



## Evaluation of Some Visual Pollution Indicators in the Physical Environment of Al-Hilla City

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### ABSTRACT:

The physical environment of Al-Hilla city is subject to successive developments due to changes in various economic, technological and humanitarian aspects.

These changes are accompanied by the physical appearance of the phenomenon of "visual pollution", which results from the imbalance in the visual performance of the components of the physical environment of the city, causing the sense of psychological discomfort and loss of belonging to the surrounding environment and its aesthetic is almost nonexistent.

The objective of this research is to evaluate the state of the visual components of the physical environment of Al-Hilla city, through an analytical field study of the visual impact indicators of the state of the physical environment of Al-Hilla city, and comparing it with the visual performance standards, to determine the defect and gap. For research purposes, the field study was conducted for the most important street in the city center, which is Imam Ali Street, on the basis of which the visual pollution ranges were determined, and therefore the recommendation of making the right decisions (whether at the level of implementation or field monitoring) is necessary in order to reduce or mitigate the phenomenon of visual pollution) to improve the visual performance of the street in particular, and the physical environment of Hilla city in general.

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## **Introduction:**

The physical environment in any urban complex consists of two elements, namely the natural environment and the built environment, which are defined as follows:

**Natural environment:** This environment includes the objects that does not related to humans in its existence or usage. For example, desert, seas, climate, terrain, surface water, groundwater, plants' and animals' life, and the natural environment with a direct or indirect impact on the life of any living group of a plant, animal or human being [1].

**The built environment:** - It consists of the physical infrastructure constructed by human in addition to the established social systems and institutions by human being as well. Thus, the built environment can be observed through the way in which societies organized their lives, which changed the natural environment to serve human needs, and the built environment includes land uses for agriculture, residential regions, and exploration for natural resources, in addition to industrial areas, commercial centers, schools, institutes, roads ... etc. [1].

The environment, both natural and built, is an integrated framework that includes the globe, or the transfer of the life planet, and what affects other components of the universe. The contents of such framework is not rigid, but it is permanently reactive and influential and human itself is one of the components that interacts with the environment and other human beings. This comprehensive understanding was reported by Mr. U Thant, the Secretary-General of the United Nations who said "We like it or not, we travel together on a shared planet... We have no reasonable alternative but to work together to make it an environment in which we and our children can live a safe and secure life"[1]. This requires the human being, the only sane person of life, to deal with the environment in kindness and compassion, investing without damage or destruction. Perhaps, the understanding the environment and its components and their interrelationships can assist humans in finding and improving a better place for their lives and their generations afterwards [1].

The components of the physical environment (natural and built) in a city, are planned and designed in homogeneity, to achieve the highest efficiency of its spatial, functional, and visual performances, and therefore, it is a prerequisite for a city to be sustainable, and serve its current and future generations.

The triple location, function and shape, constitute the basic tools to control the physical environment and raise its performance through the planning and design of these components taking into account the general visual impact arising from them that can

enhance the performance efficiency of the physical environment.

However, achieving homogeneity in the physical environment represents a complex issue because of the overlapping effects. Many states have sought to reduce the negative impacts on the physical environment by enacting legislation and regulations to achieve homogeneity.

For example, in the early 1980s, the British government called for easing some laws that have an indirect impact on safety, including those related to the aesthetic aspects of the physical environment as they are affected by taste and opinions, meaning that the aesthetic aspects of the physical environment are subjective and cannot be agreed upon among all members of society [2].

## **Forming the physical appearance:**

The physical appearance represents the art of relationships that bring buildings together to achieve aesthetic appearance and certain qualities. The visual relations between the elements have a major role in organizing the physical appearance and crystallizing the integrated sensory image of it [3]. Kevin Lynch, in his study mentioned in his book "The image of the City", identified five key elements which all combined forming the visual composition and the formation of the city. The elements can even control the mental image formation of the city as they effect on the humans' perspectives about the city. The elements were summarized in Figure (1) and which are as follows [4]:

- **PATHS:**

These are the main traffic routes for the residents of a city, including the network of roads and paths with a visual significance that connects the different parts of the city as well as different footpaths. Thus, they represent lines of longitudinal spaces through which movements and different visual landscapes observations can occur, formed by different movement lines (for cars or footpaths).

- **EDGES:**

These are visual boundaries which determine the borders of a city, a region, or a complex as well as the borders within a city, confirming its external formation. The boundaries are either natural boundaries (mountains, seas or rivers, and trees) or human-made artificial borders (walls of buildings, roads, and bridges). Thus, they represent continuous longitudinal lines that can be perceived as boundaries between regions and their strength depends on their ability to be penetrated by movement or sight.

- **DISTRICTS:**

They represent the division of a city to a range of areas, including central areas and their nearby areas, and open areas, given that each area has a distinctive character, homogeneous with other areas, and has clear boundaries providing the residents with a sense of belonging to that area.

- **LANDMARKS:**

These are distinctive signs that enable the identification of a city or its parts as well as the determination of the directions of movement and access paths within it. The landmarks can be either buildings or elements illustrating the formation of a city or areas and enabling the possibility of a viewer to identify their location and direction in a city or a region. The signs are either external being observed from outside the urban block of a city, or internal being seen by roaming around a city.

- **NODES:**

These are fields and squares areas in addition to the contact points. They represent the centers of movement, transmission, assembly, and activities in a city, and are reflected in the presence and formation of assembly points.

### **Visual Performance:**

Brolin has divided the characteristics that affect the homogeneity of the physical appearance into two parts:

**1-General characteristics:** These are the characteristics that are familiar to most people and most modern contemporary designs have criteria for regulating those characteristics, providing a sense of attachment to the original [5]:

- o Setback from a road
- o Height
- o Mass: And how to configure the size of the main building ..
- o Interface and directivity ratios.
- o Materials.
- o Appearance and visual images
- o Arrangements of doors and windows.
- o color.
- o Size of doors and windows and their ratios.
- o Scale: How a building perceives its relationship to human size.

**2-Historical and non-historical characteristics:** These characteristics are related to the traditional and their homogeneity and unity can be achieved by with dealing with details and processors themselves.

Brolin asserts that these characteristics are only general lines for creating unity in the physical appearance. Then, he selected a set of visual properties for checking the continuity of a range of buildings and homogeneity of the physical appearance [5]. These are as follows:

**-Construction Line:** The organization of the construction line represents the basis of the visual continuity of a group of buildings. The facades lines along a road have a direct effect on the way by which buildings are observed and their relation to other buildings. The unification of the construction line plays a significant role on the personality and identity of a road network, strengthening the sense of place and indicating the importance of regulating the distance of setback of buildings and its impact on the formal homogeneity.

**-Height of buildings and skyline:** The issue of buildings height and its relationship to the skyline represents one of the most prominent visual issue of a range of buildings. The differences between building heights break the skyline and affecting the formal homogeneity of the physical appearance.

**-Unit Width:** Unifying the width of building units contributes to the cohesion and homogeneity of buildings.

**-Quality of details and materials:** The use of local materials can provide a strong sense of visual unity for the city, since its use in new buildings contributes to ensuring visual continuity. Building construction with different materials can lead to breaking homogeneity, lines, color and texture.

**-Ratio between window's openings to the wall:** The regularity of openings for a group of adjacent buildings contributes in achieving homogeneity and visual continuity of the physical appearance, while the variance in the openings lead to inhomogeneity and break the continuity of the physical appearance.

**-Space containment:** In order to achieve homogeneity, attention should be given to the formal characteristics of the surrounding buildings and to avoid buildings with weak characteristics or visual homogeneity.

### **Visual Pollution:**

Visual Pollution is defined as the entire irregular formations, which are mostly found in natural and built environments [6]. Visual Pollution is a term used for the unattractive visual elements, which are all types of different landscapes surrounding humans, such as unexamined buildings, informal architecture, and random advertisements.

The visual pollution is also defined as anything that can adversely affect the visual image and distract it including unaesthetic, and heterogeneous views in addition to elements distorting the aesthetic form.

Visual pollution encompasses all environmental elements that are socially unsuitable or unacceptable. It is a changing value of the environment based on the cultural background of the viewer and society. There are many sources of visual pollution in contemporary cities, starting from contiguous contradictory architectural patterns to distortion of the visual vision of by the use of many banners and advertisements in addition to the dazzling use of lights, colors and shapes. Visual pollution generally appears in the physical environment, including buildings, streets and landscape. The visual pollution can be easily observed in cities, particularly large and crowded ones in the third world countries in which the visual pollution has become a common factor.

Researchers have defined pollution as "The imbalance that occurs in the visual performance of the physical environment with all its natural and built components which reduces the aesthetic sense of it". Perhaps this definition is the most comprehensive and the closest to the methodology of this research used in the case of the study.

The features of the visual pollution can be determined in the following points [7]:

- inhomogeneity of form, proportions, color, and movement.
- All that can reduce cleanliness, safety, and authenticity.
- The presence of an element contrary to environmental features and considers intruder on the environment.
- All that adversely impact on the public taste, including drawing, signal, or speech.
- All factors that reduce the integration of the aesthetic sense of the environment.

### **The case of the study and the research objective:**

The physical environment of Al-Hilla city is subjected to successive developments as a result of changes in various economic, technological and humanitarian aspects. Along with these changes, the physical appearance is exposed to the phenomenon of "visual pollution" which results from the imbalance in the visual performance of the components of the physical environment of the city, causing a psychological discomfort and loss of belonging to the environment as well as being virtually unaesthetic.

Therefore, this research aims to evaluate the state of visual aspects of the components of Al-Hilla city physical environment, through an analytical field study of the visual impact indicators of these components .

### **Research Methodology:**

To achieve the objective of the research, analytical field study was adopted for comparing the visual impact indicators of the state of the physical environment of the Al-Hilla city with the visual performance criteria. This was to establish the defects on which the visual contamination is determined, and for reaching to several conclusions and recommendations to reduce this phenomenon.

For research purposes, the field study was conducted on the most important road in the city center, which is Al-Imam Ali Street. Also, in order to achieve the accuracy in field surveys, the street was divided into three sections A, B, C, and each section with two sides right and left, as shown in the following figures numbered (2, 3, 4, and 5):

### **Field survey structure form of Al-Imam Ali street:**

Table (2) show the field survey structure form of Al-Imam Ali street in Hilla city, which had been achieved in four months ,beginning from 1-2-2019.

### **Results analysis:**

From the field survey, it can be indicated that there are three sections in the roads highlighted on the areo-graphs of the road varying from one another in the fault present in the visual performance, these sections are section A, section B, and section C. The visual performance varies from (100)% given five points (•••••) which means high visual

performance i.e. very low visual pollution to (20)% given one point (•) which means very low visual performance i.e.very high visual pollution (because of final loss for some of the indicators necessary for roads in visual pollution)

For table (3) section (A), the main functional organisation of the sidewalk is missing due to high variations of functions nearby such as business stores, car parks and the openings of the theses parks which is linked with that of old residential blocks with the section being close to Al-Handiya bridge and the old market with the performance of the other indicators being inefficient

In terms of table (4) section (B), the visual performance is approximately lower than the results of the front side of road buildings, though the performance is very low for the rest of the indicators and has not reached the accepted level.

In terms of table (5), it is noticed that there is a substantial decline in visual performance which means that visual pollution is very high in section (C). The reason behind that is the presence of commercial advertisements in a significant manner that doesn't meet the criteria adopted in the research. This leads to visual pollution in all of its indicators from one side and obstructing the fluency of the pedestrian movement from the other side.

### **Conclusions:**

It would be obvious to conclude the followings:

#### **1- Buildings surrounding the roads:**

The decline in the level of visual pollution in the building elevations surrounding the roads is related to the presence of formality in structure, design style, and the building materials utilized in its construction with the presence of correlation between them in terms of colours (similarity and colour gradations). In term of the heights of the buildings surrounding the road, they should have relatively similar heights to define the road and unified with the ground of the sidewalk or similar, and equal to the outline of the sidewalk. In term of cantilevers that extend to above the sidewalk, it should be on appropriate height and extension so it wouldn't exceed the width of the sidewalk with having appropriate and correlated colors and measurements and finishing materials having relatively similar colors, type, texture and not affecting the driver's eye.

#### **2- Traffic island and sidewalk dimensions:**

The decline in the level of visual pollution linked to unifying the height, width, and level of the sidewalk and possessing certain slopes in crossing areas. In terms of sidewalk furniture, the criteria suitable dimension should be selected that absorb the dimensions of movement lines entirely by providing safety for these lines and preventing cars, goods, and boards, etc. from acceding them.

#### **3- Advertisement:**

The decrease in the level of visual pollution is associated with organizing these advertisements in term of its dimensions, heights, and distributing

them in appropriate and unified manners that wouldn't affect the pedestrian movement on sidewalk, or crossing of middle island with selecting suitable material in its manufacturing so it has no effect on driver's eyes and it needs to adhere to the roads criteria from the aesthetic and appearances

4- Opening Spaces of the secondary movement axes on roads:

The reduction in the level of visual pollution is associated with the definition of these outlets from the structural and design aspects and distinguishing them from the areas allocated to the sidewalk by having low levels at these areas and confirming them in architectural blocks landscape. These all are in addition to defining the quality of the outlets, if they vary from each other using the human scale and the boards or controlling the width of the outlets.

### **Recommendations:**

It could be useful to recommend the following:

The research recommends taking the right decisions (on the executive level or site monitoring) to cut off or minimize the visual pollution phenomena in Al-Imam Ali Street to enhance the visual performances of the street specifically, and the physical environment of Hilla city generally, so it becomes in the best way, by making the decisions and undertaking the necessary recommendation to improve the visual performances to the streets of the city by the following:

1- Inviting the authorized people responsible about decision making: (it includes the physical planning department and municipal departments, municipalities, and governance) by putting laws and instructions that prevents the constructions that do not adhere to street criteria, also prevent the bad use of the building, sidewalk, and street which spoil and pollute their appearance and commercial uses.

2- Inviting the planning, designing and execution authorities: (involves the planners, and engineers for all specialties and contractors) to execute the street criteria according to the quality and choose the upper or medium-level, without resorting to the minimum standard to abbreviate the activities lines of the roads, sidewalk, and middle island, so take into account the absorption of the increase in human densities.

3- Inviting the benefiting groups: (includes the roads users who are the people lived in and around it and the owner of the stores and drivers passing it as well as pedestrian) to follow the specific instructions associated with the constructions and utilization and working on organizing the sidewalk and not exceeding it by displaying goods, advertisements and stalls in the way that obstacle the fluency of other services and distort the road

appearance in general, and to keep the continuity of the road maintenance and performance its function in the best manner and cooperate with other groups in that, in addition to the use of the social activities in the pedestrian intersections with roads to increase the daily utilization hours of the roads.

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Figure (1): Elements of physical appearance of Kevin Lynch

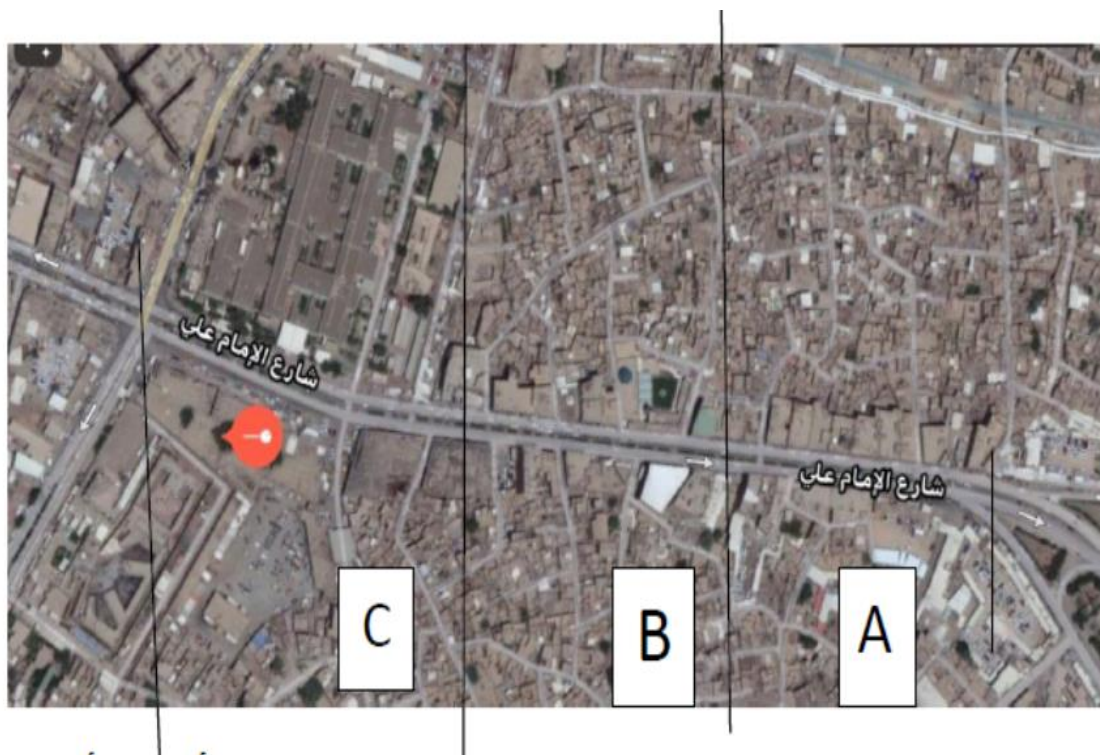
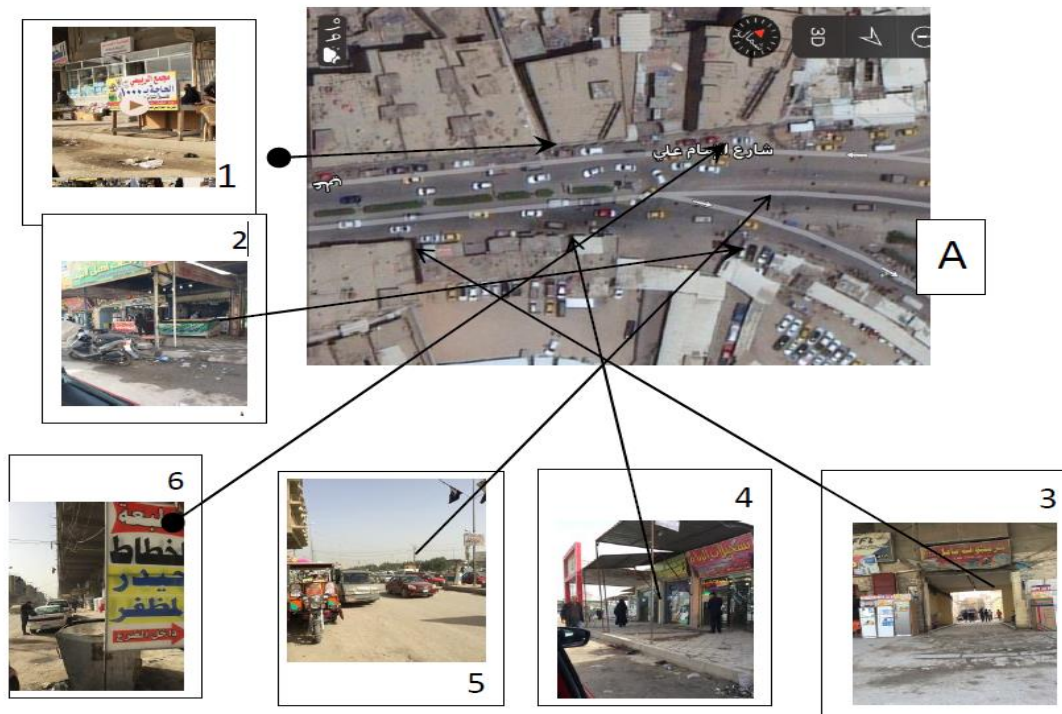
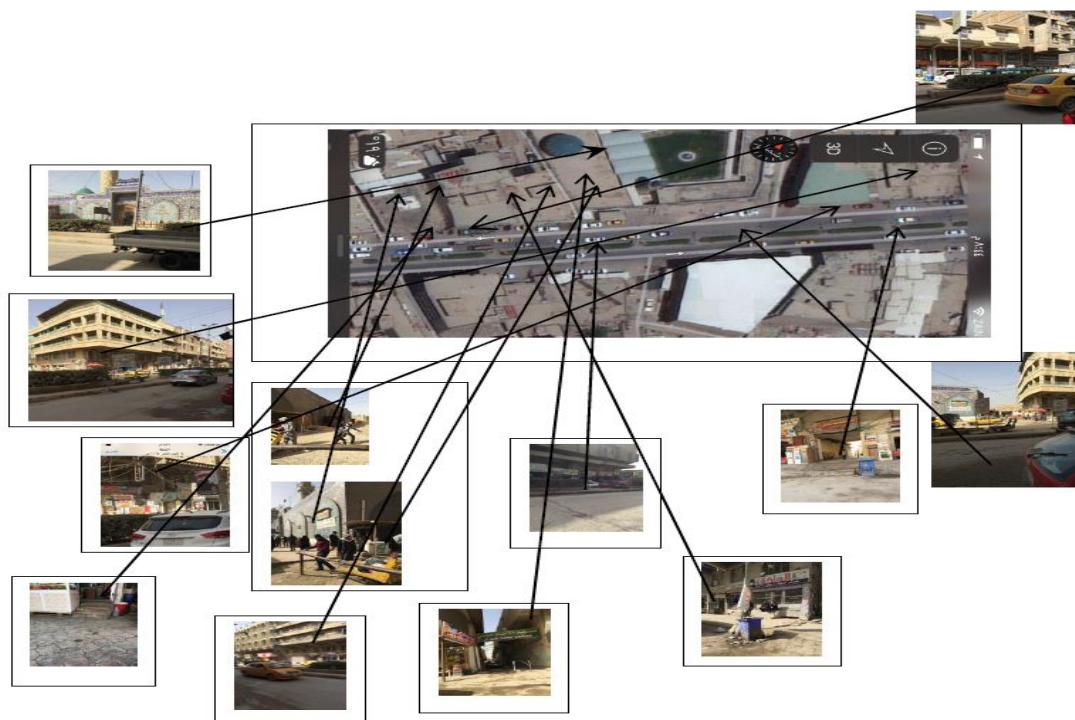


Figure (2): The aerial image and the division of the street into three sections to facilitate the process of reading the visual performance of Al-Imam Ali Street.

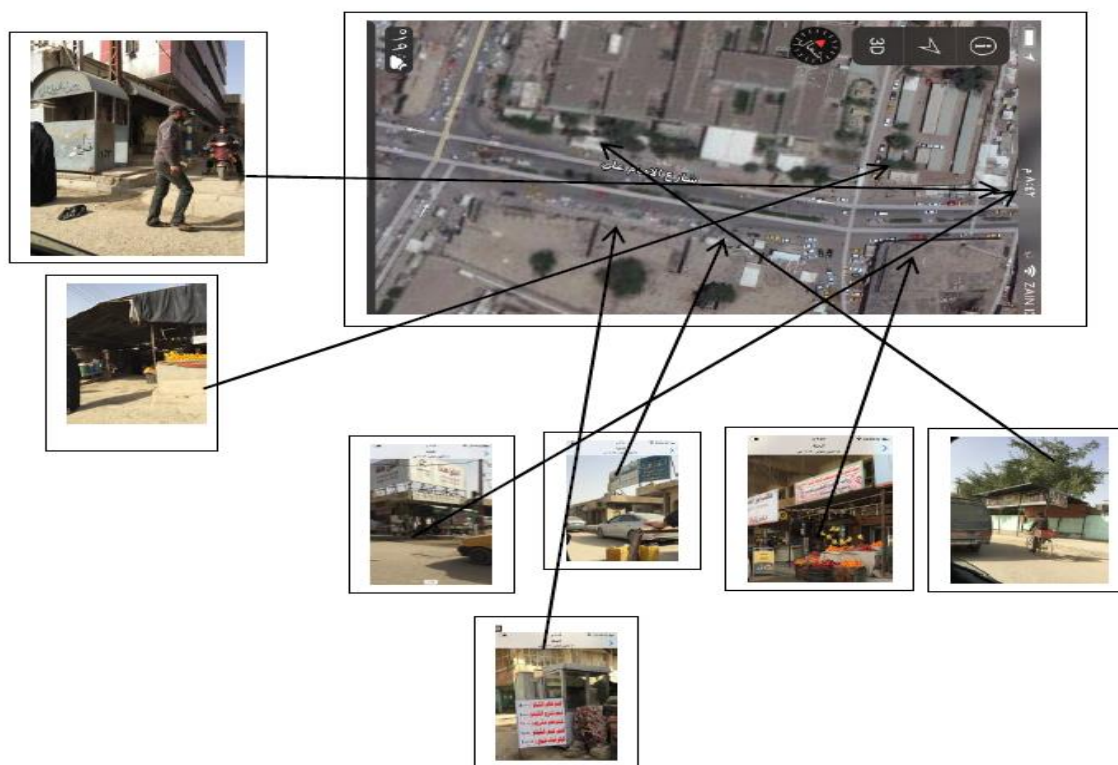




**Figure (3): Images of defects in the visual performance standards of Al-Imam Ali Street in section (A)**



**Figure (4): Images of defects in the visual performance standards of Al-Imam Ali Street in section (B)**



**Figure (5): Photos of defects in the visual performance standards of Al-Imam Ali Street in section (C)**

**Table (1): The method of measuring the visual performance of Al-Imam Ali Street using a method derived from the five-level Likert scale.**

Visual Performance						Visual Pollution
Measurement points	●●●●●	●●●●	●●●	●●	●	
Performance percentage	100%	80%	60%	40%	20%	
Performance quality	Very high	High	Medium	Low	Very low	
Performance direction						



**Table (2): The field survey structure form of Al-Imam Ali street**

Categories		Indicators	Required criteria	Measurement or description of current condition	Assessment		
Properties of the street [8]  The street type is commercial  Note/ the assessment is for all sections		Width of the whole street with pavement	From (22.5-34 m)				
		Width of vehicle street	From (7.5-23 m)				
		Width of middle island	From (2-5 m)				
		Time for full utilization of the roads	Within (24) hours or according to the commercial function with the presence of late-working shops or mixed-use.[9]				
		Vehicle’s speed	Less than or equal to (50) k/h				
Buildings adjacent and around the street	Building facades	Facade design Convergence in form, proportions, color, movement, similarity and consistency.	1- It should be a mixture of similarity and consistency among them in terms of colors, design and proportional with the traditional style, whether near or within the old heritage even in some similarities [10].  2- The cantilevers should be equal and their width should not exceed the width of the pavement [11].				
	Building material (structural reinforced concrete)	Near or the same for avoiding the differences in contraction or extension of building materials especially for adjacent buildings [10].					
	finishing materials of buildings’ facades in terms of: The presence of extraneous structural elements extraneous or not, reflecting the		Unified or converged to clarify or enhance the identity of the street facades and its adjacent, providing it with integration and aesthetic appearance				

		identity of the street and the style of the area adjacent style					
	Number of floors		Floors (6)				
	The horizontal setback of the buildings from the sidewalk		Should not be less than (0.7 m) [10]				
	Configurations of buildings' heights (skyline) from the street		The same level usually from achieving homogeneity in configuration and visual performance of the urban appearance of the street				
	Buildings' level from the pavement		Higher by (20 cm) to achieve homogeneity in configuration of the street				
Sidewalks	Height of sidewalk from the street		Least dimension is (15 cm) and highest dimension is (25 cm) [10]				
	Width of sidewalk = 4 m		From (4 m) as a whole to (8 m) in proportion to the type of the street [8]				
	Height level of the sidewalk affects the homogeneity, the regularity, and the aesthetic of the sidewalk and the street		The same level except for areas of crossing signals which should slope 15° for disables [10]				
	Sidewalk furniture [^]						
	Pedestrian walk		Minimum length 2.2 <sup>•</sup> m				
	Disable walk		Minimum length 80 cm				
	Bicycle movement		Minimum width 100 cm				
	Landmarks		Distinguish each line from the others				
	Paving the sidewalk	Form of finishing materials	Unified shape and material				
		The quality of building material					
	Sitting places		= 1.20 m Clear with a definite width				

		Car parks	Width= 2.5 m is the minimum dimension		
		Planting places	Width= 2 m And about (2,3,4) m far from the sidewalk [١٠]		
		Locations of trash can [١٠]	Allocate places for them within the service network area (telephone stalls, sitting places, water pathway) or the building reflection so it wouldn't affect the pedestrian walk [١٠]		
		Bicycle lanes [٨]	Width= 1 m on the sidewalk and 2.20 within the road[٨]		
		Spaces for discharging the goods in commercial areas [٨]	Discharging areas placed behind the building of the roads to avoid traffic and distribution. In case the buildings lie on the same road, the trucks go to reflection point between the two buildings to avoid closing the main road [١٠]		
	Overruns on the sidewalk (the evaluation is specified for the fluency of movement on the sidewalk [10])	Boards	Boards are placed far from the pedestrian lines for protecting them [١٠]		
		Stalls	Identify the location of the necessary stalls in a way not effecting the Pedestrian movement		
		Camps of various activities that block the pedestrian paths	Prefer to be within buildings allocated specially for them and do not disturb the pedestrian movement		
		Areas for displaying the goods of commercial stores	Areas of setbacks of commercial stores = from (1.4 m to 0.75 m) free from goods. after that display goods behind the glass of the stores		
	Measurement axes				
	Organizing the sidewalk (design)				
	The visual suitability (movement axes)				
	Functional suitability (privacy and safety) and road furniture				

Advertisements [١٢]	Dimensions		Have an area of no more than (180*240 cm <sup>2</sup> ) and in all situations, width of advertisement boards no more than 25% of sidewalk width [١٢]		
	Its height in reference to sidewalk Evaluation in term of its adherence to criteria		The allowable minimum height of the advertisement is ٣ m of the sidewalk level and prohibit placing it in a <b>way</b> disrupt the Pedisteran movement [12]		
	Its types according to materials made <b>it</b> affecting the organi zation and identity of roads		prevent the use of lighting advertisements as they influence the driver's eyes and prefer the advertisements with lights interior [١٢]		
	H omogeneity with roads aspects (aesthetic, visual, and color themes)		Indicate according to dimensions of road space withadvertisements inclined by ٣٠° and completely prevent the advertisementsfrom being parallel to the direction of traffic movement. In addition to unifyingits colors and make it very similar to each other to make it easy to distinguish it from the traffic lights. Also, prohibit placing it at distance less than ١٠٠ m from junctions and ٥٠ m from each other [١٢]		
[١٢] The <b>appropriate</b> place for it	In middle island	It's height range from (4- <b>5</b> ) m to )٣,٤( When it is in the middle island of the road [١٢]  The minimum height is (2.2) when it is on the sidewalk and ٥٠ m between an advertisement and another			
	On sidewalk				
Disruption in term of homogeneity, aesthetics, and consistency		According to certain functional allocations or according to its location though it should not hide the significant features the style of the road as well as not preventing the vision [١٢]			

Points of connecting between the roads and lines leading to it in term of safety, originality, suitability and Consistency	Define the entrance of outlets	Define the visual outlets for district coming after the outlets to create kind of coherency in their visual scene and that of the roads by using architectural solutions for the mental image of the lines and distinguish the services and the functions of the outlets and the next one		
	The function of outlets assembling roads, residential roads, and service roads	Defining the visual outlets to determine the function with special signals and advertisements and emphasizing them by architectural blocks and landscape as the best solutions [^]		
	Outlets of car movement (for the secondary roads leading to Al-Imam road)	Presence of road junction before the entering of drivers to the main road with signs for pedestrians crossing [^]		
	Outlets of pedestrian movement	Use of human scale to control the type of movement with the use of boards, narrowing the roads and changing the type of paving materials [^] With the use of columns, arches, and open space and the height of the highest point of the arch should not exceed (°) m as a ratio of its height		
	Mixed movement outlets (outlets of car parks and residential paths)	The presence of artificial boards to separate the movement of cars and pedestrians and vice versa or to distinguish the levels with reduced speed elements with indicative signs [^]		



**Table (3): The average measurements of the rate of visual pollution for the selected indicators for Al-Imam Ali road for section A (researcher)**

In term of building line and front side	In term of the sidewalk and itsfurniture	In term of advertise ment	Rubbish bans	Points open to the secondary lines leading to the road	Finishing materials	Appropriate						30 %	Inappropriate
						In term of originality and						20 %	Not consistent
						In term of criteria and organization						20	Not consistent
						Environmental performance						20	Environmental pollution
						Consistency with roads contest						20 %	Not consistent
						Adherence with						20 %	Not consistent
						Consistency Function						20 %	Functional inconsistency
						Visual correlation						20 %	Visual inconsistency
						Organizing						20 %	Not organized
						Skyline define						40 %	Not define
						Homogeneity with						30 %	Non-
						Organizing						20	Disruption
						Similarity						20	Difference



**Table (5): The average measurements of the rate of visual pollution for the selected indicators for Al-Imam Ali road for section C (researcher)**

Finishing materials	Appropriate							20	Inappropriate
Points open to the secondary lines leading to the road	In term of originality and							20	Inconsistency
	In term of criteria and							20	Inconsistency
Rubbish bin	Environmental performance							20	Environmental pollution
In term of advertisement	Consistent with road criteria								Inconsistency
	Consistent with criteria								Inconsistency
	Consistency Function and								Functional inconsistency
In term of the sidewalk and its furniture	Visual consistency								Visual inconsistency
	Organizing								Not organised
	Sky line Defined						20		Not define
In term of building line and front side	Consistency with road						30 %		Non homogeneity
	Organizing						20		Disruption
	Similarity						20		Difference