents The Relationship direct correlation positive between Indicators of achieving protection and safety for pedestrians and a sense of safety by users

We conclude from this process that the elements extracted as indicators to achieve protection,

Safety has an impact and a positive direct correlation in achieving a sense of safety and protection for pedestrians on the roads, especially in the study area, which will be addressed to the indicators to measure the level of safety and work on a proposal to provide for all elements to reach the desired goal of the research.

Therefore, we reject the null hypothesis (H0) because it does not affect the independent variable (Transit areas, galleries, lighting, floors, logging, Shared paths) on the dependent variable (feeling of safety)

We accept the alternative hypothesis (H1) which is the presence of the effect of the independent variable (crossing areas, hallways, lighting, floors, loggias, common paths) on the dependent variable (feeling of safety).

## Practical application (a Case Study of the Qibla Street of Imam Hussein, Peace be Upon Him in the City of Karbala)

The study area is located in Iraq in the center of the city of Karbala, and it is considered one of the important axes leading to the city's religious center, as the street extends from the intersection of the Qibla Gate of Imam Hussein, peace be upon him, to the banner yard (the central library yard) with a length of 550 meters.



Administrative boundaries of Iraqi provinces

A



Map of Gate Dome Imam Hussein A.S. Street

B

**FIGURE 1.** a and b showing the location of the city

Source: The researcher based on the GIS program GIS 10.4

The width of the street is 40 meters, divided into sidewalks on both sides, with a width of 2 meters, the opposite side is 7 meters, and the street basin is 31 meters



A



B

**FIGURE 2.** a and b shows the width of the sidewalks  
Source: researcher



Traffic on the street in one direction, which is the exit from the old city center. Traffic is generally shared between pedestrians, bicycles, and automatic vehicles (cars, wheeled transport, tuk-tuk, motorcycles)

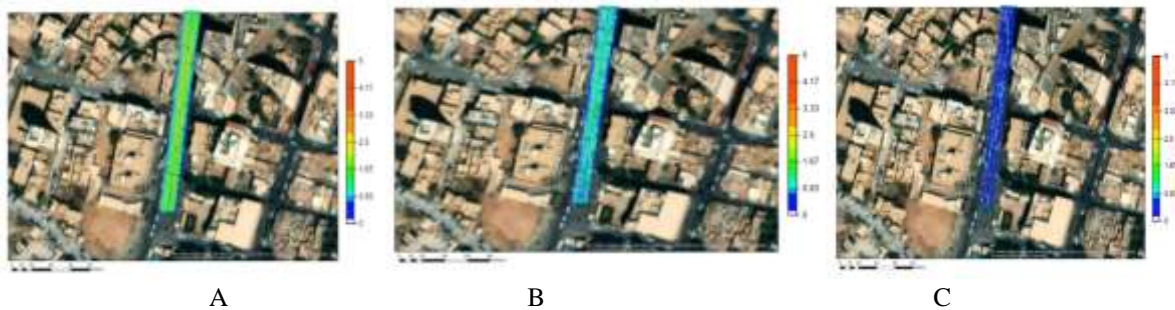
Street vendors use the sidewalks on both sides, shop owners, and hotels (It cannot be walked on by pedestrians), and even crawls from the sidewalks to the first lanes of the street exceeding 5 meters from each side of the street, meaning that the net common area for the use of vehicles and Pedestrians are within the limits of 20 meters only



**FIGURE 3.** shows overtaking on pedestrian paths  
Source: researcher

The reality of the situation can be analyzed according to the field survey of pedestrian and car traffic and copied into

Virtual reality in the simulation program (ANYLOGIC 8.8.00 PRO) and to identify realistic and simulated problems of the studied axis at different times as follows.



**FIGURE 4.** A- shows the minimum time for pedestrians at 6 am . B- shows the average peak for pedestrians at 5 pm. C- shows the highest peak for pedestrians Thursday  
Source: researcher based on software (Any logic 8.8.0 University Researcher 2022)



**TABLE 7.** shows the passage of pedestrians and cars at different times of the week, except the times of millions of visits to the axis of Bab Qibla of Imam Hussein, peace be upon him

Vehicle movement speed (km/h)	Auto (vehicles/min)	Pedestrian space per person (person / square meter)	pedestrian (person/minute )	the time	T
40-60	5-8	1p-2m	10_15	Low peak (morning time from 6-7 am)	1
20-40	10-15	2p-1m	40-45	Average Peak (time 5-6 pm Monday)	2
>20	5-10	3p-1m	100-150	Highest peak time (5-6 pm on Thursday)	3

Source: the researcher, a field study and simulation program (Any logic 8.8.0 University Researcher 2022)





We conclude from the simulation analysis of the reality of the situation that the movement of cars at the times of the least peak is an acceptable speed, but the speed of cars at peak times is less by  $\approx 30\%$ , so it is low, and this causes a problem for the movement of ambulances and emergency vehicles, and the area allocated for pedestrians reaches less than 0.35 square meters for each person, so it becomes crowded and in direct contact with the movement of cars, which adds a feeling of insecurity, and protection for pedestrians and the difficulty of walking for vehicles. In the following, indicators of achieving protection and safety in pedestrian paths for users will be addressed to the reality of the situation according to a field study of the study's axis

**TABLE 8.** Shows the interview of the reality of the situation with the indicators of the theoretical chapter of the research to know the extent of protection and safety in the reality of the situation and the quality of urban and planning indicators in the city for planning pedestrian paths and sustainable transport routes, especially in the city center of Karbala.

Indications	The reality of the situation	picture
Quality of finishing materials and floor planning	There is no kind of attention to floor planning and a lack of maintenance of the pedestrian area	
Allocating a particular area for pedestrian traffic by separating the vehicular paths and the pedestrian path	As an urban structure, there are sidewalks designated for pedestrians that cannot be used by pedestrians because they are used by street vendors, shop owners, and hotels, so pedestrians resort to sharing vehicles in the traffic paths, which exposes them to the risk of traffic accidents, as there is no procedure to separate pedestrians from vehicles	

**FIGURE 5.** shows the floors  
Source: researcher

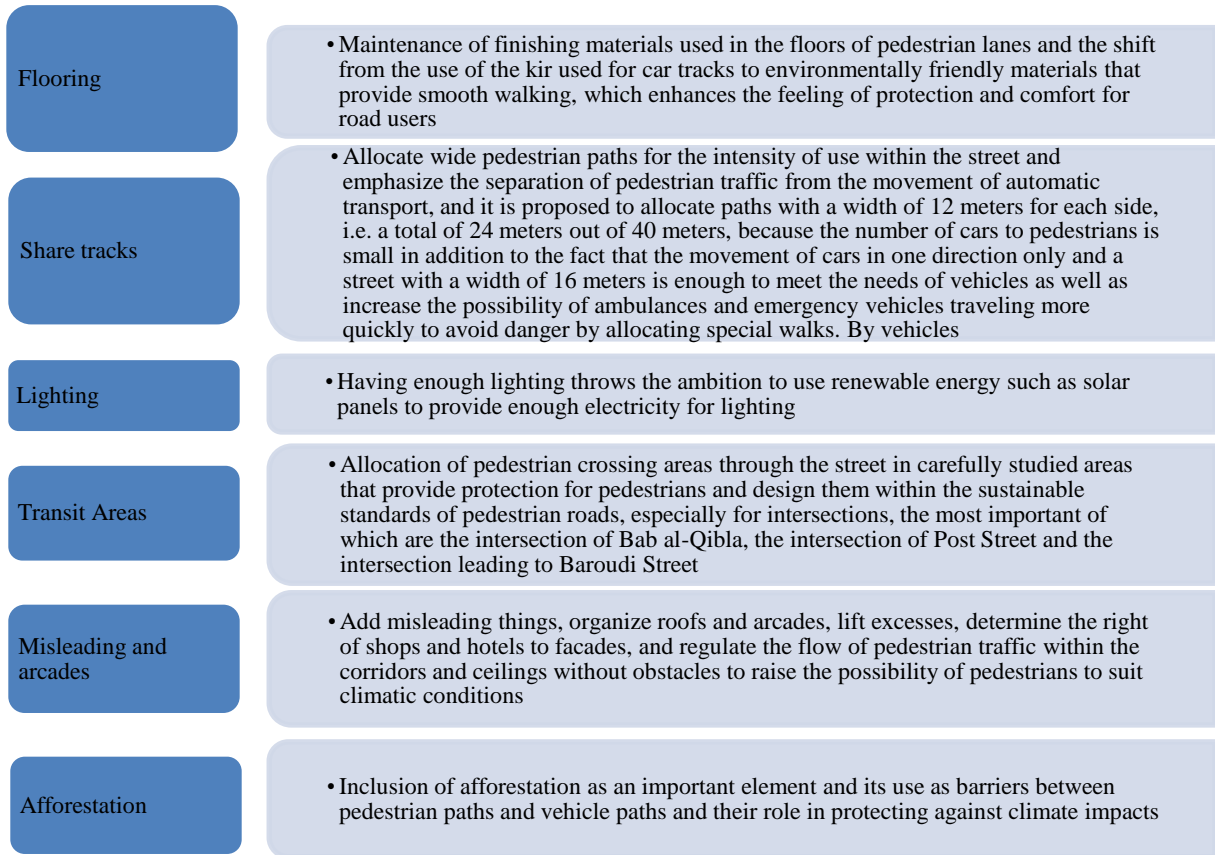
**FIGURE 6.** shows overtaking on pedestrian paths  
Source: researcher

Indications	The reality of the situation	picture
Adequate lighting units for pedestrian paths	There are generally good lighting units, such as lighting poles for every 50 meters, in addition to lighting shops and hotels	
Planned and safe transit areas	There are no planned or designated crossing areas for pedestrians. Rather, the movement is random and irregular in crossing car lanes or at intersections with secondary roads and may cause some congestion and social problems due to a lack of organization	
Roofs, awnings, and active arcades to protect pedestrians	<p>There are corridors in some areas of the street, but pedestrians cannot use them because they are subject to the use of shop owners and hotels.</p> <p>There are no roofs or parachutes designated to protect pedestrians from weather conditions despite the harsh climatic conditions in the area</p>	
Afforestation as an isolation area, adding a sense of safety and softening the environment	There is no type of afforestation along the path	

Source: researcher

### Suggestions to Provide Protection and a Sense of Safety in the Focus of the Study for Pedestrians and on the Axes Learned

A safe environment for pedestrians can be enhanced through Bab Al-Imam Al-Hussein's Qibla Street in the center of Karbala city by adding the elements of basic pedestrian paths that promote a safe environment, protect pedestrians and encourage walking, as follows.



**FIGURE 11.** the elements of basic pedestrian paths that promote a safe environment, protect pedestrians and encourage walking

Simulation programs can be used to find out the extent to which it is possible to apply the regulation of pedestrian movement within paths designated for pedestrians to understand the movement of cars and the extent of the success of the proposals, and analyze the results resulting from the simulation for a virtual reality similar to the study area (using a program (any logic 8.8.02 simulation pedestrian) in pedestrian simulation and GIS software (GIS 10.4).



**FIGURE 12.** shows the simulation of pedestrians with the lowest peak  
 Source: the researcher based on simulation software  
 (Any logic 8.8.0 University Researcher 2022)

Figure (12) shows a pedestrian simulation using Any logic 8.8.02 simulation pedestrian and GIS software (GIS 10.4) On both sides of the vehicular road, using barriers that separate the movement in a time with a minimum number of pedestrians from 6-7 am at the entrance to the street, as it shows a high flow of vehicles and pedestrians and achieves a high degree of safety for pedestrians.



**FIGURE 13.** shows a pedestrian simulation an average peak  
 Source: the researcher based on simulation software  
 (Any logic 8.8.0 University Researcher 2022)

Figure (13) shows the flow of pedestrians and cars using simulation software **Any logic 8.8.02 simulation pedestrian and GIS software (GIS 10.4)** During the normal times of weekdays (the survey was conducted on Monday at 5-6 pm, as it represents the highest peak in the usual days), the simulation results show a high flow of pedestrians and cars, especially allowing ambulances to move at high speeds compared to the current situation and with a very high degree of safety and protection.



**FIGURE 14.** shows pedestrian simulation the most expensive peak (on Thursday)  
 Source: the researcher based on simulation software  
 (Any logic 8.8.0 University Researcher 2022)

Figure (14) shows the flow of pedestrians and vehicles using simulation software Any logic 8.8.02 simulation pedestrian and GIS software (GIS 10.4) Peak time (except for major occasions) on Thursdays at 6-7 pm and is considered the highest peak as it is a major hub for visitors to enter the city's religious center

**TABLE 10.** shows the results of testing solutions using simulation

Vehicle movement speed (km/h)	Auto (vehicles/min)	Pedestrian space per person (person / square meter)	pedestrian (person/minute )	the time	T
40-60	5-8	1p-2m	10_15	Low peak (morning time from 6-7 am)	1
40-60	10-15	1p-1m	40-45	Average Peak (time 5-6 pm Monday)	2
40-60	5-10	2p-1.5m	100-150	Highest peak time (5-6 pm on Thursday)	3

Source: the researcher based on simulation software analysis (Any logic 8.8.0 University Researcher 2022)

From the observation of the results of the above table, it was shown that the areas for pedestrians were improved and the pedestrian movement was isolated, which increases the feeling of safety and protection from traffic accidents, especially for the elderly and children, as well as the possibility of cars moving more smoothly,

Allowing the movement of emergency and ambulance cars at greater speeds to bypass the dangerous situation by not reducing speeds until peak times.

## CONCLUSIONS

- 1- The positive signs in the multiple linear regression indicate that there is a direct relationship between each of the (crossing regions), galleries, lighting, floors, and logging The feeling of safety, that is, an increase in each variable by one unit leads to an increase in the feeling of safety. As for the lane-sharing variable, as it appeared in the street, it indicates an inverse relationship between it and the feeling of safety, meaning that the increase in the sharing of paths between pedestrians and automated traffic causes a feeling of insecurity.
- 2- The study area suffers from many problems due to the lack of interest in planning in general and planning pedestrian paths in particular
- 3- The participation of pedestrians and cars in one lane adds a feeling of insecurity and protection for pedestrians, which is the most important person in planning; protecting and achieving safety is a priority.
- 4- Irregular street vendors are a phenomenon that causes chaos and disorder in entering roads and streets, especially in important city centers, and this is evident in the focus of the study, as it prevents pedestrians from taking the lane designated for pedestrians and overtaking on designated paths.
- 5- The corridors and shades are an important element to encourage walking to protect against environmental conditions, especially in the study area, which is characterized by harsh weather conditions in summer and winter.
- 6- The crossing areas are random in the axis, no facility is allocated to serve the crossing areas, especially at two important intersections (the intersection of Bab al-Qibla and the main intersection) in which cars, bikes, and ambulances participate.
- 7- Lighting is important on the roads, as it adds a sense of protection and safety for pedestrians, and it is important to work on developing it and converting it to the use of renewable energy such as solar energy, which is used in other areas of the city.
- 8- Simulation adds the possibility of analyzing the reality of the situation and testing proposals and solutions to address problems to the reality of the situation with high capabilities that help to reach the best solutions in a short time, with costs and less effort

## RECOMMENDATIONS

- 1- Focusing on planning processes in general and planning roads and pedestrian paths in particular, focusing on important city centers that are a destination for large numbers of residents, such as the city center of Kabala, and working to provide a safe environment that provides protection for pedestrians and encourages outdoor activity.
- 2- Providing public transportation with specific and studied paths that facilitate the access of visitors to all parts of the city center from religious shrines and service departments
- 3- Attention to floor finishes and materials used in them to add comfort in their use, especially by people with special needs, the elderly, and children
- 4- Focus on separating pedestrian and car paths, as it is one of the most important reasons that add a sense of danger to pedestrians and traffic accidents
- 5- Paying attention to the lanes and corridors of pedestrian paths to protect from climatic conditions and to add the aesthetic character of the street, especially in an important religious city center such as Karbala city center and its historical and religious symbols.
- 6- Allocating bicycle paths as a sustainable means of transportation
- 7- Focusing on adding afforestation elements on the path, especially at the intersection of Bab al-Qibla and along the street, to add an aesthetic panel because the street is straight and ends with an important religious landmark represented by the shrine of Imam Hussein, peace be upon him, and to add a sustainable environmental aspect to protect the environment
- 8- Detailed planning of the crossing areas at the intersections of Bab Al-Qibla Street of Imam Al-Hussein, peace be upon him, especially in crowded and vital intersections such as the Postal Intersection and Bab Al-Qibla Intersection

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