

# RESTORATIVE STREETSCAPE DESIGN FOR HEALTHY CITY EXPERIENCE WITH SPECIAL REFERENCE TO CAIRO

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## Abstract

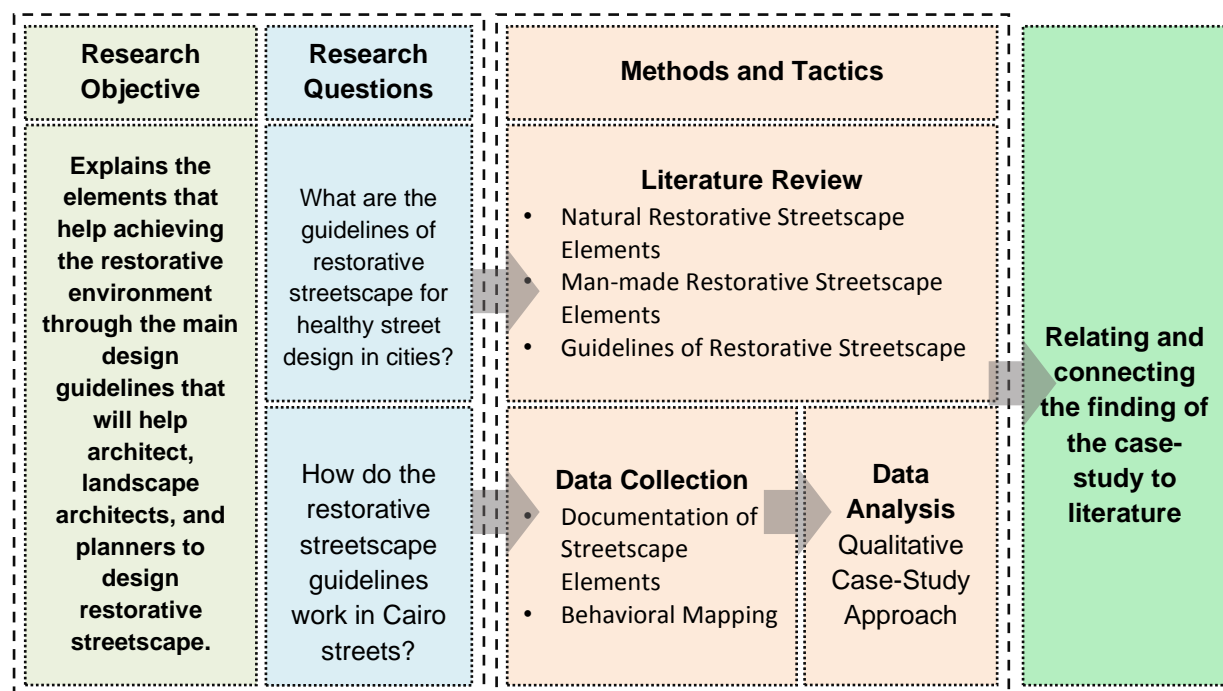
This research addresses the problem of lack of guidelines for implementing restorative streetscapes in order to enhance wellbeing and reduce stress for city residents. This research explains the elements that help achieving restorative environment through establishing design guidelines that will help architects, landscape architects, and planners apply restorative streetscapes. This research investigates the relationship between restorative streetscape elements and patterns of activities in streets of Cairo. The research method followed a qualitative case-study approach and was conducted on a local case study (Street 9 of Mokattam city in Cairo, Egypt). The research answered two main questions: (Q1) what are the guidelines for a restorative streetscape employment for healthy street design in cities? (Q2) How do restorative streetscape guidelines work in streets of Cairo? Data collection techniques included documentation of streetscape elements and behavioral mapping of street activities. The research confirmed that streetscape elements significantly contribute to promoting activities in streets and could possibly promote them to restorative ones.

**Keywords:** Streetscape, Restorative Streetscape, Healthy Streets, Restorative Environment

## 1. INTRODUCTION

Illness, injury, or congenital condition cause poor mental or physical health. Meanwhile nature is considered as enabling environment that aids in curing many diseases. Access to restorative environments is very important to public health since people cannot live a healthy lifestyle without an appropriate environment. Thus, previous studies showed that there is a connection between nature, stress, and well-being. As the connection with nature increases the sense of well-being increases and the stress decrease and vice versa (Souter-Brown, 2014). Cities' physical environment is where people practice their daily lives, go or do their work, and obtain care from others. This environment, especially the streets, produces urban stresses that threat the ability of people to recover from stress and the mental fatigue in their daily life. Therefore, the main aim of most external environments is to provide people with the atmospheres and facilities that improve their daily lives and health (Ferm & Tomaney, 2018; Prominski & Seggern, 2019; Souter-Brown, 2014). In this situation, stress is a mental disorder that results from conditions that affect the mental and physical health of people. Psychological stress happens when people perceive their ability to adjust to their surroundings as being higher or lower. Generally, psychological restoration is the ability to overcome stress and mental fatigue (S. Kaplan & Peterson, 1993; Ulrich, 1984; Ulrich et al., 1991). Access to green spaces

produces a social connection, well mental and physical health (Souter-Brown, 2014). Most of the urban environments that are designed to restore stress and recover from mental fatigue includes lots of elements from nature and improve restoration. For that reason, this research focuses on the potential of applying restorative streetscape designs that play an important role in citizen's experience. The streetscape elements that apply restoration which are assumed to be healthy and green are also illustrated in this research. The problem of this study is the lack of guidelines for implementing restorative streetscapes for promoting wellbeing and reducing stress. The research objective is to identify the elements that help achieving restorative streetscape. The objective has been investigated through the research methodology (Figure 1) which follows a qualitative case-study approach that was applied on a main street in Mokattam city (Street 9) in Cairo, Egypt. The study clarifies the streetscape elements that could assist architects, designers of landscapes, and planners in applying the guidelines of restorative streetscape to develop Restorative Street. Two questions were addressed by the study: (Q1) what are the guidelines of restorative streetscape for healthy street design in cities? This question was answered in the literature review. (Q2) How do the restorative streetscape guidelines work in Cairo streets? The second question was answered by selecting a case study in Cairo, where streetscape features were documented and street activities behaviors was mapped out. Based on the research, the findings of the empirical part are connected and related to the literature and then generalized to assist in improving urban environments to become more restorative.



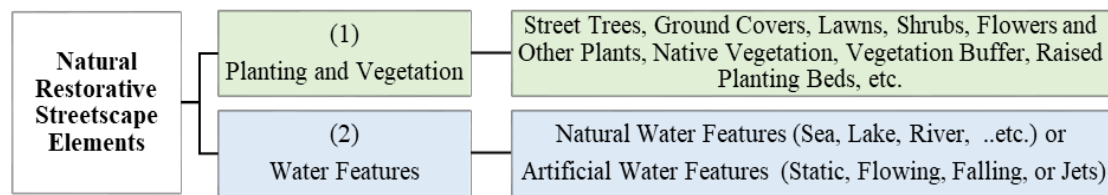
**Figure 1: Research Methodology and Structure**  
(Authors)

## 2. RELEVANT LITERATURE

The fundamental unit of the urban environment through which people experience a city is the street. It is often misunderstood due to the two-dimensional floor that motors travel on as they move from one place to another. Streets are, in fact, multidimensional areas comprising many surfaces and structures. It enables a variety of uses and activities and provides spaces for access and movement. Streets are dynamic areas that have adapted over the years to guide environmental sustainability, public health, critical activity, and cultural significance (Dover & Massengale, 2013; Marshall, 2004; Moughtin, 2003). In order to identify the guidelines for achieving restorative streetscape design in cities, this research goes through investigating the main elements of streetscapes. Many studies were conducted to identify the restorative environment through enhancing elements of streetscape. Based on their co-occurrence in the review of the literature streetscape elements can be classified into natural and manmade streetscape elements. Natural streetscape elements are presented in planting and vegetation, as well as water features. Manmade streetscape elements are presented in landform and surfaces, edges and walls, streetscape structure, site structures, public furniture, services and infrastructure, signage, and art features (Bell, 2019; Booth, 1989; Dover & Massengale, 2013; Moughtin, 2003).

### 2.1 Natural Restorative Streetscape Elements

Natural restorative streetscape elements are concluded in two groups as shown in Figure 2. Plants and other vegetation are working to offer buildings and streets restorative characteristics, as well as aesthetic and environmental functions (Canepa & Ab Ghafar, 2020; Woodward, 2005; Zhao et al., 2020). Practice physical activities in a pleasant natural area, according to different studies, improve health and well-being and provide people with restoration (Marcus & Sachs, 2013; Mitchell, 2013; Zhao et al., 2020). The soft fascination and sensory stimulation experience are enhanced by the use of natural elements (Berto, 2005; Marcus & Sachs, 2013). Moreover, it creates restorative environments in urban, rural, and street settings to advance social, physical, and mental wellbeing. Children's cognitive maps are organized in large parts by parks, playgrounds, green spaces, and entrances. Accordingly, the addition of urban clarity elements should improve urban environments' navigability, habitability, and sustainability (Askarizad et al., 2022; Berto, 2005; Kadir & Othman, 2012; Mullaney et al., 2015; Wood & Esaian, 2020). One of the most restorative aspects of streetscape design is believed to be the use of water features. It improves the sensory stimulation through enhancing the five senses. A prerequisite for restoration is that the street be readable to people during their travels. Moreover, planting elements, street trees and water features can act as landmarks (Canepa & Ab Ghafar, 2020; Woodward, 2005; Zhao et al., 2020).



**Figure 2: Natural Restorative Streetscape Elements**

Source: modified from (Bell, 2019; Booth, 1989; Dover & Massengale, 2013; Moughtin, 2003).

## 2.2 Man-made Restorative Streetscape Elements

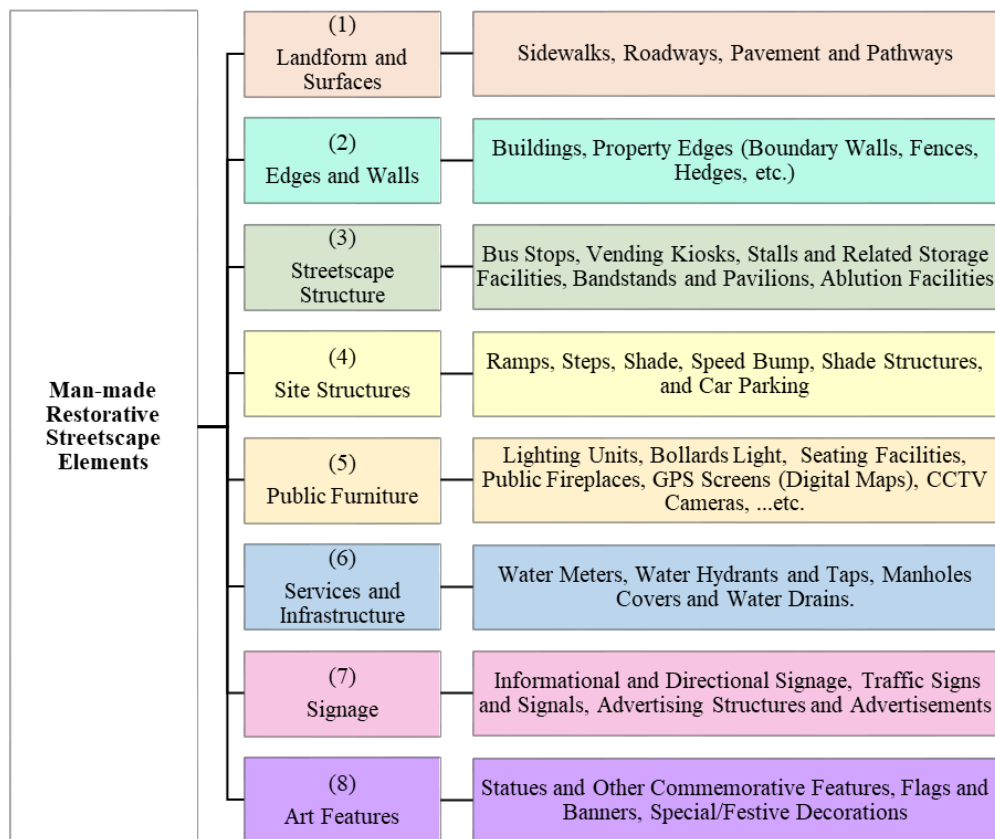
Manmade streetscape elements are presented in eight groups as shown in Figure 3. Sidewalks, roadways, pavement and pathways play a great role in forming a restorative street by providing suitable and comfortable sidewalks for the pedestrians to walk and practice physical (Baobeid et al., 2021; Berto, 2005). Pavement is any material that is used to give a surface layer to a path to help give different effects in the streetscape experience. Pavement and paths improve the deviations of nature when natural materials are used in paving. Natural materials such as wood, stones, and rocks can give users a sense of soft fascination, and landscape and site structures are the elements that facilitate transportation as well as enhance aesthetic and functional dimensions in street design (Bell, 2019; Booth, 1989; Dover & Massengale, 2013; R. Kaplan et al., 1989; Moughtin, 2003; Ulrich, 1999).

Edges and walls of the street encourage activities for example in commercial streets, the building activity areas encourage to interact and connect to the building facade and the uses within that building. This area allows for storefront doors, patios, and potted plants to open without impeding pedestrian flows. Serves as an extension of the adjacent building and use of the land, be it for signage or retailers to display their wares or a café or restaurant to set up a patio. This area is usually on private property and businesses are encouraged to use this part of the street as part of their downtown experience (Barros et al., 2021; Mehta, 2007).

Active public transportation, slow pedestrian areas for the elderly or frail, trails and bike routes are known to be good for health, as life can slow down with the pace of human walking, where people can gather and enjoy a variety of activities. Facilitating walking, riding bicycles on streets, and using public transportations even through heavy traffic times, is a must. And make those three ways are easier and healthier than driving private cars (Mueller et al., 2015). Streets that are designed and furnished to respond the needs and expectations of users, it can provide comfort and safety for all: pedestrians, drivers, street vendors, etc. When streets are safe during the day and at night, and no crime in them; it encourages people to walk, site and ride bicycle. This will give a sense of security and comfort to the whole community while using it (Bell, 2019; Booth, 1989; Dover & Massengale, 2013; Moughtin, 2003; Yan et al., 2023). The safe environment is achieved through the transparency of the place. The walkable space provides direct guidance to pedestrian paths and connection to the street network. These include the presence and continuity of sidewalks and pedestrian paths that connect pedestrians with

frequent transit services with safe crossings. In addition, the street must also provide access to people with different abilities.

There are some items that can help prevent vandalism and crime such as light fixtures, lampposts, CCTV cameras, etc. These lighting units can attract people for cycling, walking, and positioning on the street at night (Baobeid et al., 2021; Berto, 2005). Public furniture is the element that provides a lot of activities in the streets and public places, for example, it provides light at night even though the lighting unites, it provides cleanliness of the street through the litter box ...etc. Street comfort and safety can be achieved by responding to the needs and expectations of users when it is designed and furnished to provide comfort and safety for all: pedestrians, drivers, street vendors, etc. When streets are safe during the day and at night and there is no crime in them, it encourages people to walk, bike, and ride bicycles. This will give a sense of security and comfort to the whole community while using the streets (Bell, 2019; Booth, 1989; Dover & Massengale, 2013; Moughtin, 2003; Yan et al., 2023).



**Figure 3: Man-made Restorative Streetscape Elements**

Source: modified from (Bell, 2019; Booth, 1989; Dover & Massengale, 2013; Moughtin, 2003).

### 3. MATERIAL AND METHODS

This study followed a qualitative approach adopting multiple data gathering techniques. It started by investigating main streetscape elements through critical literature review. Then it identifies the main guidelines for applying restorative streetscape in cities. Consequently, it identifies the interrelationship between the elements and guidelines in terms of achieving a successful restorative healthy streetscape design.

#### 3.1 Guidelines for restorative streetscape application

Natural elements fulfill the biological needs of humans and give them a sense of restoration and comfort in the streets (Barros et al., 2021; Zhao et al., 2020). One of the main objectives of restorative streetscape is establishing a direct relationship for the people with the city where they live and work in (Brown & Corry, 2020; Lindal & Hartig, 2013) landscape designers will use the guidance for design of restorative streetscape infrastructure when they need to target a special area in the streetscape or overall, to achieve restoration for the citizens and user. Moreover, there are no comprehensive guidelines or frameworks addressing health integration in street scope design. Therefore, identifying design guidelines for restorative streetscape must be deeply investigated. The estimated guidelines for restorative streetscape could be divided into four categories (Urban, Environmental, Social, and Economic).

##### A. Urban Guidelines

- Streetscape elements provide a pleasant, relax, and restorative environment, through well designed, clean, ccolourful natural and man-made elements of restorative streetscape, that improve walk, cycle, and enjoy in the street.
- Comfort and safety for streets could be achieved by being attentive to user wants and expectations.
- Streetscape elements motivate adults and children to practice physical activities, by providing pedestrian walkways, ramps, and steps that encourage them to move around, walk in nature, and take in attractive art elements.
- Locate the streets by making landmarks out of plants, making art elements legible for the views, or using site buildings as signs to direct visitors to their destinations.
- Using natural materials in pathways flooring and edges gives flexibility in design for the users which enhances the sense of soft fascination that improves the sensory stimulant experience.
- Applying visual continuity between the streets and its edges.
- Maintaining regular maintenance for the streetscape elements.
- Emphasizing the historical context through the design (if existed).



## **B. Environmental Guidelines**

- The presence of green spaces will heighten the users' sense of place and increase their ability for temporary escape.
- Expanded access to water features generates a good distraction through engagement with it and its sound, which blocks out negative diversion.
- Familiar material like stones and rocks, help calming stressed users who may feel some anxiety.
- Colourful plantation relieves pressure to form healthy environment.
- Finding water management solutions that increase groundwater recharge.
- Improve water qualities in through storm water planter, natural systems for transporting runoff from the rain, and provide pavement surfaces that clean and filter water before it is emptied into storm sewers or filtered into ground underneath.
- Reduce urban heat island effect, through natural streetscapes elements. A green environment enhances social support and cohesion, which reflect on the creativity of the users due to their good mental health which is resulted from nature.

## **C. Social Guidelines**

- Urban public spaces encourage people for social gathering by locating streetscape benches and seats that enhance socialization.
- Natural streetscape elements (in materials and colours) enhance one or more of the five senses (sight, touch, smell, and hearing).
- The presences of safe streets for pedestrians and calm traffic.
- Alternative methods of transportation available in the street.
- Sense of community increase with streetscape elements.

## **D. Economic Guidelines**

- Green transportation offer equity for all people to reach their destination on the same time.
- Reducing infrastructure costs
- Less Property damage due to flooding
- Using environmentally friendly water treatment approaches can lower the cost of water treatment.

In the light of the previously reviewed literature the relationship between the restorative streetscape guidelines and the streetscape design elements is illustrated in Table 1 and Table 2.

According to the previous investigation, the research answered question one “What are the guidelines of restorative streetscape for healthy street design in cities?”

**Table 1: Relationship between Main Elements of Restorative Streetscape and the Urban and Environmental Guidelines of Restorative Streetscape**

(Authors)

Main Elements of Restorative Streetscape  Guidelines of Restorative Streetscape	Natural		Man-Made							
	Planting and Vegetation	Water Features	Landform and Surfaces	Edges and Walls	Streetscape Structure	Site Structures	Public Furniture	Services and Infrastructure	Signage	Art Features
<b>Urban Guidelines</b>										
Streetscape Elements Provide a Pleasant, Relax, and Restorative Environment.	•	•	•	•	•	•	•	•		•
Comfort and Safety for Streets.	•	•	•	•	•	•	•	•	•	•
Encouraging Activities for Adults and Kids.	•	•	•	•	•	•	•			•
Locate the Streets by making Landmarks.	•	•					•			•
Using Natural Materials in Pathways Flooring and Edges.	•	•	•	•						
Applying Visual Continuity.	•	•	•	•		•	•			•
Maintaining Regular Maintenance.	•	•	•	•	•	•	•	•	•	•
Emphasizing the Historical Context through the Design (If exist).			•	•	•	•	•		•	•
<b>Environmental Guidelines</b>										
The Presence of Green Spaces.	•									
Expanded Access to Water Features.		•								
Familiar Material.	•	•	•	•		•	•			•
Colourful Plantation.	•									
Finding Water Management Solutions.		•	•			•		•		
Improve Water Qualities.		•	•							
Reduce Urban Heat Island Effect.	•	•	•	•		•				



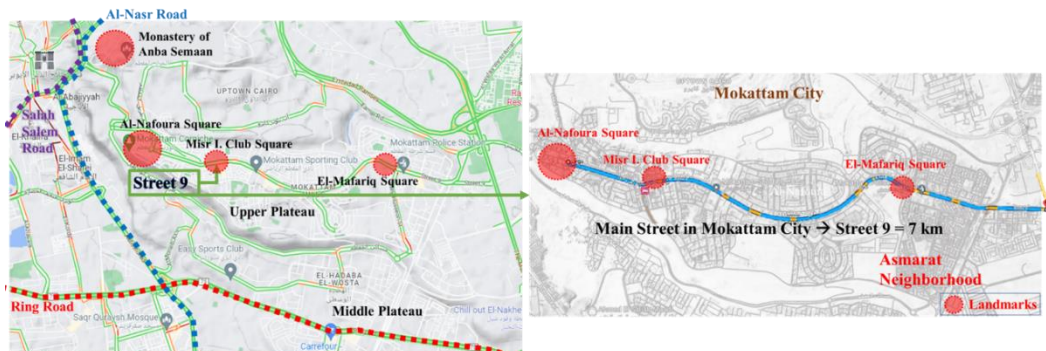
**Table 2: Relationship between Main Elements of Restorative Streetscape and the Social and Economic Guidelines of Restorative Streetscape**

(Authors)

Main Elements of Restorative Streetscape	Natural		Man-Made							
	Planting and Vegetation	Water Features	Landform and Surfaces	Edges and Walls	Streetscape Structure	Site Structures	Public Furniture	Services and Infrastructure	Signage	Art Features
Guidelines of Restorative Streetscape										
<b>Social Guidelines</b>										
Urban Public Spaces Encourage People for Social Gathering.	•	•	•	•	•	•	•			
Natural Streetscape Elements Enhance one or more of the Five Senses.	•	•								•
The Presences of Safe Streets for Pedestrians and Calm Traffic.			•	•	•	•	•		•	•
Alternative Methods of Transportation Available in The Street.			•			•			•	
Sense Of Community Increase with Streetscape Elements.	•	•	•	•	•	•	•			•
<b>Economic Guidelines</b>										
Green Transportation.			•		•	•				
Reducing Infrastructure Costs.			•	•		•	•	•		
Less Property Damage due to Flooding.	•	•	•	•		•		•		
Using Environmentally Friendly Water Treatment Approaches.	•	•	•	•		•		•		

#### 4. CASE STUDY: STREET 9 IN MOKATTAM CITY

Mokattam City is located on top of the Mokattam mountain in the middle of Cairo governorate. It is divided into three main plateaus: the upper plateau, the middle plateau, and the lower plateau. The Mokattam neighborhood is characterized by calmness and relatively moderate temperatures in the summer season due to its height. Street 9 is the main street in the upper plateau of Mokattam city, and it starts from Al-Nafoura square and reaches the Asmarat neighborhood. The street is divided into a group of residential and commercial buildings; its length is about 7 km. The beginning of Street 9 at Al-Nafoura square, is characterized by mixed use activities including commercial and the presence of banks and small enterprises. Among the most important landmarks of Mokattam are Al-Nafoura square, Misr I. Club square, El-Mafariq square and monastery of Anba Semaan. Mokattam is distinguished for its easy access, as it is surrounded by Al-Nasr Road, Salah Salem Road, and the Ring Road, which makes accessibility the neighborhood very easy (Figure 4).



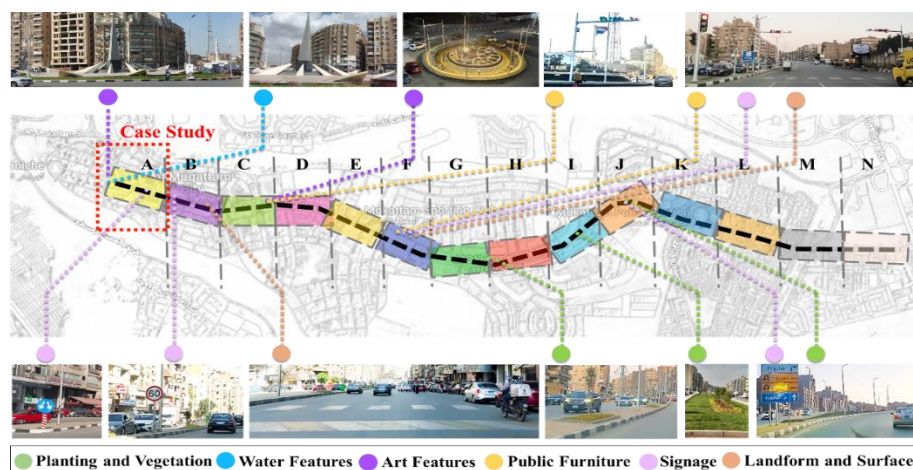
**Figure 4: Location of Street 9 in Mokattam City**

Source: Google Map 2023, annotated by the authors

## 5. RESULTS AND DISCUSSION

In order to facilitate the study of street 9, the researchers divided it into 14 relatively small sectors from A to N to use as units of data collection and analysis. The sizes of the sectors were identified during a pilot study and ranged about 0.5 km (walkable distance). The sizes were determined according to the variations in activities taking place due to the available streetscape elements.

The presented research goes through sector a ((Figure 5), where visual analysis and behavioral observation took place. The visual analysis of the street assisted in documenting the condition and status of the different streetscape elements that were found. The behavioral observation helped in identifying the patterns of use, users' preferences and the different attractive physical features. This study held in winter and the beginning of spring 2023.







**Figure 5: Samples Photos for the Streetscape Elements in Street 9 / Case Study Sector A**  
(Authors)

## 5.1 Documentation of Streetscape Elements in Sector A

The documentation took place by the researchers in the winter and spring of 2023. This tactic is used to rate the existing situation of the different streetscape elements in Street 9. The rating was done by the researchers by visiting the street sector A and recording the situation of the streetscape elements on a scale from 0 to 3; where 0 means very bad condition and 3 means excellent condition (Table 3 & 4). Based on the documentation of streetscape elements for street 9, it appears that most of the streetscape elements are available in this street sector, but some important streetscape elements, like the sitting areas and benches, are not available. From these tables, it appeared that a lot of streetscape elements are not in a good condition to assist in achieving the restorative guidelines.

Planting and vegetation are available in moderate condition in street trees and raised planting beds. While the ground cover in Al-Nafoura Square -which is located at the entrance of Street 9- is presented in excellent condition. Also, the water feature that acts as a landmark is available in excellent condition. The streetscape structure, services, and infrastructure of sector and are in very bad condition. In contrast, pavement, crossing pathways, and modern art statues are in excellent condition. Especially the art feature appears in a pleasant condition during both day and night. Edges, walls, and signage in sector and are found to be in moderate condition. While the site structure and public furniture are documented to be in very bad condition, for example, the researchers found that there are a lot of light bollards that do not work well at night, which affects the security and sense of safety for the citizens. Moreover, there is a lack of regular maintenance for most of the streetscape elements.

**Table 3: Visual Analysis for Natural Streetscape Elements of Sector A**  
(Authors)

	Photos		Situation
Planting and Vegetation	 Street Trees	 Raised Planting Beds	2
	 Ground Covers		3
Water Features	 Artificial Water Feature (Falling)		3



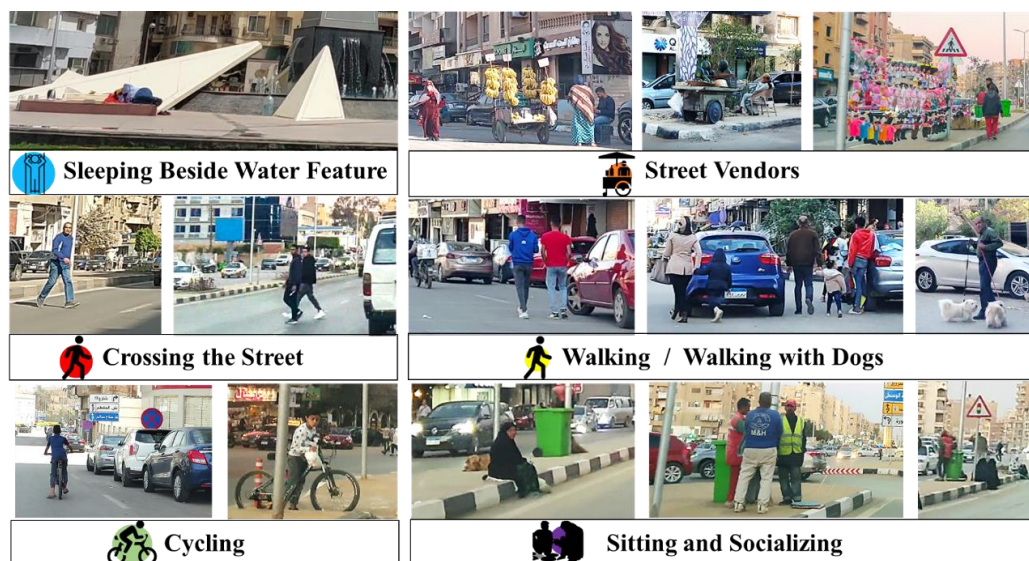
**Table 4: Visual Analysis for Man-made Streetscape Element of Sector A (Authors)**

	Photos		Situation
Landform and Surfaces		Pavement and Crossing Pathway	3
Edges and Walls		Buildings	2
Streetscape Structure		Vending Kiosks	0
Site Structures		Speed Bump	1
Public Furniture		Lighting Units	1
Services and Infrastructure		Water Drain	0
Signage		Advertising Structures and Advertisements	2
Art Features		Modern Art Statues	3

## 5.2 Behavioral Mapping

The behavioral observations were held during January and April 2023. To achieve more precision and dependability, the researchers concurrently recorded the street activities through sketches, photos, and documentation on maps. The researchers carefully observed the activities while walking along the observed sector. Photos for the street activities were taken (Figure 6), as well as notes for the streetscapes elements which enhance these activities.

First, a pilot study was conducted to choose the best time for the behavioral observation to locate the activities on maps. The observation took place through 7 days twice, one during the day from 11 AM till 1 PM and the other at night from 6 till 9 PM. The eight days were 3 weekdays, 3 weekends, and one national holiday (Eid Al-Fitr). The sector is crowded most of the day due to the presence of commercial activities and enterprises. It was observed that the users tended to sleep beside the water feature where they found elements that encourage them to sit or sleep. Pedestrians walking are highly noticed, as well as people walking with their pets to enjoy the fresh air. But the weakness points that the researchers found in this sector, that there are no special paths for the cyclist to ride safely away from the cars or vehicles. Moreover, more elements needed to encourage more users to sit, rest and socialize.



**Figure 6: Samples Photos for the Street's Activities & Behaviors in Sector A**  
(Authors)

Figure 7 shows an example for the behavioral map for Sector A during the day. Through these seven days, the researchers started to document the activities that occurs by the assistance of the streetscape elements in sector A. It was observed that most of the activities occurs are riding cars or vehicles, walking and crossing the streets. As a result, to analyze how the restorative streetscape guidelines work in the case study checking the relationship between main elements of restorative streetscape and the guidelines for restorative streetscape through the proposed table of relationship was conducted.



**Figure 7: Street's Activities & Behaviors Map in Sector a of Street 9 during day from 11 AM till 1AM**

Source: Google Map 2023, annotated by the researcher

The researchers, during their observation, started to rate the effect of the rule on each streetscape element that acts to achieve the guidelines for restorative streetscape in each sector on a scale from 0 to 3 (strong = 3, moderate = 2, weak = 1, not applicable = 0), then recording the achieved percentage in each group. Table 5 and

Table 6 show the concluded percentage of the relationship between the main elements of restorative streetscape and the guidelines for restorative streetscape for each group. The recorded percentage that was achieved in each group in sector A is 58% for the urban guidelines, 52% for the environmental guidelines, 40% for the social guidelines, and 18 % for the economic guidelines.

From the two tables, the researchers observed that there are gaps in planting and vegetation, water features, and site structure that can encourage activities for adults and kids. Planting and vegetation in this sector can't act as landmarks. Moreover, there are no water management solutions available to improve the environmental guidelines for restorative streetscapes in Sector A. In addition to the absence of elements that can improve the water's qualities, despite the importance of social gathering in outdoor spaces to improve health and reduce stress, there is a lack of restorative elements in urban public spaces that encourage social gathering. There are a limited number of alternative methods of transportation available on the street, which affects the physical activities that are practiced on this street.

On this street, there are neither natural nor man-made restorative streetscape elements that can improve green transportation, despite its importance nowadays. The restorative streetscape elements that can decrease property damage due to floods also showed weak existence. Planting, vegetation, landform, surfaces, edges, walls, and site structure do not act as tools that use environmentally friendly water treatment approaches for this sector in Street 9. But the water feature of this sector acts as an environmentally responsible treatment.



**Table 5: Relationship between Main Elements of Restorative Streetscape and the Urban and Environmental Guidelines of Restorative Streetscape in Sector A of Street 9**

(Authors)

Main Elements of Restorative Streetscape	Natural		Man-Made								Calculations
	Planting and Vegetation	Water Features	Landform and Surfaces	Edges and Walls	Streetscape Structure	Site Structures	Public Furniture	Services and Infrastructure	Signage	Art Features	
Guidelines of Restorative Streetscape											
Urban Guidelines											156
Urban Guidelines in Sector A of Street 9 = 58 %											90
Streetscape Elements Provide a Pleasant, Relax, and Restorative Environment.	• 1	• 2	• 2	• 2	• 1	• 1	• 2	• 2		• 3	27 16
Comfort and Safety for Streets.	• 1	• 2	• 2	• 2	• 1	• 1	• 1	• 2	• 3	• 3	30 18
Encouraging Activities for Adults and Kids.	• 0	• 0	• 1	• 1	• 1	• 0	• 1			• 2	24 6
Locate the Streets by making Landmarks.	• 0	• 3					• 3			• 3	12 9
Using Natural Materials in Pathways Flooring and Edges.	• 2	• 1	• 2	• 1							12 6
Applying Visual Continuity.	• 2	• 3	• 1	• 1		• 1	• 1			• 3	21 12
Maintaining Regular Maintenance.	• 2	• 3	• 2	• 2	• 2	• 2	• 2	• 2	• 3	• 3	30 23
Emphasizing the Historical Context through the Design (If exist).			•	•	•	•	•		•	•	27
			Not exist						Not exist		
Environmental Guidelines											63
Environmental Guidelines in Sector A of Street 9 = 52%											33
The Presence of Green Spaces.	• 2										3 2
Expanded Access to Water Features.		• 3									3 3
Familiar Material.	• 3	• 3	• 2	• 2		• 2	• 2			• 3	21 17
Colourful Plantation.	• 2										3 2
Finding Water Management Solutions.		• 2	• 0			• 0		• 0			12 2
Improve Water Qualities.		• 0	• 0								6 0
Reduce Urban Heat Island Effect.	• 1	• 2	• 1	• 2		• 1					15 7

**Table 6: Relationship between Main Elements of Restorative Streetscape and the Social and Economic Guidelines of Restorative Streetscape in Sector A of Street 9**

(Authors)

Main Elements of Restorative Streetscape	Natural		Man-Made							Calculations	
	Planting and Vegetation	Water Features	Landform and Surfaces	Edges and Walls	Streetscape Structure	Site Structures	Public Furniture	Services and Infrastructure	Signage		Art Features
Guidelines of Restorative Streetscape											
Social Guidelines											84
Social Guidelines in Sector A of Street 9 = 40%											34
Urban Public Spaces Encourage People for Social Gathering.	•	•	•	•	•	•	•				21
	0	0	1	0	1	1	2				5
Natural Streetscape Elements Enhance one or more of the Five Senses.	•	•								•	9
	1	2								2	5
The Presences of Safe Streets for Pedestrians and Calm Traffic.			•	•	•	•	•		•	•	21
			1	1	1	1	1		3	2	10
Alternative Methods of Transportation Available in The Street.			•			•			•		9
			0			0			0		0
Sense Of Community Increase with Streetscape Elements.	•	•	•	•	•	•	•			•	24
	1	2	2	1	1	2	2			3	14
Economic Guidelines											60
Economic Guidelines in Sector A of Street 9 = 18%											11
Green Transportation.			•		•	•					9
			0		0	0					0
Reducing Infrastructure Costs.			•	•		•	•	•			15
			1	1		1	1	1			5
Less Property Damage due to Flooding.	•	•	•	•		•		•			18
	1	1	0	0		0		2			4
Using Environmentally Friendly Water Treatment Approaches.	•	•	•	•		•		•			18
	0	2	0	0		0		0			2

From the previous results the research answered question two: “How do the restorative streetscape guidelines work in Cairo streets?” Since the main objective of this research is to explain the elements that help achieving the restorative environment through the main design guidelines, the researcher draws on their documentation and observation of sector A in street 9 in Mokattam city. They determined the weak points that need improvement on this street, then put the solutions for improvement towards a restorative streetscape.

To clarify the suggested solutions for improvement, Figure 8 shows the entrance to Street 9 and how the researchers put a proposal for its improvement with the help of the restorative

streetscape guidelines. In the proposal, the researcher increased the natural streetscape elements because it was in a very bad condition with no street trees. And then the researchers added two paths, one for pedestrians and the other for riding bicycles or scooters, to increase physical activities for adults and kids. Moreover, it offers alternative methods of transportation on the street. Then the crossing pathway with the traffic signals gives a sense of safety for the users during their crossing of the street. Light bollards to identify those two paths at night were added to increase the sense of safety for the users during day and night.



**Figure 8: Proposal for Street's Activities & Behaviors in the Entrance of Street 9**  
(Authors)

## 6. CONCLUSION

The presented research aims to better understand the elements that help achieving restorative streetscape design guidelines. This will help architects, landscape architects, and planners design restorative streets by discovering the weaknesses in each case that they need to work on. Therefore, this research summarizes the main benefits of Restorative Street landscaping for citizens and stress recovery users in cities from previous literature. Then it followed a qualitative approach adopting multiple data gathering techniques. It started by studying main restorative streetscape elements through critical literature review. Correspondingly, it

classified the main guidelines for applying restorative streetscape in cities. Accordingly, it identifies the interrelationship between the elements and guidelines in terms of achieving a successful restorative healthy streetscape design.

A case study in Cairo is selected to show how the restorative streetscape guidelines work in streets of Cairo. The case study was a main street in Mokattam city, where streetscape features were documented and street activities behaviors was mapped out. The results show that there is a lack in presence of restorative streetscape elements which is required to improve citizens' health. Finally, the authors propose that if the restorative streetscape is applied in urban environments, it would increase the sensory experience of users, resulting in stress reduction and enhances people daily life. Moreover, the study found that streetscape elements play an important role in encouraging street activities and consequently it could encourage restorative behaviors.

The limitation of this study is that this research took place in two seasons only (winter and spring) it needs deeper investigation in autumn and summer as well. The research proposes future research directions for further validation of the current study, namely; quantitative investigation for the relationship between the design elements and restorative streetscape design guideline. That's to investigate the correlation and importance of each element in achieving the identified guidelines. In addition to, investigate the relationship between achieving restorative streetscape and urban quality of life to identify more aspects for healthy urban life.

## Declarations

### Availability of data and material

All data generated or analyzed during this study are included in this published article.

### Competing interests

The authors declare that there is no a known competing financial interest or personal relationships that could have appeared to influence the work reported in this paper.

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